Numbers in the billions

Remember!
Zero (0) holds a place e.g. 120 825 305 012.
Extra zeros in front of whole numbers are not necessary, e.g. write 107 670 233, not 0 107 670 233.
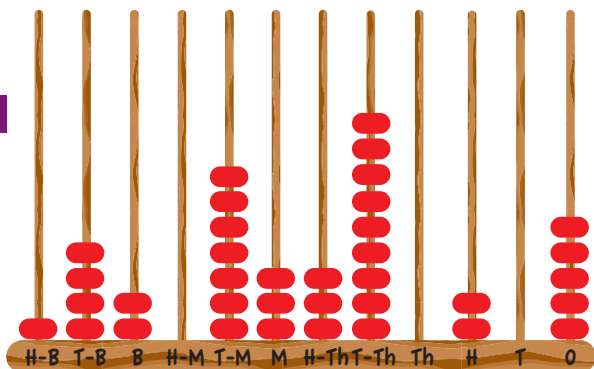There is a space between the billions and millions, millions and thousands, and thousands and ones when the number is written correctly, e.g. 5 395 012 305 695 054.
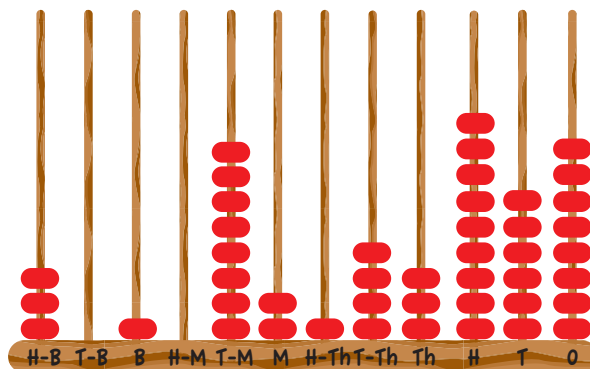
1 Write the number represented by the beads on each abacus.

H-B T-B B H-M T-M M H-ThT-Th Th H T O

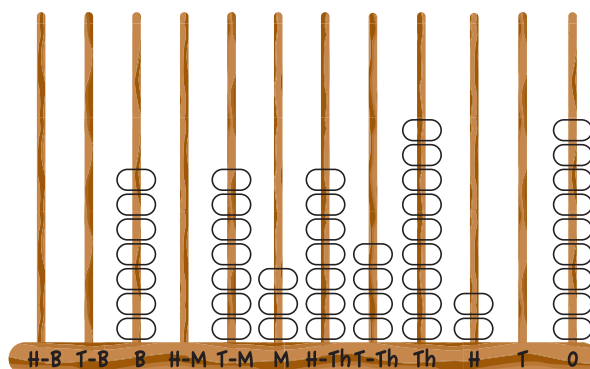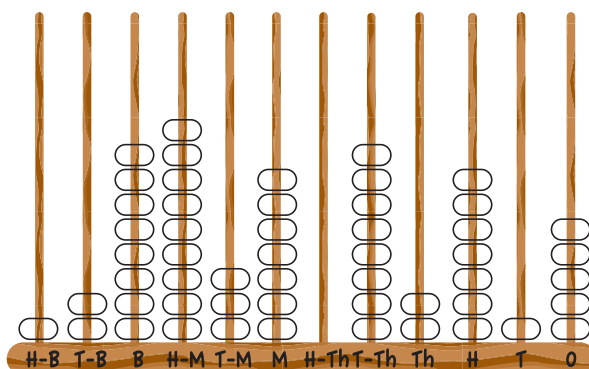**a** _142 073 390 205_   **b** _301 082 143 968_

2 Read the two numbers shown in Questions 1a and 1b to a classmate.

3 Draw beads on each empty abacus to represent the numbers.

a 128 937 082 715   **b** 7 073 749 209

Number and Place Value   **1**

MiB 3 Cards 7 & 20

Placing value in the billions

1 Find a 250 mL measuring cup and a packet of dried peas or lentils. *Students' answers will vary.*

a Count out 100 of the dried peas and place them into the measuring cup.

What is the volume of the peas? _____ cup

b Use this value to calculate the volume in mL of:
 i 1000 dried peas _____ **ii** 10 000 dried peas _____
 iii 100 000 dried peas _____ **iv** 1 000 000 dried peas _____

c **i** What is the volume in mL of 1 billion dried peas?

_____

_____

 ii How many 2 L bottles of soft drink is this equivalent to?

_____

> Is there only one type of billion? Is the billion we use in Australia the same as in the United States or Europe?

2 Draw a line through each of the zeros that are *not* necessary in these whole numbers.

a ~~00~~1 725 712 908 **b** ~~0~~8 627 008 054 **c** 851 007 657 410

d ~~0~~81 713 921 **e** 951 052 035 **f** ~~0~~54 218 024

3 Write each number using the correct spacing.

a 51896 _51 896_ **b** 7458 251 _7 458 251_

c 42 382 17 2 _42 382 172_ **d** 842 1584 1251 _84 215 841 251_

e 8416 1854 6025 _841 618 546 025_ **f** 841 21547 215 _84 121 547 215_

4 Use the internet or another source of information to estimate how many stars are in our galaxy, the Milky Way, and how many people live on Earth.

There are ____ _100 billion_ ____ stars

in our galaxy. The population of the world

is ____ _7 billion_ ____.

> Could you find an exact answer? Why is it only possible to give an estimate?

MiB 3 Card 13

2 Number and Place Value

Batty about billions

1 Write the numerals for each of these numbers.

a five billion, two hundred thousand _____ _5000 200 000_

b two hundred billion, one hundred and twelve million, sixty-four thousand and three _____ _200 112 064 003_

c one hundred and twenty-one billion, six hundred and eighty million, seventy-two thousand, three hundred and ninety-eight

_____ _121 680 072 398_

2 Write each number in words.

a 1 528 223 _____ _one million, five hundred and twenty eight thousand, two hundred and twenty three_

b 8 156 230 510 _____ _eight billion, one hundred and fifty six million, two hundred and thirty thousand, five hundred and ten_

c 830 000 820 001 _____ _eight hundred and thirty billion, eight hundred and twenty thousand and one_

3 Rewrite each set of numbers from smallest to largest.

a 152 181 514, 152 918 156, 152 946 842, 152 435 514
_152 181 514, 152 435 514, 152 918 156, 152 946 842_

b 18 515 351 512, 18 513 465 292, 18 515 354 841, 18 516 542 715
_18 513 465 292, 18 515 351 512, 18 515 354 841, 18 516 542 715_

c 3 604 512 155, 3 608 156 185, 3 604 218 816, 3 608 812 186
_3 604 218 816, 3 604 512 155, 3 608 156 185 , 3 608 812 186_

4 Match the place value of the numeral in bold by drawing a line to its equivalent in words.

152 **2**16	9 ten millions
135 024	4 billions
1 1**5**7 197	3 thousands
6 051 941	9 hundred billions
95 026 1**6**0	2 hundreds
15 41**3** 914	6 tens
991 034 094	5 ten thousands
1 6**9**1 164 065	9 hundred millions
9**4** 164 045 056	6 millions
981 065 035 846	1 hundred thousand

MiB 3
Cards
6 & 9

Number and Place Value   **3**

Number abbreviations

BUSINESS FOR SALE
$1.5m

FOR SALE
4 bdrm house $490K

TOTAL STOCK IN COMPANY
worth $100 bill

TWO COLTS SOLD AT YEARLING SALES
for $7.68m

COMPANY POSTS FIRST HALF PROFIT
of $695m

PICASSO'S 'SYLVETTE'
sells for record $6.9m

AUSTRALIA'S RICHEST MAN
worth $5.5b

WORLD'S RICHEST MAN
worth $56b

ONLINE MUSIC STORE SALES TOP 5B SONGS

SECRETARY NEEDED. Local business, part-time. $35K p.a.

1 In this table, write the numbers shown in each newspaper clipping in the left-hand column and write the full numeral in the right-hand column. The first one has been done for you.

Abbreviation	Full numeral	Abbreviation	Full numeral
$1.5m	$1 500 000	$6.9m	$6 900 000
$490K	$490 000	$5.5b	$5 500 000 000
$100 bill	$100 000 000 000	$56b	$56 000 000 000
$7.68m	$7 680 000	5B	5 000 000 000
$695m	$695 000 000	$35K	$35 000

2 Write each of the following numbers in a shorter form.

a $12 000 000 000 $12b

b $45 000 $45K

c $500 000 000 $500m

d $690 000 $690K

e $7 800 000 $7.8m

f $ 9 900 000 000 $9.9b

3 **Investigate:** When working with computers and other digital equipment such as cameras and mp3 players, we use the abbreviations MB, GB and TB.

a What do these abbreviations stand for?

MB - Megabyte. GB - Gigabyte. TB - Terabyte

b What size numbers do these symbols refer to?

Mega - million (1 000 000). Giga - billion (1 000 000 000).

Tera - thousand billion or 'trillion' (1 000 000 000 000)

4 ## Number and Place Value

Addition of numbers to 5 digits

1 Use mental strategies to complete each of the following additions.

a 47 + 73 = _120_   **b** 68 + 83 = _151_

c 28 + 34 = _62_   **d** 31 + 99 = _130_

e 56 + 84 = _140_   **f** 325 + 472 = _797_

g 905 + 358 = _1263_   **h** 655 + 549 = _1204_

i 729 + 623 = _1352_   **j** 263 + 913 = _1176_

> **Remember!**
> There are many ways that you can mentally add numbers together. Try:
> • splitting the numbers into their place values
> • rearranging the numbers to form groups of 10
> • rounding the numbers to the nearest 10 or 100.

2 Explain the mental strategy you used for Question 1h.

Students' answers will vary.

3 Compare your answer to Question 2 with your classmates'. Explain a different mental strategy that can be used to answer Question 1h.

Students' answers will vary.

4 Calculate the answers to each of the following number sentences using the empty number line that is provided. *Students' answers will vary.*

a 8698 + 4175 = _12 873_

b 6494 + 4942 = _11 436_

c 20 970 + 95 264 = _116 234_

5 A football club recorded the following details of how many people attended games in a season.

a How many people attended the team's games altogether?

79 424

b Estimate the numbers of people for 2011 based on the figures in the table. Explain why you have given this estimate.

Students' answers will vary.

Year	People
2007	18 787
2008	17 673
2009	18 673
2010	11 475
2011	12 816

MiB 3
Card 25

Number and Place Value   **5**

Addition of larger numbers

1 Find the sum of the following number sentences using a mental strategy.

a 740 + 390 = ___1130___

b 450 + 590 = ___1040___

c 8090 + 2800 = ___10 890___

d 1640 + 3700 = ___5340___

e 7700 + 4650 = ___12 350___

f 8500 + 1580 = ___10 080___

2 Barry wore a pedometer to count the number of steps he took each day. He recorded these in a notebook, which is shown below.

4

a What was the total number of steps that Barry took in this week?

___67 958___

b Put the days in order, from the day with the smallest number of steps to the day with the largest number of steps.

___Sunday, Saturday, Wednesday, Friday,___

___Tuesday, Monday, Thursday___

c Suggest a reason why the number of steps taken on Sunday is far fewer than on the other days.

___Students' answers will vary.___

d Compare your answer for Question 2c with a classmate. What other reasons could explain why Barry took fewer steps on Sunday?

___Students' answers will vary.___

Week 3

Monday	11 520
Tuesday	10 871
Wednesday	9982
Thursday	12 673
Friday	10 406
Saturday	8327
Sunday	4179

3 Find the total.

a
```
   5 3 0 1
 + 2 3 5 4
   7 6 5 5
```

b
```
   8 0 6 7
 + 9 5 5 7
  17 6 2 4
```

c
```
   8 0 3 8
 + 8 3 5 2
  16 3 9 0
```

d
```
   4 7 4 7
 + 8 2 7 6
  13 0 2 3
```

e
```
   89 0 6 8
 + 94 0 7 2
  183 1 4 0
```

f
```
   79 5 8 7
 + 76 8 0 6
  156 3 9 3
```

g
```
   34 4 7 4
 + 41 8 3 8
   76 3 1 2
```

h
```
   29 2 0 5
 + 34 1 8 9
   63 3 9 4
```

6 **Number and Place Value**

Focus on addition

1 Using an appropriate mental strategy, calculate the total for each addition.

a $536 + 802$ = __1338__   **b** $254 + 326$ = __580__

c $546 + 781$ = __1327__   **d** $864 + 765$ = __1629__

e $4711 + 4425$ = __9136__   **f** $4818 + 8490$ = __13 308__

g $5073 + 9938$ = __15 011__   **h** $8136 + 2861$ = __10 997__

2 Find the sum.

a
```
   4 0 9 4
 + 5 6 3 6
   9 7 3 0
```

b
```
   9 2 6 4
 + 7 3 1 3
  16 5 7 7
```

c
```
   1 8 5 6
   3 7 7 2
 + 7 7 3 4
  13 3 6 2
```

d
```
   5 9 3 7
   9 9 3 7
 + 4 3 0 3
  20 1 7 7
```

e
```
   7 5 4 7 2
 + 1 5 7 6 6
   9 1 2 3 8
```

f
```
   6 2 0 8 4
 + 5 9 7 8 3
  12 1 8 6 7
```

g
```
   9 0 5 0 8
 + 5 4 6 4 4
  14 5 1 5 2
```

h
```
   3 1 6 9 9
   2 0 6 9 1
 + 5 7 7 2 1
  11 0 1 1 1
```

3 The V8 Supercars are often moved by plane in 'stacks' as shown in the picture. The masses of the 'stacks' that were moved by this aircraft were 3518 kg, 3307 kg, 3213 kg, 3290 kg, 2272 kg and 3290 kg.

What was the total mass of V8 Supercars on this aircraft? Show your working.

18 890kg

How many V8 Supercar teams are there? How many cars does each team have? How many 'stacks' would be needed for all these V8 Supercars? What would their combined mass be?

Subtracting numbers

1 Using appropriate mental strategies, solve the following.

a 75 − 39 = __36__ **b** 42 − 16 = __26__ **c** 65 − 34 = __31__

d 42 − 27 = __15__ **e** 840 − 803 = __37__ **f** 443 − 116 = __327__

g 859 − 139 = __720__ **h** 588 − 508 = __80__ **i** 444 − 415 = __29__

2 Solve each of the following subtractions using the empty number line to help.

a 8452 − 3541 = __4911__

b 6470 − 4328 = __2142__

c 3548 − 2449 = __1099__

3 Felicity's USB drive can hold 2834 picture files. She has recently loaded 1709 files onto her empty USB drive. How many more can she add before it is full?

__1125__

4 Complete the following subtractions by filling in the blanks.

a
```
    8 9 3
  − 4 2 7
  ───────
    4 6 6
```

b
```
    6 2 3
  − 4 0 5
  ───────
    2 1 8
```

c
```
    8 5 1
  − 3 4 7
  ───────
    5 0 4
```

d
```
    9 5 9
  − 5 2 2
  ───────
    4 3 7
```

5 A subtraction question has been worked out below. Explain what has been done incorrectly and find the correct solution to the question.

$$
\begin{array}{r}
{}^{7}8{}^{1}4\ 042 \\
-\ 59\ 090 \\
\hline
25\ 052
\end{array}
$$

24 952

The 4 should have taken a 1 from the zero to the left before subtracting the 9.

Use the internet or other information sources to find out the data storage capacity of different devices, such as a DVD, CD-ROM, mp3 player, mobile phone or SD card. Approximately how many photographs can you fit on each of these devices? What will this depend upon?

8 Number and Place Value

Subtraction of larger numbers

1 Use a mental strategy to find the difference between the following numbers.

a 910 − 130 = _780_   **b** 720 − 120 = _600_   **c** 4300 − 3000 = _1300_

d 9500 − 8100 = _1400_   **e** 8500 − 7200 = _1300_   **f** 5100 − 4200 = _900_

g 9500 − 7700 = _1800_   **h** 9800 − 5800 = _4000_   **i** 3900 − 2700 = _1200_

2 Calculate the answer to each subtraction.

a
```
  6 8 9 4
− 4 6 0 5
  2 2 8 9
```

b
```
  7 6 4 1
− 5 2 5 5
  2 3 8 6
```

c
```
  4 2 3 8
− 3 1 2 6
  1 1 1 2
```

d
```
  7 6 8 1
− 6 6 3 5
  1 0 4 6
```

e
```
  9 6 2 6 5
− 3 1 5 8 4
  6 4 6 8 1
```

f
```
  8 8 5 0 2
− 4 6 9 4 0
  4 1 5 6 2
```

g
```
  5 9 4 0 2
− 5 8 5 1 8
      8 8 4
```

h
```
  8 1 4 6 0
− 6 2 4 5 4
  1 9 0 0 6
```

3 Write 5 subtraction sentences or algorithms that all have an answer of 1382.

Students' answers will vary.

4 Lin has $7846 in her bank account. If she purchases a car for $5999, how much money remains in her account?

$1847

5 **Investigate:** Write down two 4-digit numbers. Find the difference when the larger number is subtracted from the smaller number. Repeat this using other 4-digit numbers. What happens when you subtract a larger number from a smaller one?

The answer is a 'negative number', that is, it is less than zero

MiB 3 Cards 15 and 16

Number and Place Value   9

What is the difference?

Remember!
It's important to estimate the answer before you subtract. This way you can tell if your answer is reasonable. Estimate by:
- rounding the numbers first, using only the 2nd or 3rd highest place values
- splitting the number into its place values
- subtracting each place value to find the estimate.

1 **a** Estimate the answers to these subtractions. Write your estimates in the table.

b Use a calculator to check your estimates.

	Subtractions	Estimate	Calculator answer
i	9026 − 4924 =	*Students' answers will vary.*	4 102
ii	92 399 − 53 399 =		39 000
iii	817 719 − 694 013 =		123 706
iv	6 956 243 − 4 868 971 =		2 087 272

2 Describe to a classmate the mental strategy that you used to estimate Question 1b iv. Write down this strategy.

Students' answers will vary.

3 Find the answers to the following questions. Show your working in the space provided.

a A pool holds 17 562 L of water. If 12 866 L has already been put into the pool, how much water still needs to be added?

4696L

b A large truck can carry 60 000 kg of freight. If 32 642 kg has been loaded onto the truck, how much more can be put onto this truck?

27 358kg

c The Melbourne Cricket Ground can hold up to 100 000 people. At a recent cricket game the crowd totalled 72 582. How many more people could have been admitted?

27 418 people

10 Number and Place Value

Subtraction strategies

1 Complete each subtraction using the most appropriate strategy.

a $8049 - 2878 = $ _____5171_____   **b** $9942 - 8415 = $ _____1527_____

c $8460 - 5122 = $ _____3338_____   **d** $9542 - 2062 = $ _____7480_____

e $4918 - 1481 = $ _____3437_____   **f** $4712 - 3740 = $ _____972_____

2 What strategy did you use to answer Question 1c? Why did you choose this strategy?

_____*Students' answers will vary.*_____

_____

_____

3 Compare your answer to Question 2 with your classmates'. Describe a different strategy that can be used to work out the answer to Question 1c.

_____*Students' answers will vary.*_____

_____

_____

_____

4 Complete the following subtractions and then check your answer by completing the inverse operation on a separate piece of paper.

Remember!
The inverse operation to subtraction is addition.

For example:
$$\begin{array}{r} 65\ 730 \\ -\ 25\ 620 \\ \hline 40\ 110 \end{array} \qquad \begin{array}{r} 40\ 110 \\ +\ 25\ 620 \\ \hline 65\ 730 \end{array}$$

a
$$\begin{array}{r} 62\ 951 \\ -\ 58\ 946 \\ \hline 4\ 005 \end{array}$$

b
$$\begin{array}{r} 69\ 056 \\ -\ 44\ 514 \\ \hline 24\ 542 \end{array}$$

c
$$\begin{array}{r} 58\ 140 \\ -\ 25\ 654 \\ \hline 32\ 486 \end{array}$$

d
$$\begin{array}{r} 87\ 003 \\ -\ 22\ 150 \\ \hline 64\ 853 \end{array}$$

e
$$\begin{array}{r} 37\ 337 \\ -\ 16\ 838 \\ \hline 20\ 499 \end{array}$$

f
$$\begin{array}{r} 99\ 286 \\ -\ 49\ 780 \\ \hline 49\ 506 \end{array}$$

5 The Australian wheat industry usually produces around 25 000 kilotonnes of wheat each year. However, because of the drought, only 9800 kilotonnes were produced in 2008. What is the difference between these amounts?

15 200 kilotonnes

Addition and subtraction

1 Use a mental strategy to calculate the answer to each question.

a 522 + 57 = _579_ **b** 756 − 70 = _686_

c 8487 + 884 = _9371_ **d** 6431 − 260 = _6171_

e 84 320 + 7095 = _91 415_ **f** 48 077 − 8422 = _39 655_

2 Find the answers.

a
```
  3 7 8 9
+   6 7 6
  4 4 6 5
```

b
```
  3 0 5 8 7
+   9 2 8 3
  3 9 8 7 0
```

c
```
  6 7 4 5
−   9 9 9
  5 7 4 6
```

d
```
  2 2 7 5 6
−   1 1 5 2
  2 1 6 0 4
```

3 The electricity meter is read at John's house in January, March, June and September. The latest readings are shown in the table.

Month	Electricity reading (kilowatt hours)
January	29 756
March	31 542
June	33 217
September	34 826
January	36 563
March	38 517

a How many kilowatt hours did John's family use between March and June?

1675 kilowatt hours

b How much electricity did they use over the warmer months (September to March)?

3691 kilowatt hours

c How much electricity did they use in the 12 months, from January to January?

6807 kilowatt hours

d In which 3-month period did they use the least electricity?

June to September (1609 kilowatt hours)

What can you do to save electricity during winter or during summer?

12 Number and Place Value

Sum or difference?

1 Read each of the following worded problems and draw lines to match each of them to the correct working.

a Kenji planted 50 341 carrot seeds in his garden. He harvested 4654 carrots. How many seeds failed to grow?

$$\begin{array}{r} 50\ 341 \\ +\ \ \ 4\ 654 \\ \hline 54\ 995 \end{array}$$

b Samantha swims to keep fit. Over the years she has swum 50 341 laps. If she swims another 4654 laps this year, how many will she have swum altogether?

$$\begin{array}{r} 54\ 995 \\ -\ \ \ 4\ 654 \\ \hline 50\ 341 \end{array}$$

c Avani is learning to drive and has logged 4654 minutes driving time. If she spends another 45 687 minutes driving, how many minutes altogether will she have logged?

$$\begin{array}{r} 45\ 687 \\ +\ \ \ 4\ 654 \\ \hline 50\ 341 \end{array}$$

d Michelle is paid $54 995 for a year's work. If it costs her $4654 a year to catch the train to work, how much does she have left?

$$\begin{array}{r} 50\ 341 \\ -\ \ \ 4\ 654 \\ \hline 45\ 687 \end{array}$$

2 A national community association wants to sell 400 000 badges in order to raise money for much needed equipment and research. In the first week of the campaign, they sell 84 702 badges.

a At the end of the first week, how many badges still need to be sold?

315 298 badges

b If the group continues to sell the same number of badges each week, how long will it take them to sell all 400 000?

They will sell the final badge in the 5th week.

Use the internet to try to find out how many badges were sold across Australia during Legacy Week? How many Australians did not buy a Legacy badge?

Number and Place Value | **13**

1

6

a An aircraft arrives in Sydney with 13 267 kg of fuel on board It is re-fuelled so that it contains 89 752 kg of fuel in its tanks and departs for Hong Kong. How much fuel was loaded in Sydney?

_76 485kg_

b The plane arrives in Hong Kong with 15 423 kg of fuel remaining. How much fuel was used on the flight to Hong Kong?

_74 329kg_

c The plane is re-fuelled again with 69 791 kg of fuel loaded into it. The plane then returns to Sydney, arriving with 12 893 kg in its tanks. How much fuel was used on the return trip to Sydney?

_72 321kg_

2 Dalia is a hairdresser who wishes to work from home. She lists the costs of starting her own hairdressing business.

Item	Cost
Equipment (e.g. furniture and appliances)	$6280
Consumables (e.g. shampoo, gel and colour dyes)	$2150
Hair-care products (to sell to customers)	$890
Advertising and printing	$545
Monthly operating costs (e.g. phone, extra consumables and electricity)	$362

a How much money will Dalia need to start her own hairdressing business?

_$10 227_

b If Dalia makes $792 profit in her first month, estimate how long it will take her to pay for the items she bought when starting her business.

13 months

Mental multiplication

1 Complete the following multiplications using appropriate mental strategies.

Hint: You can work out 48 × 7 by adding 40 × 7 to 8 × 7.

a 48 × 7 = _336_ **b** 41 × 5 = _205_ **c** 55 × 4 = _220_

d 63 × 9 = _567_ **e** 40 × 7 = _280_ **f** 36 × 6 = _216_

g 80 × 10 = _800_ **h** 73 × 2 = _146_ **i** 89 × 5 = _445_

7

2 Round the numbers in the following questions and use them to help you estimate the answer. The first one has been done for you.

Question	Rounding	Estimate
a 21 × 79 =	20 × 80	1600
b 31 × 47 =	30×50	1500
c 48 × 11 =	50×10	500
d 33 × 31 =	30×30	900
e 94 × 19 =	90×20	1800
f 63 × 50 =	60×50	3000
g 89 × 68 =	90×70	6300

3 Each picture taken on Seth's digital camera is approximately 3 MB in size. This weekend he took 187 photographs.

a Would these photos all fit on a CD that holds 600 MB?

Yes

b How much space would be left on the CD?

_39MB_

c How many extra photos could Seth burn onto this same CD?

_13_

Are all digital camera files the same size? Try using different settings on a digital camera. What changes affect the size of the photo file?

1-digit multiplication

The split method of multiplication
Multiply each place value separately, starting with the largest, then add the parts to give the total answer.

```
    4 2 3
×       5
2 0 0 0   5 × 400
  1 0 0   5 × 20
     1 5  5 × 3
2 1 1 5   Add these for the final answer
```

1 Complete the following multiplication tables grid.

×	2	3	4	7	8	10
3	6	9	12	21	24	30
5	10	15	20	35	40	50
7	14	21	28	49	56	70

2 Complete the following multiplications.

a
```
    8 9 3
×       7
  6 2 5 1
```

b
```
    3 9 0
×       6
  2 3 4 0
```

c
```
    4 4 8
×       9
  4 0 3 2
```

d
```
    9 8 2
×       4
  3 9 2 8
```

e
```
    5 8 4
×       6
  3 5 0 4
```

f
```
    1 3 5
×       7
    9 4 5
```

g
```
    7 6 4
×       8
  6 1 1 2
```

h
```
    4 9 3
×       5
  2 4 6 5
```

3 Anton's shopping basket has 9 cans of fruit salad. Each can has a mass of 440 g. What is the total mass of the cans in Anton's shopping basket?

3960g

2-digit multiplication

68 × 45 is really 68 × 5 plus 68 × 40

```
    ⁴6  8              ³6  8                  3  4  0
×       5         ×        4  0      +   ¹2  7  2  0
    3   4  0          2  7  2  0          3  0  6  0
```

Below is a short-hand way of recording your work.

```
       ³,⁴6  8
×             4  5
       3   4  0
     ¹2  7   2  0
     3   0   6  0
```

1

a
```
      9  2
×     2  8
   2 5 7 6
```

b
```
      5  5
×     7  3
   4 0 1 5
```

c
```
      7  2
×     8  4
   6 0 4 8
```

d
```
      9  9
×     3  6
   3 5 6 4
```

e
```
      4  4
×     1  6
     7 0 4
```

f
```
      5  9
×     2  9
   1 7 1 1
```

g
```
      1  8
×     3  7
     6 6 6
```

h
```
      6  2
×     6  3
   3 9 0 6
```

2 Max's dad is a used car salesman. Last week he sold 13 cars for $5990 each, 15 cars for $8490 each and 19 cars for $3850 each. What was the total value of the cars that Max's dad sold?

$278 370

Division by 2, 5 and 10

1 Draw a picture to help you explain what 25 ÷ 4 means.

Students' answers will vary.

_____

_____

_____

_____

2 Write the following using numerals and mathematical symbols.

a seventy-two divided by two ___ $72 \div 2$ ___

b four thousand, nine hundred and eighty divided by one hundred

___ $4980 \div 100$ ___

c eleven thousand, three hundred and ten divided by four hundred and twenty ___ $11310 \div 420$ ___

3 Write each of these mathematical statements in words.

a 84 ÷ 10 ___ *eighty four divided by ten* ___

b 827 ÷ 18 ___ *eight hundred and twenty seven divided by eighteen* ___

Use the numbers displayed in the box to help answer Questions 4 and 5.

881 781	99	1825	48	153	1969	124
5913	1855	949	60	126 635 960		
11 310	2350	9 146	270	84	83	865	130 327

4 a Place a blue box around the numbers that can be divided evenly by 5.

b What do all of these numbers have in common?

They end in 5 or 0

5 a Place a black triangle around the numbers that can be divided evenly by 10.

b What do all these numbers have in common?

They end in 0

c Are all the numbers that can be divided evenly by 10 also able to be divided evenly by 5? Explain why or why not.

Yes, because 10 can also be divided evenly by 5

_____

Division notation

1 Fill in the blanks in the following division statements.

a $97 \div 5$ or $5\overline{)97}$

b $18 \div 3$ or $3\overline{)18}$

c $77 \div 10$ or $10\overline{)77}$

d $53 \div 11$ or $11\overline{)53}$

Division can be represented as a mathematical statement in 3 different ways.

For example:
'Divide 524 into 4 equal groups' can be written as:

$524 \div 4$ or $4\overline{)524}$ or $\dfrac{524}{4}$.

2 Complete the following divisions.

a $12 \div 4 = \underline{\quad 3 \quad}$

b $22 \div 11 = \underline{\quad 2 \quad}$

c $14 \div 7 = \underline{\quad 2 \quad}$

d $50 \div 10 = \underline{\quad 5 \quad}$

e $12\overline{)84} = \underline{\quad 7 \quad}$

f $3\overline{)76} = \underline{\quad 25.33 \quad}$

g $6\overline{)59} = \underline{\quad 9.83 \quad}$

h $5\overline{)73} = \underline{\quad 14.6 \quad}$

3 A group of 9 people went out for dinner to a restaurant and decided to split the bill evenly. If the total bill was $414, how much did each person need to pay?

$46

8

4 The local Rotary club is running a car trial to raise money. Each car can hold 4 people comfortably. If 70 people are interested in attending, what is the minimum number of cars that would be needed?

18

5 Krishna has invited 37 people to a short meeting at his house. He buys soft drinks that are in packs of 4. How many packs will Krishna need to buy to ensure that everyone will get a drink?

10

6 Joe is inviting 15 people to his house to watch the football final. Each pizza from Giuseppe's Pizzeria has 8 slices. If each person eats 3 slices of pizza, how many pizzas does Joe need to order?

6

MiB 3
Card 43

Division and the calculator

1 Circle the numbers that are divisible by 4.

(12) (712) (51 660) 7638 23 (1916) 647
(9040) (60) (28) 83 865 851 (40)

2 Circle the numbers that are divisible by 8.

29 827 (8600) (98 368) 5971 44 39 963
918 (3192) 6966 182 (88) (25 680) (280)

3 Fill in the blanks to complete the following statements.

a $38 \div 11$ or $11\overline{)38}$ or $\dfrac{38}{11}$

b $13 \div 2$ or $2\overline{)13}$ or $\dfrac{13}{2}$

c $80 \div 8$ or $8\overline{)80}$ or $\dfrac{80}{8}$

d $26 \div 6$ or $6\overline{)26}$ or $\dfrac{26}{6}$

e $77 \div 5$ or $5\overline{)77}$ or $\dfrac{77}{5}$

f $93 \div 7$ or $7\overline{)93}$ or $\dfrac{93}{7}$

g $15 \div 4$ or $4\overline{)15}$ or $\dfrac{15}{4}$

h $46 \div 5$ or $5\overline{)46}$ or $\dfrac{46}{5}$

4 **Investigate:** What answer do you get if you put the numbers into a calculator the wrong way around? Use the examples from Question 3. Put them into a calculator the right and wrong way around. Record the results in the table and write any observations about the answers. The first one has been done for you.

Correct input	Incorrect input
38 ÷ 11 = 3.4545	11 ÷ 38 = 0.2894
13 ÷ 2 = 6.5	2 ÷ 13 = 0.1538
30 ÷ 8 = 10	8 ÷ 80 = 0.1
26 ÷ 6 = 4.3333	6 ÷ 26 = 0.2308
77 ÷ 5 = 15.4	5 ÷ 77 = 0.0649
93 ÷ 7 = 13.2857	7 ÷ 93 = 0.0753
15 ÷ 4 = 3.75	4 ÷ 15 = 0.2667
46 ÷ 5 = 9.2	5 ÷ 46 = 0.1087

a) If you divide a smaller number by a larger number, the answer is less than 1 b) If you divide a larger number by a smaller number, the answer is greater than 1 c) Multiplying the answer from the correct input by the answer from the incorrect input gives 1

5 Rhys uses a calculator to find the answer to $8\overline{)26\,872}$. The answer that the calculator gives is $\boxed{0.000297707}$. Is this the correct answer? What has Rhys done? Which operation has Rhys used?

No. Rhys has put the numbers into the calculator the wrong way around.

Division down the drain

1 Solve the following divisions using appropriate mental strategies.

a $14 \div 2 =$ _____7_____   **b** $44 \div 4 =$ _____11_____   **c** $70 \div 7 =$ _____10_____

d $53 \div 5 =$ _____10.6_____   **e** $9 \overline{)99} =$ _____11_____   **f** $3 \overline{)15} =$ _____5_____

g $7 \overline{)49} =$ _____7_____   **h** $6 \overline{)93} =$ _____15.5_____   **i** $\dfrac{25}{5} =$ _____5_____

j $\dfrac{21}{3} =$ _____7_____   **k** $\dfrac{80}{4} =$ _____20_____   **l** $\dfrac{35}{8} =$ _____4.375_____

2 Suri has the choice of buying 5 lolly frogs for 50c or 12 lolly frogs for $1. Which is the better deal? Give a reason for your answer.

_____12 lolly frogs for $1; cheaper per frog_____

3 The tap in Hermione's bathroom fills the bath at a rate of 12 L of water per minute.

a How many litres of water will be in the bath after 3 minutes?

_____36L_____

b How long will it take to fill the bath if it can hold 132 L of water?

_____11 minutes_____

c If Hermione returns to the bathroom 10 minutes after she turns on the tap, will she be in time to stop the water from flooding the room? Explain your answer.

_____Yes, because at that time the bath would still have_____
_____room for 12 more litres._____

d If Hermione turned the tap on so that it was filling the bath at 15 L of water per minute, how many minutes would she be able to leave the tap running before it floods the bathroom? Explain your answer.

_____After 8 minutes, the bath would contain 120 L, but if left_____
_____running for another minute, it would overflow (after 8 minutes, 48 seconds)_____

Hermione's shower uses 9 L of water per minute. How much water would Hermione have used if she had a shower for 10 minutes instead?

MiB 3
Card 36

Number and Place Value   **21**

Is it divisible?

1 Use mental strategies to determine which of the numbers in the box are divisible by:

84	26	51
70	99	48
35	58	94
404	820	975
807	171	800
521	101	315

a 2 _84, 26, 70, 48, 58, 94, 404, 820, 800_

b 4 _84, 48, 404, 820, 800_

c 5 _70, 35, 820, 975, 800, 315_

d 10 _70, 820, 800_

e 20 _820, 800_

f 25 _975, 800_

g 100 _800_

2 Solve the following divisions.

9

a $2\overline{)236}$ = _118_

b $5\overline{)105}$ = _21_

c $8\overline{)821}$ = _102.625_

d $9\overline{)882}$ = _98_

e $7\overline{)886}$ = _126.5714_

f $8\overline{)960}$ = _120_

g $6\overline{)809}$ = _134.83_

h $4\overline{)124}$ = _31_

i $3\overline{)948}$ = _316_

j $2\overline{)949}$ = _474.5_

k $7\overline{)554}$ = _79.1429_

l $9\overline{)902}$ = _100.22_

m $3\overline{)439}$ = _146.33_

n $6\overline{)916}$ = _152.67_

o $4\overline{)382}$ = _95.5_

3 A jigsaw puzzle has 750 pieces. If 3 children construct the jigsaw, placing an equal number of pieces each, how many pieces did each of them place?

250 pieces

4 A team of 8 cyclists is riding 768 km from Melbourne to Adelaide to raise money for charity. If they each cover an equal distance, how many kilometres does each of them ride?

_96km_

MiB 3 Card 41

22 **Number and Place Value**

Division problems

1 Solve these divisions.

a $186 \div 9 =$ _20.67_ **b** $258 \div 8 =$ _32.25_ **c** $792 \div 6 =$ _132_

d $935 \div 7 =$ _133.57_ **e** $\dfrac{448}{4} =$ _112_ **f** $\dfrac{673}{5} =$ _134.6_

g $\dfrac{912}{3} =$ _304_ **h** $\dfrac{599}{2} =$ _299.5_ **i** $9\overline{)117} =$ _13_

j $6\overline{)392} =$ _65.33_ **k** $5\overline{)890} =$ _178_ **l** $3\overline{)228} =$ _76_

2 Tony, Raj and Kim are planning a holiday together, which is going to cost $9566. If they share the cost equally, how much will they each have to pay?

_$3188.67_

3 500 000 people attend an event.

a There is a chair for every person who attends. How many truck loads of chairs are needed, if each truck can carry 250 chairs?

2000 truck loads

b If there are 20 trucks to complete this task, how many loads would each truck need to carry?

100 loads per truck

4 A specialty chocolate shop that makes and hand wraps chocolates can produce 9120 chocolates in a week.

a If the store operates 6 days a week, approximately how many chocolates are made each day?

1520 per day

b A chocolate maker can make and wrap 80 chocolates in an hour. How many hours are spent making chocolates each day?

19 hours

c Is it likely that the store is open for this long each day? Suggest how it is possible that it can produce so many chocolates each day.

The store has more than 1 chocolate maker

More divisions

1 Write an estimate for each of the following divisions. Indicate with a tick (✓) whether the answer will be a whole number or a whole number with a remainder.

	Estimate		Whole number without remainder	Whole number with remainder
786 ÷ 2	*Students' answers will vary.*		✓	
$\frac{220}{8}$				✓
7) 686			✓	
939 ÷ 5				✓
$\frac{558}{9}$			✓	
3) 122				✓

2 Jana spends 1056 minutes a week at swimming training. If she trains for the same length of time each day for 6 days a week, how long is each training session?

176 minutes

3 A gardener orders 3500 kg of mulch for 4 garden beds. If the mulch is evenly distributed between the 4 garden beds, what mass of mulch does each garden bed receive?

875 kg

4 Roger has twice as many swap cards as Wilson. Serge has 3 times as many cards as Wilson. If they have 912 cards altogether, how many does each person have?

Wilson 152, Roger 304, Serge 456

Dividing them up

1 Complete each of the following divisions. Use a calculator to check your answer is correct.

a $\dfrac{496}{2} =$ _____248_____   **b** $953 \div 8 =$ _____119.125_____

c $4 \overline{)7864} =$ _____1966_____   **d** $6 \overline{)9434} =$ _____1572.33_____

2 The Wanguri Wombats cricket team has made a total of 2944 runs in their last 8 matches. If they scored the same number of runs in each match, how many did they score?

_____368 runs_____

3 A group of 6 people decided to split the cost of a jet ski that cost $9660. How much will each person have to pay?

_____$1610_____

4 Hope, Eleanor and Mackenzie are all registered on a social networking website. Hope has twice as many friends as Eleanor, and Mackenzie has three times as many friends as Hope. If they have 882 friends between them, how many friends does each girl have?

_____Eleanor 98, Hope 196, Mackenzie 588_____

5 When Mrs Weasle dishes out the porridge she gives Ranee twice as much as Herman and gives Harry three times as much as him. If the pot has 930 g of porridge, how much does each person receive?

10

_____Herman 155g_____

_____Harry 465g_____

_____Ranee 310g_____

Number and Place Value   **25**

Factors and multiples

1 Identify, by placing a tick (✓) next to the number, which are factors of the numbers shown in bold.

a **12** ☑ 2 ☑ 3 ☑ 4 ☐ 5 ☑ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 20

b **35** ☐ 2 ☐ 3 ☐ 4 ☑ 5 ☐ 6 ☑ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 20

c **96** ☑ 2 ☑ 3 ☑ 4 ☐ 5 ☑ 6 ☐ 7 ☑ 8 ☐ 9 ☐ 10 ☐ 20

d **115** ☐ 2 ☐ 3 ☐ 4 ☑ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 20

e **300** ☑ 2 ☑ 3 ☑ 4 ☑ 5 ☑ 6 ☐ 7 ☐ 8 ☐ 9 ☑ 10 ☑ 20

2 Complete these multiplications.
You can use a calculator if you wish.

a 6 × 10 = _60_   6 × 100 = _600_   6 × 1000 = _6000_

b 43 × 10 = _430_   43 × 100 = _4300_   43 × 1000 = _43000_

c 122 × 10 = _1220_   122 × 100 = _12200_   122 × 1000 = _122000_

3 **a** List all the patterns you can see in the answers to Question 2.

Multiplication by 10 adds 1 zero to the end of the number.

by 100 adds 2 zeros and by 1000 adds 3 zeros.

b Use some or all of these patterns to help you complete the following multiplications, without using a calculator.

i 84 × 10 = _840_   84 × 100 = _8400_   84 × 1000 = _84000_

ii 273 × 10 = _2730_   273 × 100 = _27300_   273 × 1000 = _273000_

iii 5731 × 10 = _57310_   5731 × 100 = _573100_   5731 × 1000 = _5731000_

c Use some or all of these patterns to help you complete these inverse operations, without using a calculator.

i 90 ÷ 10 = _9_   900 ÷ 100 = _9_   9000 ÷ 1000 = _9_

ii 560 ÷ 10 = _56_   5600 ÷ 100 = _56_   56 000 ÷ 1000 = _56_

iii 2100 ÷ 10 = _210_   213 000 ÷ 100 = _2130_   2 103 000 ÷ 1000 = _2103_

Do any of these patterns continue? What happens when you multiply or divide by 10 000, 100 000 or 1 000 000?

MiB 3
Cards 7
and 13

26 **Number and Place Value**

Factors of numbers

1 Write down all the factors of the following numbers.

a 12
_1, 2, 3, 4, 6, 12_

b 13
_1, 13_

c 20
_1, 2, 4, 5, 10, 20_

d 30
_1, 2, 5, 6, 15, 30_

e 48
_1, 2, 3, 4, 6, 8, 12, 24, 48_

f 67
_1, 67_

g 79
_1, 79_

h 80
_1, 2, 4, 5, 8, 10, 16, 20, 40, 80_

i 100
_1, 2, 4, 5, 10, 20, 25, 50, 100_

2 What do your answers to Questions 1b, f and g have in common?
The only factors are 1 and the number itself

3
a Complete the factor tree for 150.   _Students' answers will vary._   150

b List all the factors of 150 in order from smallest to largest.
_1, 2, 3, 5, 6, 10, 15, 25, 30, 50, 75, 150_

c Compare your factor tree and your list of factors with a classmate. How are they the same? How are they different?
Students' answers will vary.

d How do you know that you have found all the factors of 150?
All the branches of the factor tree have been filled out.

4 A local community group is organising a trivia night. They have enough room for 640 competitors.

a If all people must be in a team and all teams are the same size, what size teams can 640 people be divided into? (**Hint:** what are the factors of 640?)
_1, 2, 4, 5, 8, 10, 16, 20, 32, 40, 64, 80, 128, 160, 320, 640_

b If there are only 80 tables, what is the smallest team size that they can have, if there is to be one team per table?
80 tables of 8 competitors per table.

MiB 3 Card 2

Number and Place Value 27

Composite and prime numbers

Prime numbers are numbers that have only two factors, themselves and the number 1. (The number 1 is NOT a prime number, as it has only one factor, itself.) 13 is a prime number as only 1 and 13 are factors.

Composite numbers are numbers with more than two factors. 6 is a composite number as its factors are 1, 2, 3 and 6.

1 Use mental strategies to determine which of these numbers are composite. Place a circle around them.

(9)   17   (21)   (25)   (36)   (45)   47

(52)   (66)   73   79   (81)   (85)   (92)

(93)   (99)   (100)   (120)

2 What steps did you follow to determine which numbers were composite in Question 1 and which were not?

Students' answers will vary.

_____

_____

3 List all the factors for these composite numbers, and then rewrite the factors in order from smallest to largest.

	Composite numbers	Factors	Ordered factors
a	15	1, 3, 5, 15	1, 3, 5, 15
b	36	1, 2, 3, 4, 6, 9, 12, 18, 36	1, 2, 3, 4, 6, 9, 12, 18, 36
c	55	1, 5, 11, 55	1, 5, 11, 55
d	81	1, 3, 9, 27, 81	1, 3, 9, 27, 81
e	95	1, 5, 19, 95	1, 5, 19, 95

4 Complete the following divisions and use your answer to decide if the statement is *true* or *false*.

a $4 \overline{)608}$ 4 is a factor of 608.   _____True_____

b $\dfrac{932}{8}$ 8 is a factor of 932.   _____False_____

c $424 \div 6$ 6 is a factor of 424.   _____False_____

d $9 \overline{)675}$ 9 is a factor of 675.   _____True_____

MiB 3
Cards 10
and 39

Number and Place Value

Thirds, sixths and twelfths

1 Divide each group of 60 apples, using a ruler to draw lines between the apples, as directed.

   a Divide into thirds, then sixths and finally twelfths.
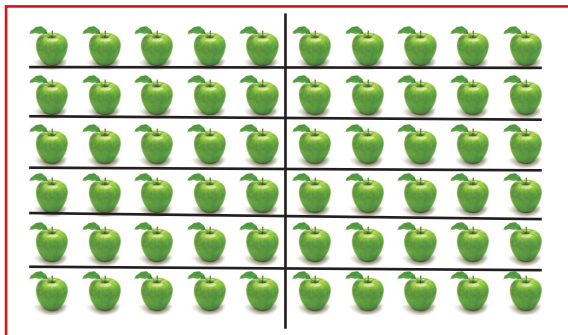
   b Divide into half and then quarters.
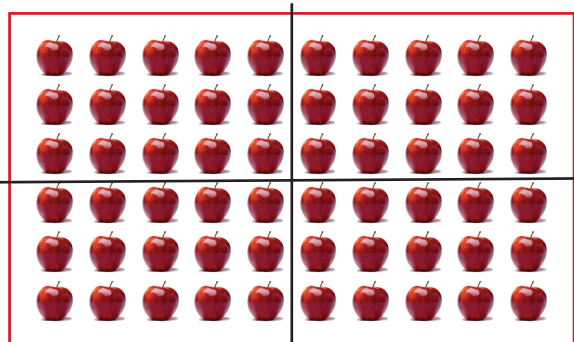
2 Use the information in Question 1 to complete the following statements.

   a $\frac{1}{2}$ of 60 = _____30_____
   b $\frac{1}{3}$ of 60 = _____20_____

   c $\frac{1}{4}$ of 60 = _____15_____
   d $\frac{1}{6}$ of 60 = _____10_____

   e $\frac{1}{12}$ of 60 = _____5_____
   f $\frac{2}{3}$ of 60 = _____40_____

   g $\frac{5}{6}$ of 60 = _____50_____
   h $\frac{7}{12}$ of 60 = _____35_____

3 Write *true* or *false* for the following statements.

   a $\frac{1}{2}$ of 60 has twice as many items as $\frac{1}{4}$ of 60.   _____True_____

   b $\frac{1}{6}$ of 60 has half the number of items of $\frac{1}{12}$ of 60.   _____False_____

   c There are fewer items in $\frac{1}{3}$ of 60 than in $\frac{1}{4}$ of 60.   _____False_____

4 Travis is having a birthday party. His cake is shown in the picture.

   a Divide the cake into 12 equal slices.

   b If Travis and his friends eat 11 slices of cake, how many will be left? What fraction of the original cake is this?

     _____1 piece. $\frac{1}{12}$ of cake_____

   c If every person gets the same number of slices, and Travis eats 2 slices of his birthday cake, how many friends does he have at his party?

     _____5 friends_____

5 Simon's mother made 25 chocolate chip muffins. If Simon took $\frac{3}{5}$ of the muffins to school for a cake stall, how many muffins did he take?

   Simon took _____15_____ muffins to school.

MiB 3
Card 59

Fractions and Decimals : **29**

Fractions of a group

1 Find the answer to each question using the pictures to help you.

a
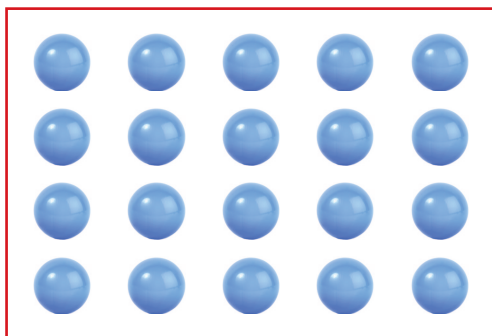
$\frac{3}{4}$ of 20 = _____15_____

$\frac{3}{10}$ of 20 = _____6_____

$\frac{1}{5}$ of 20 = _____4_____

b
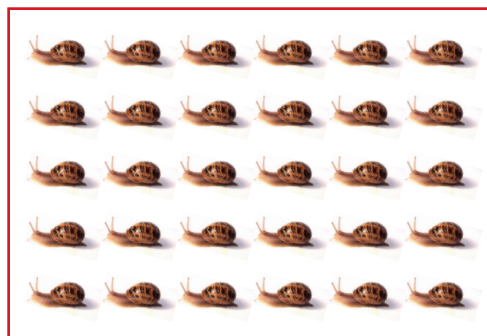
$\frac{2}{5}$ of 30 = _____12_____

$\frac{5}{6}$ of 30 = _____25_____

$\frac{1}{3}$ of 30 = _____10_____

c
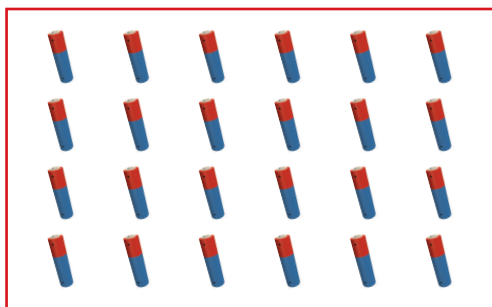
$\frac{3}{8}$ of 24 = _____9_____

$\frac{5}{12}$ of 24 = _____10_____

$\frac{1}{6}$ of 24 = _____4_____

d
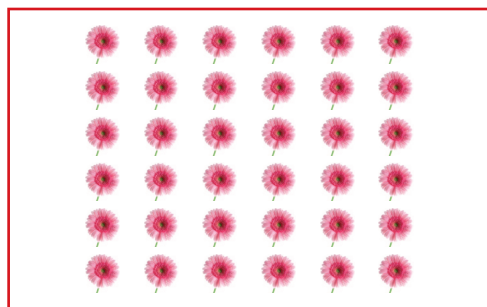
$\frac{1}{3}$ of 36 = _____12_____

$\frac{10}{12}$ of 36 = _____30_____

$\frac{1}{4}$ of 36 = _____9_____

2 Place a circle around the fraction that has a larger number of items.
Use your answers from Question 1 to help you.

a $\boxed{\frac{3}{4} \text{ of } 20}$ or $\frac{2}{5}$ of 30   **b** $\boxed{\frac{1}{3} \text{ of } 36}$ or $\frac{5}{12}$ of 24

c $\boxed{\frac{1}{3} \text{ of } 30}$ or $\frac{3}{8}$ of 24   **d** $\frac{5}{6}$ of 30   or $\boxed{\frac{10}{12} \text{ of } 36}$

e $\frac{1}{6}$ of 24   or $\boxed{\frac{3}{10} \text{ of } 20}$ **f** $\frac{1}{5}$ of 20   or $\boxed{\frac{1}{4} \text{ of } 36}$

30 Fractions and Decimals

Comparing thirds, sixths and twelfths

1 Write the fraction that has been shaded, and then write <, > or = in the boxes to complete the statements.

a
$\frac{1}{2}$ $>$ $\frac{1}{3}$

b
$\frac{2}{3}$ $=$ $\frac{4}{6}$

c
$\frac{2}{6}$ $<$ $\frac{8}{12}$
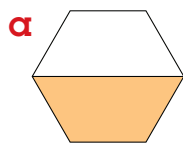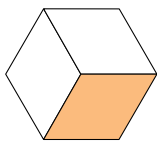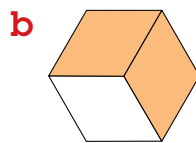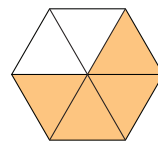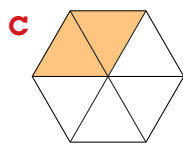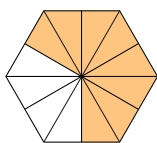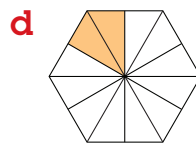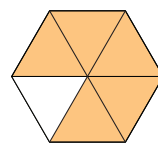
d
$\frac{2}{12}$ $<$ $\frac{5}{6}$

2 Write these fractions in order from largest to smallest.

a $\frac{1}{8}, \frac{1}{2}, \frac{7}{8}, \frac{1}{4}$ $\qquad \frac{7}{8}, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}$

b $\frac{1}{6}, \frac{4}{6}, \frac{3}{6}, \frac{5}{6}$ $\qquad \frac{5}{6}, \frac{4}{6}, \frac{3}{6}, \frac{1}{6}$

c $\frac{2}{3}, \frac{5}{6}, \frac{3}{6}, \frac{1}{3}$ $\qquad \frac{5}{6}, \frac{2}{3}, \frac{3}{6}, \frac{1}{3}$

d $\frac{3}{10}, \frac{3}{5}, \frac{5}{10}, \frac{1}{5}$ $\qquad \frac{3}{5}, \frac{5}{10}, \frac{3}{10}, \frac{1}{5}$

e $\frac{1}{3}, \frac{5}{12}, \frac{4}{6}, \frac{2}{12}$ $\qquad \frac{4}{6}, \frac{5}{12}, \frac{1}{3}, \frac{2}{12}$

3 Place each fraction in its correct position on the number line.

$\frac{1}{3}$ $\frac{1}{6}$ $\frac{1}{12}$ $\frac{2}{3}$ $\frac{5}{6}$ $\frac{11}{12}$ $\frac{3}{6}$ $\frac{7}{12}$

$\frac{3}{6}$

$0 \qquad \frac{1}{12} \qquad \frac{1}{6} \qquad \frac{1}{3} \qquad \frac{1}{2} \qquad \frac{7}{12} \qquad \frac{2}{3} \qquad \frac{5}{6} \qquad \frac{11}{12} \qquad 1$
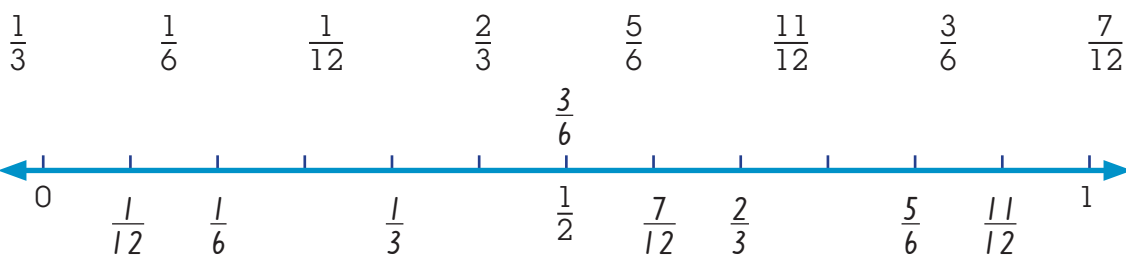
4 You are given a choice of taking $\frac{2}{3}$ of a packet of 36 chocolate eggs or $\frac{5}{6}$ of a packet of 60 chocolate eggs. Which would you choose and why?

$\frac{5}{6}$ of $60 = 50$

$\frac{2}{3}$ of $60 = 40$

$\frac{5}{6} = $ more chocolate

Multiplication and 'of'

1 Rewrite each of these statements using mathematical symbols.

In Mathematics the word 'of' often means multiplication. So, $\frac{1}{4}$ of 12 can also be written as $\frac{1}{4} \times 12$.

a $\frac{1}{2}$ of 100 $\quad \frac{1}{2} \times 100$

b $\frac{1}{10}$ of 70 $\quad \frac{1}{10} \times 70$

c $\frac{1}{3}$ of 90 $\quad \frac{1}{3} \times 90$

d $\frac{7}{8}$ of 64 $\quad \frac{7}{8} \times 64$

Use the pictures below to help you answer Questions 2 and 3.
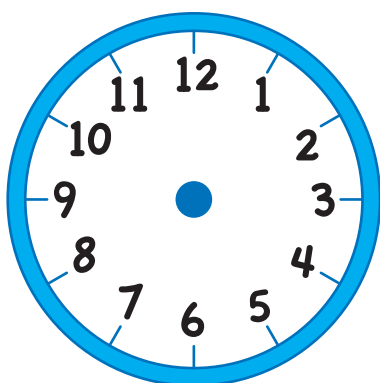
2 Calculate the following, giving your answers in minutes.

a $\frac{1}{6}$ of an hour = _10 minutes_ **b** $\frac{1}{3}$ of an hour = _20 minutes_

c $\frac{2}{5}$ of an hour = _24 minutes_ **d** $\frac{5}{12}$ of an hour = _25 minutes_

e $\frac{1}{10}$ of an hour = _6 minutes_ **f** $\frac{3}{4}$ of an hour = _45 minutes_

3 Emily spent $\frac{2}{3}$ of an hour doing her homework, while Bethany spent $\frac{6}{10}$ of an hour doing her homework.

a Who spent longer on their homework, Emily or Bethany?

_____ _Emily_ _____

_____

_____

b How much longer did she spend on her homework? ___ _4 minutes._ ___

4 Use a calculator to find these quantities.

One way of writing a division is as a fraction, and 'of' means to multiply. So, $\frac{7}{11}$ of 121 can be re-written as $(7 \div 11) \times 121$.
On a calculator you type 7 ÷ 1 1 × 1 2 1 =

a $\frac{7}{11}$ of 121 = _77_

b $\frac{5}{16}$ of 128 = _40_

c $\frac{27}{100}$ of 500 = _135_ **e** $\frac{9}{20}$ of 160 = _72_

d $\frac{17}{50}$ of 300 = _102_ **f** $\frac{4}{25}$ of 275 = _44_

32 Fractions and Decimals

Comparing fractions

Use these pictures to help you answer the questions on this page.

Halves

Thirds

Quarters

Fifths

Sixths

Eighths

Tenths

Twelfths
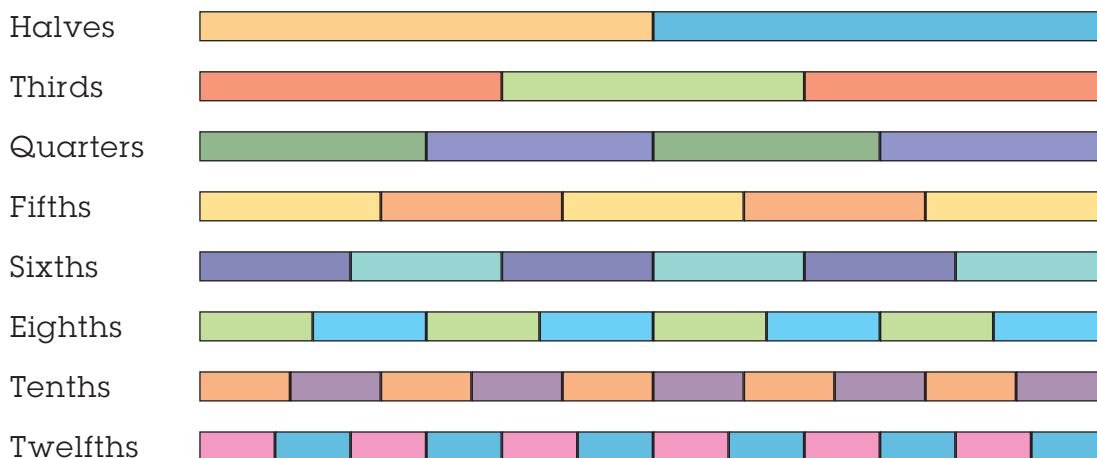
1 Look at the pictures above, and complete the following statements by inserting <, > or =.

a $\dfrac{1}{2}$ < $\dfrac{5}{8}$ b $\dfrac{1}{8}$ < $\dfrac{2}{10}$ c $\dfrac{4}{5}$ = $\dfrac{8}{10}$

d $\dfrac{1}{5}$ > $\dfrac{1}{6}$ e $\dfrac{2}{4}$ = $\dfrac{3}{6}$ f $\dfrac{1}{3}$ = $\dfrac{4}{12}$

g $\dfrac{3}{4}$ = $\dfrac{9}{12}$ h $\dfrac{2}{3}$ > $\dfrac{1}{2}$ i $\dfrac{2}{8}$ < $\dfrac{3}{10}$

j $\dfrac{5}{6}$ > $\dfrac{6}{10}$ k $\dfrac{3}{12}$ < $\dfrac{3}{8}$ l $\dfrac{1}{4}$ > $\dfrac{1}{12}$

2 Rewrite each set of fractions in order from largest to smallest.

a $\dfrac{1}{3}, \dfrac{1}{12}, \dfrac{1}{6}, \dfrac{1}{2}$ $\qquad \dfrac{1}{2}, \dfrac{1}{3}, \dfrac{1}{6}, \dfrac{1}{12}$

b $\dfrac{1}{4}, \dfrac{1}{10}, \dfrac{1}{5}, \dfrac{1}{8}$ $\qquad \dfrac{1}{4}, \dfrac{1}{5}, \dfrac{1}{8}, \dfrac{1}{10}$

c $\dfrac{1}{12}, \dfrac{1}{5}, \dfrac{1}{2}, \dfrac{1}{8}$ $\qquad \dfrac{1}{2}, \dfrac{1}{5}, \dfrac{1}{8}, \dfrac{1}{12}$

d $\dfrac{1}{4}, \dfrac{1}{3}, \dfrac{1}{12}, \dfrac{1}{10}$ $\qquad \dfrac{1}{3}, \dfrac{1}{4}, \dfrac{1}{10}, \dfrac{1}{12}$

3 Imperial spanners or wrenches, such as those shown in the picture, can be measured using fractions.

The sizes of these spanners are: $\dfrac{1}{4}, \dfrac{3}{8}, \dfrac{1}{2}, \dfrac{5}{8}, \dfrac{3}{4}$.

a Rewrite these sizes using a denominator of 8 for each one.

$\dfrac{2}{8}, \dfrac{3}{8}, \dfrac{4}{8}, \dfrac{5}{8}, \dfrac{6}{8}$

b Are there any spanner sizes missing? If so, which size/s are missing? Give a reason for your answer.

Students' answers will vary.

Fractions and Decimals **33**

Are they the same fraction?

1 Colour $\frac{1}{2}$ of each of the shapes and complete the fractions.
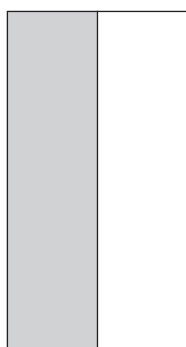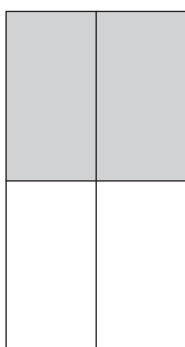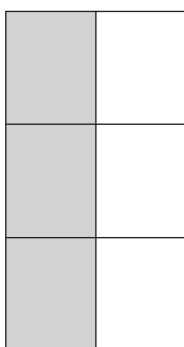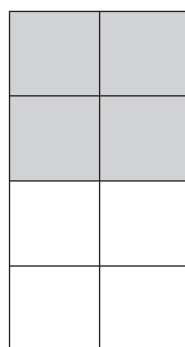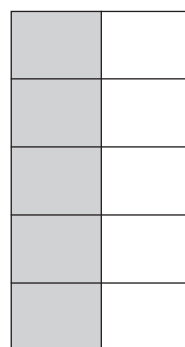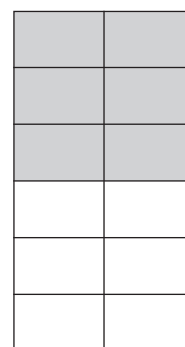
$$\frac{1}{2} \qquad \frac{2}{4} \qquad \frac{3}{6} \qquad \frac{4}{8} \qquad \frac{5}{10} \qquad \frac{6}{12}$$

2 Colour $\frac{1}{4}$ of each of the shapes and complete the fractions.
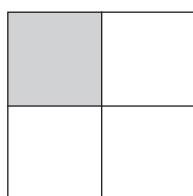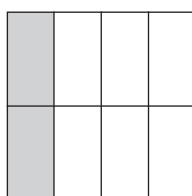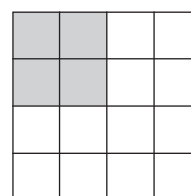
$$\frac{1}{4} \qquad \frac{2}{8} \qquad \frac{4}{16}$$

3 Colour $\frac{1}{3}$ of each of the shapes and complete the fractions.
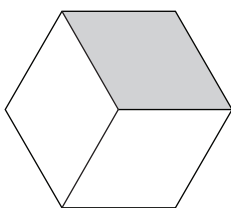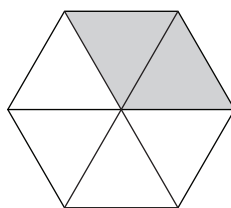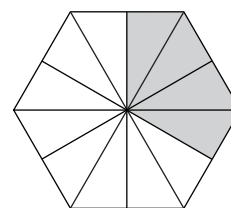
$$\frac{1}{3} \qquad \frac{2}{6} \qquad \frac{4}{12}$$

4 Question 1 shows fractions that are equivalent, or equal to $\frac{1}{2}$. In your own words, write a description of an equivalent fraction.

Students' answers will vary.

_____

_____

_____

Use the picture of 120 stars to help you complete the questions.

1 Complete the following using a mental strategy.

   a $\frac{1}{2}$ of 120 = _____60_____   **b** $\frac{1}{4}$ of 120 = _____30_____   **c** $\frac{3}{4}$ of 120 = _____90_____

2 Split the stars into thirds and sixths. How many stars are in each fraction?

   a $\frac{1}{3}$ = _____40_____   **b** $\frac{2}{3}$ = _____80_____   **c** $\frac{1}{6}$ = _____20_____

   d $\frac{2}{6}$ = _____40_____   **e** $\frac{3}{6}$ = _____60_____   **f** $\frac{4}{6}$ = _____80_____

   g $\frac{5}{6}$ = _____100_____

3 Now split the stars into twelfths and complete the following sentences.

   a $\frac{1}{12}$ of 120 = _____10_____   **b** $\frac{2}{12}$ of 120 = _____20_____   **c** $\frac{3}{12}$ of 120 = _____30_____

   d $\frac{4}{12}$ of 120 = _____40_____   **e** $\frac{5}{12}$ of 120 = _____50_____   **f** $\frac{6}{12}$ of 120 = _____60_____

   g $\frac{7}{12}$ of 120 = _____70_____   **h** $\frac{8}{12}$ of 120 = _____80_____   **i** $\frac{9}{12}$ of 120 = _____90_____

   j $\frac{10}{12}$ of 120 = _____100_____   **k** $\frac{11}{12}$ of 120 = _____110_____

4 Look at your answers to Questions 1, 2 and 3. Which fractions contain the following?

   a 90 stars _____ $\frac{3}{4}, \frac{9}{12}$ _____

   b 80 stars _____ $\frac{2}{3}, \frac{4}{6}, \frac{8}{12}$ _____

   c 60 stars _____ $\frac{1}{2}, \frac{3}{6}, \frac{6}{12}$ _____

   d 40 stars _____ $\frac{1}{3}, \frac{2}{6}, \frac{4}{12}$ _____

   e 30 stars _____ $\frac{1}{4}, \frac{3}{12}$ _____

5 Write *true* or *false* for the following statements.

   a $\frac{1}{2} = \frac{4}{6}$ _____ *False* _____

   b $\frac{1}{3} = \frac{5}{12}$ _____ *False* _____

   c $\frac{3}{4} = \frac{9}{12}$ _____ *True* _____

   d $\frac{1}{2} = \frac{6}{12}$ _____ *True* _____

   e $\frac{9}{12} = \frac{1}{3}$ _____ *False* _____

   f $\frac{1}{3} = \frac{6}{12}$ _____ *False* _____

   g $\frac{3}{12} = \frac{1}{4}$ _____ *True* _____

12

Fractions and Decimals   35

Forming equivalent fractions

Equivalent fractions can be formed by multiplying the numerator and the denominator of a fraction by the same number.

For example:
$\frac{2}{3}$ is changed into $\frac{4}{6}$ by $\frac{2 \times 2}{2 \times 3} = \frac{4}{6}$

In a similar way,
$\frac{3}{4}$ is changed into $\frac{9}{12}$ by $\frac{3 \times 3}{4 \times 3} = \frac{9}{12}$

They can also be formed by dividing the numerator and the denominator by the same number.

When reducing the fraction to its lowest form, you should continue dividing until the numerator and denominator cannot be evenly divided by the same whole number.

For example:
$\frac{8 \div 2}{12 \div 2} = \frac{4}{6}$, which can be further reduced as 4 and 6 are divisible by 2;
$\frac{4 \div 2}{6 \div 2} = \frac{2}{3}$, this is the lowest fraction as 2 and 3 cannot be evenly divided by the same whole number.

1 Use the information above to help you change these fractions. The first one has been done for you.

a $\frac{1}{2}$ $\xrightarrow{\times 4}$ $= \frac{4}{8}$ $\xrightarrow{\times 4}$

b $\frac{3}{4}$ $\xrightarrow{\times 3}$ $= \frac{9}{12}$ $\xrightarrow{\times 3}$

c $\frac{2}{3}$ $\xrightarrow{\times 4}$ $= \frac{8}{12}$ $\xrightarrow{\times 4}$

d $\frac{1}{4}$ $\xrightarrow{\times 4}$ $= \frac{4}{16}$ $\xrightarrow{\times 4}$

e $\frac{1}{3}$ $\xrightarrow{\times 3}$ $= \frac{3}{9}$ $\xrightarrow{\times 3}$

f $\frac{1}{5}$ $\xrightarrow{\times 4}$ $= \frac{4}{20}$ $\xrightarrow{\times 4}$

g $\frac{8}{12}$ $\xrightarrow{\times 2}$ $= \frac{16}{24}$ $\xrightarrow{\times 2}$

h $\frac{4}{6}$ $\xrightarrow{\times 2}$ $= \frac{8}{12}$ $\xrightarrow{\times 2}$

i $\frac{2}{8}$ $\xrightarrow{\times 2}$ $= \frac{4}{16}$ $\xrightarrow{\times 2}$

2 Change the following fractions into their lowest form, and write a statement showing what factor you used to divide. The first one has been done for you.

a $\frac{12}{36}$ $=$ $\frac{1}{3}$ 12 divides both numbers

b $\frac{36}{48}$ $=$ $\frac{3}{4}$ *12 divides both numbers*

c $\frac{15}{60}$ $=$ $\frac{1}{4}$ *15 divides both numbers*

d $\frac{50}{100}$ $=$ $\frac{1}{2}$ *50 divides both numbers*

Changing fractions

1 Complete each of the following by finding the equivalent fraction.

a $\dfrac{1}{2} = \dfrac{\boxed{3}}{6} = \dfrac{6}{\boxed{12}}$

b $\dfrac{1}{3} = \dfrac{\boxed{2}}{6} = \dfrac{4}{\boxed{12}}$

c $\dfrac{1}{4} = \dfrac{2}{\boxed{8}} = \dfrac{\boxed{3}}{12}$

d $\dfrac{1}{6} = \dfrac{\boxed{2}}{12}$

e $\dfrac{3}{4} = \dfrac{\boxed{6}}{8} = \dfrac{\boxed{9}}{12}$

f $\dfrac{\boxed{2}}{3} = \dfrac{4}{6} = \dfrac{\boxed{8}}{12}$

2 Complete the following by writing in the same mathematical operation for each fraction. The first one has been done for you.

a $\dfrac{1}{2} \xrightarrow[\times 5]{\times 5} \dfrac{5}{10}$

b $\dfrac{2}{3} \xrightarrow[\times 4]{\times 4} \dfrac{8}{12}$

c $\dfrac{1}{4} \xrightarrow[\times 2]{\times 2} \dfrac{2}{8}$

d $\dfrac{3}{4} \xrightarrow[\times 3]{\times 3} \dfrac{9}{12}$

e $\dfrac{2}{6} \xrightarrow[\div 2]{\div 2} \dfrac{1}{3}$

f $\dfrac{6}{12} \xrightarrow[\div 6]{\div 6} \dfrac{1}{2}$

3 Describe how you could mentally change $\frac{1}{3}$ into twelfths.

Multiply both the numerator and denominator by 4, giving $\frac{4}{12}$

_____

_____

_____

> Share your answer to Question 3 with a classmate. How are your answers the same? How are they different? How could you mentally reduce a fraction?

4 Use a mental strategy to reduce these fractions to their lowest form.

a $\dfrac{10}{30} = \dfrac{\boxed{1}}{\boxed{3}}$

b $\dfrac{60}{90} = \dfrac{\boxed{2}}{\boxed{3}}$

c $\dfrac{15}{20} = \dfrac{\boxed{3}}{\boxed{4}}$

d $\dfrac{30}{150} = \dfrac{\boxed{1}}{\boxed{5}}$

e $\dfrac{30}{100} = \dfrac{\boxed{3}}{\boxed{10}}$

f $\dfrac{6}{24} = \dfrac{\boxed{1}}{\boxed{4}}$

g $\dfrac{30}{36} = \dfrac{\boxed{5}}{\boxed{6}}$

h $\dfrac{12}{144} = \dfrac{\boxed{1}}{\boxed{12}}$

MiB 3
Card 52

Fractions and Decimals : **37**

Adding whole numbers and fractions

1 Using the pictures, complete the number sentences. The first one is done for you

a

1 $+$ $\frac{1}{2}$ $=$ $1\frac{1}{2}$

b

$\underline{1}$ $+$ $\frac{11}{12}$ $=$ $1\frac{11}{12}$
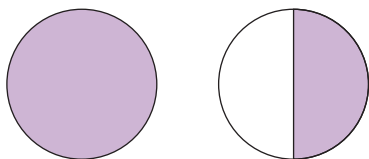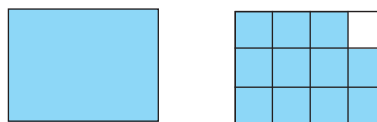
c
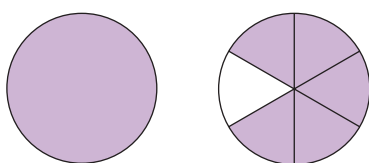
$\underline{1}$ $+$ $\frac{5}{6}$ $=$ $1\frac{5}{6}$

d
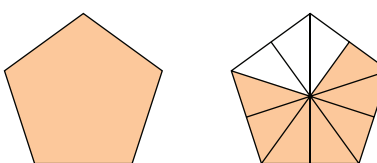
$\underline{1}$ $+$ $\frac{7}{10}$ $=$ $1\frac{7}{10}$

e
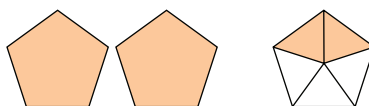
$\underline{2}$ $+$ $\frac{2}{5}$ $=$ $2\frac{2}{5}$

f
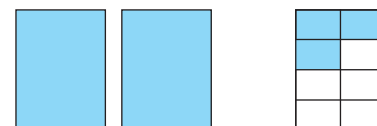
$\underline{2}$ $+$ $\frac{3}{8}$ $=$ $2\frac{3}{8}$

2 Draw pictures and complete these number sentences.

a 1 $+$ $\frac{3}{4}$ $=$ $1\frac{3}{4}$ **b** 1 $+$ $\frac{5}{8}$ $=$ $1\frac{5}{8}$

c 2 $+$ $\frac{1}{4}$ $=$ $2\frac{1}{4}$ **d** 3 $+$ $\frac{9}{10}$ $=$ $3\frac{9}{10}$

e 1 $+$ $\frac{1}{3}$ $=$ $1\frac{1}{3}$ **f** 7 $+$ $\frac{1}{6}$ $=$ $7\frac{1}{6}$

Subtracting a fraction

1 Draw pictures to help you complete the number sentences. The first one has been done for you.

13

a

$$1 - \frac{1}{2} = \frac{1}{2}$$

b

$$1 - \frac{1}{4} = \frac{3}{4}$$

c

$$1 - \frac{1}{3} = \frac{2}{3}$$

d

$$1 - \frac{1}{5} = \frac{4}{5}$$

e

$$1 - \frac{2}{5} = \frac{3}{5}$$

f
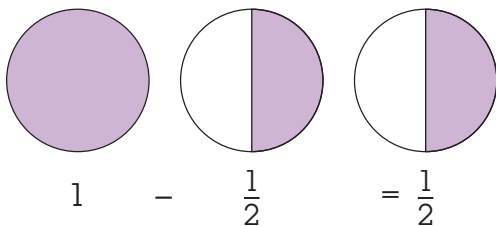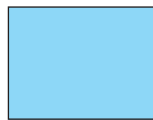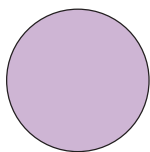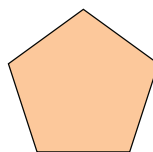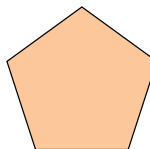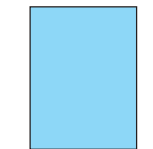
$$1 - \frac{3}{4} = \frac{1}{4}$$

2 Complete the following number sentences. Use the shape provided to help you if necessary.

a
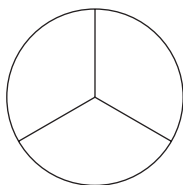
$$1 - \frac{1}{3} = \frac{2}{3}$$

b
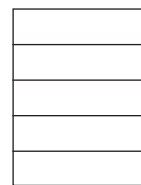
$$1 - \frac{3}{5} = \frac{2}{5}$$

c
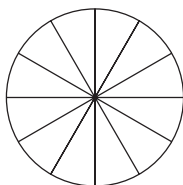
$$1 - \frac{11}{12} = \frac{1}{12}$$

d
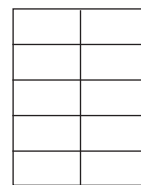
$$1 - \frac{2}{10} = \frac{8}{10}$$

e
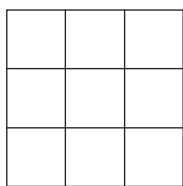
$$1 - \frac{5}{9} = \frac{4}{9}$$

f
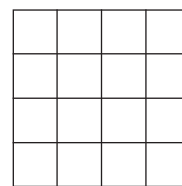
$$1 - \frac{13}{16} = \frac{3}{16}$$

MiB 3
Card 51

Fractions and Decimals 39

1 Use diagrams to help you complete the following additions. The first one has been done for you.

a $\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$
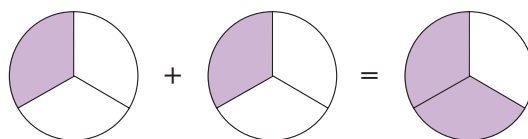
b $\frac{1}{5} + \frac{2}{5} =$ _____ $\frac{3}{5}$_____

c $\frac{5}{8} + \frac{7}{8} =$ _____ $\frac{12}{8}$_____ $=$ _____ $1\frac{4}{8}$_____
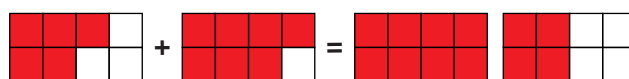
d $\frac{7}{12} + \frac{11}{12} =$ _____ $\frac{18}{12}$_____ $=$ _____ $1\frac{6}{12}$_____
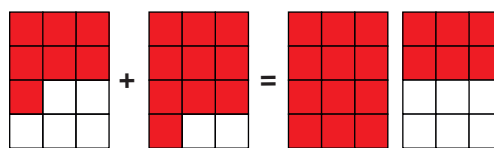
e $\frac{9}{2} + \frac{5}{2} =$ _____ $\frac{14}{2}$_____ $=$ _____ 7_____
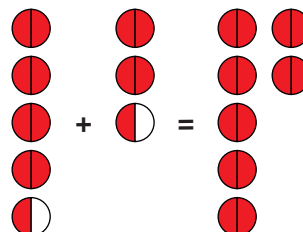
2 Complete the following additions. Use the empty number lines to help you if necessary.

a $\frac{1}{6} + \frac{1}{6} =$ _____ $\frac{2}{6}$_____

b $\frac{1}{8} + \frac{7}{8} =$ _____ $\frac{8}{8} = 1$_____

c $\frac{2}{3} + \frac{2}{3} =$ _____ $\frac{4}{3} = 1\frac{1}{3}$_____

d $\frac{11}{12} + \frac{11}{12} =$ _____ $\frac{22}{12} = 1\frac{10}{12}$_____

3 Natalie painted the bedrooms of her sons, Caleb and Joshua, the same colours, 3 walls in 'harbour sky' and a feature wall in 'blue charm'. For Caleb's room she used $\frac{5}{12}$ of a can of 'harbour sky' and $\frac{2}{8}$ of a can of 'blue charm'. In Joshua's room she used $\frac{4}{12}$ of a can of 'harbour sky' and $\frac{5}{8}$ of a can of 'blue charm'.

a How much 'harbour sky' did Natalie use altogether?

$\frac{5}{12} + \frac{4}{12} = \frac{9}{12}$ of a can

b How much 'blue charm' did Natalie use?

$\frac{2}{8} + \frac{5}{8} = \frac{7}{8}$ of a can

Fractions and Decimals

1 Use diagrams to help you complete the following subtractions. Write the fractions in their lowest form. The first one has been done for you.

a $\dfrac{11}{12} - \dfrac{3}{12} = \dfrac{8}{12} = \dfrac{2}{3}$

b $\dfrac{9}{10} - \dfrac{3}{10} = \dfrac{6}{10} = \dfrac{3}{5}$

c $\dfrac{11}{2} - \dfrac{5}{2} = \dfrac{6}{2} = 3$

d $\dfrac{19}{3} - \dfrac{7}{3} = \dfrac{12}{3} = 4$

e $\dfrac{25}{4} - \dfrac{17}{4} = \dfrac{8}{4} = 2$
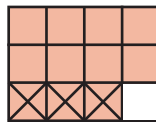
2 Complete the following subtractions. Use the empty number lines to help you if necessary.

a $\dfrac{10}{12} - \dfrac{4}{12} = \dfrac{6}{12} = \dfrac{1}{2}$

b $\dfrac{7}{8} - \dfrac{3}{8} = \dfrac{4}{8} = \dfrac{1}{2}$

c $\dfrac{20}{6} - \dfrac{14}{6} = \dfrac{6}{6} = 1$

d $\dfrac{13}{3} - \dfrac{1}{3} = \dfrac{12}{3} = 4$

3 Akiko bought $\dfrac{11}{4}$ metres of material to make a dress. Hana bought $\dfrac{33}{10}$ metres of material to make a suit. When they had cut the material for their clothes Akiko had $\dfrac{1}{4}$ of a metre left and Hana had $\dfrac{7}{10}$ metre left.

a How much material did it take to make Akiko's dress?

$$\dfrac{11}{4} - \dfrac{1}{4} = \dfrac{10}{4} = 2\dfrac{1}{2} \ \text{metres}$$

b How much material did it take to make Hana's suit?

$$\dfrac{33}{10} - \dfrac{7}{10} = \dfrac{26}{10} = 2\dfrac{3}{5} \ \text{metres}$$

c It is not common to ask for $\dfrac{11}{4}$ metres of material. How would you ask a salesperson for this length of material?

$$2\dfrac{3}{4} \ \text{metres}$$

Place value of decimals

Hundreds	Tens	Ones	Decimal point	Tenths	Hundredths	Thousandths
1	2	0	•	2		
		0	•	2	6	
	1	0	•	4		
		0	•	6	3	2

Remember!
- Zero holds a place.
- When writing decimal numbers, it is useful to write a number in the Ones column, even if the number is zero, e.g. 0.26, 0.632.
- Zeros to the right of a decimal number are not necessary, e.g. 10.400: the zeros to the right of the 4 are not necessary.

1 Place a line through each of the zeros that are not necessary.

   a   1003.34~~0~~
   b   176.003~~0~~
   c   ~~0~~12.403

   d   ~~00~~ 122.021~~0~~
   e   420.054~~000~~
   f   41.032~~00~~

2 Write each of the following as decimal numbers.

   a   twelve point six, nine, three   12.693

   b   two hundred and six point nine, zero, one   206.901

   c   one thousand two hundred point one, one, nine   1200.119

   d   one million and thirty thousand point six zero, six   130000.606

   e   nine thousand and twenty seven point zero, zero, five   9027.005

   f   forty-seven and twenty-eight hundredths   47.28

   g   one hundred and two, and two hundred and forty thousandths   102.240

   h   ninety-three and seventy-seven thousandths   93.077

3 Write in words how these numbers would be read aloud.

   a   3.942   Three point nine, four, two

   b   42.903   forty two point nine, zero, three

   c   5002.523   five thousand and two point five, two, three

   d   62 020.707   sixty two thousand and twenty point seven, zero, seven

Decimals, fractions and place value

1 Write each of the numbers in the place value table, and write the place value of the number shown in bold.

Number	Hundreds	Tens	Ones	Decimal point	Tenths	Hundredths	Thousandths	Place value
13.**8**35					8			$\frac{8}{10}$
1**8**3.037		8						80
1.92**6**							6	$\frac{6}{1000}$
0.3**7**3						7		$\frac{7}{100}$
1**6**.03			6					6

2 Write each of these decimals as a fraction.

a $0.425 = \frac{425}{1000}$ **b** $0.012 = \frac{12}{1000}$

c $0.502 = \frac{502}{1000}$ **d** $0.63 = \frac{63}{100}$

e $0.02 = \frac{2}{100}$ **f** $0.3 = \frac{3}{10}$

3 Write each of these fractions as a decimal.

a $\frac{832}{1000} = 0.832$ **b** $\frac{902}{1000} = 0.902$

c $\frac{530}{1000} = 0.530$ **d** $\frac{18}{1000} = 0.018$

e $\frac{6}{1000} = 0.006$ **f** $\frac{4}{100} = 0.004$

4 Express each length in kilometres.

a 8 m = _0.008_ km

b 59 m = _0.059_ km

c 680 m = _0.68_ km

> **Remember!**
> A metre is $\frac{1}{1000}$ of a kilometre.

5 Express each mass in kilograms.

a 5 g = _0.005_ kg

b 823 g = _0.823_ kg

c 501 g = _0.501_ kg

> **Remember!**
> A gram is $\frac{1}{1000}$ of a kilogram.

Fractions and Decimals **43**

Comparing decimals

1 Circle the larger number of each pair.

a (0.9) or 0.09   **b** 0.003 or (0.03)

c (0.53) or 0.053   **d** 0.021 or (0.21)

e 0.423 or (0.432)   **f** (0.832) or 0.328

g (0.32) or 0.23   **h** (0.234) or 0.023

i (0.090) or 0.009   **j** 0.324 or (0.359)

2 Order the numbers below, from smallest to largest, by placing a 1, 2, 3 or 4 in the blanks.

a [1] 0.145   [2] 0.328   [4] 0.975   [3] 0.642

b [4] 13.965   [1] 13.759   [2] 13. 836   [3] 13.923

c [2] 0.436   [4] 0.5   [1] 0.42   [3] 0.467

d [4] 1.082   [3] 1.08   [2] 1.053   [1] 1.042

3 Rewrite each set of numbers from largest to smallest.

a 198.596, 198.534, 198.923, 198.302

198.923, 198.596, 198.534, 198.302

b 0.974, 0.243, 0.427, 0.853

0.974, 0.853, 0.427, 0.243

c 54.9, 54.935, 54.608, 54.62

54.935, 54.9, 54.62, 54.608

d 0.6, 0.02, 0.735, 0.035

0.735, 0.6, 0.035, 0.02

4 Write 4 numbers that have the place values indicated. The first one has been done for you. *Students' answers will vary.*

a 4 hundredths   12.1**4**7   931.0**4**   5.0**4**1   85.9**4**8

b 6 tenths   _____ _____ _____ _____

c 8 thousandths   _____ _____ _____ _____

d 2 hundredths   _____ _____ _____ _____

e 3 tenths, 5 thousandths   _____ _____ _____ _____

f 0 hundredths, 7 thousandths   _____ _____ _____ _____

44 Fractions and Decimals

Working with decimals

1 During a walk-a-thon, students must walk as far as they can in one hour. The results are shown in the table.

a List the top 3 students.

Student	Distance walked (km)
Xavier	6.052
Anthony	6.847
Lian	6.856
Ada	6.408
Asher	6.480

i First place _____Lian_____

ii Second place _____Anthony_____

iii Third place _____Asher_____

b All of the students walked between 6 km and 7 km. Name the students that walked:

i 6 km and 52 m. _____Xavier_____

ii 6 km and 408 m. _____Ada_____

c How far did each of the place-getters walk?

i First place ____6____ km and ____856____ m

ii Second place ____6____ km and ____847____ m

iii Third place ____6____ km and ____480____ m

d Malik was absent on competition day and completed the walk-a-thon when he returned to school. He walked 6.672 km in one hour. Does this change the top 3? Give a reason for your answer.

Yes, Malik is in third place because he walked

further than Asher but not as far as Anthony.

2 **a** Write each of the decimals in the table as a fraction.

b Using a calculator, or a mental strategy, reduce these fractions to their lowest form.

c Identify the factor that was used to reduce the fractions.

Decimal	Fraction	Lowest form of the fraction	Factor used
0.75	$\frac{75}{100}$	$\frac{3}{4}$	25
0.9	$\frac{90}{100}$	$\frac{9}{10}$	10
0.852	$\frac{852}{1000}$	$\frac{213}{250}$	4
0.065	$\frac{65}{1000}$	$\frac{13}{200}$	5

Fractions and Decimals **45**

Percentage

A percentage (%) is a fraction with a denominator of 100.
25% means twenty-five out of one hundred or $\frac{25}{100}$.

1 Colour each 100 grid as directed and complete the statements.

a Colour $\frac{17}{100}$ of the 100 grid.
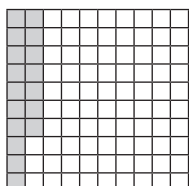
$\frac{17}{100} = \underline{\quad 17 \quad}\%$

b Colour $\frac{42}{100}$ of the 100 grid.
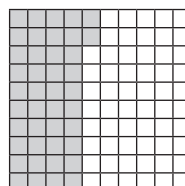
$\frac{42}{100} = \underline{\quad 42 \quad}\%$

c Colour $\frac{1}{2}$ of the 100 grid.
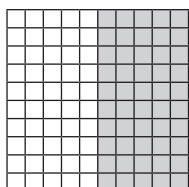
$\frac{1}{2} = \frac{\boxed{50}}{100} = \underline{\quad 50 \quad}\%$

d Colour $\frac{1}{4}$ of the 100 grid.
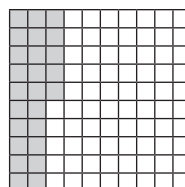
$\frac{1}{4} = \frac{\boxed{25}}{100} = \underline{\quad 25 \quad}\%$

e Colour $\frac{1}{10}$ of the 100 grid.
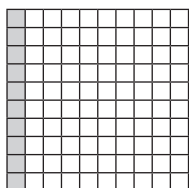
$\frac{1}{10} = \frac{\boxed{10}}{100} = \underline{\quad 10 \quad}\%$

f Colour $\frac{1}{5}$ of the 100 grid.
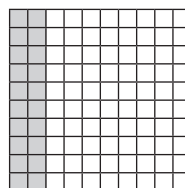
$\frac{1}{5} = \frac{\boxed{20}}{100} = \underline{\quad 20 \quad}\%$

2 Use a 100 grid, or a mental strategy, to write each fraction as a percentage.

a $\frac{5}{100} = \underline{\quad 5 \quad}\%$

b $\frac{12}{100} = \underline{\quad 12 \quad}\%$

c $\frac{39}{100} = \underline{\quad 39 \quad}\%$

d $\frac{52}{100} = \underline{\quad 52 \quad}\%$

e $\frac{80}{100} = \underline{\quad 80 \quad}\%$

f $\frac{98}{100} = \underline{\quad 98 \quad}\%$

g $\frac{4}{10} = \underline{\quad 40 \quad}\%$

h $\frac{7}{10} = \underline{\quad 70 \quad}\%$

i $\frac{9}{10} = \underline{\quad 90 \quad}\%$

j $\frac{2}{10} = \underline{\quad 20 \quad}\%$

46 Fractions and Decimals

Percentages, decimals and fractions

A percentage means 'out of 100'. So, 43% is $\frac{43}{100}$.
When written as a decimal, $\frac{43}{100}$ is 0.43, 43 hundredths
or 4 tenths and 3 hundredths.
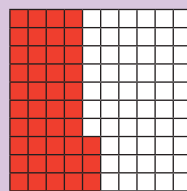
43%
43 hundredths
4 tenths and three hundredths

15

1 Write each of these percentages as a fraction of 100 and as a decimal.

a 25% = $\frac{25}{100}$ = _0.25_

b 50% = $\frac{50}{100}$ = _0.5_

c 10% = $\frac{10}{100}$ = _0.1_

d 67% = $\frac{67}{100}$ = _0.67_

e 95% = $\frac{95}{100}$ = _0.95_

f 9% = $\frac{9}{100}$ = _0.09_

2 Write each of these decimals as a percentage.

a 0.77 = _77_ %

b 0.62 = _62_ %

c 0.21 = _21_ %

d 0.98 = _98_ %

e 0.03 = _3_ %

f 0.01 = _1_ %

g 0.16 = _16_ %

h 0.37 = _37_ %

i 0.85 = _85_ %

j 0.55 = _55_ %

3 Complete the table.

Fraction	Decimal	Percentage
$\frac{4}{5}$ or $\frac{80}{100}$	0.8	80%
$\frac{9}{10}$	0.9	90%
$\frac{52}{100}$ or $\frac{13}{25}$	0.52	52%
$\frac{2}{25}$ or $\frac{8}{100}$	0.08	8%

Fraction	Decimal	Percentage
$\frac{3}{4}$ or $\frac{75}{100}$	0.75	75%
$\frac{20}{100}$ or $\frac{1}{5}$	0.2	20%
$\frac{15}{100}$ or $\frac{3}{20}$	0.15	15%
$\frac{3}{10}$ or $\frac{30}{100}$	0.3	30%

What percentages have you seen recently? Where did you see them? How were they being used?

Fractions and Decimals **47**

Calculate with percentages

1 Omar must share each of the items below equally with his brother Ahmed.

a What percentage will each receive? _____50_____ %

b Calculate using mental strategies how many items each brother will receive.

A block of chocolate (32 squares)	14 balloons	68 marbles	100 stickers
_16_ squares	_7_ balloons	_34_ marbles	_50_ stickers

20 toy cars	50 coloured pencils	250 lollies	42 plastic bugs
_10_ toy cars	_25_ coloured pencils	_125_ lollies	_21_ plastic bugs

2 In Nina's family there are 5 people. They share the items below equally between them.

a What percentage will each person in Nina's family receive? _____20_____%

b How much will each person in Nina's family receive?

15 apples	60 cookies	250 g bag of chips	box of 30 ice-creams
_3_ apples	_12_ cookies	_50g_ of chips	_6_ ice-creams

Using percentages

1 Nariko is shopping from a department store catalogue. The prices that are shown do not include the 10% GST that will be charged. Calculate the GST for each of these items.

a

Shirt $60

_$6_

b

Jeans $150

_$15_

c

Boots $320

_$32_

d

Necklace $75

_$7.50_

e

Men's suit $400

_$40_

f

Tie $20

_$2_

g
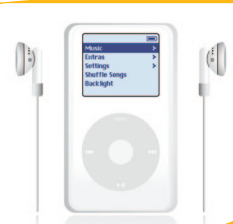
mp3 player $200

_$20_

h

LCD television $1200

_$120_

2 A survey found that 25% of people play organised sport. If this is true, how many people in each of these towns play sport?

a Milingimbi: population 900

_225_

b Kununurra: population 5500

_1375_

c Warragul: population 10 000

_2500_

d Warrnambool: population 28 800

_7200_

Work with a partner to write and conduct a survey. Present the results as percentages.

MiB 3
Card 58

Fractions and Decimals   **49**

The GST is a 10% tax on goods and services that is collected by the Federal Government. The total price of an item, including GST, is 110% of the original price.

The GST part of a price is $\frac{10\%}{110\%}$ of the total price.

GST part of the total price = $\frac{10}{110} = \frac{1}{11}$

To find the GST component of a price multiply by $\frac{1}{11}$ or divide by 11.

1 Chloe bought some things to sell at the school fete to raise money for a local charity. Because she's raising money for charity, Chloe can claim back the GST that she has paid. For the following three receipts, find out or calculate how much GST she paid.

```
JP PROVEDORES

DANISH FETTA          17.95
KALAMATA OLIVES       23.95
SUN-DRIED TOMATOES    15.95
DOLMADES              26.85
PITA BREAD            10.00
OLIVE OIL              9.95
DUKKAH                12.95
CHORIZO               14.95

TOTAL              $132.55

THANK YOU FOR YOUR CUSTOM
**************************
```

```
BEN'S PLATES N' STUFF

SIDE PLATE/26@ 2.90 EA
            75.40 EX GST

TASTING FORK/26@1.75 EA
            45.50 EX GST

PK 100 NAPKINS/1@4.00 EA
             4.00 EX GST


SUBTOT          $124.90
GST AMT          $12.49

TOTAL           $137.39

    SEE YOU SOON!
        ***
```

```
FANCY FIZZ

GRAPEFRUIT FIZZ 5L    25.00
LIME FIZZ 5L          25.00
STRAWBERRY FIZZ 5L    25.00
LYCHEE FIZZ 5L        25.00
50 TUMBLERS-FANCY     43.00

TOTAL              143.00

HAVE A FANCY DAY
***
```

GST _____ *$13.26* _____   GST _____ *$12.49* _____   GST _____ *$14.30* _____

2 How much GST did Chloe claim back in total? How much did she spend herself?

	GST	Amount Chloe spent without GST
JP Provedores	*$13.26*	*$132.55*
Ben's Plates N' Stuff	*$12.49*	*$124.90*
Fancy Fizz	*$14.30*	*$143.00*
Total	*$40.05*	*$440.50*

Sausage sizzle fundraising

The Dashville Demons Athletics Club runs a sausage sizzle at the local hardware store each weekend to raise money for new equipment. During the sausage sizzle they sell 25 sausages every hour. For every 10 sausages that they sell they make $5.

1 Complete the table showing how many sausages are sold during the sausage sizzle.

No. of hours of the sausage sizzle	1	2	3	4	5	6	7
No. of sausages sold	25	50	75	100	125	150	175

2 Write the rule which connects the number of sausages sold to how long the sausage sizzle has run.

number of hours multiplied by 25 is equal to the number of sausages sold

3 Complete the table showing how much money is made by selling the sausages.

No. of sausages sold	10	20	30	40	50	60	70
Money that is made ($)	$5	$10	$15	$20	$25	$30	$35

4 Write the rule which connects the number of sausages sold to how much money is made.

Half the no. of sausages sold is equal to the money made.

5 Use your answer to Question 2 to calculate how many sausages will be sold if the sausage sizzle is run for 20 hours.

500 sausages

6 Use your answers to Questions 4 and 5 to calculate the money that the club will make if the sausage sizzle is run for 20 hours.

$250

7 If the club needs to make $1500 to buy their equipment, how many sausages do they need to sell and how many hours do they have to run the sausage sizzle for?

3000 sausages, 120 hours.

1 Look at each of the following patterns. Draw or write the next 3 elements of the pattern.

a 100, 200, 300, 400, 500, __600__, __700__, __800__

b ABC, ABD, ABE, ABF, ABG, __ABH__, __ABI__, __ABJ__

c 2, 6, 10, 14, 18, __22__, __26__, __30__

d ♠ ♣ ♥ ♦ ♠ ♣ ♥ ♦ ♠ __♣__, __♥__, __♦__

e ☺☻, ☺☻☻, ☺☻☻☻, ☺☻☻☻☻, __☺☻☻☻☻☻__, __☺☻☻☻☻☻☻__, __☺☻☻☻☻☻☻☻__

f Ȧ A·, Ạ ·A, Ḃ B·, __Ḅ ·B__, __Ċ C·__, __Ç ·C__

2 **a** Draw the next 3 elements of the pattern.

△△, △△△, △ __△△△△△   △△△△△△ △△△△△△△__

b Use the pattern to complete the table.

No. of triangles	1	2	3	4	5	6	7
No. of sides	3	6	9	12	15	18	21

c What patterns can you see in the table?

No. of sides is equal to no. of triangles times 3.

Looking for patterns?
In a table of values, look for patterns that go across the rows as well as down the columns.

1	2	3	4	
3	6			

3 **a** Draw the next 3 elements of the pattern.

□, □ □, □ □ □, □ __□□□□ □□□□□ □□□□□□__

b Use the pattern to complete the table.

No. of squares	1	2	3	4	5	6	7
No. of sides	4	8	12	16	20	24	28

c Look at the table. What patterns can you see?

No. of sides is equals to no. of squares times 4.

Geometric patterns

1

a Draw the next 3 elements of this pattern of pentagons.

⬠, ⬠⬠, ⬠⬠⬠, ⬠⬠⬠⬠, ⬠⬠⬠⬠⬠ , ⬠⬠⬠⬠⬠⬠ , ⬠⬠⬠⬠⬠⬠⬠
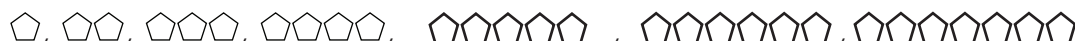
b Use the pattern to complete the table.

No. of pentagons	1	2	3	4	5	6	7
No. of sides	5	10	15	20	25	30	35

c What patterns can you see in the table?

No. of sides is equal to no. of pentagons times 5.

d How many sides would there be for 12 pentagons? *60*

e How did you work out the answer to part d?

12 × 5

2 Kayla's grandmother is planning to make a quilt. The block pattern that she has chosen uses squares and triangles in 4 different colours – red, orange, light blue and navy blue. In a quilt many blocks are made and joined together to make the final quilt.
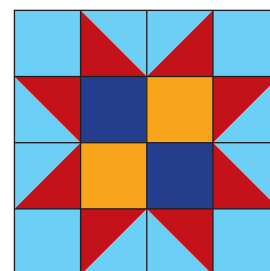
a Use the block picture to complete the table.

No. of blocks	1	2	3	4	5	6	7
Navy blue squares	2	4	6	8	10	12	14
Orange squares	2	4	6	8	10	12	14
Red triangles	8	16	24	32	40	48	56
Light blue squares	4	8	12	16	20	24	28
Light blue triangles	8	16	32	32	40	48	56

b Write in words the pattern that connects the number of blocks to:

i the number of navy blue squares needed.

The number of navy blue squares needed is twice the number of blocks

ii the number of red triangles needed.

The number of red triangles needed is eight times the number of blocks

c If Kayla's grandmother has 30 navy blue squares, how many blocks is this enough for? *15*

d If the finished quilt has 240 red triangles, how many blocks does it have? *30*

Patterns and Algebra **53**

Patterns in columns

1 a Draw the next 3 elements of this hexagon pattern.

⬡, ⬡⬡, ⬡⬡⬡, ⬡⬡⬡⬡, _⬡⬡⬡⬡⬡_ , ⬡⬡⬡⬡⬡⬡, ⬡⬡⬡⬡⬡⬡⬡

b Use the pattern to complete the table.

No. of hexagons	1	2	3	4	5	6	7
No. of sides	6	12	18	24	30	36	42

c Look at the table. What patterns can you see?

No. of sides is equal to no. of hexagons times 6.

d How many hexagons would there be if there were 120 sides? _____*20*_____

e How many sides would there be if there were 50 hexagons? _____*300*_____

The **column pattern** is the pattern that connects one set of numbers to another set of numbers. You find the pattern by looking down each column.

1	2	3	4	5
7	14	21	28	35

For example:
As shown in the table, the bottom numbers can be found by multiplying the top numbers by 7; 1 x **7** = 7, 2 x **7** = 14, 3 x **7** = 21.

This pattern occurs in *every* column of this table.

---

2 Complete each table and write in words the pattern that can be found in the columns.

a

1	2	3	4	5	6	7	8	9	10
2	3	4	5	6	7	8	9	10	11

The bottom numbers can be found by adding 1 to the top numbers.

b

1	2	3	4	5	6	7	8	9	10
0.5	1	1.5	2	2.5	3	3.5	4	4.5	5

The bottom numbers can be found by halving the top numbers.

Patterns and Algebra

Working with patterns

1

a Draw in the next 3 elements of the pattern.

⬡, ⬡⬡, ⬡⬡⬡, ⬡⬡⬡⬡, _⬡⬡⬡⬡⬡_, _⬡⬡⬡⬡⬡⬡_, _⬡⬡⬡⬡⬡⬡⬡_

b Use the pattern to complete the table.

Place in pattern	1	2	3	4	5	6	7
No. of hexagons	1	2	3	4	5	6	7

c Look at the table. What patterns can you see?

The numbers are the same.

d How many hexagons would the 35th place in the pattern have? _35_

e Which place in the pattern would have 60 hexagons? _60th_

2 Plates come out on a sushi train at the rate of 8 per minute.

a Complete the table to show how many plates have come out.

Minutes	1	2	3	4	5	6	7
Number of plates	8	16	24	32	40	48	56

b Write the column pattern that connects the number of minutes that have gone by to the number of plates that have come out on the sushi train.

Number of minutes times 8 equals number

of plates.

c If the sushi train has been operating for three hours, how many plates have come out?

1440 plates

d If 2880 plates have come out, how long has it been running in hours?

6 hours.

1   **a**   Draw in the next 3 elements of the pattern.

▯▯▯ , ▯▯▯▯ , ▯▯▯▯▯ , ▯▯▯▯▯▯ , ▯▯▯▯▯▯▯ , ▯▯▯▯▯▯▯▯
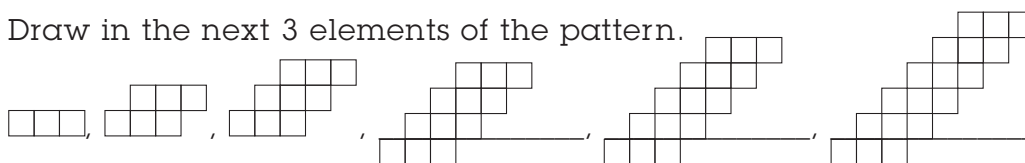
17

b   Use the pattern to complete the table.

Steps	1	2	3	4	5	6	7
No. of small squares	3	6	9	12	15	18	21

c   Write in words the pattern that you find in the columns of the table.

The number of small squares is 3 times the number of steps

d   If there were 276 small squares, how many steps would there be?   *92*

2   Write the column pattern/rule in words for each of the tables.

5	6	7	8	9	10	11
1	2	3	4	5	6	7

Column pattern/rule: *Subtract 4 from top number to get bottom number*

> The **column pattern** is also known as **the 'rule'**. It connects the first set of numbers (1st row) to the second set of numbers (2nd row).

7	8	9	10	11	12	13
14	16	18	20	22	24	26

Column pattern/rule: *Multiply top number by two to get bottom number*

3   A cafe sells sliced cake at the rate of $1\frac{1}{4}$ cakes per hour.

a   Complete the table using the information provided.

No. of hours	1	2	3	4	5	6	7
Amount of cake	$1\frac{1}{4}$	$2\frac{1}{2}$	$3\frac{3}{4}$	5	$6\frac{1}{4}$	$7\frac{1}{2}$	$8\frac{3}{4}$

b   Write the rule which connects the number of hours to the amount of cake sold.

multiply top row by $1\frac{1}{4}$ to get the amount of cake sold.

c   Use the rule to calculate how many hours it would take to sell ten cakes.

$12\frac{1}{2}$ hours.

Graphing patterns

The graph shows the pattern between the number of rides on a carousel and the number of tickets used to ride it.
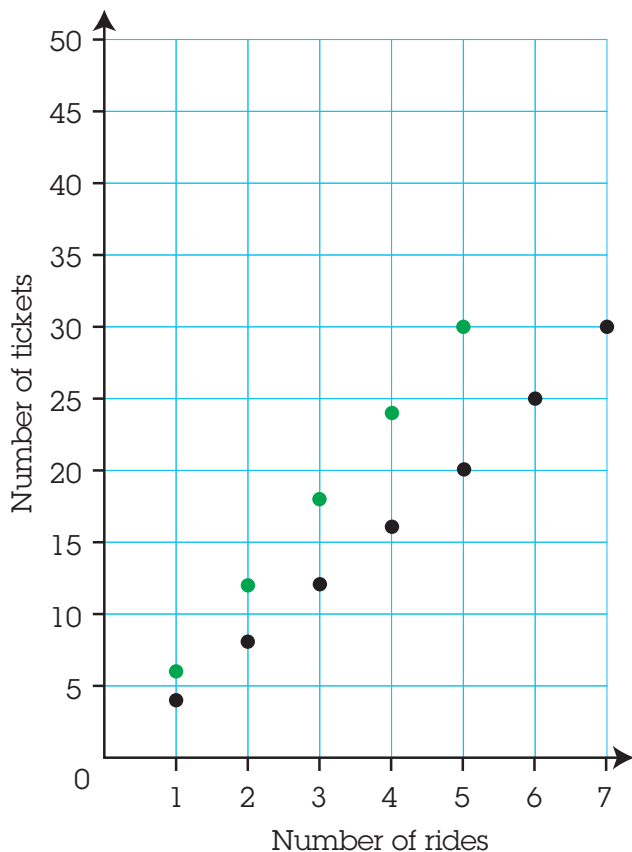
1 Use the graph to complete the following sentences.

a The points on the graph form a pattern that looks like _diagonal line_.

b For each ride that is taken the number of tickets increases by _4_.

2 Plot the points for the number of tickets needed for 6 and 7 rides.

3 On the same graph in a different colour, plot the information in the table below which shows the number of tickets required to ride on the Giant Slide.

Number of rides	1	2	3	4	5
Number of tickets	6	12	18	24	30

4 Is it more or less expensive to ride on the Giant Slide than the carousel?

more expensive

5 Describe how the graphs of the ticket information for the Giant Slide and the carousel are:

a the same.

Both are straight lines with positive slopes if you connect the points.

b different.

The Gaint Slide's line is steeper than the carousel's line.

Missing numbers

One of the easiest ways to solve some simple missing number problems is to use the reverse operation. Here are two examples:

◯ + 19 = 32

reverse the operation

◯ = 32 − 19

So ◯ = 13

3 × ◈ = 27

reverse the operation

◈ = 27 ÷ 3

So ◈ = 9

Marisol has been to Venus and collected these aliens. She wants to sell them to a collector on Mars. Solve these missing number problems to find out how much each alien is worth. Write your answers on Marisol's catalogue below.

| 6 | 5 | 22 | 21 | 131 | 55 | 3 | 16 |

| 3 | 10 | 6 | 7 | 15 | 350 | 750 |
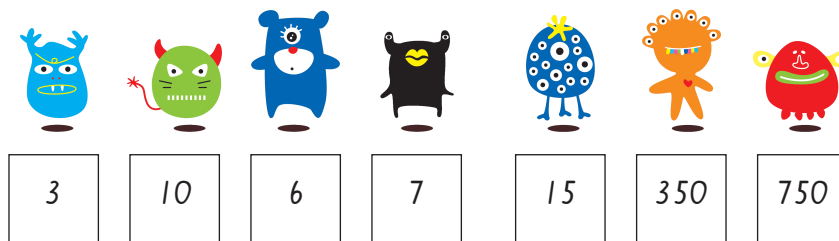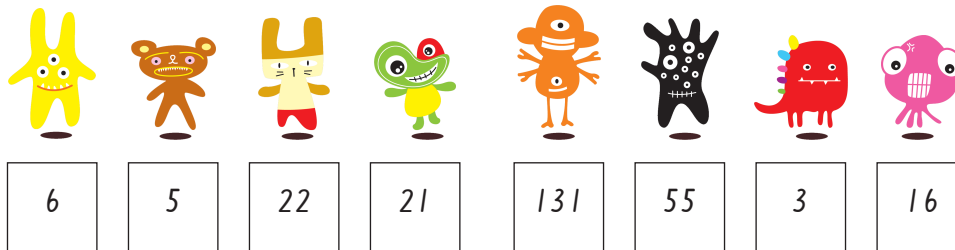
1 **a** ☺ + 7 = 13 **b** 11 + ☺ = 16 **c** 33 + ☺ = 55

d 67 = ☺ + 46 **e** 95 = ☺ − 36 **f** 245 + ☺ = 300

2 **a** 4 × ☺ = 12 **b** 20 × ☺ = 200 **c** 36 = ☺ ×6

d 560 = ☺ × 80 **e** ☺ × 300 = 900 **f** 64 = 4 × ☺

3 **a** ☺ ÷ 5 = 3 **b** ☺ ÷ 7 = 50 **c** ☺ ÷ 50 = 15

Introducing kilometres

1 Put a tick (✓) under those pictures that show distances that are most appropriate to measure in kilometres.

a Height ☐

b Length of the road ✓

c Length of the corridor ☐

d Distance travelled ✓

e Length of the stream ✓

f Depth ☐

g Length of the bridge ☐

h Distance travelled ✓

2 Measure each of the following distances, and record the results in the table.

Activity	Distance
From your house to school	
From school to the local shops	
Walking around your local park	
Running around the school oval	
The distance around your school	

Students' answers will vary.

3 Use the internet or other sources to find the following distances in kilometres:

a the length of your nearest airport runway _____ km

b from school to the nearest suburb/town starting with 'D' _____ km

c the Olympic marathon race _____ km

d the distance from Mackay to Rockhampton _____ km

e the distance from Hobart, Australia to Auckland, New Zealand _____ km

f the depth of the deepest part of the world's oceans, the Mariana Trench _____ km

g the height of Mount Everest _____ km

MiB 3
Card 95

Using Units of Measurement 59

Working with kilometres

1 Determine if the following statements are *true* or *false*.

> To change a number from metres to kilometres the number gets **smaller** (because one metre is 1000 times shorter than one kilometre). Divide metres by 1000 to get kilometres.
>
> To change from kilometres to metres the number gets **larger** (because one kilometre is 1000 times longer than one metre). Multiply kilometres by 1000 to get metres.

a There are 1000 metres in 1 kilometre. ___*True*___

b When changing from kilometres to metres the number gets smaller. ___*False*___

c When changing from metres to kilometres the number gets larger. ___*False*___

2 Convert each of the measurements in metres to a measurement in kilometres.

a 4000 m = ___4___ km   **b** 63 000 m = ___63___ km

c 360 000 m = ___360___ km   **d** 8 273 000 m = ___8273___ km

3 Convert each of the measurements in kilometres to a measurement in metres.

a 2 km = ___2000___ m   **b** 75 km = ___75000___ m

c 482 km = ___482000___ m   **d** 5185 km = ___5185000___ m

4 Sven and Inge are Swedish backpackers who are visiting Australia. They buy a van and travel around Australia. The logbook of their trip is shown below, as well as the odometer reading when they start. Calculate how far they have travelled, and complete the second odometer to show what it reads at the end of their trip.

Darwin – Perth	4172 km
Perth – Adelaide	3290 km
Adelaide – Melbourne	1781 km
Melbourne – Canberra	2065 km
Canberra – Sydney	445 km
Sydney – Brisbane	931 km
Brisbane – Cairns	1681 km
Cairns – Darwin (via Uluru)	4642 km

Start
km/h 425 479

Finish
km/h 444 486

60 Using Units of Measurement
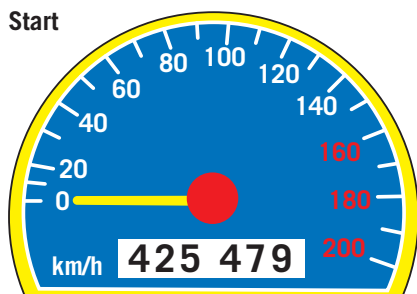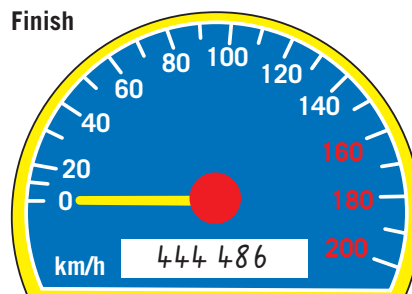
Kilometre problems

1 A map of Rottnest Island is shown. Luis travels there for the day, landing by ferry at Thomson Bay with his bicycle. Plan a bike trip for Luis of as close to 25 km as you can. Where could he visit on the trip?

Students' answers will vary.

Rottnest Island

4.5 km
760 m
Thomson Bay
1 km
2.5 km
Kingstown Barracks
2 km
Stark Bay
Lighthouse
550 m
2 km
1900 m
600 m
Narrow Neck
1800 m
500 m
2670 m
Oliver Hill Lookout
4 km
1 km
2590 m
West End
Jeannie's Lookout
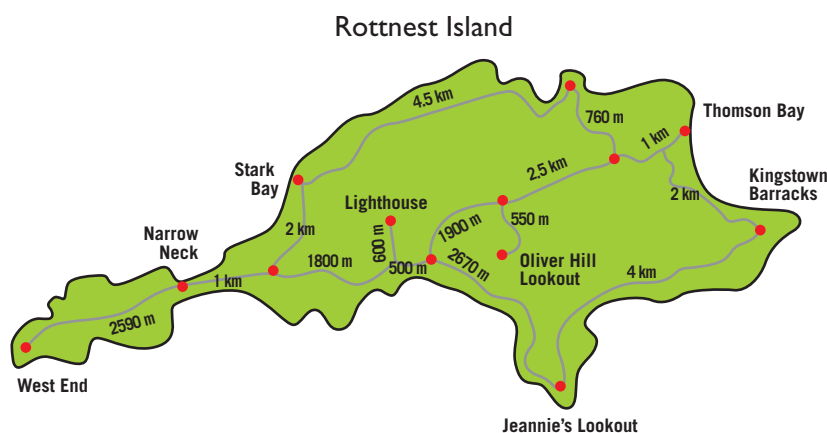
2 The Andes mountains in South America sit next to a deep-sea trench. The picture shows the highest and lowest points. If you were able to travel *directly* from the highest point to the lowest point, how far would you have travelled in kilometres?

6962 m

8065 m
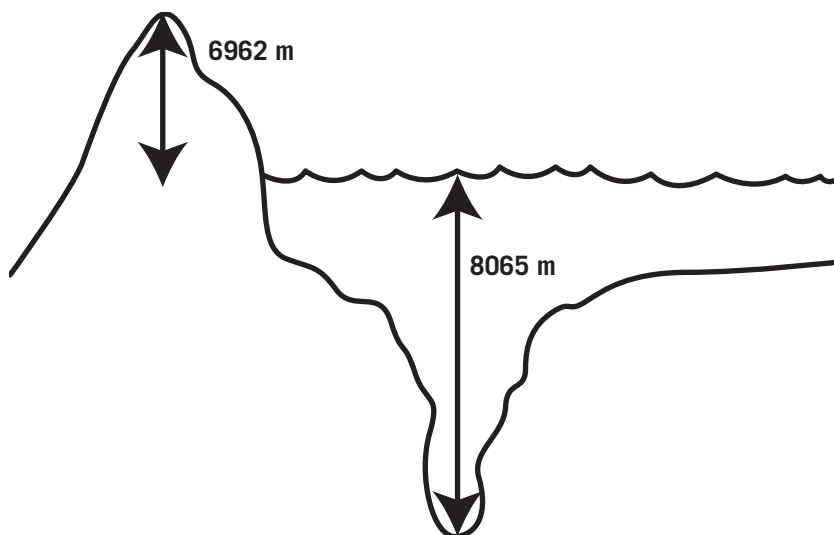
15027m

3 The wreck of RMS *Titanic* lies 3965 m below the surface of the ocean off the Newfoundland coast in the North Atlantic Ocean. The wreck of HMAS *Sydney* lies 2468 m below the surface of the Indian Ocean just off the Western Australian coast.

a Which wreck is deeper?

Titanic

b How many kilometres deeper is it?

1497km

Measuring perimeter

1 Use a ruler to measure the perimeter of each shape using the unit of measurement indicated.

Remember!
Perimeter is the distance around the outside of a two-dimensional shape.

a ___8___ cm

b ___51___ mm

c ___80___ mm

d ___16___ cm
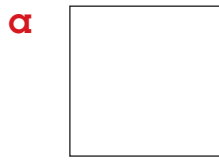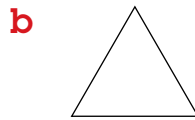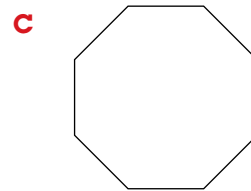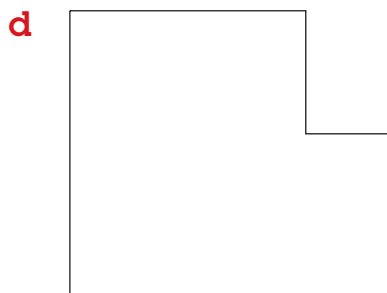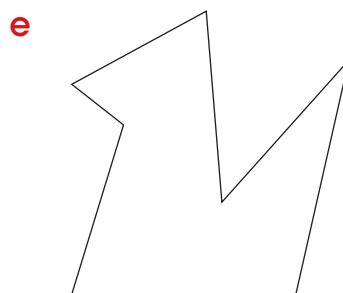
e ___165___ mm
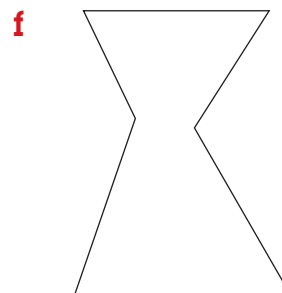
f ___14___ cm

2 Draw 3 shapes that have a perimeter of 12 cm.

Students' answers will vary.

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MiB 3 Cards 97, 98 and 99

Using Units of Measurement

Calculating perimeters

1 Measure the perimeter of each shape.

a

b

c
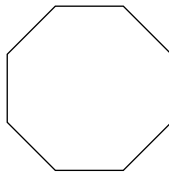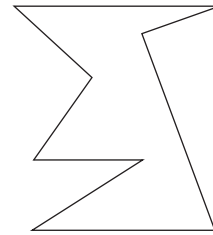
___14___ cm   ___72___ mm   ___151___ mm

2 Calculate the perimeter of each shape.

a

9 cm

8 cm

6 cm
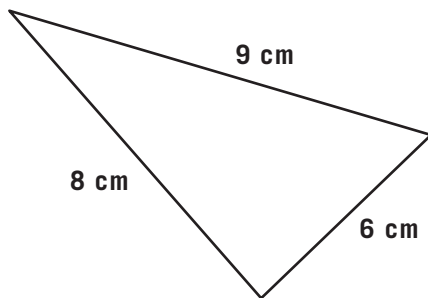
Perimeter = ___8___ + ___9___ + 6 cm

= ___23___ cm

b

270 mm

150 mm   150 mm

100 mm
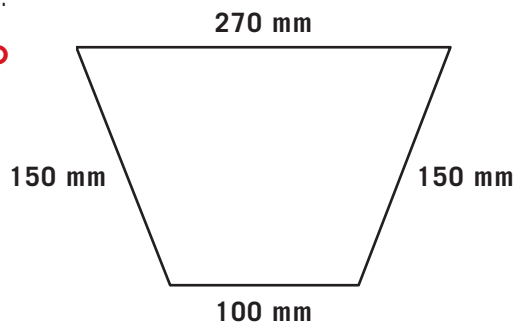
Perimeter = ___270___ + 150 mm + ___150___ + ___100___

= ___670___ mm

c

2 m   2 m

1 m   1 m   1 m

1 m

3 m   3 m

5 m
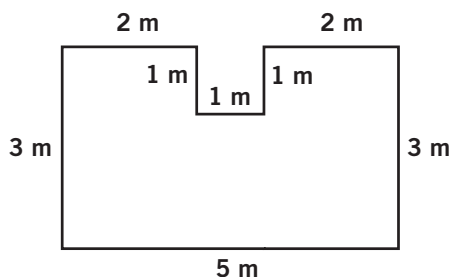
Perimeter = $\underline{3+5+3+2+1+1+1+2}$

= ___18___ m

d

8 m   6 m

6 m

17 m   3 m
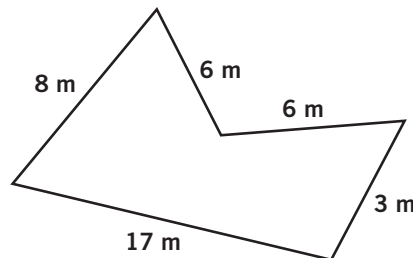
Perimeter = $\underline{8+6+6+3+17=40m}$

= ___0.04___ km

3 A builder needs to buy a length of skirting board to go around a bedroom. The bedroom is rectangular, with walls measuring 540 cm and 310 cm. What length of skirting board does the builder need to purchase? Give your answer in metres.

$\underline{1700cm = 17m}$

skirting boards

Using Units of Measurement **63**

Perimeters using different units

1 Calculate the perimeter of each shape.

a

2.5 cm

6.5 cm

6.5 cm

2.5 cm

P = _____ $6.5 + 2.5 + 6.5 + 2.5$ _____

= _____ 18 _____ cm

b

423 mm

105 mm

423 mm

P = _____ $423 + 423 + 105$ _____

= _____ 951 _____ mm

c

37 mm

21 mm

2 cm

4.5 cm

5 cm

P = _____ $3.7 + 2.1 + 2 + 5 + 4.5$ _____

= _____ 17.3 _____ cm

d

27 mm

52 mm

3 cm
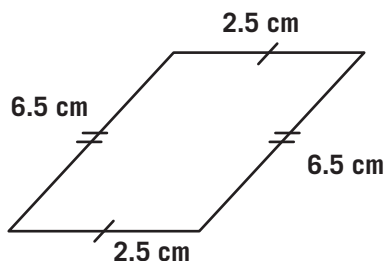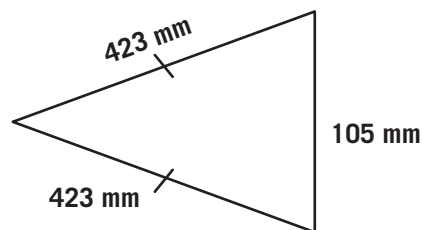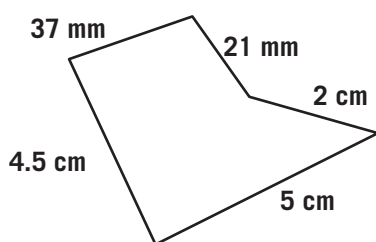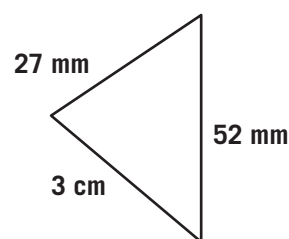
P = _____ $27 + 30 + 52$ _____

= _____ 109 _____ mm

2 The local orienteering club traversed a course that took them 210 m to a large tree, 370 m to the riverbank, 406 m to an old shearers' shed, 151 m to a large boulder and finally 363 m back to their start point.

210 m

370 m

406 m

Start
A
Finish

363 m

151 m

a Label the picture with start/finish and arrows to show the direction they walked.

b How many kilometres did they walk? _____ 1.5 _____
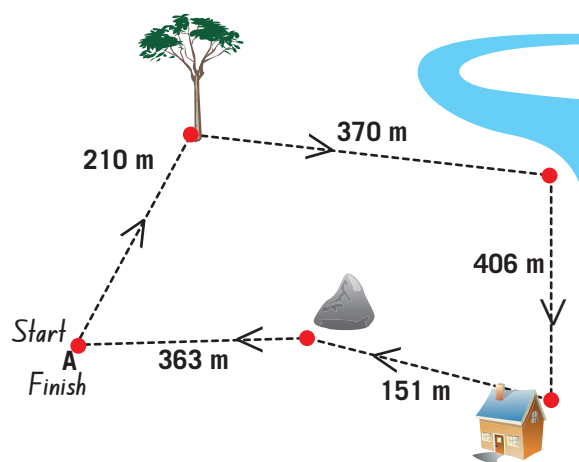
3 Which of the rugs has the largest perimeter? Show your working.

1 m

120 cm

1.5 m

80 cm
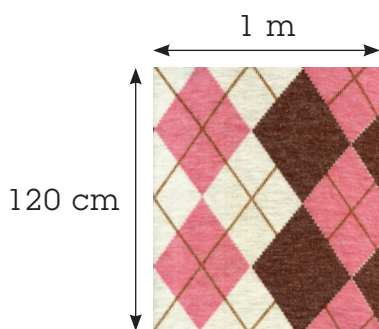
$P = 1 + 1 + 1.2 + 1.2$

$= 4.4m$
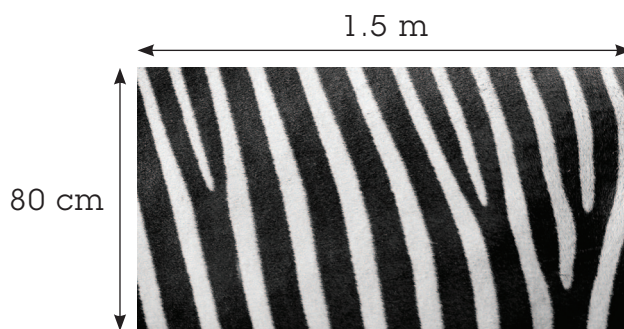
$P = 1.5 + 1.5 + 0.8 + 0.8$

$= 4.6m$ = larger perimeter

Perimeter and speed

1 Write the speed shown on each speedometer in the space underneath.

a

80 100 120
60 140
40
20 160
0 180
km/h 1 1 7 7 5 200

_85km/hr_

b

80 100 120
60 140
40
20 160
0 180
km/h 1 1 7 7 5 200

_0km/hr_

c

80 100 120
60 140
40
20 160
0 180
km/h 1 1 7 7 5 200

_50km/hr_

d

80 100 120
60 140
40
20 160
0 180
km/h 1 1 7 7 5 200
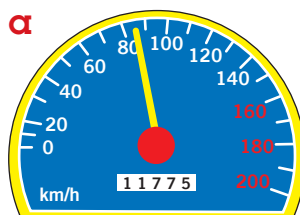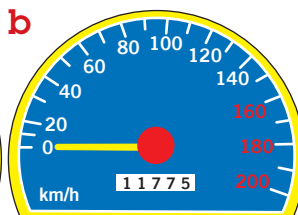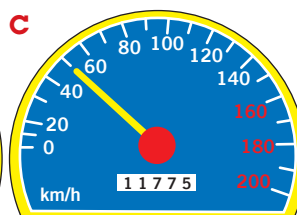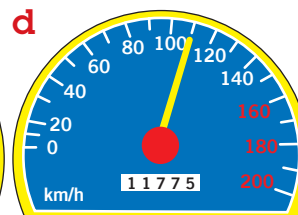
_110km/hr_

2 **a** If Katrina rides her bicycle at 6 km/h, how far will she have travelled:

    i after 1 hour? _6km_ **ii** after 2 hours? _12km_ **iii** after 5 hours? _30km_

  b How long would it take Katrina to travel:

    i 24 km? _4 hours_ **ii** 54 km? _9 hours_ **iii** 90 km? _15 hours_

3 A farmer rides around his property on a motorcycle to check whether the fences are in need of repair. The path that he takes is shown in the picture.

  a How far does the farmer travel?

        _26km_

  b If he travels at 10 km/h, how long does it take?

        2.6hrs (2hrs 36min)

5 km
4 km
3 km
1 km
2 km
5 km
6 km
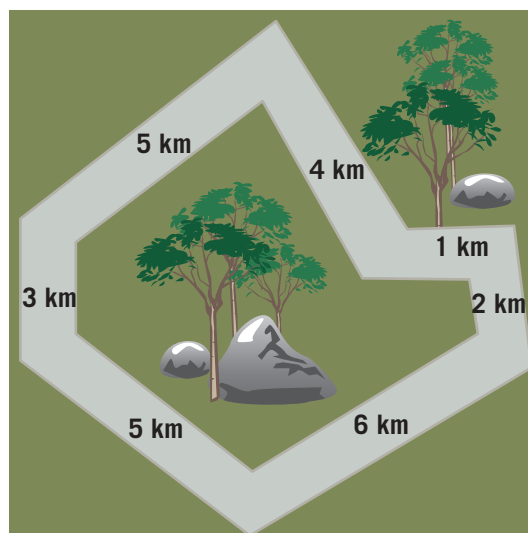
  c If the farmer travelled by horse at 3 km/h, how much time does he save using a motorcycle?

        8.6 hrs by horse, therefore he saves 6 hrs by motorcycle.

4 Describe how you could measure the perimeter of shapes with curved sides such as the one shown.

    Use a piece of string to trace the shape then measure the string with a ruler.
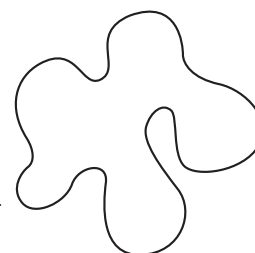
How can you easily calculate the perimeter of shapes that have some or all of their sides the same length? Talk about which shapes this applies to.

Using Units of Measurement **65**

The hectare

Remember!
The area of a shape is how much of a surface it covers. We can measure area by covering a surface with squares that are identical to each other and counting them. All units of area are squares.
A hectare is 10 000 square metres (m²), a square with sides that measure 100 m.

1 Indicate with a tick (✓) which areas would be larger than a hectare.

a The stadium surface [ ]

b A tennis court [ ]

c A small town [✓]

d A fort (inside the walls) [ ]

2 Each grid square in these pictures represents 100 m by 100 m. Count the squares to determine the area, in hectares, of each shape.
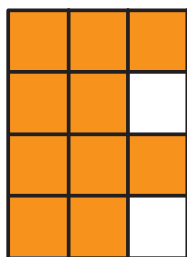
a _10 ha_
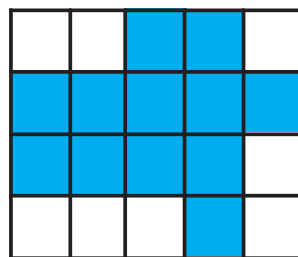
b _12 ha_
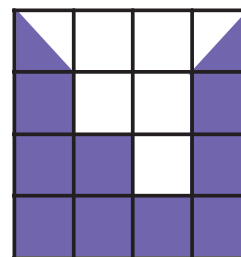
c _10 ha_
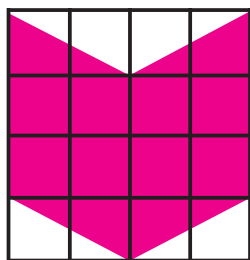
d _12 ha_

e _10 ha_

f _14.5 ha_

21

Using Units of Measurement
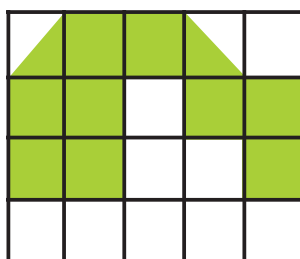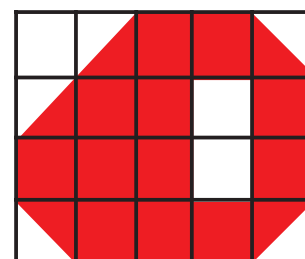
Calculating area

1 Calculate the area of these squares and rectangles.

a   8 cm / 8 cm square

Area = __8__ × __8__

= __64__ cm²

b   11 cm / 4 cm

Area = __11__ × __4__

= __44__ cm²

c   9 cm / 6 cm

Area = __9__ × __6__

= __54__ cm²

d   7 m / 4 m

Area = __7__ × __4__

= __28__ m²

e   20 m / 4 m

Area = __20__ × __4__

= __80__ m²

f   13 m / 8 m

Area = __13__ × __8__

= __104__ m²

2 Calculate the area.

a   12 cm / 12 cm

Area = __12__ × __12__

= __144__ cm²

b   14 cm / 5 cm

Area = __14__ × __5__

= __70__ cm²

c   15 cm / 7 cm

Area = __15__ × __7__

= __105__ cm²

d   13 m / 2 m

Area = __13__ × __2__

= __26__ m²

e   11 m / 6 m

Area = __11__ × __6__

= __66__ m²

f   8 m / 10 m

Area = __10__ × __8__

= __80__ m²

MiB 3
Card
105
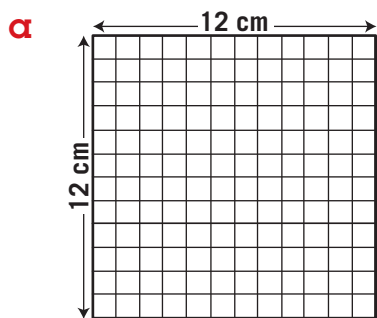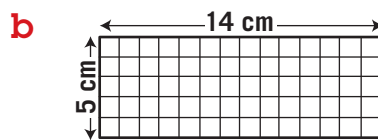
The square kilometre

1 Each grid square in these shapes has an area of one square kilometre (1 km²). Count the squares to determine the area, in square kilometres, of each shape.

a   **b**   **c**

_____10_____ km²   _____10_____ km²   _____9_____ km²
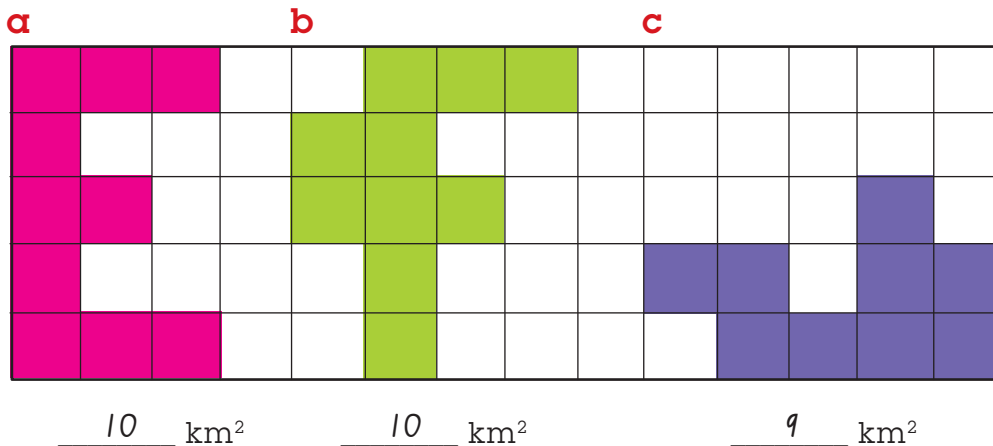
2 Indicate with a tick (✓) the most appropriate unit to measure the area of the items in the table.

	cm²	m²	ha	km²
Carpet in a room		✓		
A national park				✓
Your backyard		✓		
A football field		✓		
The city of Ballarat			✓	
A DVD cover	✓			

3 The table gives the area, in square kilometres, of the Australian state and territory capital cities. Use this information to answer the questions.

Capital city	Area in km²
Adelaide	1827
Brisbane	5905
Canberra	806
Darwin	112
Hobart	1357
Melbourne	8831
Perth	5386
Sydney	12 145

a Which city covers the largest area? _____Sydney_____

b Which city covers the smallest area? _____Darwin_____

c List the cities in order from smallest area to largest area.

_____Darwin, Canberra, Hobart, Adelaide,_____

_____Perth, Brisbane, Melbourne, Sydney_____

MiB 3 Card 104

68 Using Units of Measurement

Using the square kilometre

1 Each grid square in the shapes below has an area of 1 square kilometre (1 km²). Count the squares to determine the total area of each shape.

a　　　　　　　**b**　　　　　　　**c**

_____10_____ km²　　　_____8_____ km²　　　_____9_____ km²
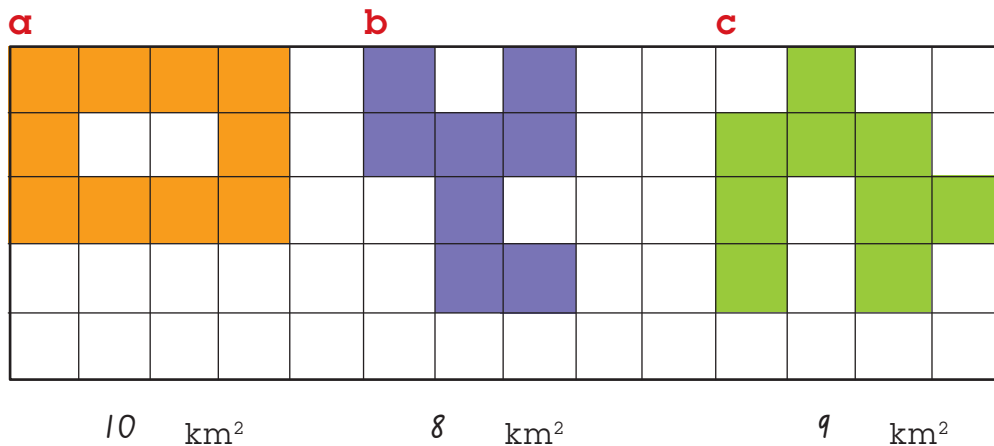
2 Write the **unit of area** (size of the grid squares) that should be used for measuring each of the rectangles.

a ← 3 km →

9 km

_____km²_____

b ← 10 m →

4 m

_____m²_____
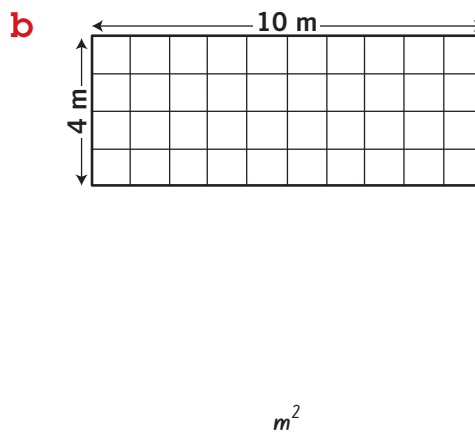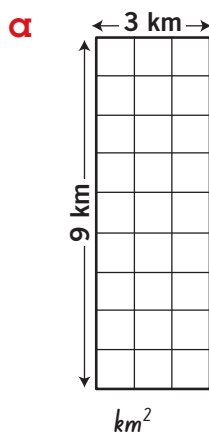
3 Calculate the area of each of the shapes below. Remember to include the unit of area (size of the grid squares).

a 5 m

4 m

_____20m²_____

_____

_____

b ← 2 cm →

8 cm

_____16cm²_____

_____

_____

c 7 cm

7 cm

_____49cm²_____

_____

_____
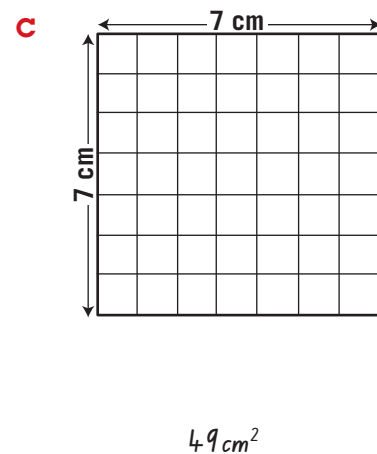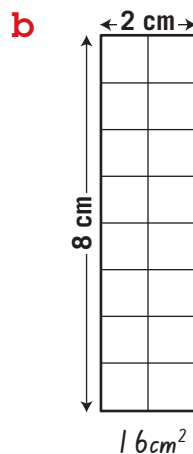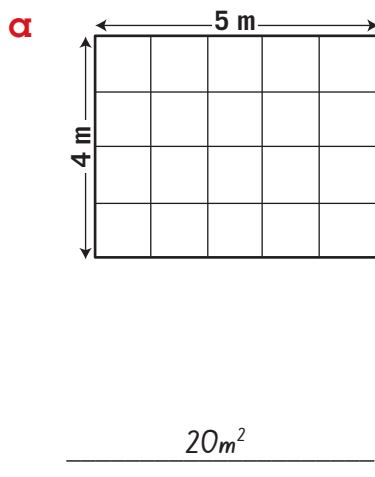
1 Choose the most appropriate unit of area for each triangle.

a

9 cm

9 cm

_____ cm^2 _____

b

17 m

_____ m^2 _____

c

9 km

7 km

1 km
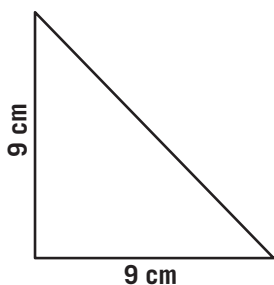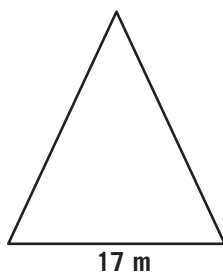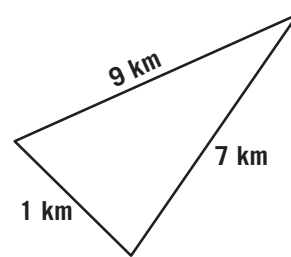
_____ km^2 _____

2 Count the grid squares to find the area of each triangle.

22

a   b   c

___4.5___ squares   ___8___ squares   ___9.5___ squares

d   e   f
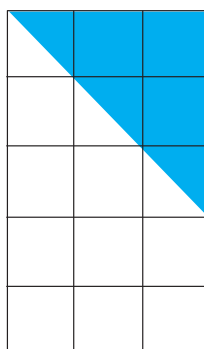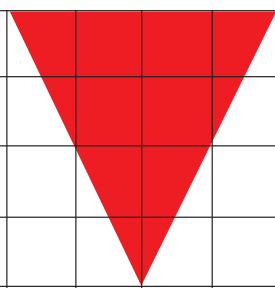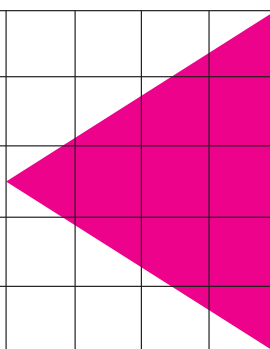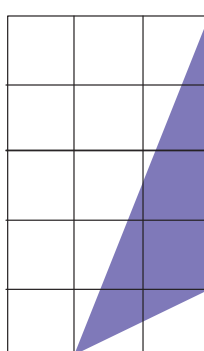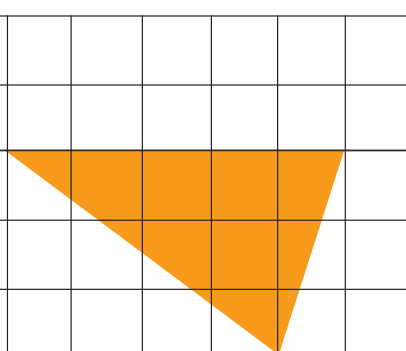
___4.5___ squares   ___4___ squares   ___7___ squares

3 What did you find difficult about counting the squares to find the area of the triangle in Question 2d?

Students' answers will vary.

_____

_____

_____

Area of irregular shapes

1 Use the grid to help you estimate the area of each shape.

a   **b**   **c**

_____12_____ squares   _____9_____ squares   _____9_____ squares

d   **e**
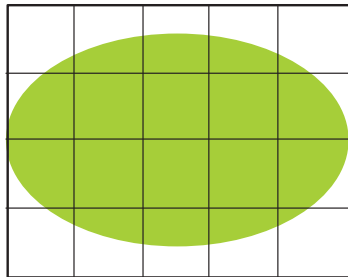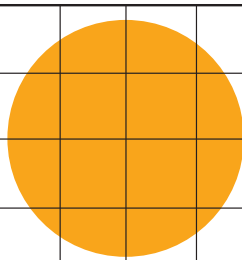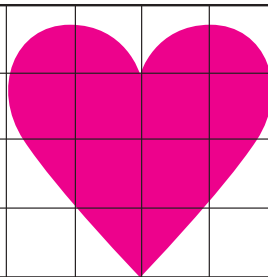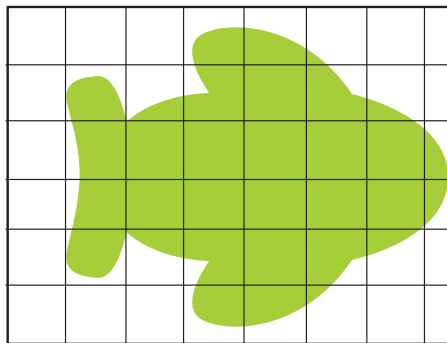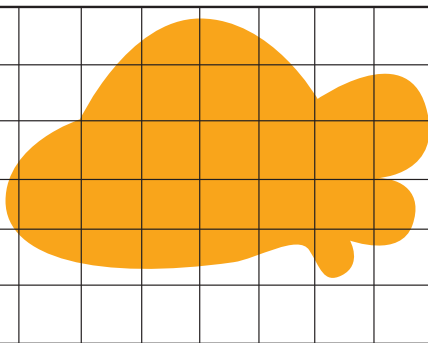
_____20_____ squares   _____22_____ squares

2 Compare your estimates with a classmate's.

> Did you use the same method to get your estimates? How were your methods the same? How were they different?

3 Calculate the area of these rectangles using a mental strategy. Remember to include the unit of area (size of the grid squares) that was used to find the area.

a ← 13 m →, 7 m

b ← 5 m →, 4 m

c ← 12 cm →, 12 cm

d ← 4 km →, 15 km
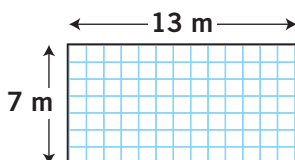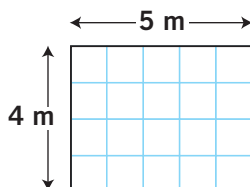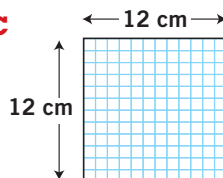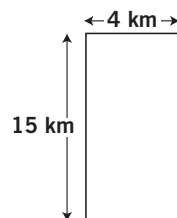
_____91 m²_____   _____20 m²_____   _____144 cm²_____   _____60 km²_____

MiB 3
Card
102

The cubic metre

1 Make a 1 m × 1 m × 1 m frame. Use it to identify, with a tick (✓), which of the following would fit inside a cubic metre (1 m³) box.

a Refrigerator ☐

b Man ☐

c Hiking backpack ✓

d Filing cabinet ✓

e Recycle bin ✓

f Microwave ✓

2 Use your cubic metre frame to find objects in your classroom or home that will and won't fit inside one cubic metre (1 m³). Record your findings in the table. *Students' answers will vary.*

Will fit into 1 m³	Won't fit into 1 m³

3 Matthew said that a standard adult racing bicycle would fit into a one cubic metre (1 m³) box, while Jacob said that it wouldn't. Explain how they are both correct.

Students' answers will vary.

_____

_____

_____

_____

_____

MiB 3 Card 113

72 **Using Units of Measurement**

Estimating with cubic metres

To estimate the volume of a space, imagine how many cubic metre boxes you could fit in it, if they were stacked in rows and columns.
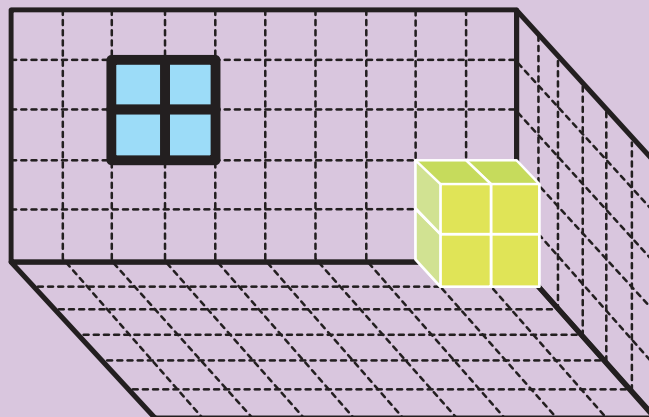
1 Estimate the size of the following items in cubic metres (m³). You may like to draw pictures in the space provided to help you. *Students' answers will vary.*

	Item	Estimated size (m³)
a	Your bedroom	
b	Your classroom	
c	Your wardrobe	
d	Your kitchen	
e	A wheelie bin	
f	A garden shed	
g	A refrigerator	
h	A bus	

2 Indicate in the table, with a tick (✓), the most appropriate unit for measuring the volume of these items.

Item	cm³	m³	Item	cm³	m³
Mulch for the garden		✓	A 'green' recycle bag	✓	
Clothes pegs in a basket	✓		A television	✓	
A large bag of potatoes	✓		The space for clothes in your wardrobe		✓
A shopping trolley		✓	Bricks to build a house		✓

MiB 3 Card 114

Using Units of Measurement 73

Measuring with cubic metres

1 Label each of the items as having volume larger than (>), smaller than (<) or equal to (=) one cubic metre (1 m³).

23

a Motorcycle   >

b Shopping trolley   >

c Portable barbecue   <

d Car   >

e Washing machine   =

f Row of wheat silos   >

2 Each of the boxes shown will hold one cubic metre (1 m³), two cubic metres (2 m³) or half a cubic metre ($\frac{1}{2}$ m³). Match each box with its correct volume by placing its letter in the table.

Volume	Box
$\frac{1}{2}$ m³	d, c
1 m³	b
2 m³	a

a 2 m × 1 m × 1 m

b 2 m × 1 m × $\frac{1}{2}$ m

c 1 m × 1 m × $\frac{1}{2}$ m

d 1 m × 1 m × $\frac{1}{2}$ m
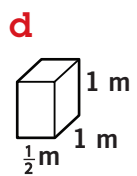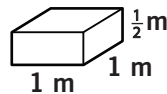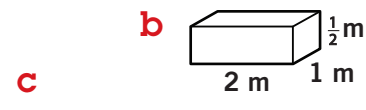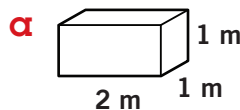
3 Each floor section of this building uses 350 m³ of concrete, and the pillars on one level use 125 m³. Use this information and the picture to work out how much concrete must be ordered.

Floor
Pillar
Floor

2375 m²

Floor   Pillar
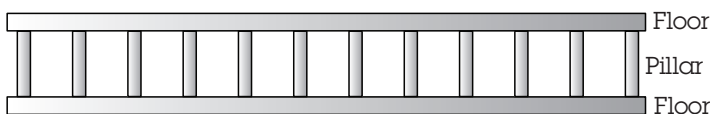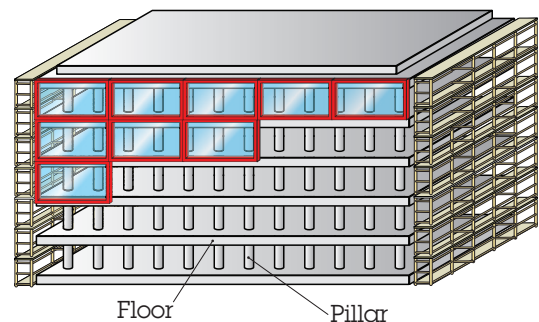
Capacity of containers

1 Place the containers in order, from largest capacity to smallest capacity, by numbering the boxes from 1 to 6.

a Skip bin — 3

b Bath — 4

c Soft-drink bottle — 6

d Water tower — 2

e Sink — 5
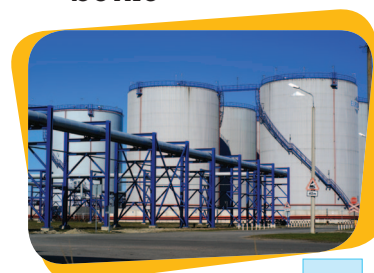
f Storage tanks — 1

2 Obtain 3 containers of various sizes and shapes. Estimate how many cubic centimetre (1 cm^3) blocks will fit into each container. Then, pack each container with cubic centimetre (1 cm^3) blocks and record its capacity in the table. *Students' answers will vary.*

Description of the container	Estimate of capacity in cubic centimetres (cm^3)	Capacity in cubic centimetres (cm^3)

Which container was easiest to fill with the cubic centimetre blocks? Why? What shape is this container? Are some shapes easier to fill than others?

3 Use 24 cubic centimetre blocks (24 cm^3) to make 3 different rectangular prisms. Draw each rectangular prism that you construct in the space provided. *Students' answers will vary.*

1 Indicate with a tick (✓), which of the pictures shows an object whose mass would be best measured in tonnes.

a A heavy suitcase ☐

b A garbage bin ☐

c A cruise ship ✓

d A bulldozer ✓

e A stack of tyres ☐

f A children's playground ☐

2 The table gives the masses of some cruise ships. Use the information to answer the questions.

Cruise ship	Mass (tonnes)
Dawn Princess	77 499
Diamond Princess	113 000
MS Volendam	61 396
Pacific Dawn	70 000
Pacific Sun	47 000
Sapphire Princess	116 000

a Which ship has the largest mass?

Sapphire Princess

b Is the *Dawn Princess* heavier or lighter than the *Sapphire Princess*?

lighter

3 a What's the total mass of all of the ships in tonnes?

484 895 tons

b Convert your answer to kilograms.

_484 895 000kg_

c Convert your answer to kilotonnes.

484.895 kilotonnes

MiB3 Card 119

76 Using Units of Measurement

Mass and multiplication

Remember!

To change from kilograms to tonnes the number gets **smaller** (because a kilogram is 1000 times lighter than a tonne) – divide by 1000.

To change from tonnes to kilograms the number gets **larger** (because a tonne is 1000 times heavier than a kilogram) – multiply by 1000.

1 Convert the masses from kilograms to tonnes.

a 7000 kg = _____7_____ t

b 87 000 kg = _____87_____ t

c 183 000 kg = _____183_____ t

d 9 275 000 kg = _____9275_____ t

2 Convert the masses from tonnes to kilograms.

a 3 t = _____3000_____ kg

b 70 t = _____70000_____ kg

c 547 t = _____547000_____ kg

d 1855 t = _____1855000_____ kg

3 Susan converted the following masses:

13 000 kg = 13 000 000 t   4500 t = 4.5 kg
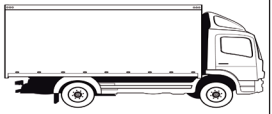
a How could Susan know that her answers are incorrect?

_____To change from kg to tonnes the number gets smaller, and to change_____

_____from tonnes to kg the number gets larger_____

b Complete the conversions correctly.

_____13 t , 4500 000kg_____

4 Three trucks are at the depot to be loaded. During their trip they will have to pass over a bridge that has the sign shown. Calculate the mass of each load to determine if they are able to cross the bridge safely.

Truck A = 10 t	Truck B = 25 t	Truck C = 35 t
Forklift = 7 t; 10 pallets each 2 t	10 pallets each 2 t	20 pallets each 1 t
37 tonnes	_45 tonnes_	_55 tonnes_
_No_	_Yes_	_Yes_

BRIDGE MAXIMUM
30t
47t
63t

MiB 3 Card 124

Using Units of Measurement 77

An environmental mass

Remember!
To change from grams to kilograms the number gets **smaller** (because a gram is 1000 times lighter than a kilogram) – divide by 1000.

To change from kilograms to grams the number gets **larger** (because a kilogram is 1000 times heavier than a gram) – multiply by 1000.

1 Convert the masses from grams to kilograms.

a 5000 g = ___5___ kg **b** 37 000 g = ___37___ kg

c 190 000 g = ___190___ kg **d** 8 635 000 g = ___8635___ kg

2 Convert the masses from kilograms to grams.

a 5 kg = ___5000___ g **b** 64 kg = ___64000___ g

c 138 kg = ___138000___ g **d** 1545 kg = ___1545000___ g

3 If you wanted to convert a mass from tonnes to grams, how would you do this?

_____multiply by 1000000_____

4 An environmental group publishes the table below to support their argument that Australia needs to do more to reduce its level of carbon dioxide (CO_2) emissions per person per year. Use this data to answer the questions.

Country	CO_2 emissions per person per year (t)
Australia	27
India	2
Kuwait	35
New Zealand	19
Qatar	56
Singapore	11
United Kingdom	11
USA	24

a Which country has the highest CO_2 emissions per person?

_____Qatar_____

b How many sacks weighing 70 kg would equal the mass of CO_2 produced per person in Qatar in one year?

_____800_____

c The population of India is 1 160 000 000 while the population of Australia is 22 500 000. Use these figures to calculate how many tonnes of CO_2 are produced by each country each year. Which country produces the greater mass of CO_2?

_____India_____

MiB 3 Card 120

78 **Using Units of Measurement**

Mass and you

1 Calculate the total mass of items in each of the containers shown below.

a
Bag of apples 2150 g
Puff pastry 1 kg
Spices 300 g
Tinned apricots 440 g

_____3.89_____ kg

b
Car 2050 kg
5 pallets 5 t
Machinery 3516 kg

_____10566_____ kg
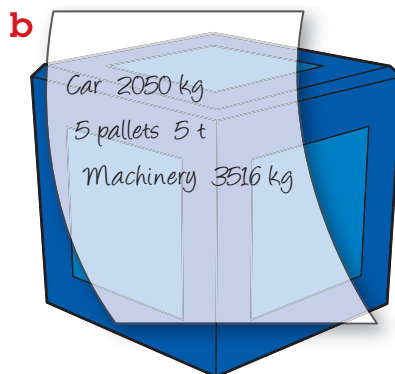
c
Jumper 550 g
Lunch 780 g
Books 5 kg
Sports gear 3 kg
Pencil case 220 g
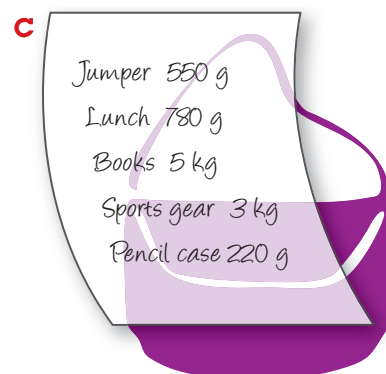
_____9.55_____ kg

2 Identify, using a tick (✓), the most appropriate unit to measure the mass of these objects.

Objects	Grams (g)	Kilograms (kg)	Tonnes (t)
Coal burnt in a power station			✓
A cake	✓		
Food for a party		✓	
Bricks to build a new house			✓
A set of dishes		✓	
A computer		✓	
Clothes pegs	✓		
A refrigerator		✓	
Sand for a large sandpit			✓

24

3 Each person produces about 700 kg of rubbish each year, which is taken to a local dump site. How many tonnes of garbage are taken to the dump each year in the following places?

a Jerilderie; population 1 600 _____1120 t_____

b Eurobodalla; population 37 000 _____25900 t_____

c Gosford; population 162 000 _____113400 t_____

d Sydney; population 4 340 000 _____303 800 t_____

What is the mass of each of the planets in the Solar System? The Sydney Harbour Bridge has a mass of approximately 60 t, how many Sydney Harbour Bridges would equal the mass of each planet?

MiB 3
Card
126

Reading thermometers

1 Read the thermometers shown below, and record your answers in the spaces provided.

a
30°C
25°
20°
15°
10°
5°
0

___16___ °C

b
40°C
30°
20°
10°
0

___26___ °C

c
80°C
60°
40°
20°
0

___56___ °C

d
39°C
38°
37°

___39.3___ °C
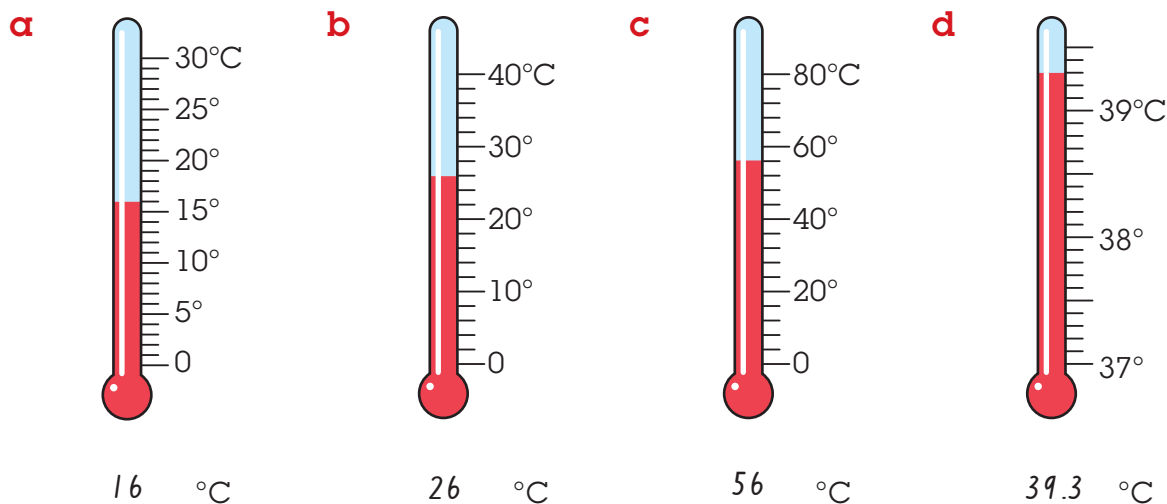
2 Colour the thermometers shown below to indicate the temperature given.

a 10°C

100°C
95°
90°
85°
80°
75°
70°
65°
60°
55°
50°
45°
40°
35°
30°
25°
20°
15°
10°
5°
0

b 65°C

100°C
90°
80°
70°
60°
50°
40°
30°
20°
10°
0

c 47°C

100°C
90°
80°
70°
60°
50°
40°
30°
20°
10°
0

d 98°C

100°C
80°
60°
40°
20°
0
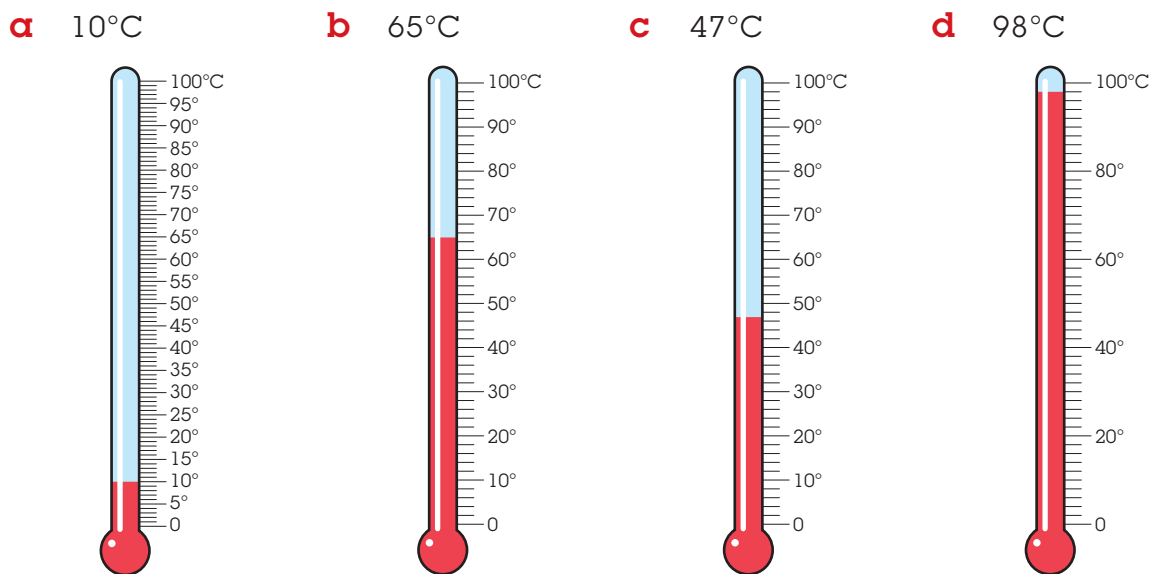
3 Food is best kept at temperatures below 4°C or above 60°C. Which of the following restaurants keeps its hot and cold foods at the appropriate temperatures?

Restaurant	Cold food	Hot food
Ethan's Easy Eatery	2°C	56°C
Flossy's Fabulous Food	1°C	62°C
Great Big Diner	5°C	64°C

Flossy's Fabulous Food.

Using a.m and p.m. time

Remember!
- a.m. stands for *ante meridiem* or before midday
- p.m. stands for *post meridiem* or after midday.

1 Look at the time each activity takes place. Place the activities in order, using the numbers 1 to 6, 1 being the earliest in the day and 6 the latest.

a   10:00 a.m.   `2`

b   4:00 p.m.   `4`

c   7:30 a.m.   `1`

d   7:15 p.m.   `5`

e   10:00 p.m.   `6`

f   2:00 p.m.   `3`

2 Write in when you do each activity, using a.m./p.m. time. *Students' answers will vary.*

a   Wake up   _____

b   Lunchtime   _____

c   Eat breakfast   _____

d   School finishes   _____

e   Leave for school _____

f   Dinnertime   _____

g   School starts   _____

h   Watch favourite TV show _____

3 Look at the picture and answer the questions.

a   Write the time that is shown on the clock. Use a.m./p.m. notation.

  6.38pm

b   Explain why you have written this time as your answer.

  Because it is dark in the picture,

  which means it is night.

Using Units of Measurement : **81**

Remember!

With 24-hour time:

- Each day begins at midnight, written as 0000 hrs. It can also be written as 2400 hrs.
- Times are recorded as hours and minutes after midnight. So times in the afternoon continue to be counted from midnight.
  - 5 o'clock in the morning is 5 hours after midnight or 0500 hrs.
  - 5 o'clock in the afternoon is 17 hours after midnight or 1700 hrs.
- There are always 4 digits in the time, with no colon separating the hours from the minutes. The abbreviation 'hrs' is written after these numerals.
  - 9 o'clock in the morning is 0900 hrs.
  - 9 o'clock in the evening is 2100 hrs.
- To say the time, the number for the hours and minutes are spoken, followed by the word 'hours'. '00' minutes is spoken as 'hundred'. For example:
  - 0615 hrs is 'zero, six, fifteen hours'.
  - 1130 hrs is 'eleven, thirty hours'.
  - 2200 hrs is 'twenty-two hundred hours'.

1 Use the clocks shown and the clues in the passage to complete the story using 24-hour time notation.

Dear Diary,

It is evening and I'm waiting for my favourite show to start at 2030hrs *(1). While I had a minute, I thought I would write about my day. I knew it was going to be 'one of those days' from the moment I woke up this morning and the clock said* 0745hrs *(2). I'd set the wrong time on my alarm clock! I'd slept in!*

The alarm was supposed to be set for 0600hrs *(3) so that I could catch the* 0650hrs *(4) train and be at school in time for morning assembly that begins at* 0845hrs *(5).*

I tried to leave a text message for my netball coach to say I would not be able to make it for practice at 1530hrs *(6), as I had to be at band practice for the school concert at* 1540hrs *(7), but this created another problem as it meant I would be late for the train that I usually take at* 1605hrs *(8), so that I could get home by* 1715hrs *(9).*

Got to run, it's 2025hrs *(10) and my favourite show is about to start. I hope tomorrow is better. I must check that the alarm clock is set for* 0630hrs *(11) instead of* 0730hrs *(12) like this morning!*

MiB 3
Card
131

82 **Using Units of Measurement**
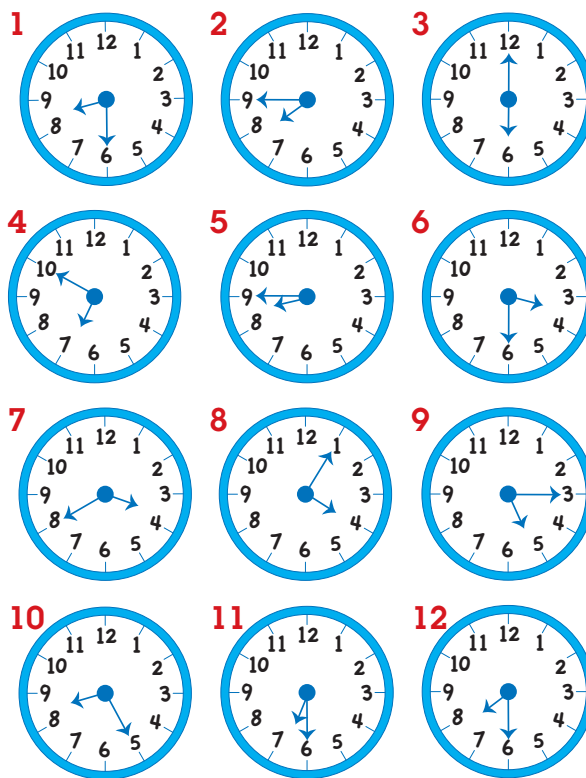
Using 24-hour time

1 Write the time on each clock in a.m./p.m. and 24-hour time notations.

25

morning

afternoon

night

a ___10 20___ hrs
___10:20___ am

b ___14 35___ hrs
___2:35___ pm

c ___21 50___ hrs
___9:50___ pm

afternoon

morning

night

4:10

7:30
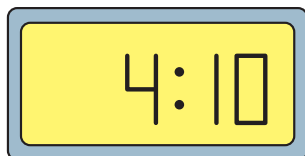
12:35

d ___16 10___ hrs
___4:10___ pm
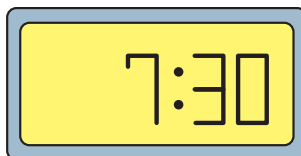
e ___07 30___ hrs
___7:30___ am

f ___00 35___ hrs
___12:35___ am

2 The agenda for a school holiday program is shown below. Use it to answer the questions.

Time	Activity
7:00 a.m.	Arrival; free play
8:00 a.m.	Pottery
9:45 a.m.	Morning tea
10:10 a.m.	Go-kart excursion
1:00 p.m.	Lunch
1:30 p.m.	Games and sport
3:30 p.m.	Afternoon tea
4:00 p.m.	Painting and drawing
5:30 p.m.	Close

a What time does the first activity begin?   ___8:00 am___

b What is happening at 1425 hrs?   _Games and sport_

c If it takes 10 minutes to walk to the go-kart track and 10 minutes to walk back, how much time do the children have at the track?
___2hrs 30minutes___

d If you attend the program all day, how many hours are you there?
___10hrs 30minutes___

e How much time is allocated for meals?
___1hr 25mins___

Imagine you are the co-ordinator of a school holiday program like the one above. Design an agenda for a week.

Using Units of Measurement   **83**

TV guide timings

1 Look at the TV program guide. At what time do the following shows begin?

a *The Romance Boat*

  _8.00pm_ or _20 00_ hrs

b *Porridge Wars*

  _10.00am_ or _10 00_ hrs

c *P*O*T*A*T*O*E*S*

  _7.00pm_ or _19 00_ hrs

d *Golf*

  _10.35pm_ or _22 35_ hrs

2 How long are each of the following shows?

a *Oscar Fly* _30mins_

b *Captain McPain* _1 hr_

c *The Days Are Long* _1 hr 50mins_

d *Where's My Soup?* _25mins_

3 Program the DVD recorder, in 24-hour time, so that it will record: *Taco Man*, *I Quite Like Suzy – The Reunion*, *Bridge to the Other Side* and *Australia's Next Top Pastry Chef*.

Program	Start time	Finish time
Taco Man	0600hrs	0635hrs
I Quite Like Suzy	0830hrs	0900hrs
Bridge to the Other Side	1200hrs	1400hrs
Australia's Next Top Pastry Chef	1710hrs	1810hrs

4 The DVD that is used to record these shows, will hold 2 hours in 'short play', 4 hours in 'long play' or 6 hours in 'extra long play'. Which mode should be set on the DVD recorder so that all the shows in Question 3 will fit on the one DVD?

  extra long play

6:00 a.m. Taco Man (G)

6:35 a.m. Where's My Soup? (G)

7:00 a.m. First Chicken in Space (G)

7:30 a.m. Oscar Fly (G)

8:00 a.m. Rick Gold's Grand Adventures (PG)

8:30 a.m. I Quite Like Suzy – The Reunion Comedy. Suzy is reunited with her long lost love, Bobby, only to find that he'd rather play with his kelpie, Boris, than get married. (G)

9:00 a.m. Captain McPain Action/Adventure (PG)

10:00 a.m. Porridge Wars (PG)

11:00 a.m. Greener Pastures Drama (PG)

12:00 p.m. Bridge to the Other Side A family uncovers a long, lost secret at a travelling circus. Danger and hilarity ensue. (M)

2:00 p.m. The Days Are Long Will Jason finally propose to Maria, or will Ken and Kim be able to stop him before it's too late? (PG)

3:50 p.m. Curse of the Jade Monkey (PG)

5:10 p.m. Australia's Next Top Pastry Chef (PG)

6:10 p.m. The Papier-Mâché Club Episode 5 of this 12-part series that delves into the dark and often misunderstood world of papier-mâché clubs. (PG)

6:35 p.m. The Sparkly Vampires (PG)

7:00 p.m. P*O*T*A*T*O*E*S (PG)

7:30 p.m. Everybody Loves Jeremy (PG)

8:00 p.m. The Romance Boat A group of 12 twenty-somethings, one boat, nowhere to run. Will sparks fly? (PG)

8:30 p.m. A Fridge Too Far (PG)

10:35 p.m. Golf Replay of today's highlights of The Springfield Pro Classic. (G)

Using Units of Measurement

 Cambridge University Press

How long does it take?

1 Work with a partner. Use a stopwatch to record how long it takes you and your partner to complete each activity. *Students' answers will vary.*

Activity	Your time	Partner's time
Hold your breath		
Do 10 sit-ups		
Say the table of fives		
Sing 'Twinkle Twinkle Little Star'		
Walk from your classroom to the school office		
Write your name 10 times		
Dribble a basketball around the outside of a basketball court		
Roll 2 dice 20 times		

2 Use the internet or other resources to find out how long each event lasts.

a Olympic 100 m sprint: men   *Students'*

women   *answers*

b A game of soccer   *will*

c An Olympic 1500 m freestyle swimming race: men   *vary.*

women   _____

d The Boston Marathon: men   _____

women   _____

e A game of netball   _____

f The Paris to Dakar Rally   _____

g Jupiter's orbit of the Sun   _____

3 Use the start and finish times to calculate how long each of the following lasted.

Activity	Start time	Finish time	Time it lasted
Rugby union game	1900 hrs	2030 hrs	*1 hr 30 mins*
Walk to school	8:00 a.m.	8:20 a.m.	*20 mins*
Maths lesson	1100 hrs	1200 hrs	*1 hr*
Car journey to the snowfields	7:00 a.m.	9:45 a.m.	*2 hrs 45 mins*
Movie	1330 hrs	1545 hrs	*2 hrs 15 mins*
A music album	3:45 p.m.	4:35 p.m.	*50 mins*

MiB 3 Cards 129, 130 and 134

Using Units of Measurement   **85**

Time to work around the house

1

A sponge pudding mix gives the directions on the right.

a How long should the mixture be mixed on medium speed? _1 minute_

b How long does the pudding have to be baked for? _35-40mins_

c If the pudding is put in the oven at 5:45 p.m., what is the earliest time that it would be ready to eat?

_6.20pm_

d If the pudding needs to be ready for dessert at 8:30 p.m., what time should it be put in the oven?

7:50pm the latest

> Preheat the oven to 180°C/350°F
>
> Pour sponge pudding mix into a large mixing bowl with egg and 3 tbsp water.
>
> Mix, using an electric mixer on low speed, until the ingredients are combined.
>
> Mix for 1 minute on medium speed, scraping down the sides of the bowl occasionally.
>
> Pour batter into a greased cake pan.
>
> Sprinkle contents of sauce sachet over batter evenly.
>
> Pour $1\frac{2}{3}$ cups of boiling water over the mix.
>
> Bake for 35–40 minutes.

2 Ready-mixed plaster, for filling small holes in walls must be left 48 hours to set before it can be sanded or painted. If you finish filling a hole at 4:00 p.m. on Saturday, what is the earliest time that you could start painting the wall?

4.00p.m on Monday

3 It takes 50 minutes for a washing machine to complete a load of washing. A drier takes 90 minutes to dry a load of washing. It takes 5 minutes to load the washing machine and another 5 minutes to transfer the washing from the washing machine to the drier.

a How long does it take to wash and dry a load of washing completely?

150mins

b If you want to wear the clothes at 3:00 p.m., what is the latest time that you must start doing the washing?

_12.30pm_

c How many complete loads of washing could be finished between 9:00 a.m. and midday?

3 loads.

Using Units of Measurement

Australian time zones

Map of Australia showing time zones:
- **Western Australia** (Port Hedland, Perth): 2:00pm
- **Northern Territory** (Darwin, Alice Springs): 3:30pm
- **South Australia** (Adelaide): 3:30pm
- **Queensland** (Cairns, Brisbane): 4:00pm
- **New South Wales** (Sydney): 4:00pm
- **ACT** (Canberra): 4:00pm
- **Victoria** (Melbourne): 4:00pm
- **Tasmania** (Hobart): 4:00pm
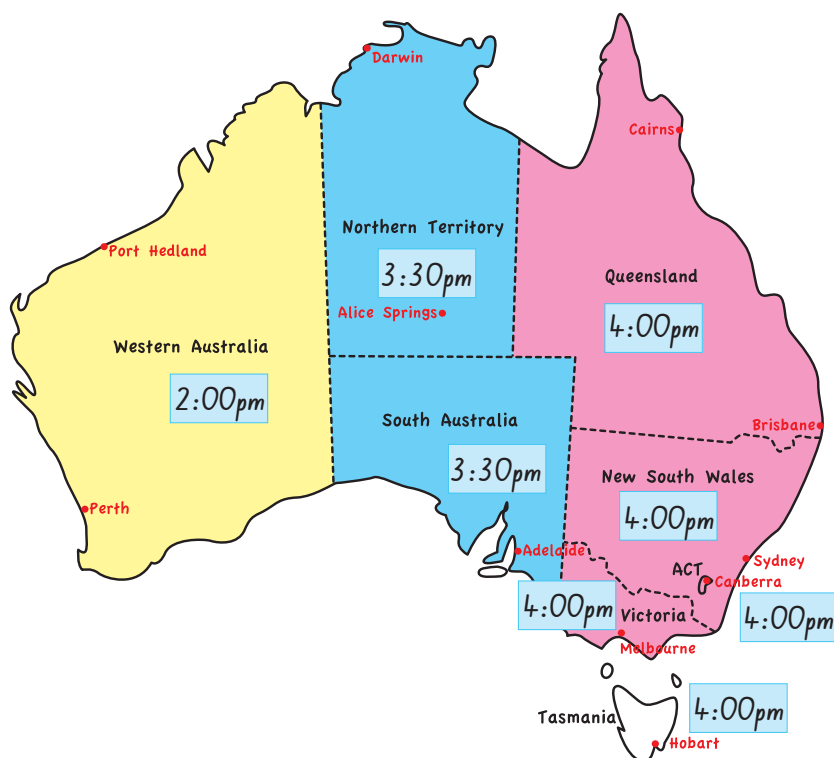
1 On the map, colour those states and territories red that use Eastern Standard Time.

2 On the map, colour those states and territories blue that use Central Standard Time.

3 On the map, colour those states and territories yellow that use Western Standard Time.

4 If it is 4:00 p.m. in Sydney, NSW, fill in the spaces on the map with the times in all the states and territories.

5 Complete the following statements.

a 9:00 p.m. in Adelaide is ___9:30pm___ in Cairns and ___7:30pm___ in Perth.

b 0600 hrs in Brisbane is ___4:00am___ in Port Hedland and ___5:30am___ in Darwin.

c 10:25 a.m. in Alice Springs is ___10:55am___ in Canberra and ___10:55am___ in Hobart.

d 2330 hrs in Perth is ___1:00am___ in Adelaide and ___1:30am___ in Melbourne.

e 2:37 p.m. in Sydney is ___12:37pm___ in Perth and ___2:07pm___ in Alice Springs.

f 1614 hrs in Port Hedland is ___5:44pm___ in Darwin and ___6:14pm___ in Cairns.

6 The grand final is being broadcast live on television. If it is being held in Adelaide, starting at 1730 hrs, what time will it begin in:

a Melbourne ___6:00pm___

b Perth ___3:00pm___

Using Units of Measurement **87**

Identifying prisms

1 Identify with a tick (✓) which of the objects look like prisms.

a

b ✓

c ✓

d ✓

2 What key feature/s does an object need in order to be a prism?

It needs to have rectangular sides.

3 Complete the table about how prisms a and b are the same and how they are different.

a
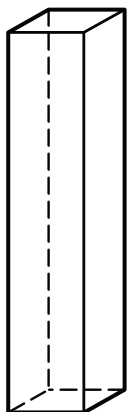
b
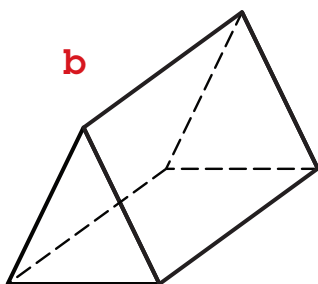
How they are the same	How they are different
both have rectangular sides	differently shaped ends
	different number of edges
	different number of faces
	different number of vertices

Describe one of the prisms that is drawn on this page to a classmate. Ask them to identify it by pointing to it. What information about the prism did you find must be given to identify it correctly?

Naming prisms

1 Identify and colour the bases of each of the prisms.

a

b

c

d

e

f

g

h

i
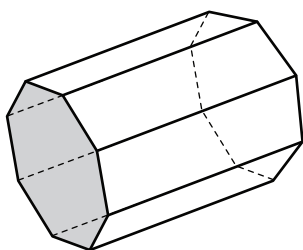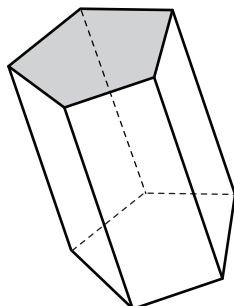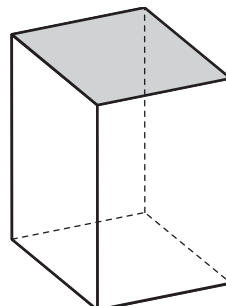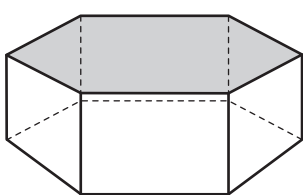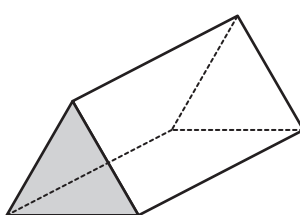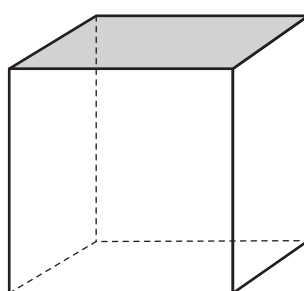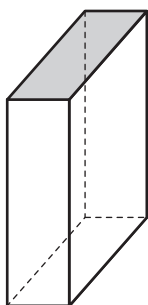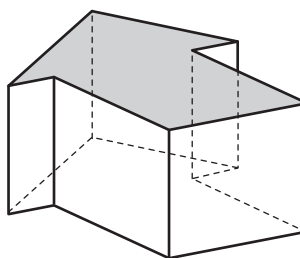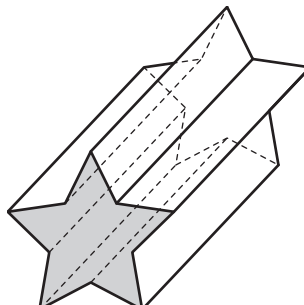
2 Write the name of each of the prisms from Questions 1a–g.

a _Octagonal prism_ **b** _pentagonal prism_ **c** _square prism_

d _hexagonal prism_ **e** _triangular prism_ **f** _cube_

g _rectangular prism_ **h** _arrow-shaped prism_ **i** _star-shaped prism_

3 In your own words, describe how to identify the 'base' of a prism.

The bases are the two ends of the prism,

while the sides are all rectangles

4 Rani drew this prism and named it a 'rectangular prism'. Explain to Rani how she should name prisms and write the correct name under the one that she has drawn.

The name of the prism comes from the base.

This is a triangular prism.
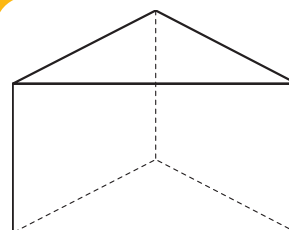
Prisms and their nets

1 Draw lines to match the prisms to the drawings of their nets.

a

b

c

d

i

ii

iii

iv
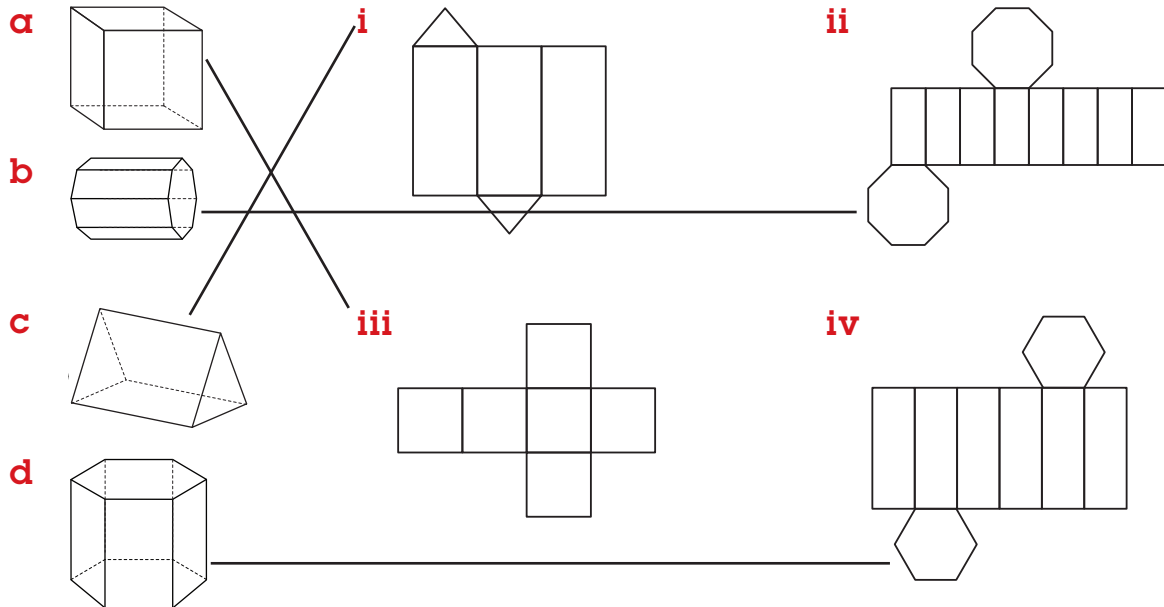
2 Name the prisms and draw a net for each.

a

rectangular prism

b

hexagonal prism

Can you draw more than one net for a prism? How many different nets can you draw for a rectangular prism? For a pentagonal prism? For a hexagonal prism?

MiB 3
Card
152
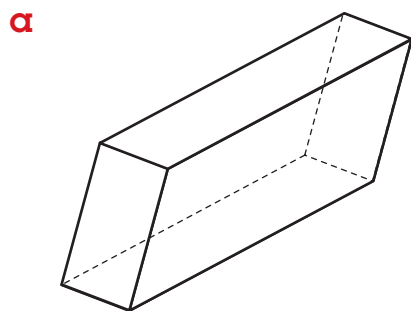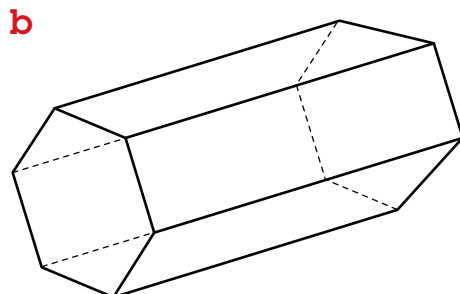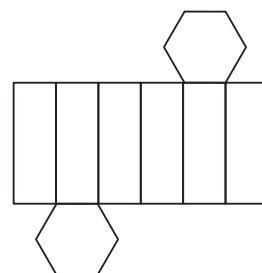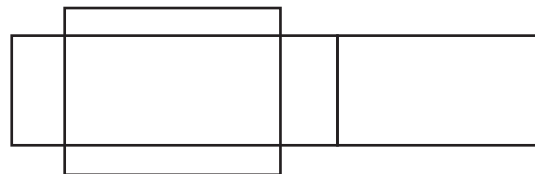
Sketching prisms

1 Name each prism in the space provided. Draw each of the prisms from two different views: the first view with a vertical edge to the front (the first one has been started below) and the second view from the front, showing depth. Write the name of each prism in the space provided.

27
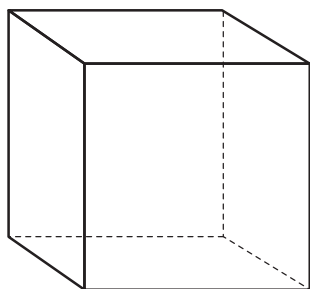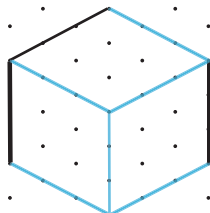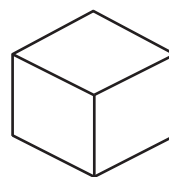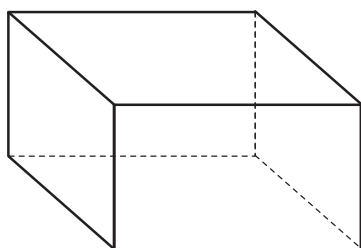
Prism	Isometric drawing	Front view
a Name: _cube_		
b Name: _rectangular prism_		
c Name: _triangular prism_		
d Name: _hexagonal prism_		
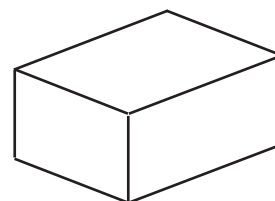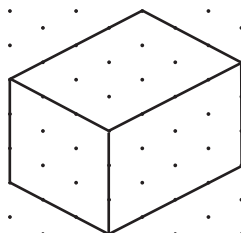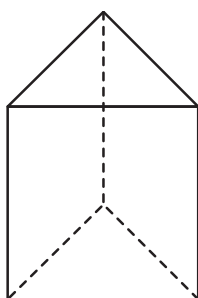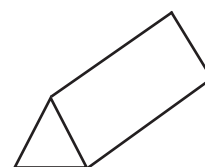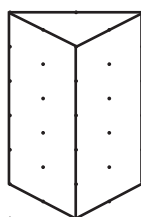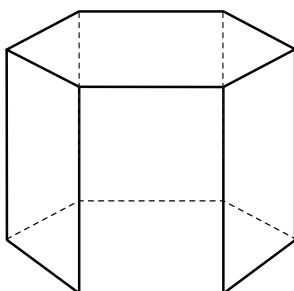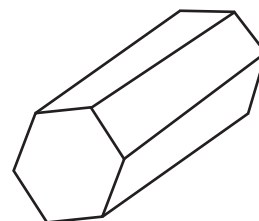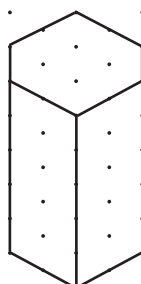
Identifying pyramids

1 Identify with a tick (✓) which of the objects look like pyramids.

a [✓]   b [✓]   c [ ]   d [✓]

2 What key feature/s does an object need to be a pyramid?

It needs to come to an apex

3 Draw the cross section that is produced when these pyramids are cut as shown.

△	▢	△	⬠	△
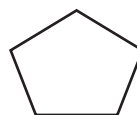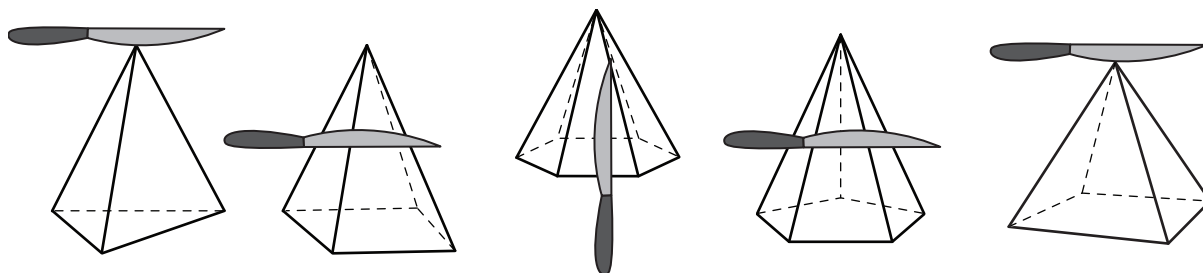
4 Complete the table about how the pyramids are the same and how they are different.

How they are the same	How they are different
Flat base	Different no. of sides
Comes to an apex	Different no. of edges
	Different cross-sections

MiB 3 Card 154
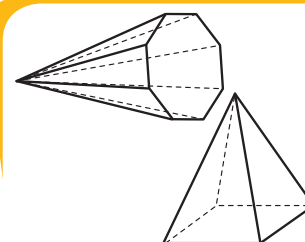
Naming pyramids

1 Identify and colour the base of each of these pyramids red.

a

b

c

d

e

f

g

h

i
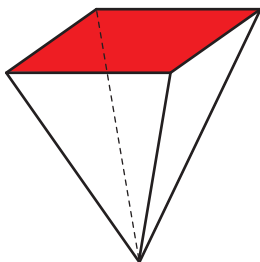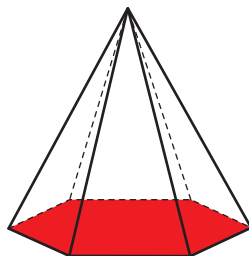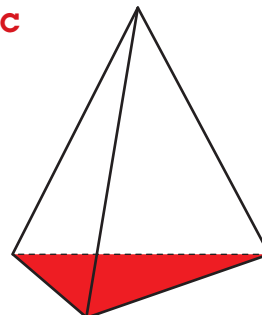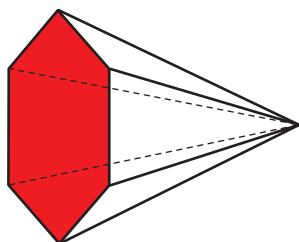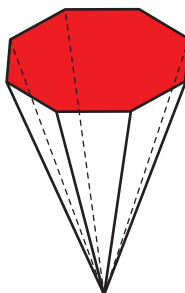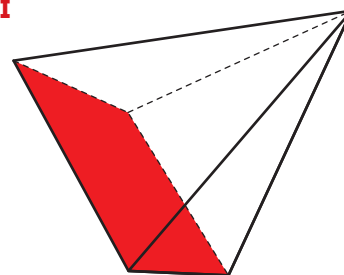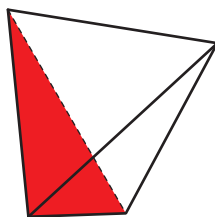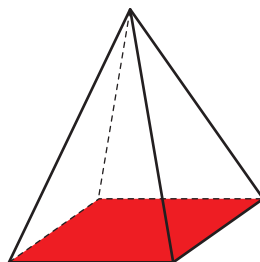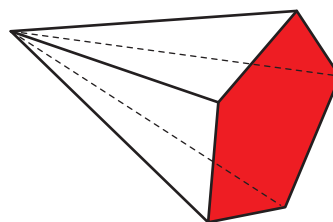
2 Write the name of each of the pyramids from Question 1.

a ___square pyramid___

b ___hexagonal pyramid___

c ___triangular pyramid___

d ___hexagonal pyramid___

e ___octagonal pyramid___

f ___rectangular pyramid___

g ___triangular pyramid___

h ___square pyramid___

i ___pentagonal pyramid___

3 In your own words, describe how to identify the 'base' of a pyramid.

___The base is the face of the pyramid on the opposite___

___end to the apex or point.___

> Describe one of the pyramids that is drawn on this page to a classmate. Ask them to identify it by pointing to it. What information about the pyramid did you find must be given to identify it correctly?

Shape **93**

1 Draw lines to match the pyramids to the drawings of their nets.

28

a   b   c   d
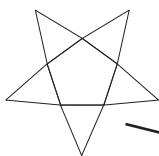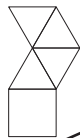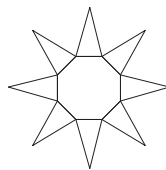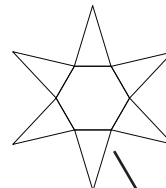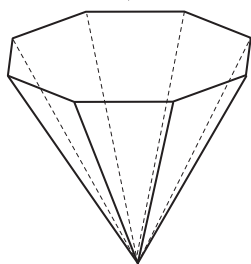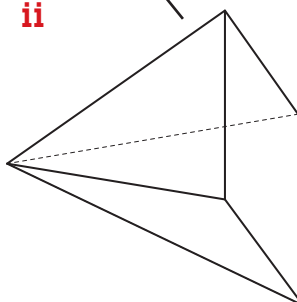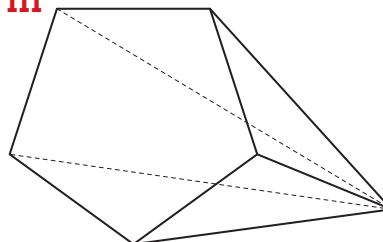
i   ii   iii   iv
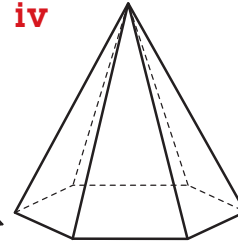
2 Name the pyramids and draw the net for each.

a
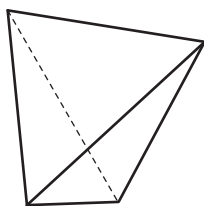
<u>triangular pyramid</u>

b
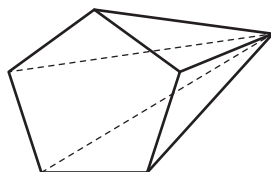
<u>pentagonal pyramid</u>
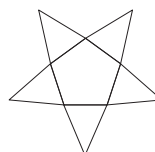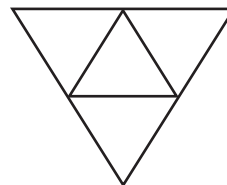
Can you draw more than one net for a pyramid? How many different nets can you draw for a rectangular pyramid? For a pentagonal pyramid? For a hexagonal pyramid?

1 Name each pyramid in the space provided. Draw each of the pyramids from two different views: the first view with a vertical edge to the front (the first one has been started below) and the second view from the front, showing depth.
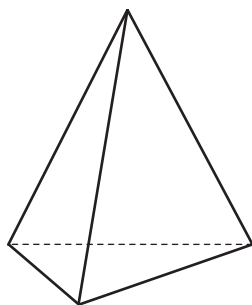
Pyramid	Isometric drawing	Front view
a Name: _triangular pyramid_		
b Name: _square pyramid_		
c Name: _hexagonal pyramid_		
d Name: _octagonal pyramid_		
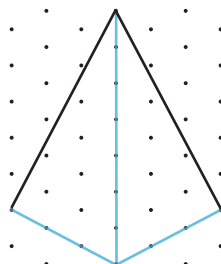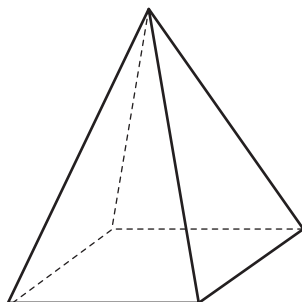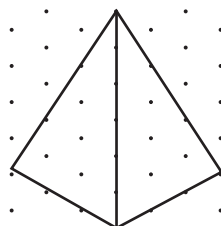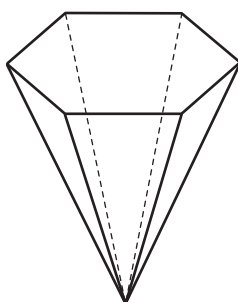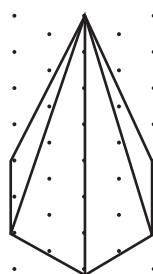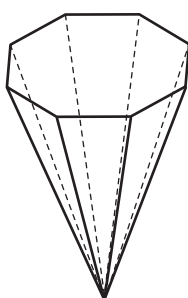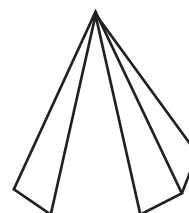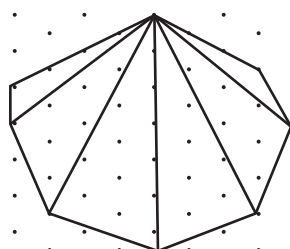
Drawing top, side and front views

1 Draw the top, front and side views of each of the solids.
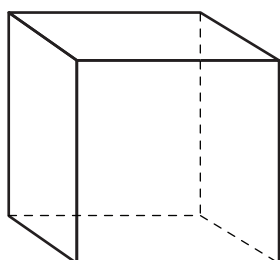
	Top view	Side view	Front view
a			
b			
c			
d			
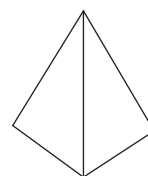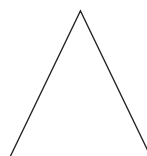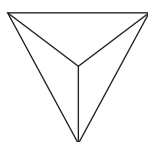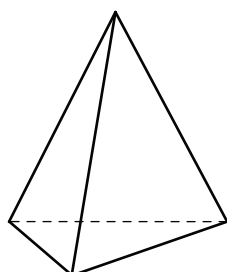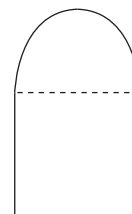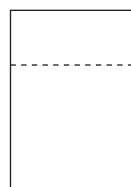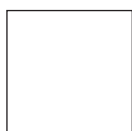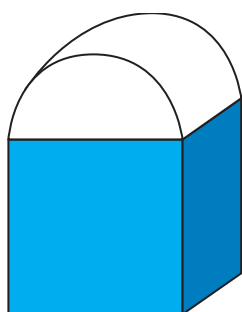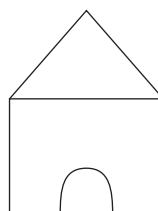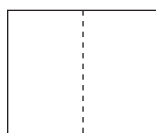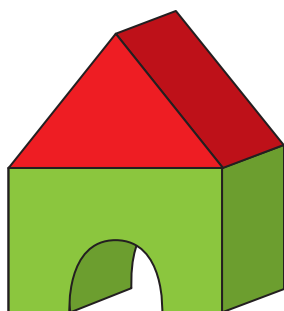
Compare your drawings with a classmate's. Discuss how they are the same and how they are different.

Identifying solids from drawings

1 Indicate with a tick (✓) which picture of the solids is represented by the picture of the top, side and front views.

a

TOP	SIDE	FRONT
2	=	S

☐   ✓

b

TOP	SIDE	FRONT
0	X K	9 C

☐   ✓

c

TOP   SIDE   FRONT

✓   ☐

d

TOP   SIDE   FRONT

✓   ☐

e

TOP   SIDE   FRONT

✓   ☐
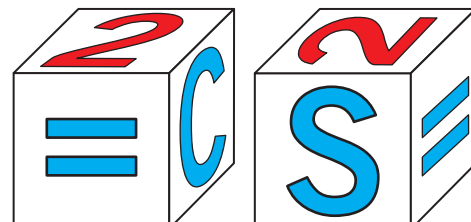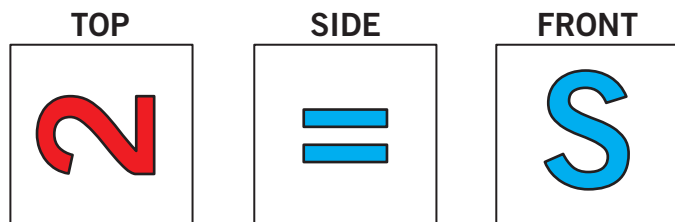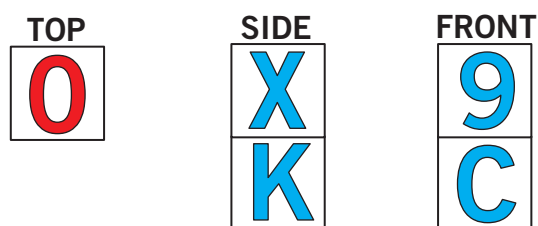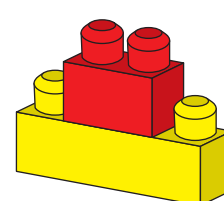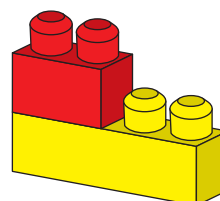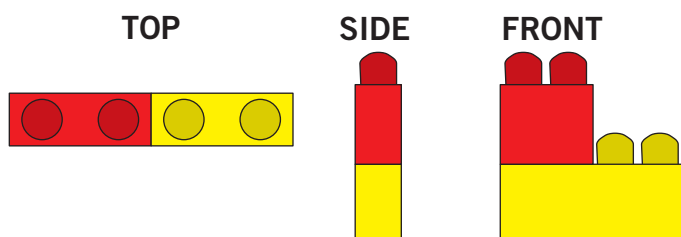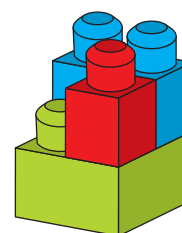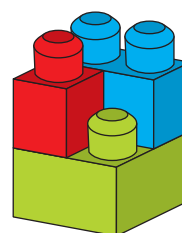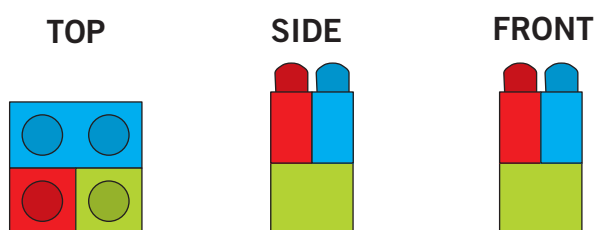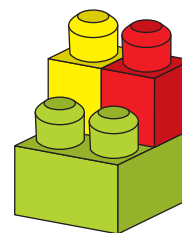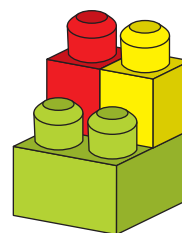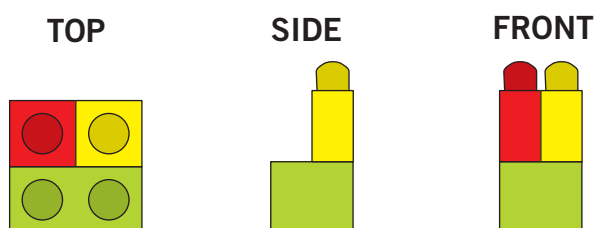
Construct your own 'tower' using blocks. Draw the top, side and front views. Ask a classmate to build your 'tower' using only your drawings as a guide.

Shape 97

Solids from different views

1 Draw and name the solids represented by each set of top, side and front views.

Top view	Side view	Front view
a		
b		
c		
d		
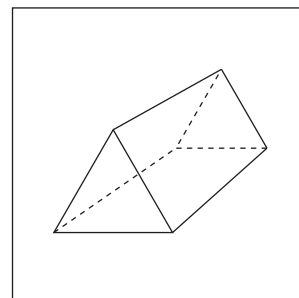
Name: _triangular prism_
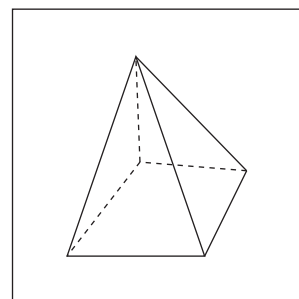
Name: _square pyramid_
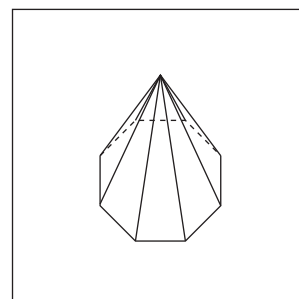
Name: _octagonal pyramid_
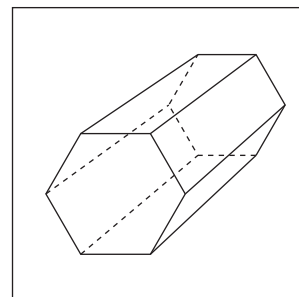
Name: _hexagonal prism_

What hints would you give someone else who is about to start this activity?

Properties of the sides of triangles

1 Measure the sides of these triangles in millimetres and record as shown.

a

25 mm · 25 mm · 25 mm

b

55 mm · 43 mm · 55 mm

c

45 mm · 45 mm · 41 mm

d

43 mm · 50 mm · 45 mm

e

47 mm · 47 mm · 47 mm

f

43 mm · 50 mm · 43 mm
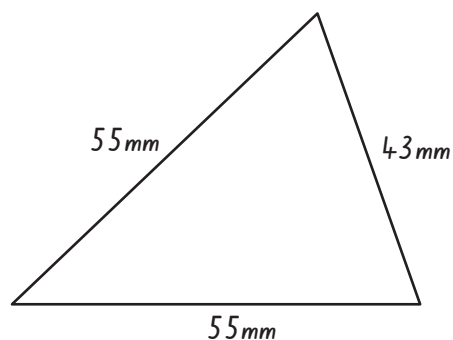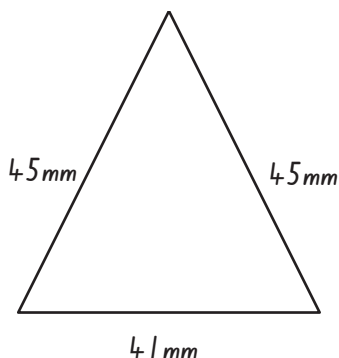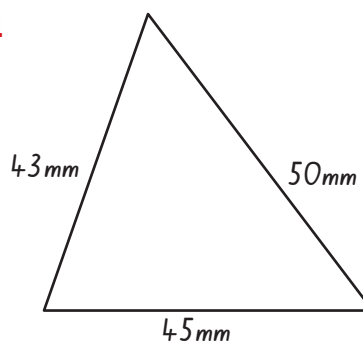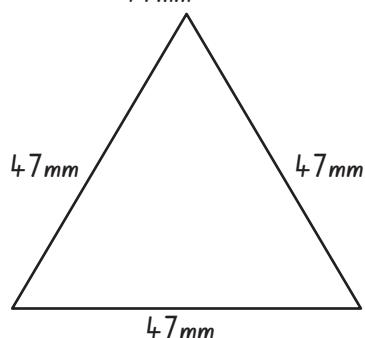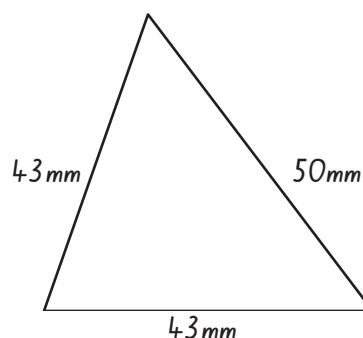
2 Look at the 3 side lengths of each triangle of Question 1. Decide which description in the table represents these 3 side measurements. Write the letter of the triangle next to the description you have chosen in the 'Examples' column.

Triangle name	Description	Examples
Scalene	No sides the same length	d.
Isosceles	2 sides the same length	c, b, f
Equilateral	3 sides the same length	a, e

3 If you wanted to identify a right-angle triangle, could you do so by measuring the sides? Why/why not?

No, because the sides could be many different lengths with the same angles.

(Note: students have not learned about Pythagoras' Theorem yet.)

Shape 99

Properties of triangles

Use geostrips, a geoboard or triangles cut from paper to complete these activities. Construct **equilateral**, **isosceles**, **scalene** and **right-angle triangles**. Look at each triangle and manipulate it to help you answer the following questions. Record your answers in the space provided. *Students' answers will vary.*

1 Does this triangle have any lines of symmetry? Draw a picture to show any lines of symmetry.

2 Does this triangle tessellate? If so, draw a section of the tessellated pattern.

Remember to label each triangle you draw as equilateral, isosceles, scalene or right-angle.

Triangles with lines of symmetry

Triangles that tessellate

MiB 3
Card
137

Properties of quadrilaterals

1 Name each quadrilateral in the space provided.
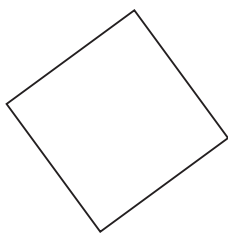
square

rectangle
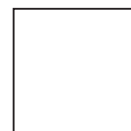
parallelogram

parallelogram
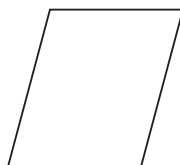
square

rectangle

parallelogram
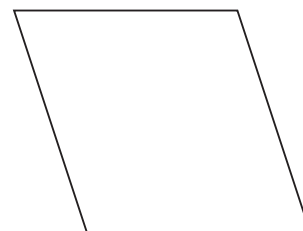
rhombus

2 Which quadrilaterals have only right angles?

square, rectangle

3 What pattern can you see in the angles of the other quadrilaterals?

The angles match across the diagonals.

4 Complete the table.

	How are they the same?	How are they different?
Square and rhombus	All sides are the same length	Different angles
Square and rectangle	They only have right angles	Different side lengths
Rectangle and parallelogram	Short ends and long sides	Different angles
Rhombus and parallelogram	They only have non-right angles	Different side lengths

Design a tree-diagram or a flowchart that can be used to classify quadrilaterals.

Circles

Circles are shapes that are formed by connecting points that are the same distance away from a central, fixed point.

1 Describe the difference between a circle and an oval. Draw a diagram to help explain the difference.

> A circle is an equal distance all the way around from the central, fixed point. An oval is narrower in some parts and wider in others.
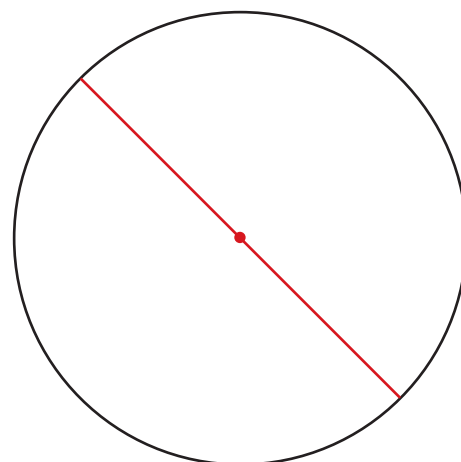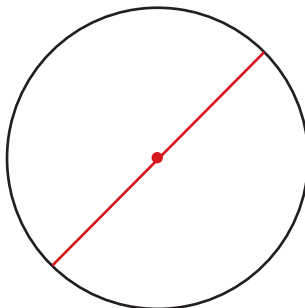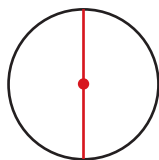
same distance

unequal distance
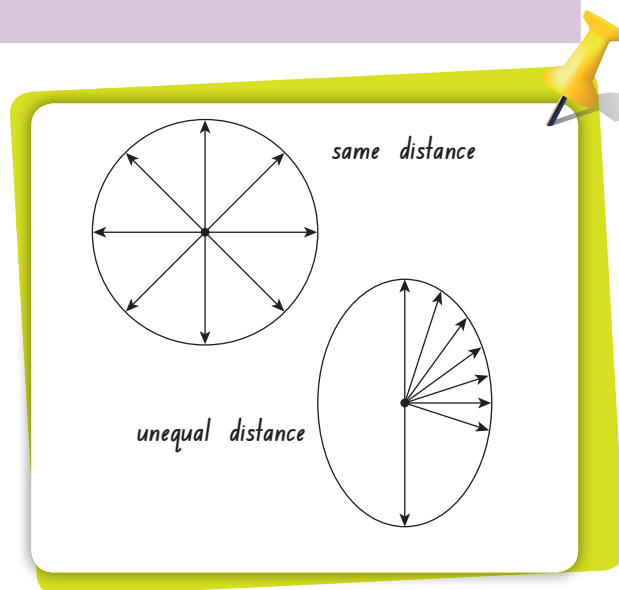
2 Use the words in the box to label the diagrams of the circles.

Radius

Sector

Centre

Qudarant   Diameter

Circumference
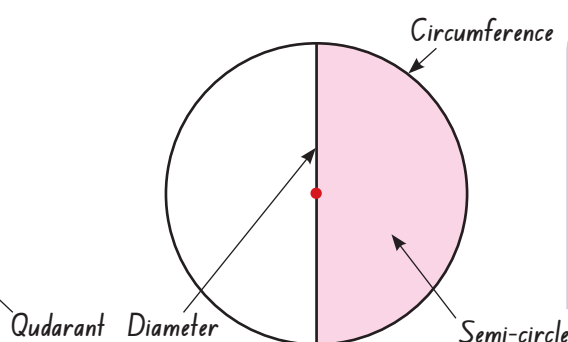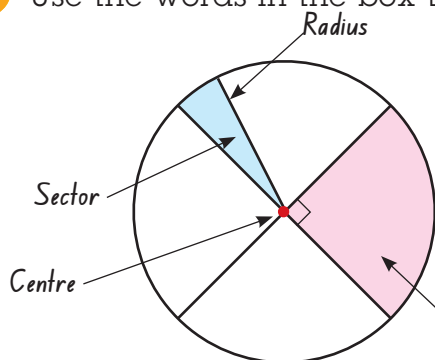
Semi-circle

Centre
Circumference
Diameter
Quadrant
Radius
Sector
Semicircle

3 Measure the diameter of each circle below. Record your answer and use it to calculate the radius of the circle.

a diameter _____2cm_____
radius _____1cm_____

b diameter _____4cm_____
radius _____2cm_____

c diameter _____6cm_____
radius _____3cm_____

Constructing circles

1 Work with a partner. Use a ruler or tape, a piece of string and a piece of chalk to make each of the 6 circles described below in a concrete area at your school.

30

a diameter 1 m   **b** radius 1 m   **c** diameter 235 cm

d radius 235 cm   **e** diameter 5 m   **f** radius 5 m

2 Describe in the space below how you and your partner constructed the circles in Question 1. Draw a diagram in the space to help you explain.
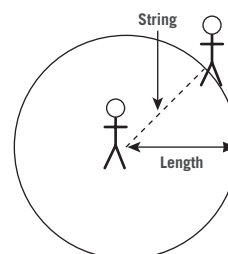
One person stands still.

The second person stands the

required distance away.
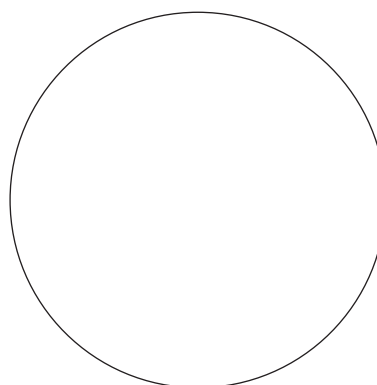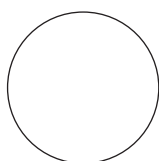
The two students draw the string

tight, as the second student

walks around the first student.

String

Length

3 Construct the following circles in the space below using a compass.

a diameter 5 cm   **b** radius 1 cm

4 The pendulum of this clock is the section that hangs below the face and swings from side to side. Imagine that the pendulum could swing the whole way around the clock to make a circle.

a What part of the circle is the pendulum? _____*radius*_____

b Where is the centre of the circle? Mark it on the picture.
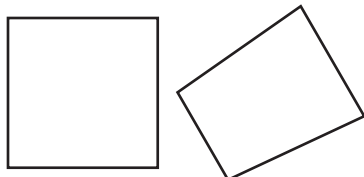
Centre of the clockface

Regular and irregular shapes

1 Use geoboards or paper to construct each pair of shapes. Then use rulers, protractors and paper to help you investigate these shapes and complete the tables.
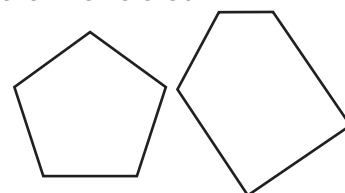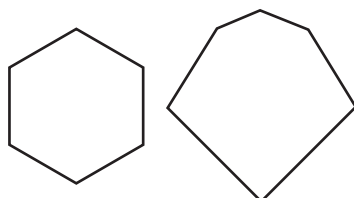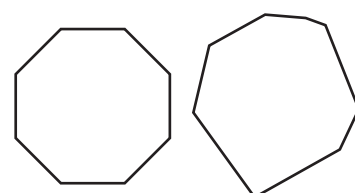
a

31

Look at:	Square	Irregular quadrilateral
Sides (number)	4	4
Corners (number)	4	4
Angles (number)	4	4
Diagonals (number)	2	2
Side length (same/diff)	same	diff
Angle size (same/diff)	same	diff
Lines of symmetry	4	0
Rotational symmetry	(yes)/no	yes/(no)

b

Look at:	Pentagon	Irregular pentagon
Sides (number)	5	5
Corners (number)	5	5
Angles (number)	5	5
Diagonals (number)	5	5
Side length (same/diff)	same	diff
Angle size (same/diff)	same	diff
Lines of symmetry	5	0
Rotational symmetry	(yes)/no	yes/(no)

c

Look at:	Hexagon	Irregular hexagon
Sides (number)	6	6
Corners (number)	6	6
Angles (number)	6	6
Diagonals (number)	9	9
Side length (same/diff)	same	diff
Angle size (same/diff)	same	diff
Lines of symmetry	6	0
Rotational symmetry	(yes)/no	yes/(no)

d

Look at:	Octagon	Irregular octagon
Sides (number)	8	8
Corners (number)	8	8
Angles (number)	8	8
Diagonals (number)	20	20
Side length (same/diff)	same	diff
Angle size (same/diff)	same	diff
Lines of symmetry	8	0
Rotational symmetry	(yes)/no	yes/(no)

Comparing and identifying shapes

1 Use pattern blocks or shapes made of paper to complete the following. You will need an equilateral triangle, a regular hexagon, a regular pentagon, a regular octagon and a square.

a Order these shapes by how many internal angles they have, from largest number to smallest number.

regular octagon, regular hexagon, regular pentagon, square,

equilateral triangle

b Order the same shapes by the size of one of their angles, from smallest angle to largest angle.

regular octagon, regular hexagon, regular pentagon, square,

equilateral triangle

c Where would a regular decagon, a shape with 10 sides, fit in the lists of parts a and b?

1st

2 Construct each of the following shapes on a geoboard. Name the shape and draw it in the space provided.

a 3 angles; 2 the same

b
- 4 angles; opposite angles are equal
- opposite sides are equal length

c 8 angles; no angles the same
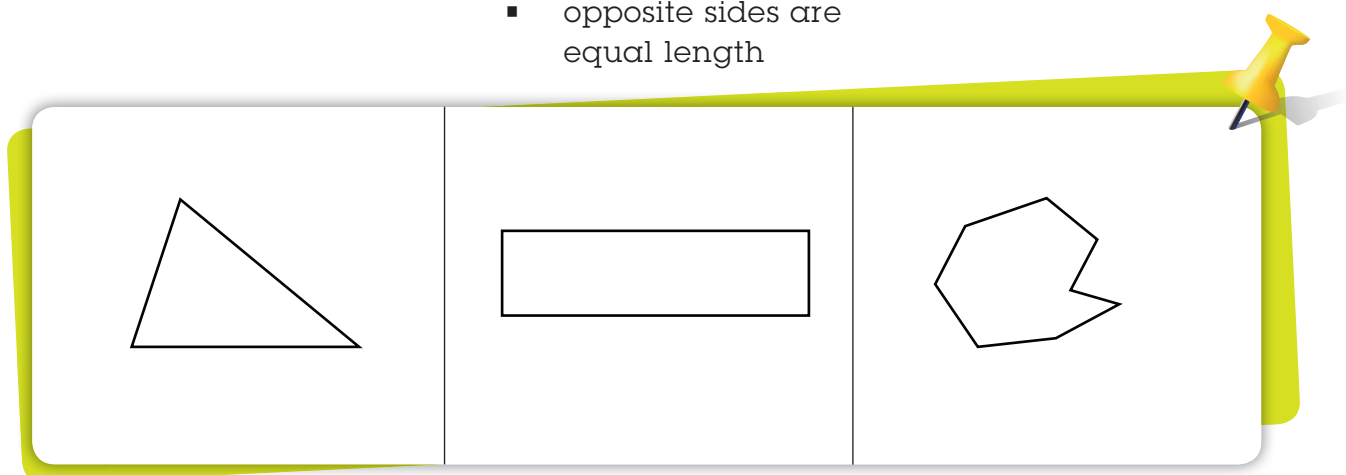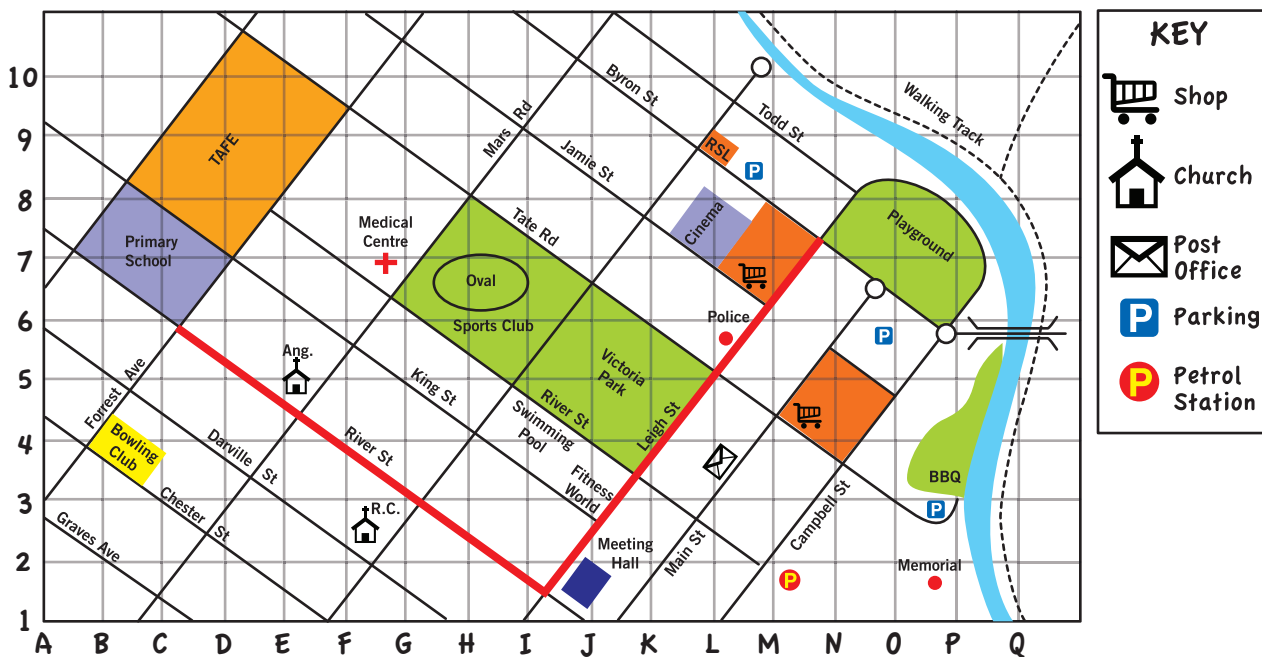
isosceles triangle   rectangle   irregular octagon

3 What shape am I? I have 3 diagonals from each of my corners, 6 lines of symmetry and rotational symmetry order 6. I am a

hexagon .

Look at the map and answer the questions below.

KEY
- 🛒 Shop
- ⛪ Church
- ✉ Post Office
- 🅿 Parking
- Ⓟ Petrol Station

1 What feature is located at the following references?

a L3 _____ post office _____ b H6 _____ oval _____

c F2 _____ church _____ d D9 _____ tafe _____

e M4 _____ shop _____ f I1 _____ meeting hall _____

2 At what grid references are the following located?

a Memorial _____ O1 _____ b Bridge _____ P5 _____

c Cinema _____ K7 _____ d Sports club _____ H5 _____

e Bowling club _____ B3 _____ f Police station _____ L5 _____

3 a Draw on the map the route you would take to get from the primary school to the playground.

b Write a set of instructions for getting from the primary school to the playground for someone to follow if they did not have a map.

Walk down River St. as far as the meeting hall then turn left.

Keep going up Leigh St and the playground will be on the right.

c Compare your route with a classmate's. How are your routes the same? How are they different?
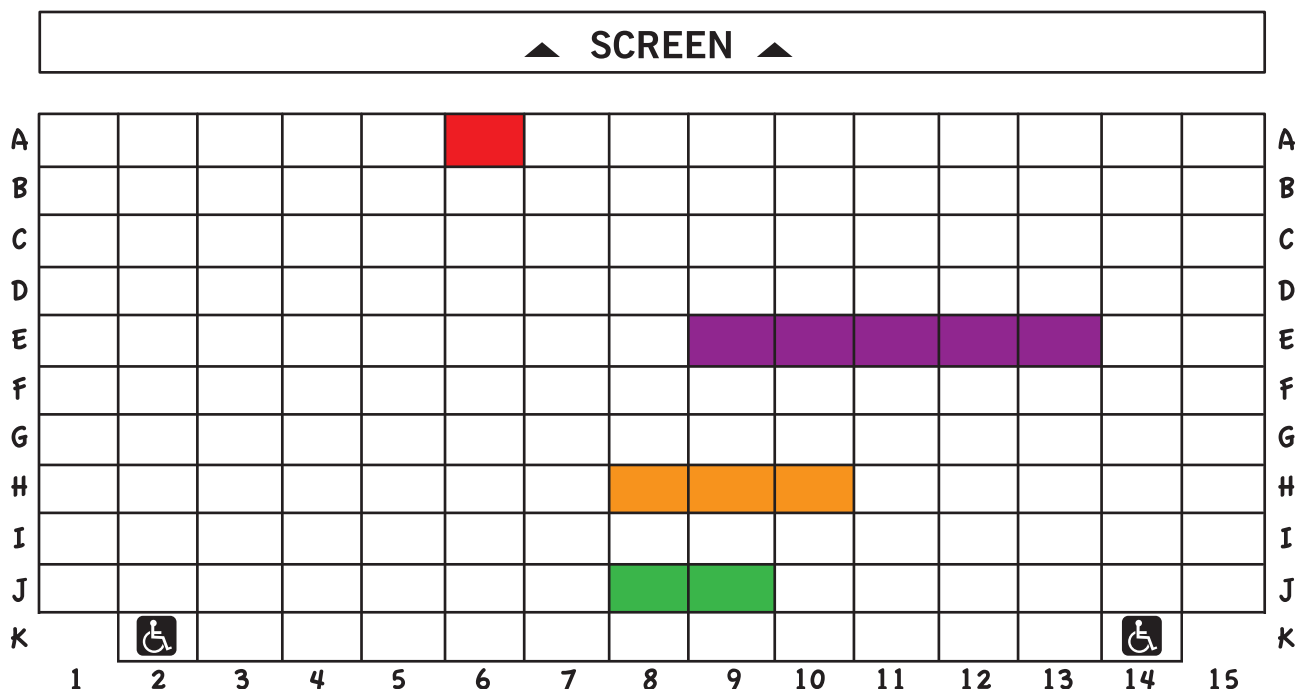
Students' answers will vary.

32

MiB 3 Card 172

The seating plan of Cinema 6 at the local movie theatre is shown below. Look at this plan and have a discussion about how it is different to a map, based on what you know about grid coordinates.

▲ SCREEN ▲															

Seating grid with rows A–K and columns 1–15. A6 is red. E9–E13 is purple. H8–H10 is orange. J8–J9 is green. K2 and K14 have wheelchair symbols.

1 Colour the seats as directed.

   a A6 – red   **b** H10 and the 2 seats to its left – orange

   c J8 and J9 – green   **d** E9 and the 4 seats to its right – purple

2 The local senior citizens club has tickets D3 to D10 as well as all of row I. How many people are there in the group?   _23_

3 What is the total seating capacity of this cinema?

_163_

4 Seats K2 and K14 are reserved for whom?

People with a disability

5 Which seats are the following locations?

   a 2 rows behind E5 and 7 seats to the right   _G12_

   b In the middle of the back row   _K8_

   c 4 rows from the front, in the middle of the row   _D8_

Draw a plan like the one above for a cinema close to you. What is the seating capacity? Are the seats and rows identified in the same way as in this cinema?

MiB 3
Card
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Location and Transformation   **107**

A section of the Sydney train network is shown below.

Sydney suburban area
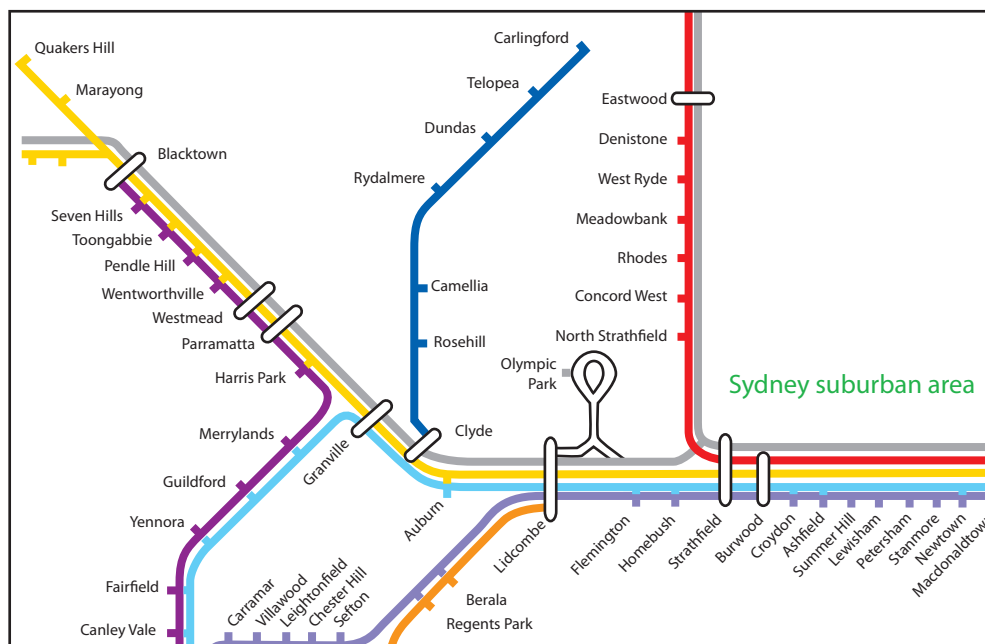
1 Which stations are located on either side of:

a Westmead _____ Wentworthville, Parramatta

b Meadowbank _____ West Ryde, Rhodes

2 Eastwood, Burwood, Strathfield, Lidcombe, Clyde, Granville, Parramatta, Westmead and Blacktown stations all have white oval symbols that cross some or all of the coloured lines. What do you think this symbol indicates?

_____ interchange between trainlines _____

3 Maria is travelling from Ashfield to Regents Park. Which stations does she pass through?

_____ Croydon, Burwood, Strathfield, Homebush, Flemington, Lidcombe, Berala _____

4 If Stephen wants to travel from Fairfield to Carlingford, will he need to change trains? If so, at which station/s could he do so?

_____ Yes Granville then Clyde _____

Watching sport

The following is a seating plan of the grandstand at the local sports centre.

Oval

Main level

Tiered level
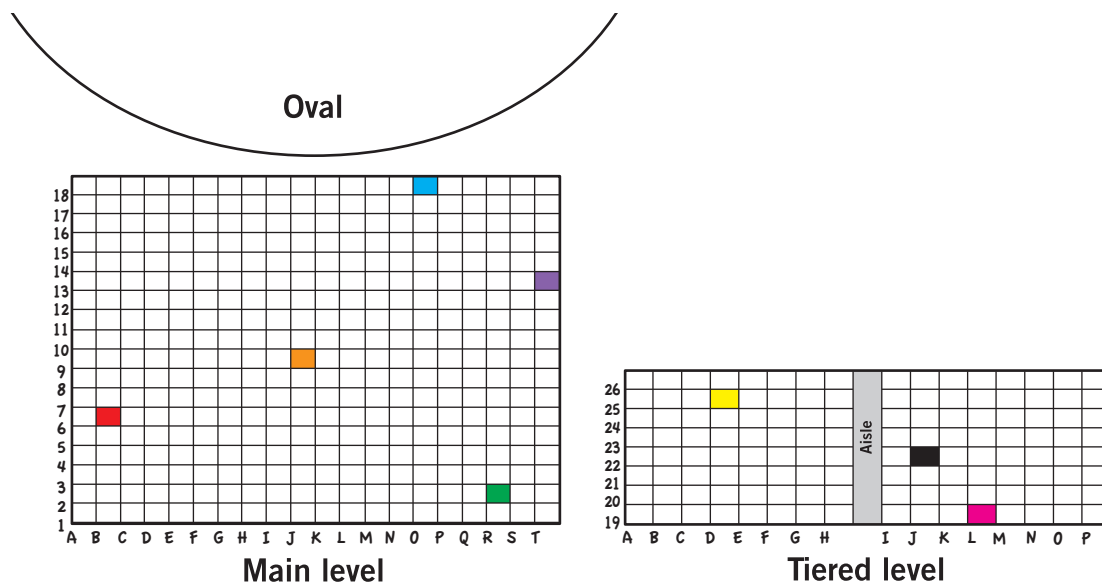
1 Colour the seats as directed.

a J9 – orange   **b** O18 – blue   **c** R2 – green

d B6 – red   **e** D25 – yellow   **f** L19 – pink

g T13 – purple   **h** J22 – black

2 The local football club has tickets H3 to Q3 as well as C21 to O21. How many people are there in the group?

23 people

3 Which of the following seats is closer to the front?

a D17 or F6 ___D14___   **b** G23 or N22 ___G23___   **c** J7 or C11 ___C11___

4 Which of these seats is on the end of a row?

a A7 or K3 ___A7___   **b** A26 or F20 ___A26___   **c** T4 or E24 ___T4___

5 Which seat is in the following location?

a 5 rows behind D14 and 3 seats to the left   ___A9___

b 2 rows in front of F11 and 10 seats to the right   ___P13___

c 4 rows behind M16 at the far right of the row   ___T12___

6 If you were booking seats in this grandstand for yourself and a friend, which seats would you choose and why?

Students' answers will vary.

Location and Transformation   **109**

Touring in the country

Look at this map of north-west NSW, and then answer the questions below.

33
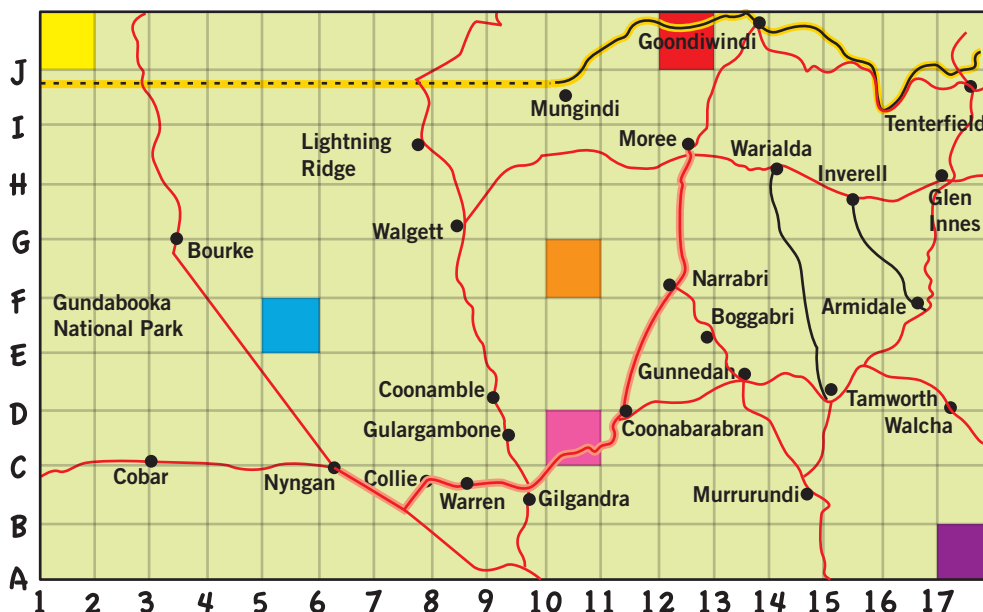
Remember!
Grid squares are named by the lines that intersect at the bottom left-hand corner of the square.

For example:
The black square is named A1, while the pink square is B3.
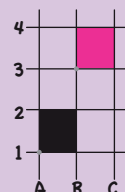
1 Colour each of the grid squares as indicated.

a E5 – blue   **b** J6 – orange   **c** A10 – yellow

d L10 – red   **e** Q1 – purple   **f** J3 – pink

2 What town is located at the following grid references?

a H7 _____*Walgett*_____   **b** G8 _____*Lightning Ridge*_____

c L8 _____*Moree*_____   **d** P5 _____*Armidale*_____

3 At what grid reference are the following towns located?

a Cobar _____*C3*_____   **b** Coonabarabran _____*K4*_____

c Warialda _____*N8*_____   **d** Coonamble _____*I4*_____

4 **a** Draw a route from Moree to Nyngan on the map.

b Write instructions for a person without a map to get from Moree to Nyngan.

_____*Drive south from Moree until Coonabarabran, then bear west and*_____

_____*pass through Gilgandra, Warren and Collie until you reach Nyngan.*_____

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Travelling around

Look at this map of NSW, then answer the questions below.
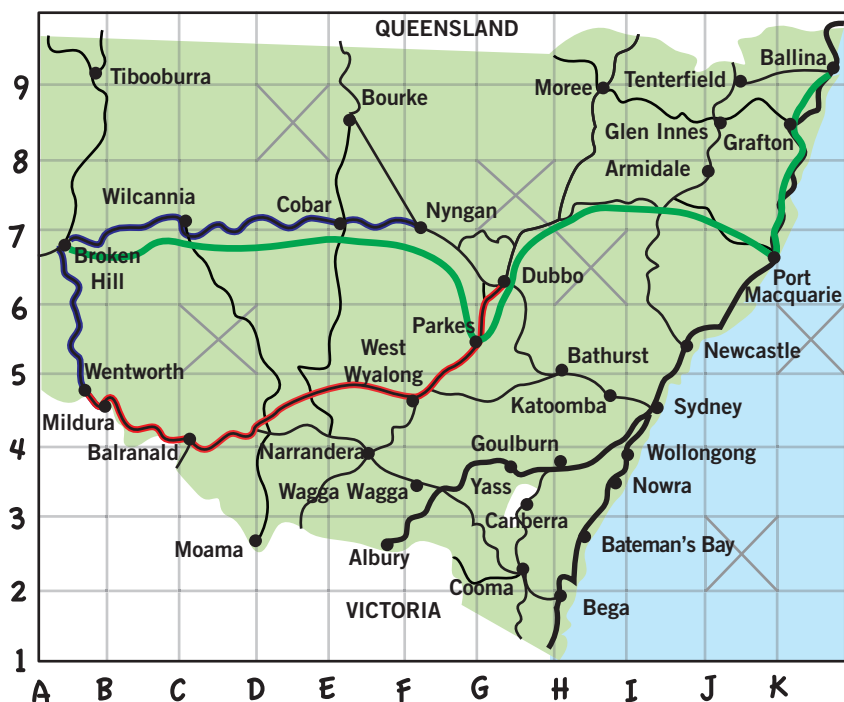
1 Mark the following grid squares with a cross (✗).

D8   J2   H6   C5   G7   K5

2 What town/city is located at the following grid references?

a A6 _____Broken Hill_____   **b** I4 _____Sydney_____

c F3 _____Wagga Wagga_____   **d** H2 _____Bateman's Bay_____

3 At what grid reference are the following towns/cities located?

a Dubbo ___G6___   **b** Bega ___H1___   **c** West Wyalong ___F4___

4 Josephine wants to travel from Mildura to Dubbo.

a Draw two possible routes for this trip on the map, in red and blue.

b If Josephine stops and visits her aunt, who lives in Narrandera, list the towns she would pass through on her trip to Dubbo.

_____Balranald, Narrandera, West Wyalong, Parkes_____

5 Felix lives in Broken Hill and is going for a holiday to Ballina. Draw a route on the map in green that he can take if he wants to stop and visit friends in Parkes and Port Macquarie on his way.

Take a trip around Australia

Look at this map of Australia and answer the questions below.

1 What town/city is located at the following grid references?

a B5 _____Geraldton_____   **b** K7 _____Gladstone_____

c E9 _____Wyndham_____   **d** H8 _____Mt Isa_____

2 At what grid references are the following places located?

a Lake Eyre __H6__   **b** Normanton __I9__   **c** Hobart __J1__

3 **a** What is the first town that is south-west of Darwin on this map? __Wyndham__

b Draw a line from Cairns going due south.
What feature does this line pass through? _____Canberra_____

c If you travel west from Gladstone to the other side
of Australia, what town would you be closest to? _____Carnarvon_____

4 Sailors aboard a yacht radio for help, as they are sinking quickly. They do
not know their exact position, but they are in the Indian Ocean, somewhere
south of Albany and Esperance. In which grid squares should the navy look
for them? Give a reason for your answer.

_____C3, D3, C2, D2, C1, D1_____

These squares are all south of the two towns.

Be a world traveller

Here is a map of the world. Study it and then answer the questions below.
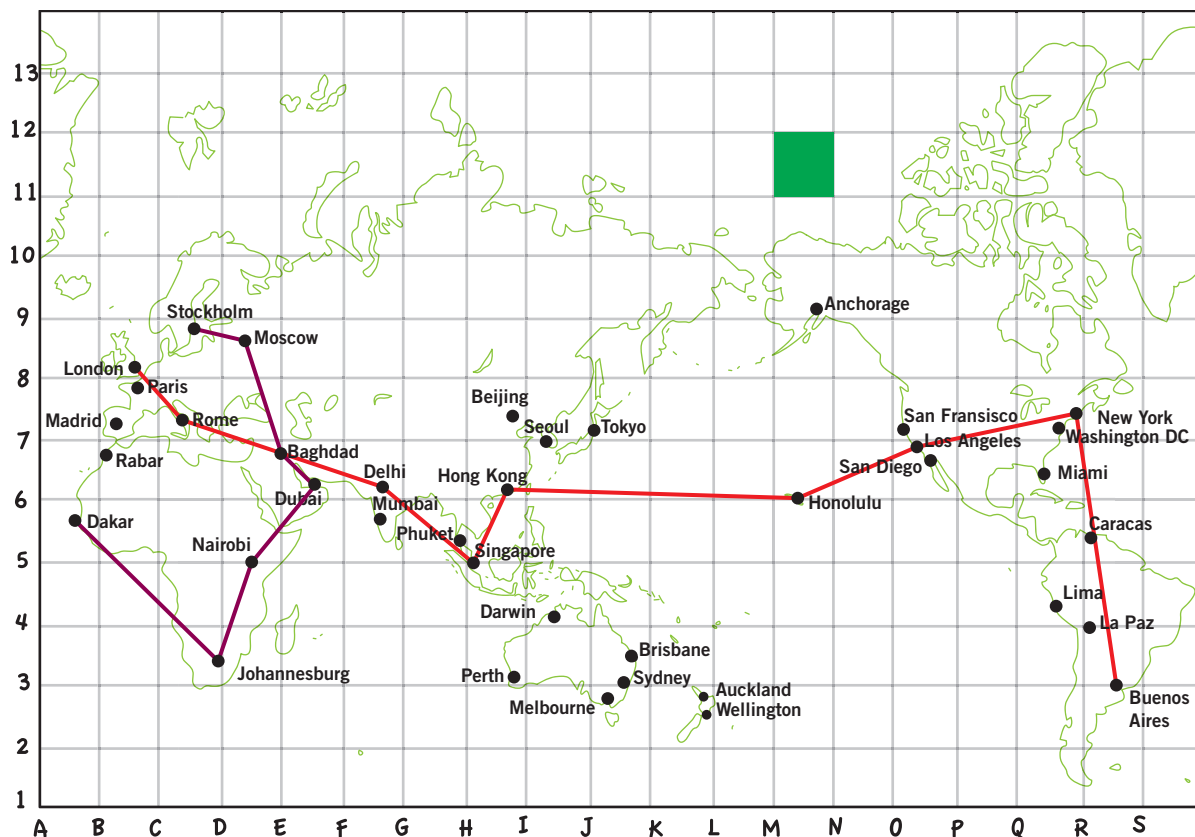
1 Ishmael is having trouble locating grid square M11 on the map. Colour this square green and provide written instructions on how to locate this grid square.

2 grid squares north of Anchorage.

_____

2 Which city is located at the following grid references?

a H7 _____*Beijing*_____   **b** R5 _____*Caracas*_____

3 Give the grid references for these cities.

a Dakar ___*A5*___   **b** Tokyo ___*J7*___   **c** Lima ___*Q4*___

4 Draw on the map the following routes as directed.

a Travelling by air, in red: London – Rome – Delhi – Singapore – Hong Kong – Honolulu – Los Angeles – New York – Buenos Aires.

b Travelling by road, in brown: Dakar – Johannesburg – Nairobi – Dubai – Baghdad – Moscow – Stockholm.

5 If you travelled due east from Baghdad, in which city would you end up?   _____*Los Angeles*_____

Location and Transformation 113

Transformations

A transformation changes a shape's position, size or shape by flipping, spinning, sliding, enlarging, reducing and/or distorting it. The following are some types of transformations.

Translation: A translation is the movement (relocation) of a shape in a straight line. A translation involves no other transformation, so the shape is not reflected, rotated or resized.

Rotation: Rotation involves the turning of a shape around a central point.

Reflection: The shape is flipped, to produce a mirror image of the original shape. A reflection can be done in a horizontal or vertical plane.

1 **a** Translate 2 to the right and 3 up.

b Reflect on the dotted line.
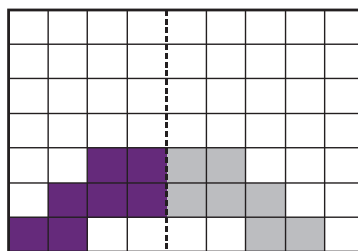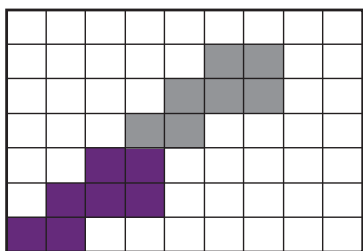
c In the adjacent grid, rotate this shape 180° around its centre.
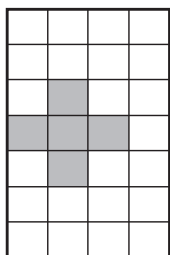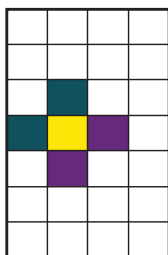
d Translate 4 to the right. Then reflect on the dotted line.
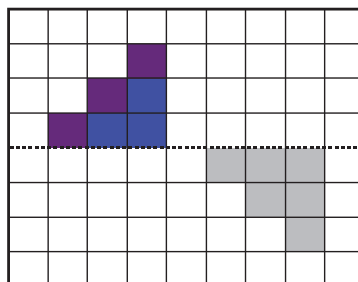
Some shapes have lines of symmetry. A line of symmetry divides a shape into two equal halves. Both of these halves are the same shape, only reflected. Some shapes have no lines of symmetry; others have more than one.

line of symmetry

2 Draw in all the lines of symmetry that you can find on the following shapes. Some may not have any lines of symmetry.

a **b** **c** **d**

e **f** **g** **h**
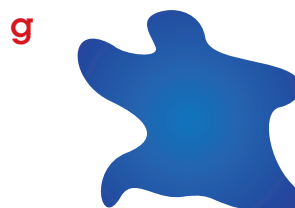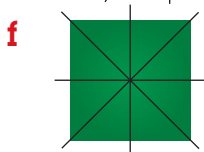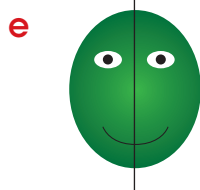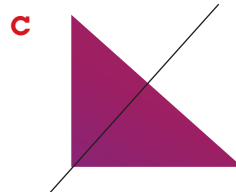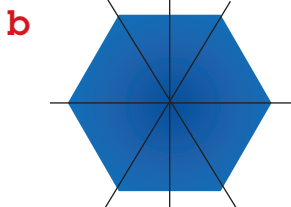
Rotational symmetry

A shape has rotational symmetry if it 'matches' itself after being rotated.
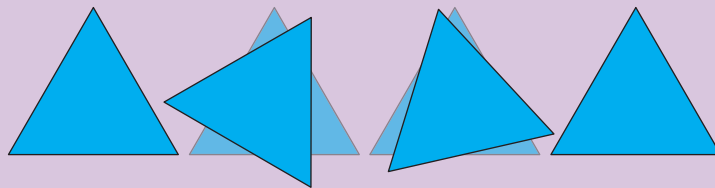
The **order of rotational symmetry** is how many times it 'matches' itself before returning to its original position. The triangle above has rotational symmetry of order **3** because it matches itself **3** times while being rotated, including its original position.
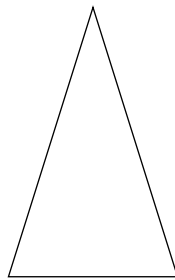
Use pattern blocks, geostrips, geoboards or copies of these shapes cut from paper to help you complete the following.

1 Which shapes have rotational symmetry? Colour these shapes red.

2 For each shape that has rotational symmetry, identify the order.
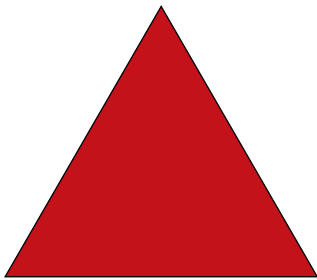
Equilateral triangle ___3___   Isosceles triangle _____   Scalene triangle _____
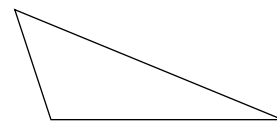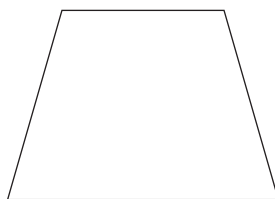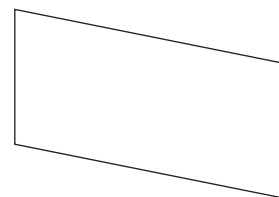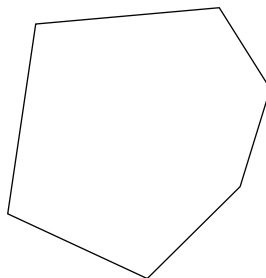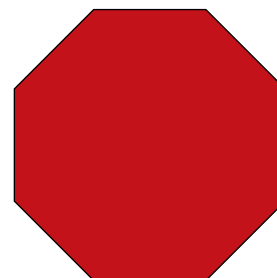
Square ___4___   Trapezium _____   Parallelogram _____
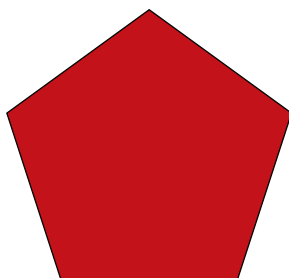
Pentagon ___5___   Irregular hexagon _____   Octagon ___8___

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Location and Transformation

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Scale drawing

When making enlargements or reductions of pictures, we describe how much the picture is to be enlarged or reduced using a **scale**.

A scale is a number that describes how to change the measurements of the picture vertically and horizontally. A scale greater than 1 is an enlargement, while a number smaller than 1 is a reduction.

1 Enlarge or reduce each of the pictures as described.

Shape 1

Shape 2

scale to $\frac{1}{2}$ scale to $\frac{1}{4}$ scale to 2
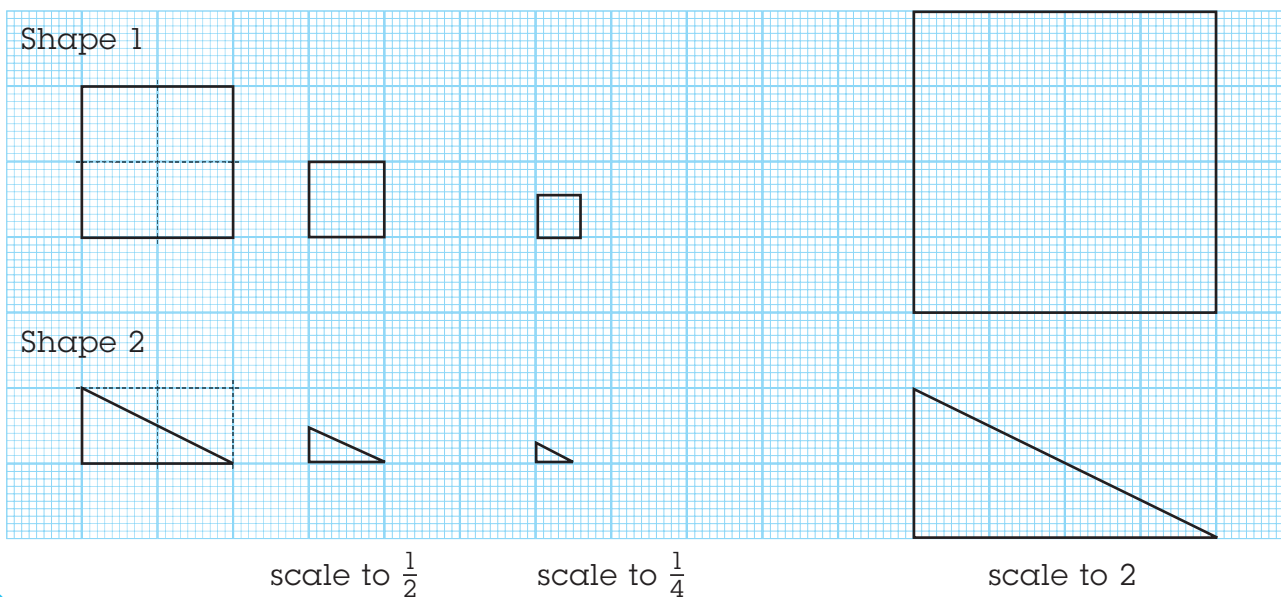
2

a Describe what has happened to the length of the sides in each case.

Shape 1 _____ *Each side is multiplied by the scale factor* _____

Shape 2 _____ *Each side is multiplied by the scale factor* _____

b Has anything happened to the angles in each shape?

Shape 1 _____ *They do not change* _____

Shape 2 _____ *They do not change* _____

c Describe what has happened to the area of each shape.

Shape 1 _____ *The area is multiplied by the square of the scale factor.* $(\times \frac{1}{4}, \times \frac{1}{8}, \times 4)$ _____

Shape 2 _____ *The area is multiplied by the square of the scale factor.* $(\times \frac{1}{4}, \times \frac{1}{8}, \times 4)$ _____

Another way to do enlargements or reductions is to use a grid. The original object has a 1 cm grid put over the top as shown below. The grid is then re-drawn to size according to the scale. The picture is then drawn using the new grid.
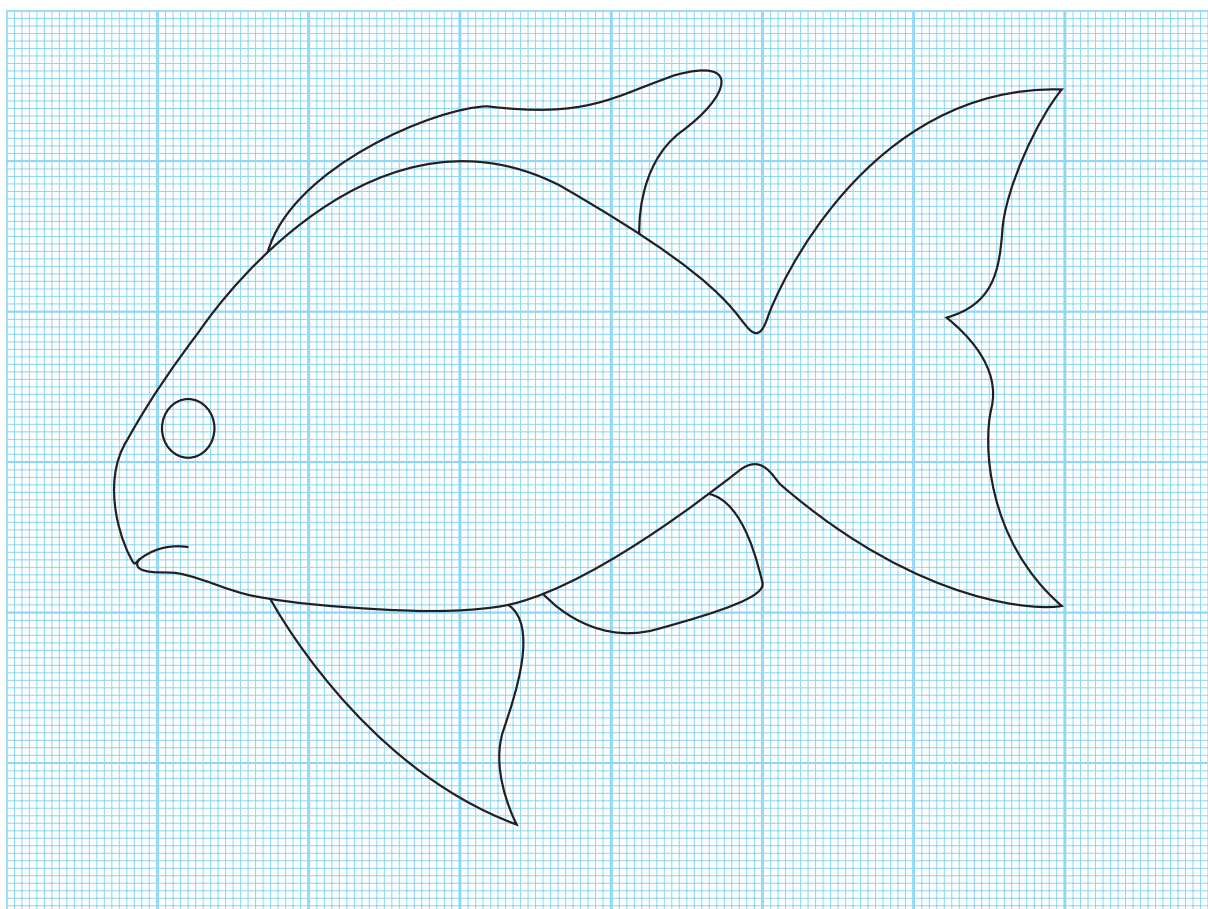
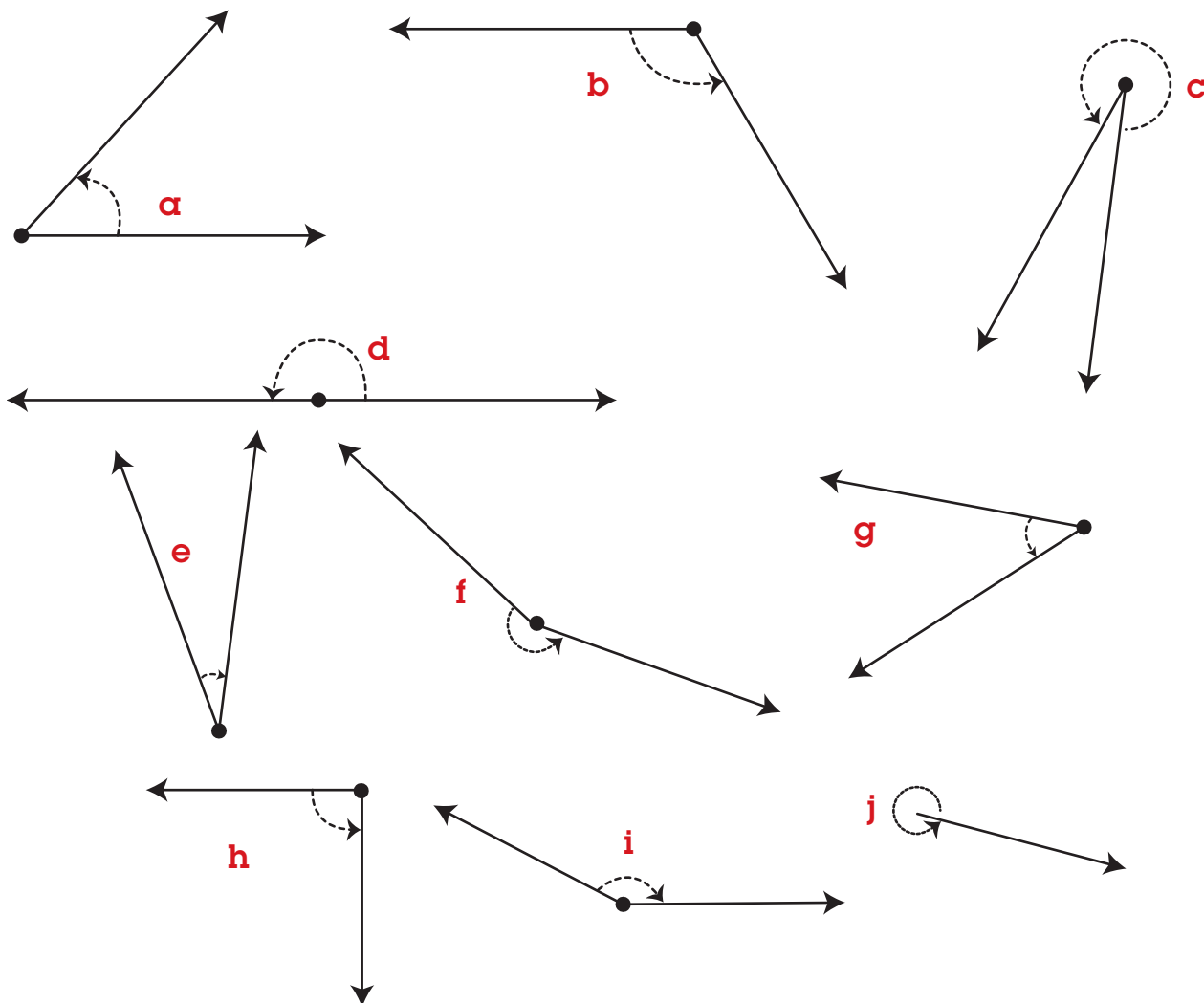**1** Redraw this picture on the grids provided.

a
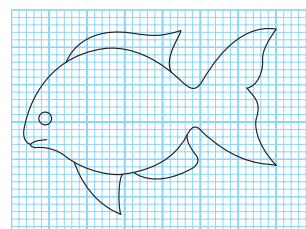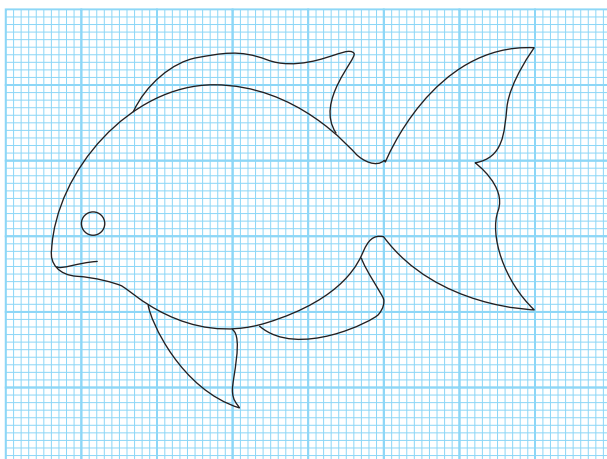
scale to $\frac{1}{2}$

b

scale to 2

Measuring angles

Here are a set of angles indicated by the arrows. Classify, estimate and accurately measure each of the angles and record your results in the table below.

Angle	Type	Estimate	Measure
a	acute		48°
b	obtuse		122°
c	reflex		338°
d	straight line		180°
e	acute		27°

| Angle	Type	Estimate	Measure
f	reflex		202°
g	acute		42°
h	acute		90°
i	obtuse		159°
j	rotation		360°

Write a set of instructions on how to use a protractor to accurately measure an angle. What are the key pieces of information that someone would need to know?
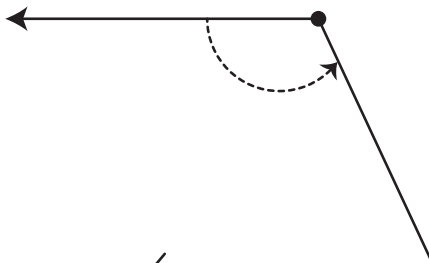
118 Geometric Reasoning

Constructing angles

1 Construct the following angles with a protractor. Make the arms 4 cm in length.

a 45°
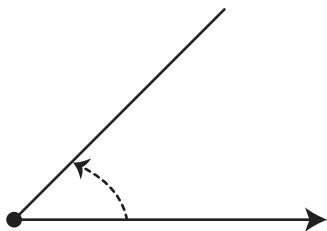
b 115°

c 320°

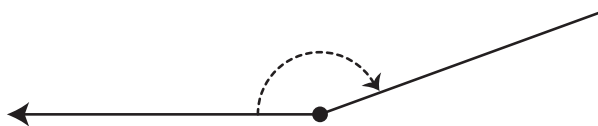**d** 230°

e 90°
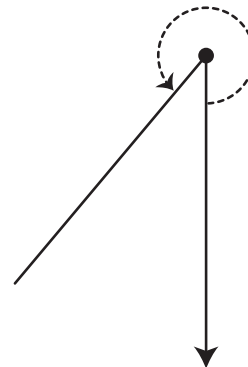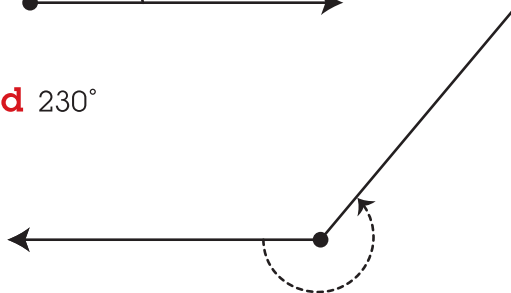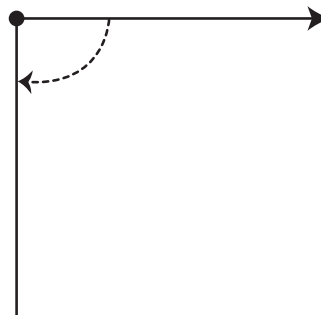
f 160°
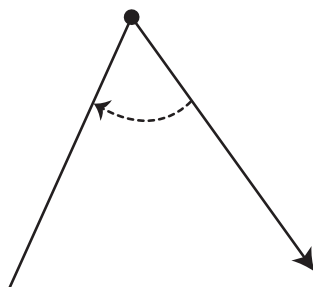
h 300°

g 60°
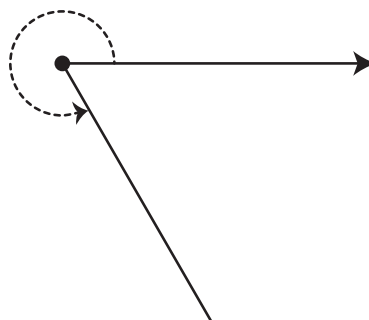
i 180°

j 200°
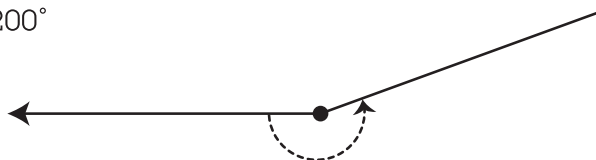
Angles are measured with protractors. Remember that you can read protractors from both ends.
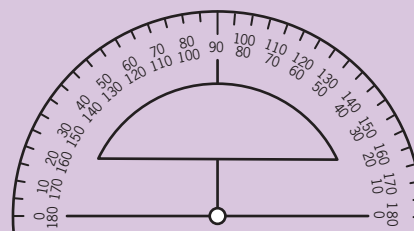
1 Measure all the angles of the triangles and record them as shown in a.

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a

56° 35° 90°

b

90° 36° 54°

c

25° 90° 65°

d

60° 60° 60°

e

25° 25° 130°

f

68° 52° 60°
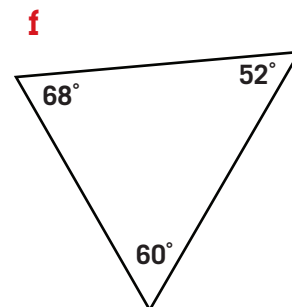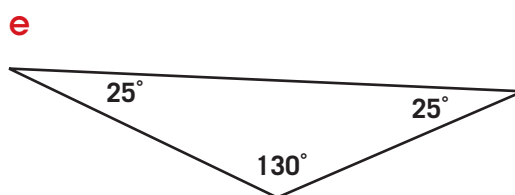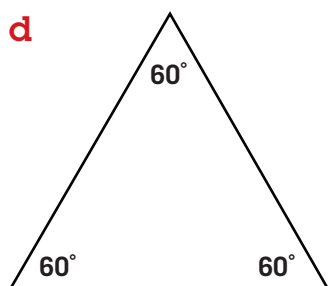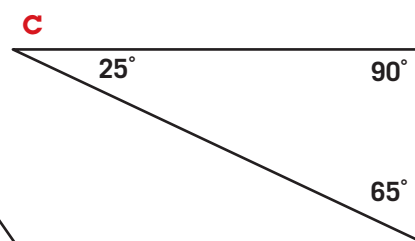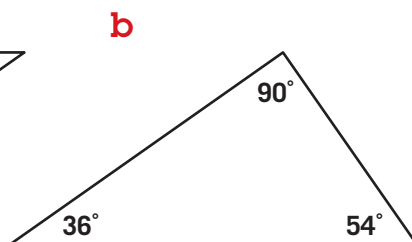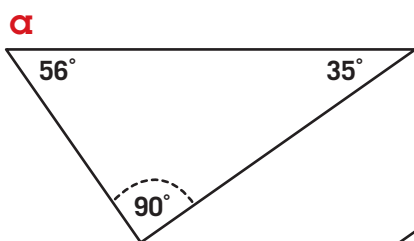
> **Remember!**
> An **equilateral triangle** has three sides the same length and three angles the same size.
> An **isosceles triangle** has two sides the same length and two angles the same size. A **scalene triangle** has no sides the same length and no angles the same size. The **right-angle triangle** has one right angle (90°).

2 Look at the 3 angles of each triangle in Question 1. Decide which description/s in the table matches the 3 angles. Write the letter of the triangle next to the description you have chosen in the 'Examples' column. The angles of the triangle may fit more than one description. See below for an example.

Triangle name	Description	Examples
Scalene	No angles are the same.	a , f, b, c
Isosceles	2 angles are the same.	e
Equilateral	3 angles are the same.	d
Right-angle	One angle is 90°.	a , b, c
Acute	All angles are acute angles.	d

Can a right-angle triangle also be an isosceles triangle? Explain.

Introducing divided bar graphs

1 Use the divided bar graph to answer the following questions.

Australian Olympic medal tally

Key
- Gold
- Silver
- Bronze
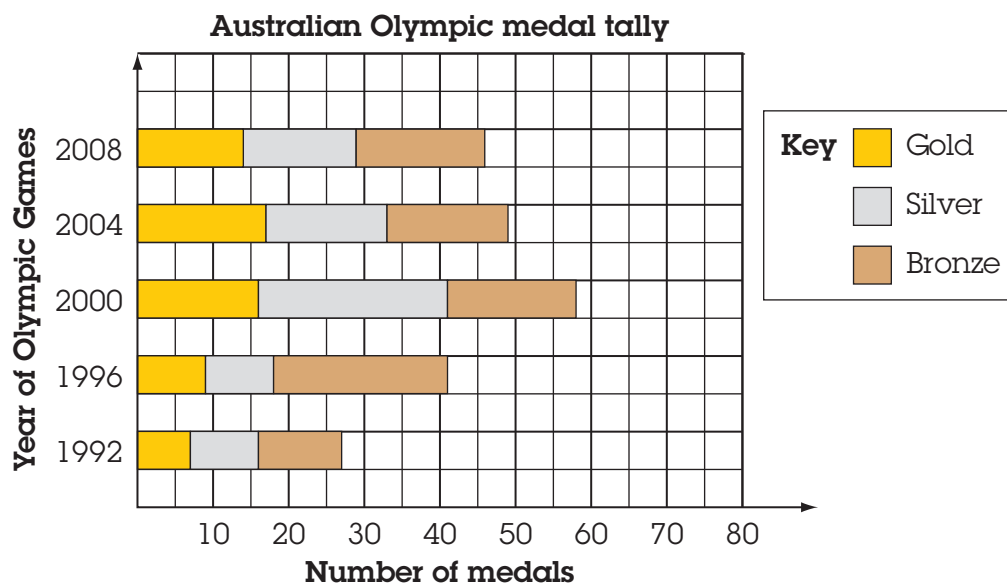
a What is the largest number of silver medals won by the Australian team? In which year?

25 silver medals in 2000

b Which Olympic Games do you consider to be the Australian team's 'most successful'? Give a reason.

Students' answers will vary.

2 A teacher graphed the absences of their students for Term 1 and Term 2. The results are shown in the divided bar graph below. *Students' answers will vary.*

a Decide on a name for this graph and write it in the space provided.

b Suggest a reason why Natalie had many more absent days in Term 1 than in Term 2.

c How could the teacher use this graph?

Key
- Term 1
- Term 2

Divided bar graphs

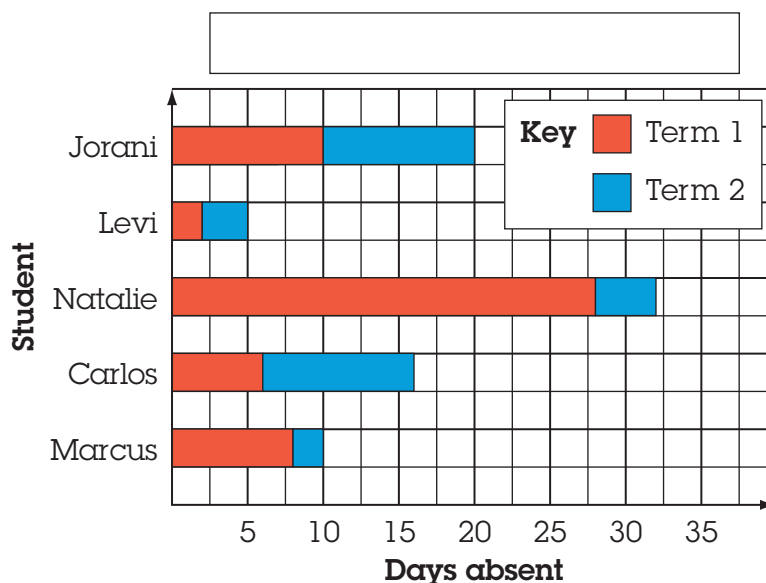**1** Use the divided bar graph to answer the questions.

SA agriculture production

Key
- Wheat
- Corn
- Barley
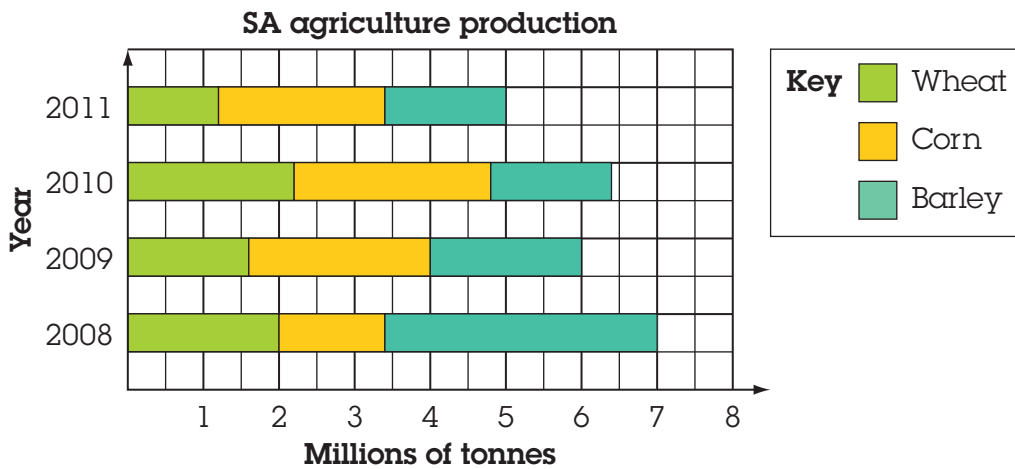
a In what year did SA have its largest production of wheat? _2010_

How many tonnes were produced? _2.2 million_

b List in order, from best year to worst year, corn production in SA.

_2010, 2009, 2011, 2008_

2 The table and graph show how many people in each Year 5 group were born in Australia or overseas.

Year 5 group born in Australia or overseas

Key
- Australia
- Overseas

Year 5 group	Born in Australia	Born overseas
2011	44	8
2010	40	14
2009	26	30
2008	50	2
2007	21	29
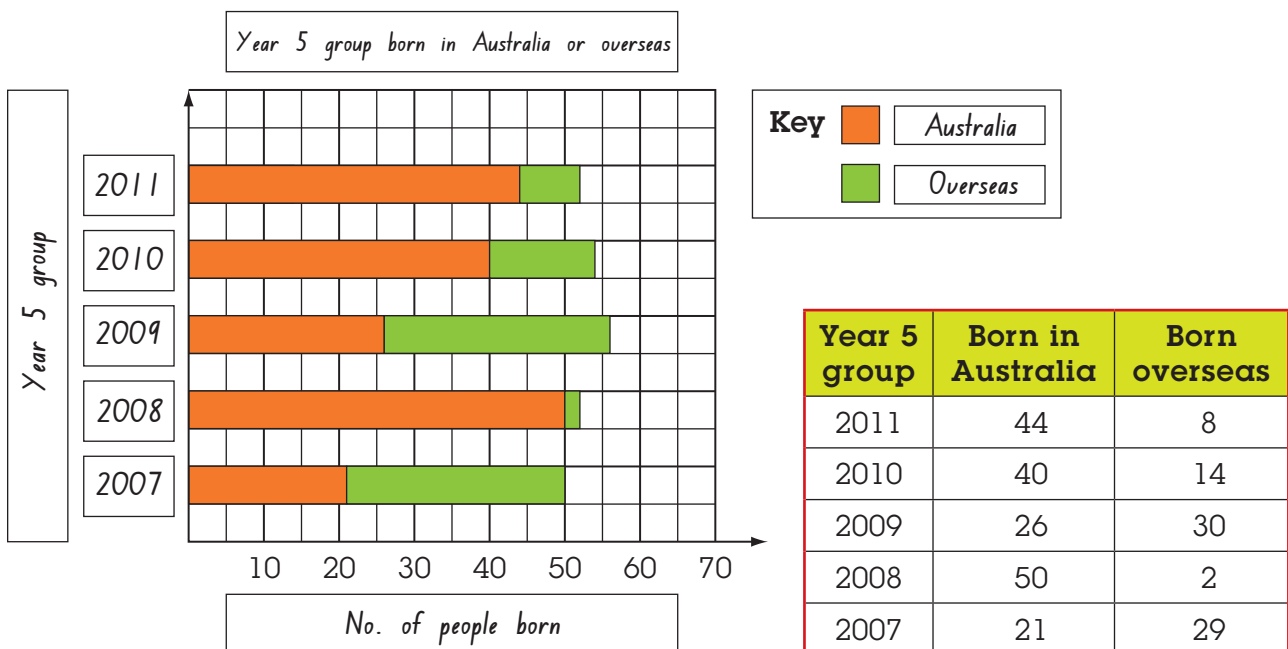
a Use the information in the table to help you complete all the missing labels on the graph and in the key.

b Write a question that can be answered using this graph.

Give your question to a classmate to answer.

Introducing sector (pie) graphs

A sector or pie graph is a circle that has been divided into parts. The parts are usually coloured differently to make them easier to see and often have a percentage value written on each part.

1 Use the pie graph to answer the questions.

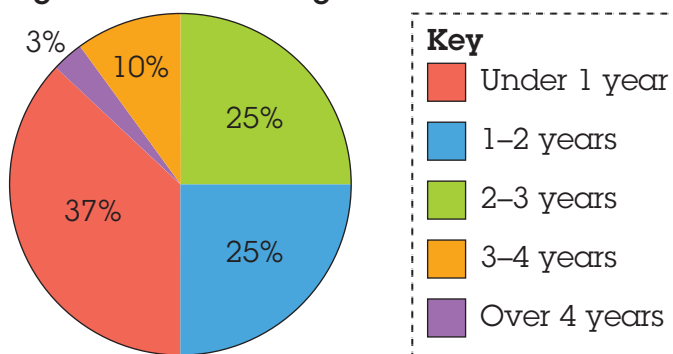**Age at first swimming lesson**

3%
10%
25%
37%
25%

Key

- Under 1 year
- 1–2 years
- 2–3 years
- 3–4 years
- Over 4 years

a What percentage of children had their first swimming lesson before their first birthday?

37%

b Which two age groups had the same number of children starting lessons?

1-2 years and 2-3 years.

In which country has this data most likely been collected – England, USA or Australia? Give a reason.

2 This sector (pie) graph was constructed from a survey conducted among travel agents. It shows the destinations that most families went to on their holidays.

a Write a title on the graph.

b Where is the most popular holiday destination?

Gold Coast, QLD

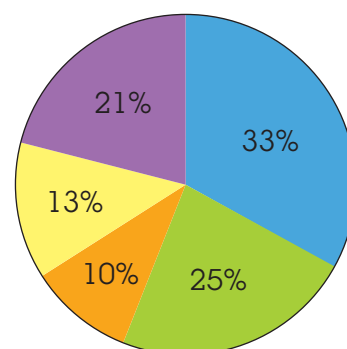**c** List the destinations in order, from most popular to least popular.

Gold Coast, New Zealand, Other, Fiji, USA

d List 5 locations that could have been included in the category 'other'.

Students' answers will vary.

Family holiday distinations

21%
33%
13%
10%
25%

Key

- Gold Coast, QLD
- New Zealand
- Other
- Fiji
- USA

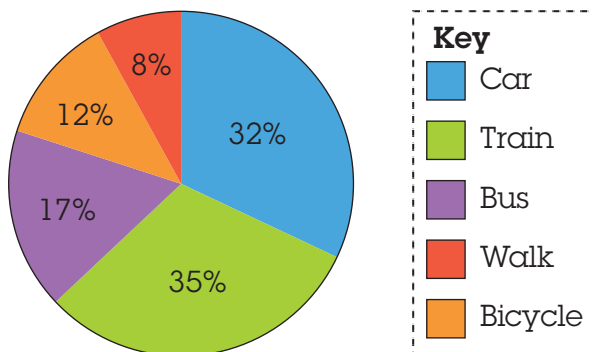Suggest a reason why the USA is not a more popular holiday destination.

Sector (pie) graphs

1 The Transport Department surveyed school students about how they get to school each morning. The results are shown in the pie graph.

How students travel to school

Key
- Car
- Train
- Bus
- Walk
- Bicycle

8%
12%
32%
17%
35%

a What percentage of students catch the train to school?

_35%_

b Do more students walk than take the bus?

_No_

c Suggest a reason why the Transport Department conducted this survey.

Students' answers will vary.

**d** Write 3 other questions that can be answered using this pie graph.

i _Students' answers will vary._

ii _____

iii _____

2 A florist recorded the type of flowers that were purchased from her business during one year. The results are shown in the table and incomplete sector (pie) graph.

Flower	% of yearly total
Roses	50%
Carnations	25%
Native flowers	10%
Lilies	10%
Other	5%

Key
- Roses
- Carnations
- Native flowers
- Lilies
- Other
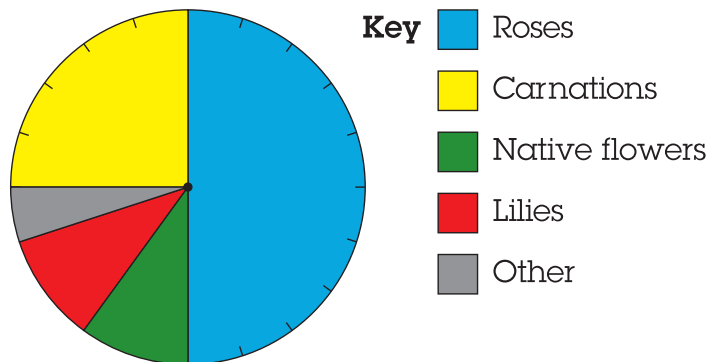
a Label, colour and complete the key of the sector (pie) graph using the information given in the table.

b How can the florist use this information to help run their business?

Students' answers will vary.

_____

_____

c What results would you expect if you conducted this survey at a different florist's shop?

Students' answers will vary.

_____

MiB 3
Cards 74
and 79

Comparing graphs

1 Collect data from your class in the table below. *Students' answers will vary.*

Favourite colours of Year 5

Colour	Tally	Score	Percentage
Red			
Blue			
Green			
Yellow			
Other			
Total			

2 Present this data as a column graph **and** as a sector (pie) graph.

39

Key
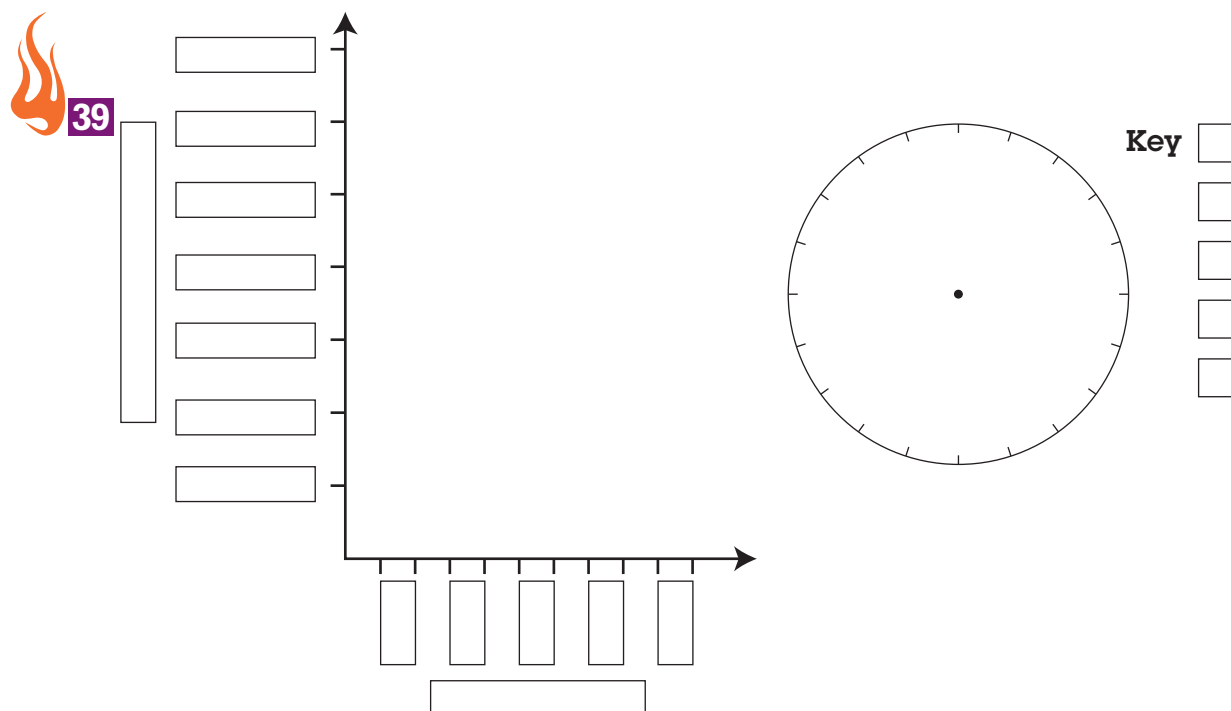
3 a How are these graphs the same?

_____

_____

_____

b How are these graphs different?

_____

_____

_____

Data **125**

Dot plots and graphs

A scientist has collected a sample of mould growing on a sandwich found in a student's schoolbag. Ten different types of mould grew.

1 Count how many of each kind of mould colony you can see in the dish, and complete the table on the right.
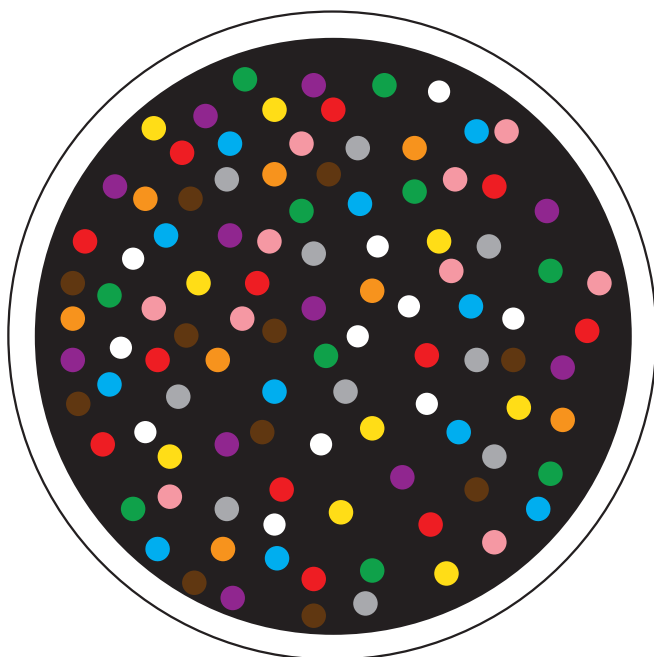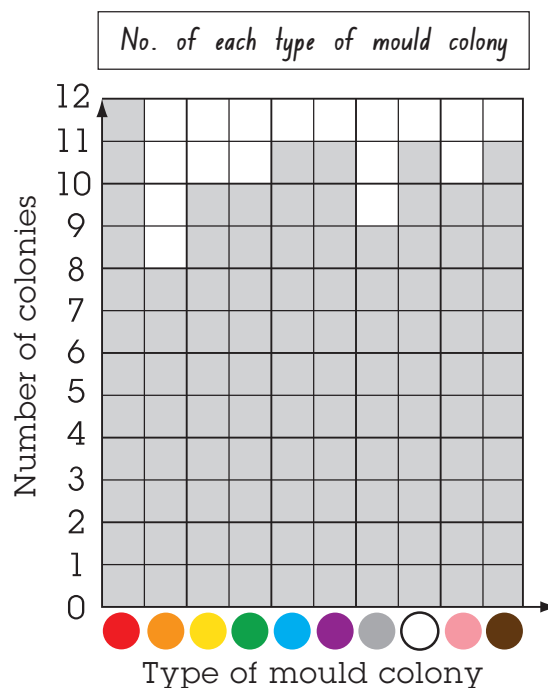

Type of mould colony	Number of colonies
Red	12
Orange	8
Yellow	9
Green	10
Blue	11
Purple	11
Grey	9
White	11
Pink	10
Brown	11

2 Display your data on this dot plot and column graph. Give the graphs titles.

40

No. of each type of mould colony

Number of colonies

No. of each type of mould colony

Number of colonies

Type of mould colony
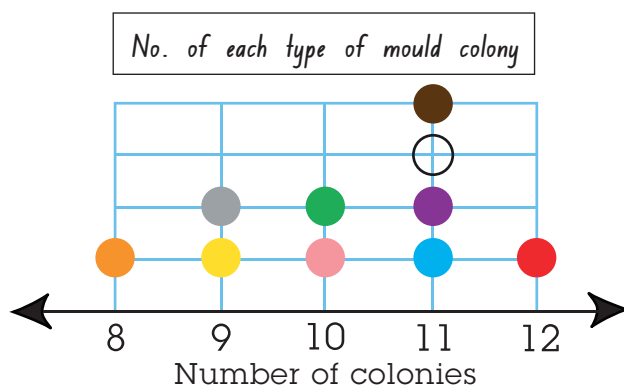
3 Which type of graph do you think shows this information better?

Students' answers will vary.

Which graph?

Picture graph

Sector (pie) graph

Column graph
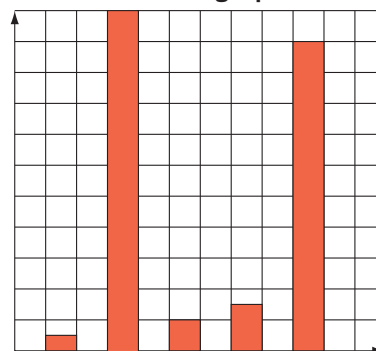
Divided bar graph

Dot plot

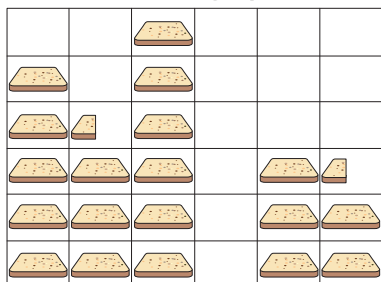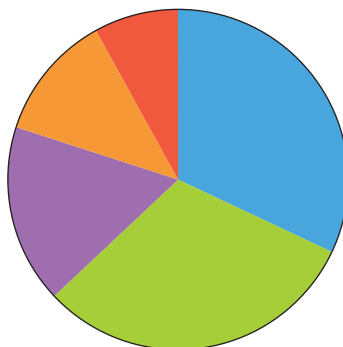48   49   50   51   52   53   54   55
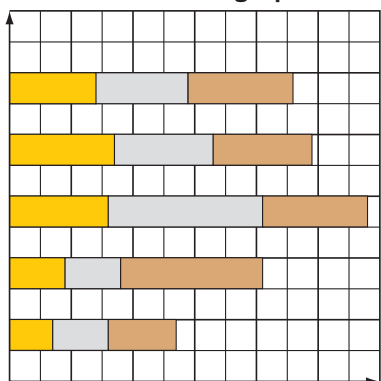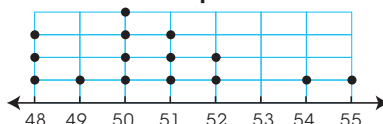
Bar graph
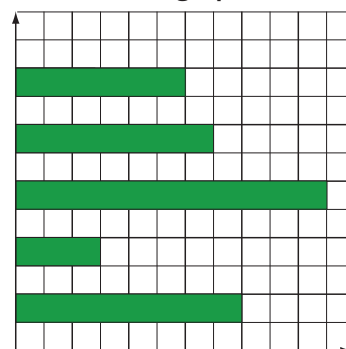
Shown above are 6 different ways of presenting data. Look at each of the situations below, and decide which way you would choose to present that data. Give a reason for your choices. *Students' answers will vary.*

1 car sales from month to month

_____

_____

2 the number of sunny, rainy and cloudy days this month

_____

_____

3 the results from rolling a dice 50 times

_____

_____

4 the heights of the students in your class

_____

41

Data **127**

Chance events

1 Place the spinners in order, by numbering the boxes, from those least likely (1) to spin green to those most likely (6) to spin green.

4   6   3   1   2   5

2 Re-order the events in the table. Put them in order from those that are most likely to occur to those that are least likely to occur.

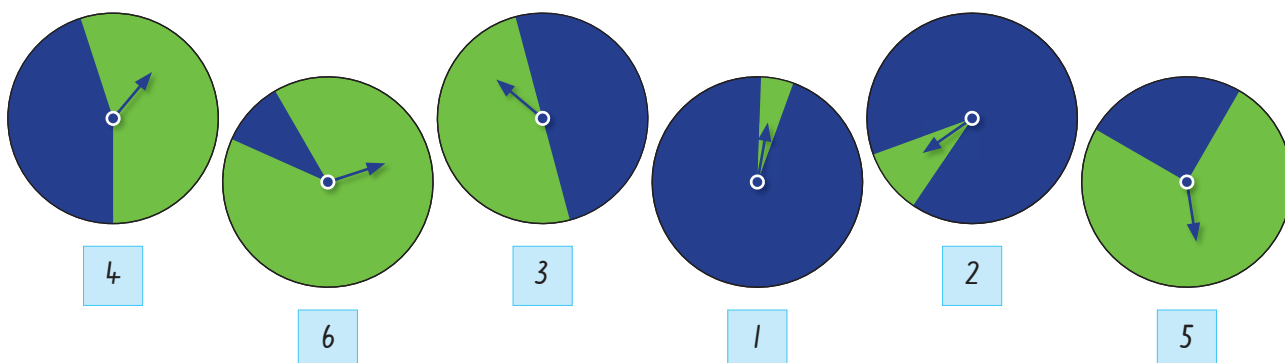| Events	Re-ordered events
Be at school next week	Be at school next week
Go on a holiday	Watch a movie
Win a million dollars	Go swimming tomorrow
Go swimming tomorrow	Go on a holiday
Watch a movie	Win a million dollars

3 At Oliver's birthday party, a game is played where you have to pick up jellybeans from a plate using chopsticks, while blindfolded.

a Using fractions describe the chance of choosing:

a pink jellybean from the plate $\frac{4}{10}$

a purple jelly bean from the plate $\frac{3}{10}$

a blue jelly bean from the plate $\frac{2}{10}$

an orange jellybean from the plate $\frac{1}{10}$
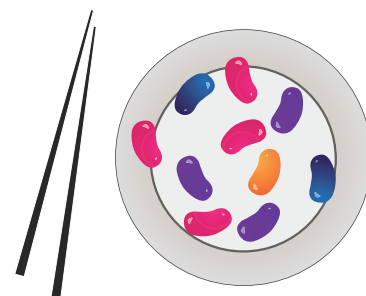
b What is the chance of choosing a green jellybean?   0

c Add all the answers from Question 3a and describe what this result tells you about probability.

probability = 1

d Place and label each result from Questions 3a and 3b on this number line.

0    $\frac{1}{10}$ $\frac{2}{10}$ $\frac{3}{10}$ $\frac{4}{10}$ $\frac{1}{2}$ 1

MiB 3 Card 67

Investigating spinners

Look at the spinner.

1 Make a spinner like this, with 4 colours which do not have an equal chance of occurring. *Students' answers will vary.*

2 List the 4 colours in order from least likely to most likely to occur when the spinner is spun.

_____

3 Spin the spinner 50 times and record your results in the table.

4 Based on your results in Question 3, list the 4 colours in order from least spun to most spun.

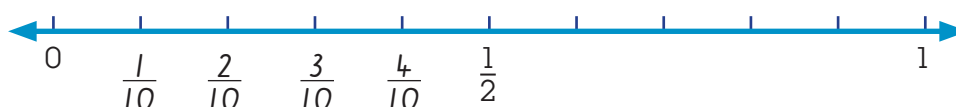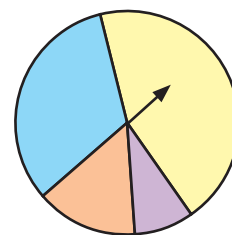| COLOUR	TALLY	SCORE

5 Compare these results to your prediction in Question 2. How are they the same/different?

_____

_____

6 Spin the spinner another 50 times. Record your results in the table.

7 List the 4 colours in order from least spun to most spun from the results of your 100 spins.

COLOUR	FIRST SCORE (from above)	TALLY	TOTAL SCORE

_____

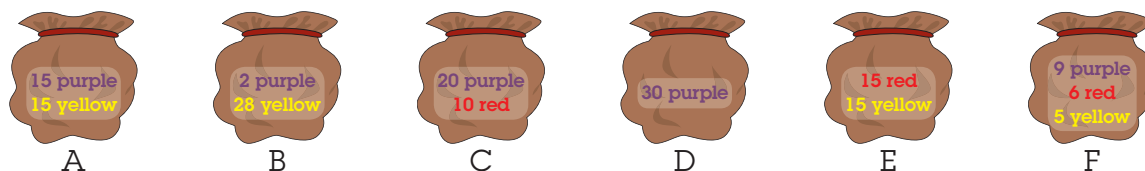**8** How has the order changed?

_____

_____

9 If you spun the spinner another 50 times, how would this affect the order of the colours?

_____

_____

Add the results from another group to yours. What happens as you increase the number of spins?
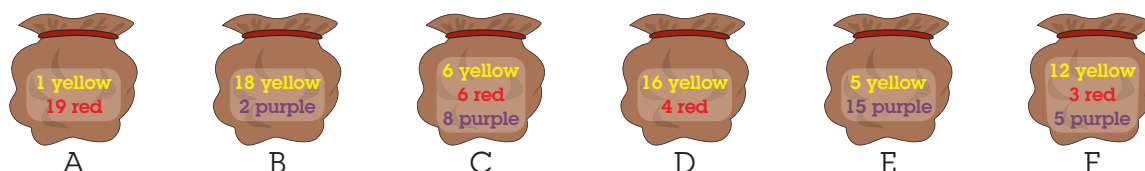
What is the chance?

1 Each of the bags below contains an assortment of coloured marbles. Place the bags (labelled A to F) in order on the scale, indicating the likelihood that the next marble from each bag will be:

a Purple

15 purple 15 yellow	2 purple 28 yellow	20 purple 10 red	30 purple	15 red 15 yellow	9 purple 6 red 5 yellow
A	B	C	D	E	F

Least likely __E__   __B__   __F__   __A__   __C__   __D__ Most likely

b Yellow

1 yellow 19 red	18 yellow 2 purple	6 yellow 6 red 8 purple	16 yellow 4 red	5 yellow 15 purple	12 yellow 3 red 5 purple
A	B	C	D	E	F

Least likely __A__   __E__   __C__   __F__   __D__   __B__ Most likely

2 Match each event with the appropriate numerical value to describe its likelihood.

A coin will land on tails. $\frac{1}{13}$

A dice will land on 4. $\frac{1}{12}$

A card drawn from a pack will be a jack. $\frac{1}{2}$

A domino drawn will be a double. $\frac{1}{4}$

Two dice will land on a score of 10. $\frac{1}{6}$

3 Design a spinner with a greater than 50% chance of spinning red. It must also contain the colours orange and blue, where blue has a greater chance of being spun than orange.
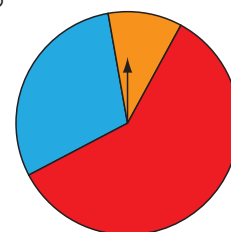
4 Use the spinner below to help you complete these statements.

a There is a greater than 50% chance the arrow will land on _red or green_.

b There is a ___greater___ chance the arrow will land on yellow rather than on blue.

c The colour with the least chance of being landed on is ___blue___.

d There is an equal chance the arrow will land on ___yellow___ and ___green___.

Chance
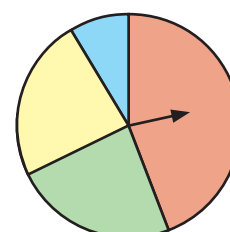
Rolling with the dice

1 The results of rolling a single die 120 times are shown in the table.

DIE VALUE	TALLY	SCORE
1	ℍℍ ℍℍ ℍℍ ℍℍ ℍℍ	25
2	ℍℍ ℍℍ ///	13
3	ℍℍ ℍℍ /	11
4	ℍℍ ℍℍ ℍℍ ℍℍ ℍℍ ℍℍ //	32
5	ℍℍ ℍℍ ℍℍ ℍℍ /	21
6	ℍℍ ℍℍ ℍℍ ℍℍ ℍℍ ℍℍ ℍℍ ℍℍ ℍℍ	45

a Complete the table by reading the tally marks and recording the score.

b Given that the die rolled was fair, how many times would you expect each number to occur?

_20_

c What would you expect to happen to the results in the table if the die was rolled another 120 times?

Each value would come up 20 times, so we would add 20 to each score in the table.

2 Crown and Anchor is a traditional game of chance that uses 3 dice. Use the internet or another information source to research this game. Use your information to complete the questions. _Students' answers will vary._

a Who traditionally played the game Crown and Anchor?

b By what names are other versions of this game known? Which countries are they played in?

c Describe how the dice that are used for this game look. Complete the net diagram of one of the dice.
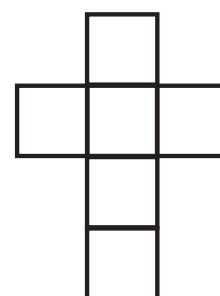
> What other games do you know that use dice? Do any of them use different dice like Crown and Anchor? How many different types of dice are there?