Assessment Rubric 1—Lower Primary

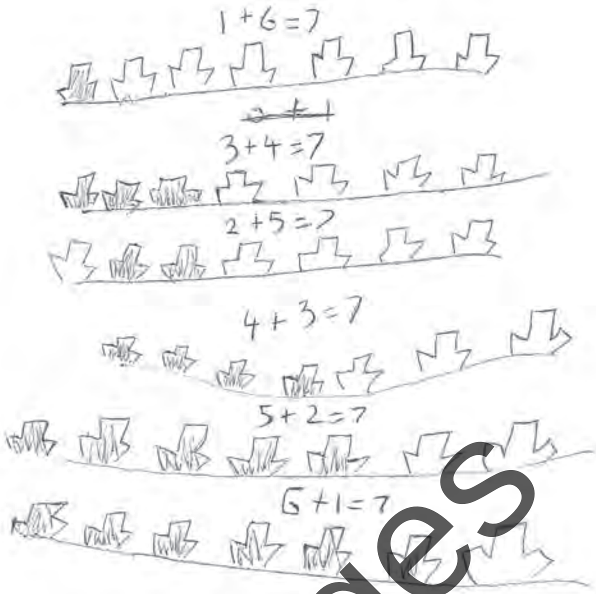
This task was given to students in their first year of school and students in year 1. Relevant work samples are shown for each achievement level.

Task: *There are seven shirts hanging on a clothes line. Some are white and some are blue. There are no other colours. How many of each colour might there be?*

Achievement level	Criteria
Beyond expectations →	Student draws, or uses numbers to describe, all possible combinations of shirts. That is: 1 + 6, 2 + 5, 3 + 4, 4 + 3, 5 + 2 and 6 + 1. (Note: 7 + 0 or 0 + 7 does not apply as the task states there are some of each colour.)
Accomplishes task and understands central mathematical idea →	Student draws or describes with numbers one or more, but not all, possible combinations of shirts. The example/s given are correct.
Makes some progress but not completed satisfactorily →	Student does one of the following: a) Draws more than one line of shirts but at least one line is incorrect. b) Draws seven shirts but all seven are the same colour. (See student work sample.)
Little or no understanding evident →	Student does one of the following: a) Makes an incorrect attempt by drawing the wrong number of shirts. b) Makes no attempt.

Student Work Samples

Beyond expectations
draws and describes all possible combinations



Accomplishes task
draws one combination only

Makes some progress
all shirts one colour

Little or no understanding
six shirts drawn

Assessment Rubric 2—Lower Primary

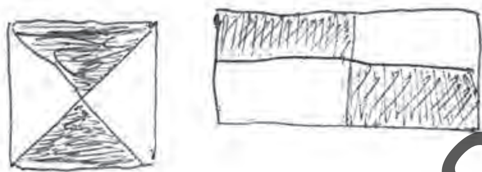
This task was given to students in years 1 and 2. Relevant work samples are shown for each achievement level.

Task: *One half of a flag is one colour and the other half is another colour. Draw what the flag might look like.*

Achievement level	Criteria
Beyond expectations	Student draws more than one correct flag. All flags drawn clearly show equal parts. In one or more of the flags there is evidence of understanding equivalence, i.e. that $\frac{1}{2}$ is equal to $\frac{2}{4}$ and $\frac{3}{6}$.
Accomplishes task and understands central mathematical idea	Student draws more than one flag and all are correct. In the flags drawn, half is shown as two equal parts and this is demonstrated with flags that are divided in more than one way.
Accomplishes task but shows limited understanding	Completed work shows one of the following: a) Only one flag drawn and it is correct. b) More than one flag drawn but all have been divided into two equal parts in the same way. (Accept flags with two parts that are not equal but are close to equal. See student work sample.)
Makes some progress but shows misconceptions in key concepts	Student shows two or more obviously unequal parts in one or more of the flags drawn.
Little or no understanding evident	Student does one of the following: a) Makes no attempt. b) Makes an attempt which is incorrect.

Student Work Samples

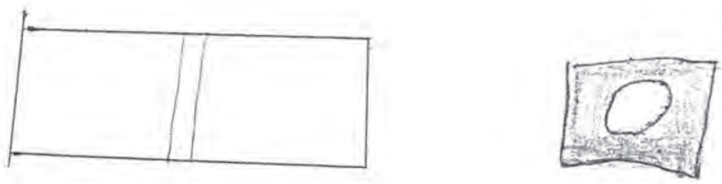
Beyond expectations
an understanding that half
is the same as two-quarters



Accomplishes task
half shown in more
than one way

Accomplishes task,
limited understanding
all flags divided into
halves in the same way

Makes some progress
flags show unequal parts



Little or no understanding
none of the flags show halves

Investigation 1—Middle Primary

Crazy Counting

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

Investigate which number is most frequently said when counting to 100 if one student starts counting to 100 in twos, another student in threes, another in fours, another in fives and another in sixes.

What number do you think will be said the most? ____________

Record all your counting here.

What did you find?

Was the number you predicted above the one that was said the most?

What other numbers are frequently said?

Are there any numbers that are never said? What do these numbers have in common?

Things to consider

Will a number chart help? If so, use the one on BLM 5 (page 132).
How can you tell if a number will be in a counting pattern without counting?

Investigation 2

Apply the Rule

Here is a pattern that mathematicians are trying to prove. That is, they want to be sure that the rule works in every case.

Begin with a number of your choice.

If your number is even, divide it in half.

If your number is odd, multiply it by 3, then add 1.

Whatever answer you get, apply the rule over again, then again, and again and again.

Example 1:

11

11	×	3	= 33
33	+	1	= 34
34	÷	2	= 17
17	×	3	= 51
51	+	1	= 52
52	÷	2	= 26
26	÷	2	= 13
13	×	3	= 39
39	+	1	= 40
40	÷	2	= 20
20	÷	2	= 10
10	÷	2	= 5
5	×	3	= 15
15	+	1	= 16
16	÷	2	= 8
8	÷	2	= 4
4	÷	2	= 2
2	÷	2	= 1

Example 2:

5

5	×	3	= 15
15	+	1	= 16
16	÷	2	= 8
8	÷	2	= 4
4	÷	2	= 2
2	÷	2	= 1

Do this with as many numbers as you can.

Describe any patterns that you find.

Things to consider

Does it work for all numbers, be they one-digit, two-digit or three-digit?

Will a calculator help?

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Investigation 3

Top Secret

Writing in code is fun, especially when numbers are substituted for letters.

Write some words that are worth exactly 500 if:

A = 26, B = 25, C = 24 … Z = 1

Write your words here, showing the calculations you used for each word.

Design your own code using letters and numbers.

Things to consider

Are vowels more frequent in words than consonants?
Is there a way of estimating the value of words before undertaking a calculation?
Will a calculator help?

Measurement and Geometry

Mass

Dad bought a total of 2.85 kilograms of fruit. He had five different types of fruit, all of which had different masses. What fruits might he have bought and how much might each type weigh?	*Are the masses that students relate to each fruit type realistic? Check how easily students can convert between grams and kilograms.*
The total mass of three kittens is $\frac{15}{16}$ kg. One kitten weighs $\frac{1}{4}$ kg. What could be the mass of the other two kittens?	*This task could also be under fractions as it involves an understanding of equivalent fractions. Can students work with fractions of a kilogram? You could ask students to give the mass of each kitten in grams.*

Volume and Capacity

A prism was made with four layers each of nine centicubes. What other ways can you make a prism with the same volume as that one?	*Do students understand how to calculate the volume of the described prism and can they use that to make other prisms of the same volume? You could ask students to draw their prisms.*
A school has a lamington drive to raise funds. How many different ways could we pack 12 lamingtons, all the same size, to fit into a box?	*Students should record their answers by drawing and by recording the number of lamingtons that fit along the length, width and height of a box.*
A container has a volume of one cubic metre but it is not shaped like a cube. What might its dimensions be?	*This is quite a difficult task. Students need to understand that there are one million cubic centimetres in one cubic metre, so the dimensions can be any three numbers that multiply together to equal 1 000 000. For example: 10 cm × 100 cm × 1000 cm or 200 cm × 100 cm × 50 cm.*
An object made from cubic centimetres has a volume of 7 cm^3. Draw what it might look like.	*You might like to provide centimetre square grid paper or isometric dot paper. If students want, allow them to use centimetre cubes to construct objects before they draw them. Do students realise that objects made from 7 cubic centimetres have a volume of 7 cm^3 even when their faces are not aligned rather than being joined exactly?*

A rectangular prism has a volume of 36 cm^3 and one of its dimensions is 3 centimetres. What might the other dimensions be?	*This task requires students to know that volume is calculated by the formula: length × width × height. The three dimensions need to have a product of 36 and because we are told one of them is 3 cm the other two must be factors of 12; 1 and 12, 2 and 6, or 3 and 4.*
An object is made from two cubes, each with dimensions in whole centimetres, joined together. It has a volume less than 60 cm^3. What might its volume be?	*Do students realise that the two cubes do not have to have the same volume? Objects can be combinations of cubes of the following volumes: 1 cm^3, 8 cm^3, and 27 cm^3.*

Length and Perimeter

Ben fenced his garden with a particular type of fencing that cost $8.25 per metre. He spent $396 on the fencing and completely enclosed his garden. What might a plan of Ben's garden look like?	*Students have to first calculate the perimeter of the fence by dividing 396 by 8.25 (48) and then draw a plan of a garden that has a perimeter of 48 metres.*
Create a symmetrical design with a perimeter of 20 centimetres.	*This task also relates to 2D Shapes. You could also use other perimeter measurements such as 36 centimetres. To extend this task, ask students to investigate if it is possible to create a symmetrical design with a perimeter that is odd, for example 27 centimetres.*
Rosie wrote a sentence that was about 15 centimetres long. What might the sentence have been?	*Provide rulers and lined paper for this task. Encourage students to write more than one sentence. Share the finished sentences so students realise that size and spacing of handwriting and the writing tool used affect the outcome. You could also do this on a computer so that all students use the same font, size and spacing. Note how students work out the length of their sentences. Which students measure out 15 centimetres and then try to fit a sentence in the space? Which students use their normal writing and adjust the words in their sentence until it is 15 centimetres long?*

Area

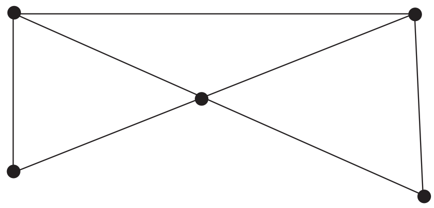
A shape made from two rectangles has an area of 16 square centimetres. What might this shape look like?	*Ask students to give at least five different responses and to mark the dimensions on each shape.*
Design some garden beds that cover exactly 14 square metres and are not rectangular in shape.	*Provide centimetre square paper and discuss how a scale of 1 cm = 1 metre can be used. As students are working note how they count centimetre squares. Which students design garden beds using part squares?*
For every 1 millimetre of rainfall, 1 square metre of roof will catch 1 litre of water. After a heavy downpour Joe collected 1800 litres of water in his water tank. What might the dimensions of his roof be?	*Note those students who give realistic measurements. For example: a 30 metre × 15 metre roof has an area of 450 square metres and would collect 1800 litres if there was 4 mm of rain; a 15 m × 15 m roof has an area of 225 square metres and would collect 1800 litres if there was 8 mm of rain.*

Time

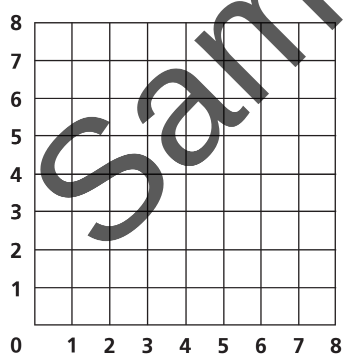
Use a map to design a car trip that will take $1\frac{1}{2}$ hours travelling at an average speed of 70 km/h. Show your planned journey.	*Students will need a map with a scale and a ruler. Share the planned journeys.*
We are travelling by car to a place that is 360 kilometres away. How long might it take us to get there? At what average speed per hour would we be travelling?	*Are students' responses reasonable? Do they allow for slowing down through towns and cities?*

Location

Jamie used the scale 1 cm = 1 m to draw a diagram of a shape. Use the same scale to draw a shape that has a perimeter of 15 metres.	*Share the completed shapes so students can see that many different shapes are possible.*
Use a road map to work out some places that are about 150 km apart.	*Students need a map with a scale marked on it and a ruler. It is best to use a map of your state that has many places marked.*
Choose a page from a street directory. List pairs of features that are about 0.5 km apart.	*Note students who use the scale to work this out. Are they able to use it correctly?*

The network shown here is traversable. That is, it is possible to draw over it without retracing any line and without lifting your pen from the shape. Draw a network of your own that is traversable. 	*Share the completed networks so students can check that they are traversable. A network is traversable only if an odd number of lines meet at less than three junctions.*
Terry calculated that the distance between two places on opposite sides of a map was about 1000 km. What might the map scale be?	*Look for realistic responses and ask students to justify them. For example, a scale of 1 cm = 100 km is only acceptable if the map is about 10 cm wide. A better response would be 1 cm = 50 km for a map that is 20 cm wide. If the map is very large then a scale of 1 cm = 10 km could be acceptable. Note those students who understand this.*

2D Shapes

I drew a parallelogram on a grid like the one shown below. I recorded the co-ordinates for my parallelogram. What co-ordinates might I have written? 	*This task can be used for a variety of 2D shapes.*
Peter wrote some three-digit numbers and then realised that they had both vertical and horizontal symmetry. What numbers might he have written?	*The only digits that could have both vertical and horizontal symmetry are 0, 1 and 8 so the three-digit numbers must contain combinations of those digits, for example, 888, 101, 818. Students at this level could be asked to find all possible three-digit numbers.*

Sweet Pea gave these instructions to her friend to help her find her way around Treat Town. • Marshmallow St, Rocky Rd and Nougat Ave are all parallel • Licorice Lane is perpendicular to Marshmallow St and ends at Nougat Ave. • Candy Rd is diagonal to Nougat Ave and ends at Rocky Rd. • Peanut Brittle Court runs off Licorice Lane. What might a map of Treat Town look like?	*This task checks if students understand the meaning of different linear terms. A secondary focus is on the different maps that match this description.*
A shape has at least one pair of opposite angles that are congruent. Draw what the shape might look like.	*You may like to provide protractors for this task. Share the finished shapes. Use them for classification activities such as: shapes with one pair of opposite angles that are congruent; shapes with two pairs…*
If one angle in a triangle is 45°, what might each of the other angles be?	*Do students know that the angles in a triangle total 180°? Students may like to use a protractor to draw possible triangles. You could extend this task by asking students to draw both isosceles and scalene triangles. Discuss if it is possible to draw an equilateral triangle with an angle of 45°.*
The angles in a shape add up to 360°. What might the shape look like and how many degrees might each of its angles be?	*Do students realise that their shape must be a quadrilateral? They can use protractors to measure the angles in their shape and check that the total is 360°.*

Investigation 23

Stretch Your Writing!

If you straightened out each of the lines in all your handwriting, how long a line would you write in a day?

Write your prediction here: ____________________

Work out a way to check your prediction.

How accurate was your prediction?

Things to consider

How much writing do you do each day?
Will sampling a few of your handwritten words help?
What measurement tools might help you?

Investigation 24

Feel the Pulse

To take your pulse, place one or two fingers on the back of your wrist on the thumb side, until you feel your pulse. Count the number of beats over a ten second period and multiply your count by six to find how many times your heart beats in one minute.

What is the average pulse rate of students in your class:

- when resting
- when exercising
- 1 minute after exercise
- 2 minutes after exercise
- 5 minutes after exercise?

Record your findings in a table.

Summarise your findings as a written report on another sheet of paper.

Things to consider

How will you collect data from students in the class?
Would it be useful to allocate sections of this investigation to various students?
How will you work out an average?
What will you use to ensure your timing is accurate?