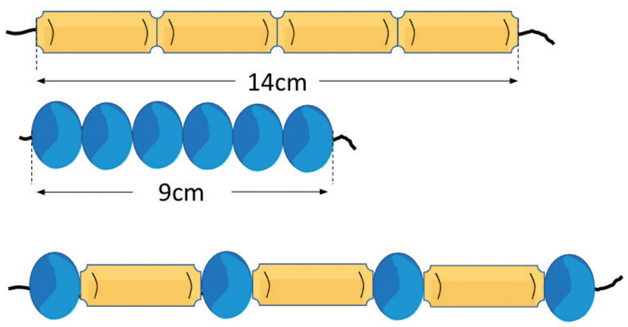
Y7 Learning at home activity sheet #5

Problem 1:

How long is the bottom string of beads?



Problem 2:

Since 2001 standard car number plates are made up of three letters and three digits. Personalised plates like “M8TE” and “XUSE ME” are extra.
How many different standard car number plates are possible?

Problem 3:

Single scoop icecreams cost $3.50.
Double scoop icecreams cost $5.00.
Twenty people at a birthday party each bought an icecream.
The total cost was $88.00.
How many people had two scoops?

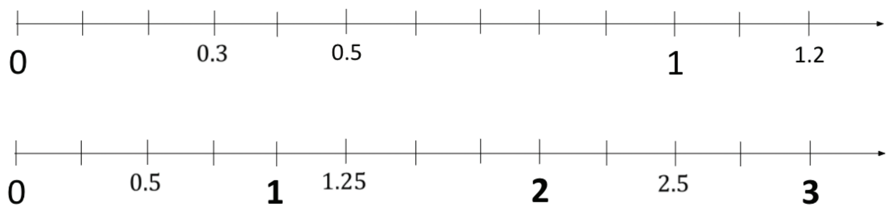
Finding factors:

Your kuia makes two batches of cookies for the school gala.
She makes 72 chocolate chip cookies.
She could fill 8 bags with 9 cookies per bag, or 6 bags with 12 cookies per bag.

1. What other numbers of equal bags could she make with 72 chocolate chip cookies?
2. She also bakes 48 raisin cookies. What numbers of equal bags could she make with the raisin cookies?

Placing numbers:

Write the missing decimals on these number lines.



nzmaths.

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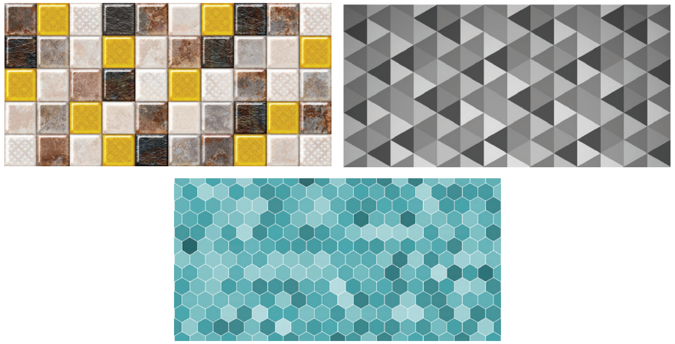
Tessellations:

Here are some regular tessellations. Each example is made by joining the same regular polygon with no gaps or overlaps.



Look closely. What is meant by the word “regular” when it describes a polygon?

Explain why equilateral triangles, squares and regular hexagons tessellate with no gaps or overlaps.

Look for examples of tessellations around your house.

Prisms:

Look at the pictures of these solids. They are all prisms.
What do prisms have in common?

Find some other examples of prisms around your house.

Circles investigation:

We often wrap lengths around a circle to store them tidily. Hose reels and cotton reels are good examples.

Is it possible to predict how many times a length of string will wrap around a circle?

Get a circular object, like a food can.

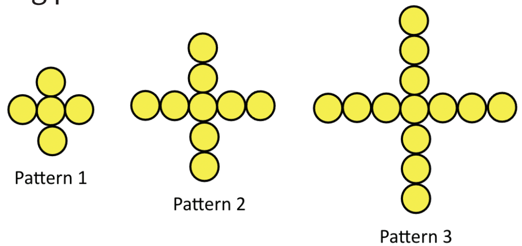
Cut some different lengths of string or wool, say 30cm, 60cm, 1m, 1.5m and 2m.

How many times does the string wrap around the circular object with no overlaps?

Try different circles and different lengths.
Can you find a pattern?

Pattern finding:

Here is a growing pattern made with circles.



Draw Pattern 4.
Predict how many circles will be in pattern 10.
Explain your prediction.

Find a rule for the number of circles in any pattern number you are given. Test your rule on patterns 2, 3, and 4 to see it works.

Learning at home: Notes for whānau

When your child finishes each activity, ask them to add a mouth to the face to show how they felt about that activity.

Problem 1:

Each long yellow bead is a quarter of 14cm, or 3.5cm long.

Each round yellow bead is one sixth of 9cm, or 1.5cm. 3 x 3.5cm = 10.5cm and 4 x 1.5cm = 6cm so the total length is 10.5cm + 6cm = 16.5cm.

Problem 2:

You may want to start with a simpler case.
Imagine that that the plates have only one letter and one number. Ten plates would be possible with A (A1, A2, A3, ..., A0), ten plates would be possible with B, etc. So 26 x 10 gives the number of plates since there are 26 letters in the alphabet.

If only two letters are used then 26 x 26 = 676 different plates can be made.
If two letters and one digit are used the number of plates is 26 x 26 x 10 = 676.
For three letters and three digits the number of possible plates is 26 x 26 x 26 x 10 x 10 x 10 = 17 576 000.

Problem 3:

Consider the conditions of the problem:

- How many icecreams were bought in total? How do you know? (20 since there are 20 people)
- What was the total cost? ($88.00)
- What amounts was the total cost made up of? (Singles at $3.50 and doubles at $5.00)

It is useful to try a few possible combinations. For example, you might try 10 singles and 10 doubles. The total cost is 10 x 3.5 + 10 x 5 = $85.00. That's close but not correct. It may help to organise attempts in a table.

Number of singles	Number of doubles	Total cost
10	10	10 x 3.5 + 10 x 5 = $85.00
11	9	11 x 3.5 + 9 x 5 = $83.50

Swapping a double for a single keeps the number of icecreams the same, 20, but lowers the total cost by $1.50. Why does that happen? (5 - 3.5 = $1.50)

Likewise swapping a single for a double increases the total cost by $1.50. 10 singles and 10 doubles cost $85.00. A total cost of $88.00 is needed so $3.00 more is needed. Two swaps of singles for doubles gives 8 singles and 12 doubles. The total cost is 8 x 3.5 + 12 x 5 = $88.00.

Finding factors:

With 72 cookies there are many different options for equal bags. Approaching the task systematically makes it easier to find all the possibilities.

- 1 bag with 72 cookies per bag (1 x 72 = 72 or 72 ÷ 1 = 72)
- 2 bags with 36 cookies per bag (2 x 36 = 72 or 72 ÷ 2 = 36)
- 3 bags with 24 cookies per bag (3 x 24 = 72 or 72 ÷ 3 = 24)
- 4 bags with 18 cookies per bag (4 x 16 = 72 or 72 ÷ 4 = 18), etc.

Your child may begin with individual possibilities, and not see the potential in using pattern.

If 8 x 9 = 72 (8 bags of 9 cookies) then 9 x 8 = 72 (9 bags of 8 cookies). If 8 x 9 = 72 then 4 x 18 = 72 (doubling the number of cookies per bag halves the number of bags). If 8 x 9 = 72 then 24 x 3 = 72 (tripling and thirding).

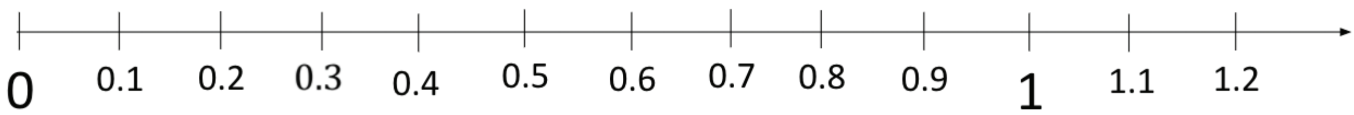
Are there any numbers of bags not possible? Five bags will result in left over cookies since 72 is not a multiple of five.

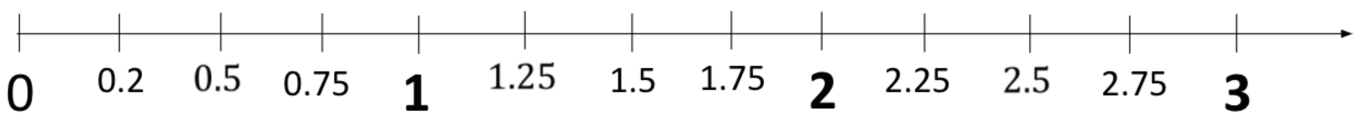
Seven bags are also not possible since 7 x 10 = 70, so two cookies are left out.

The possibilities for 72 are 1 x 72, 2 x 36, 3 x 24, 4 x 18, 6 x 12, 8 x 9, 9 x 8, 12 x 6, 18 x 4, 24 x 3, 36 x 2, and 72 x 1. Note that each multiplication has a different meaning in the story since the first factor is the number of bags and the second factor is the number of cookies per bag.

The possibilities for 48 cookies are 1 x 48, 2 x 24, 3 x 16, 4 x 12, 6 x 8, 8 x 6, 12 x 4, 16 x 3, 24 x 2, and 48 x 1.

Placing numbers:





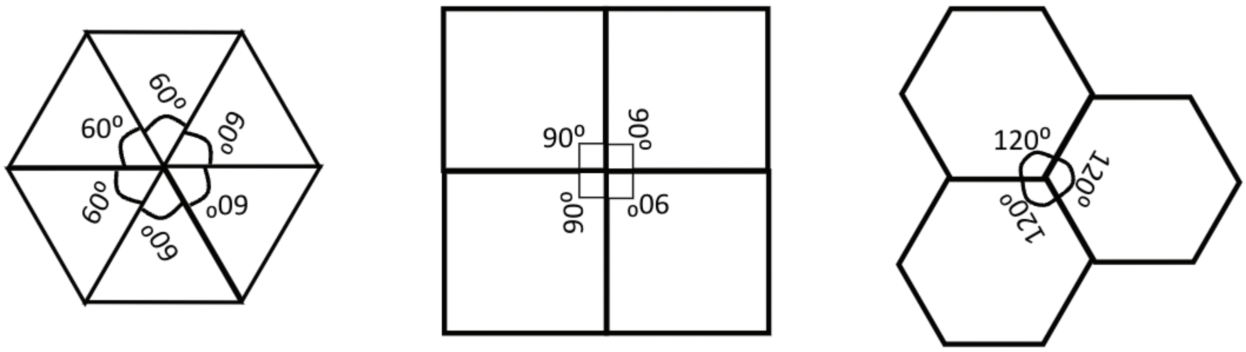
Your child should notice the pattern in the way the decimals grow. Identifying the size of each interval is important. In the top number line each interval is one tenth or 0.1. In the bottom number line the interval is one quarter or 0.25. Can your child explain why numbers like 0.5, 1.5, and 2.5 appear?

Tessellations:

Regular polygons have equal sides and angles. Both sides and angles are important to working out why the regular tessellation patterns work. The sides of each polygon are the same length, so the sides meet exactly.

Does your child know the internal angles of regular polygons? (equilateral triangle - 60^0, square - 90^0, and hexagon - 120^0)

Focus their attention on what angles meet at a vertex (point) in the tessellation. The angles always add to 360^0 so fill a full turn.



Prisms:

Prisms are solids that have a constant cross section that gives them their name. The left prism is a triangular based prism though the triangular face is not on the base and top in that picture. The other two prisms are rectangular and hexagonal based prisms. If each prism was a loaf of bread, it could be sliced into pieces the shape of the base.

Prisms are common around your home, and include items like loafs of bread, cereal boxes, and food containers. It can be argued that cylinders, such as cans, are prisms because they have constant circular cross sections.

Circles investigation:

The investigation is aimed at discovering a relationship between the diameter of a circle (the diameter) and the distance around the outside of the circle (the circumference). A can of spaghetti or baked beans has a diameter of 75 millimetres. A length of string that is about 236 millimetres will wrap around the can exactly. The circumference is a bit more than three times the radius. The multiplier, 3.14, is the famous number π (pi).

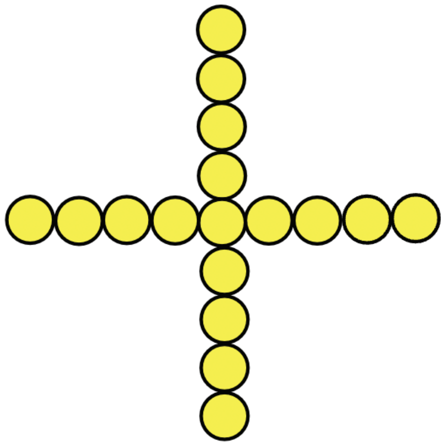
Pi is useful in predicting how many times a length of string will wrap around a circular object. Suppose the object is the can and the length of string is 1 metre long (1000mm). Using pi the circumference can be worked out as 3.14 x 75 = 235.5mm. The number of lengths of 235.5mm that fit into 1000mm is given be 1000 ÷ 235.5 = 4.25. A 1m long string will wrap around the can 4¼ times.

Pattern finding:

Does your child notice what changes and what remains the same as the pattern grows?

They should see that the ‘arms’ grow by one circle each time the pattern grows. The circle in the centre is constant.

The fourth pattern is shown to the right.



Pattern 4

Structuring the pattern will support your child to develop a rule.

What will the tenth pattern look like?

It will have a central circle and ten circles along each of the four arms.

How can you calculate the number of circles in the tenth pattern? ($4 \times 10 + 1 = 41$)

Applying the same thinking to different pattern numbers gives a general rule. If c represents the number of circles and n represents the pattern number, the number of circles is always the pattern number multiplied by four then add one. Algebraically this is $c = 4n + 1$.