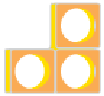
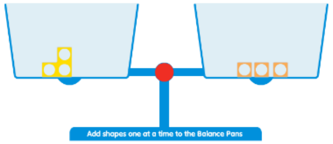
Challenge 1: Understanding part-whole relationships of unit and non-unit fractions.

Unit fractions: Look at this shape.

Using 1-shapes, cover it completely. How  many 1-shapes did you use?

Each 'one' is 'one of three equal parts' that cover the 3-shape. This is known as a 'third' or 1/3. Check that this is true using rods or the balancing scales.



Repeat this using the 5-shape. You need 5 1-shapes to cover the 5-shape; each 'one' is a fifth of the shape or 1/5.

[Children would be asked to repeat this for every shape until they were familiar with the unit fraction names]

Non-unit fractions: There are 4 seats in a car and $\frac{1}{4}$ of these seats are taken. Represent this using a 4-shape and a 1-shape or a peg: 

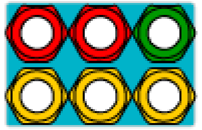
If another person gets into the car, two seats will be occupied. 

What fraction of the car seats are taken? $\frac{1}{2}$ or 2/4.

Using shapes find the following fractions:

1/5, 6/7, 4/5, 3/8, 8/10.

Challenge 2: Adding and subtracting fractions with the same denominator.

Make the following shape: 

What fraction of the shape is covered by

- red pegs? - yellow pegs? - green pegs?

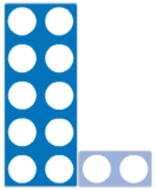
Together red, blue and green pegs cover the shape so how could we use an addition sentence to record this?

2/6 + 3/6 + 1/6 = 6/6

Using the 8-shape, cover the holes with at least two different colours of peg and write addition sentences for each one.

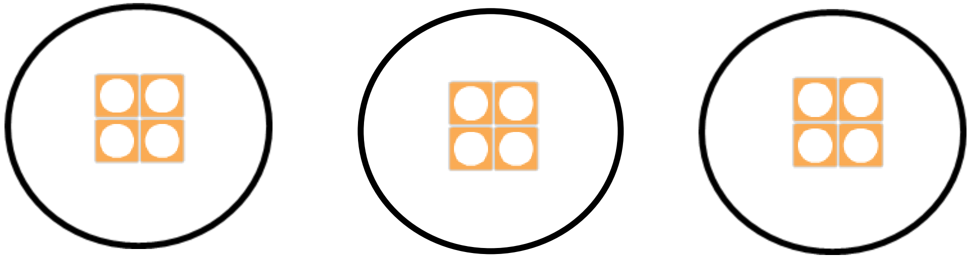
CHALLENGE: if you have a shape covered in pegs and you remove all pegs of a certain colour, how could you record this in a number sentence?

Challenge 3: Recognising fractions of a quantity.



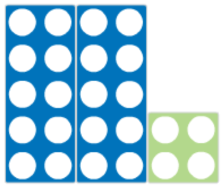
Make this shape then cover it with 1-shapes. Now share the 1-shapes equally between the three circles on the paper. Once you have done that, arrange these 1-shapes into a recognisable shape.

You should have



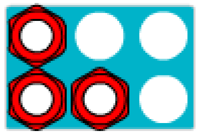
Each circle represents a fraction of the whole – 4/12 in each circle. Can you find another way of writing this fraction?

Now use four circles and then six circles. Make sure that your share the 1-shapes equally.

CHALLENGE: how many ways can you equally share  ?

Challenge 4: Finding equivalent fractions.

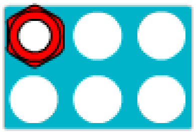
Use a 6-shape and cover half the shape with pegs. How many did you use?



The 6-shape has 6 holes so $\frac{1}{2}$ of the shape is equivalent to 3/6.

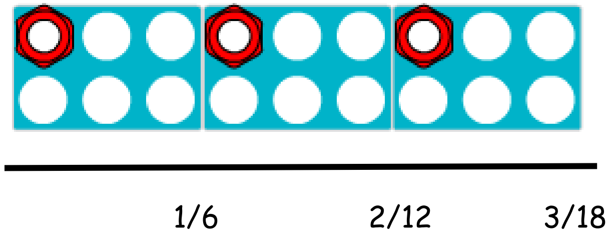
Repeat using the 8-shape. Can you find the equivalent fractions for $\frac{1}{2}$ and $\frac{1}{4}$?

Now, take the 6-shape and only fill one hole. What fraction of the shape is filled?



1/6.

Extend your line by adding another 6-shape with one peg, then another like this:



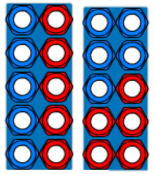
Each time the proportion of empty holes to pegs stays the same so 1/6 is equivalent to 2/12 which is equivalent to 3/18.

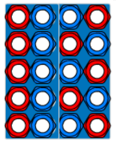
Using shapes prove that 2/7 is equivalent to 12/42.

Challenge 5: Introducing improper fractions and mixed numbers (halves).

 This shape represents a small part of a wall. It needs to be tiled with red and blue tiles. Using the pegs, show how the wall could be completed. Is there more than one way?

Look at these examples

 There are still ten tiles in total, 5 red and 5 blue. Can you find any other ways to cover the 10-shape equally with red and blue tiles?

 Now look at this shape. There are 10/20 blue tiles and 10/20 red tiles. $\frac{1}{2}$ of 20 = 20/2 = 10.

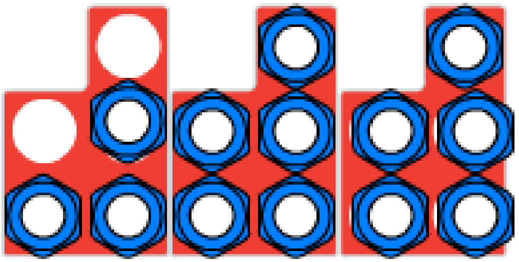
Think about other ways of showing equivalence, such as $\frac{1}{2} \times 10 = 10/2 = 5$.

Think about 2/10 and 10/2. If the numerator is bigger than the denominator it is greater than one whole; this is known as an improper fraction.

Can you split this shape into two equal pieces?  Why is it hard?

Challenge 6: Converting mixed numbers to improper fractions.

If you have 13 pegs, how many 5-shapes can you fill?



Look at one peg in a 5-shape; what fraction of the whole 5-shape does this represent? 1/5

So, 5 pegs = 5/5 = 1 whole.

How many pegs do you have? Show this as a fraction.

Remember 13 ÷ 5 = 13/5. This is an improper fraction. How can we show it as a mixed number (remember a mixed number has whole numbers and fractions)?

Try to prove this using the rods.

Can you find the improper fraction for the following mixed numbers?

$2\,^{3}/_{5}$ $5^{1}/_{4}$ $7^{1}/_{2}$

Challenge 7: Making connections between fractions and decimals.

Look at the orange decimal baseboard next to a 1-shape. This baseboard represents a 'magnified' 1-shape made up of 100 parts or 'hundredths'.

Cover half the baseboard. What shapes did you use? What are these shapes worth in total?

You could have used five 10-shapes (5/10) or fifty 1-shapes (50/100). These fractions are equivalent:

$\frac{1}{2}$ = 5/10 = 50/100.

If the orange decimal baseboard is the same as one whole 1-shape, half the board is 5 tenths or 50 hundredths of one. This is shown as

Units	●	tenths	hundredths
0	●	5	0

Choose a fraction card and find the equivalent decimal.

Challenge: Can you complete the number lines?

Challenge 8: Exploring the relationship between percentages, fractions and decimals.

Look at the statements taken from a survey on bees.

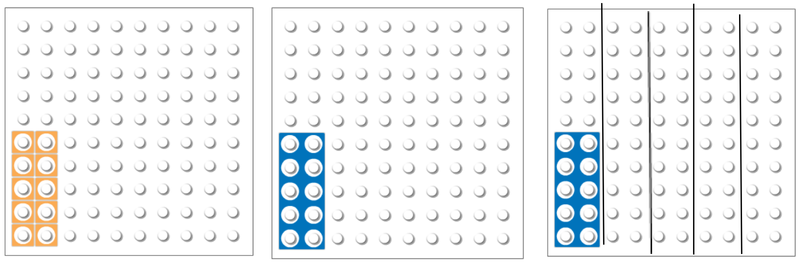
10% of the people asked said they liked bees.

10 out of 100 people asked said they liked bees.

1 out of 10 people asked said they liked bees.

1/10 of the people asked said they liked bees.

Use shapes to cover the baseboard so that each statement is correct. What do you notice?



Now use the shapes and baseboard to place the washing line cards correctly on the washing line.