Teaching for Mastery

Questions, tasks and activities to support assessment

Year 6

Mike Askew, Sarah Bishop, Clare Christie, Sarah Eaton, Pete Griffin, Debbie Morgan and Robert Wilne

Mastery Check

Please note that the following columns provide indicative examples of the sorts of tasks and questions that provide evidence for mastery and mastery with greater depth of the selected programme of study statements. Pupils may be able to carry out certain procedures and answer questions like the ones outlined, but the teacher will need to check that pupils really understand the idea by asking questions such as 'Why?', 'What happens if …?', and checking that pupils can use the procedures or skills to solve a variety of problems.

Assessment Booklet.

Name:

Class:

D.O.B

Please note, the assessments contained within can all be found on the www.ncetm.com website.

Number and Place Value

Mastery

Think about the number 34 567 800.

Say this number aloud.
Round this number to the nearest million.

What does the digit '8' represent?
What does the digit '7' represent?

Divide this number by 100 and say your answer aloud.
Divide this number by 1000 and say your answer aloud.

A scientist measures the depth of some objects below the surface of the sea.
She records her measurements using negative numbers.

Object	Depth
Coral reef	−2 m
Shipwreck	−11 m
Pirate treasure	four times as deep as the coral reef
Sleeping shark	3 metres above the shipwreck

Which object is deepest? Explain your choice.

Is the sleeping shark deeper than the pirate treasure? Explain your reasoning.

A seagull is hovering 1 m above the surface of the sea. How far apart are the seagull and the coral reef?

Notes:

Mastery

Put these numbers in order, from smallest to largest.

- 3·3, 3·03, 3·33, 3·303, 3·033
- 5834, 61·8 multiplied by 100, one tenth of 45813
- 0·034, 3·6 divided by 100, ten times 0·0033
- –4·4, –4·44, –4·04, –4·404

Estimate the answer to 4243 + 1734 by rounding the numbers to:

- the nearest 1000
- the nearest 100
- the nearest 50
- the nearest 10.

The population of Shanghai is 21 million, to the nearest million. Each person weighs on average 70 kg.

Estimate the total weight of all the people in Shanghai.

Do you think your answer is more or less than the actual answer you'd get if you weighed everyone in Shanghai accurately?

Notes:

Mastery with Greater Depth

Miss Wong, the teacher, has four cards. On each card is a number:

59 996	59 943	60 026	62 312

She gives one card to each pupil. The pupils look at their card and say a clue.
Anna says, 'My number is 60 000 to the nearest 10 thousand.'
Bashir says, 'My number has exactly 600 hundreds in it.'
Charis says, 'My number is 59900 to the nearest hundred.'
David says, 'My number is 60 000 to the nearest 10.'

Can you work out which card each pupil had? Explain your choices.

A scientist measured the temperature each day for one week at 06:00.

On Sunday the temperature was 1·6°C.
On Monday the temperature had fallen by 3°C.
On Tuesday the temperature had fallen by 2·1°C.
On Wednesday the temperature had risen by 1·6°C.
On Thursday the temperature had risen by 4·2°C.
On Friday the temperature had fallen by 0·9°C.
On Saturday the temperature had risen by 0·2°C.

What was the temperature on Saturday?

Notes:

Mastery with Greater Depth

Eduardo says, 'The the population of Mexico City is 11 million (to the nearest million) and the population of New York is 11·2 million (to the nearest hundred thousand).'

He says, 'The population of New York must be bigger than the population of Mexico City because 11·2 million is bigger than 11 million.'

Do you agree with him?

Three pupils are asked to estimate the answer to the sum 4243 + 1734.

Andrew says, 'To the nearest 100, the answer will be 5900.'

Bilal says, 'To the nearest 50, the answer will be 6000.'

Cheng says, 'To the nearest 10, the answer will be 5970.'

Do you agree with Andrew, Bilal or Cheng?

Can you explain their reasoning?

The total population of Shanghai is 21 million, to the nearest million.

If at lunchtime everyone in Shanghai eats a bowl of rice, how many grains of rice do you estimate are eaten each lunchtime?

Notes:

Addition and Subtraction

Mastery
Calculate 36·2 + 19·8 ■ with a formal written column method ■ with a mental method, explaining your reasoning.

A shop sells magazines and comics. Freya buys a magazine and a comic. She pays £2·50. Evie buys a magazine and two comics. She pays £3·90.

How much does a comic cost? How much does a magazine cost?

A shop sells boxes of chocolates. One box costs £3·99. A second box costs £2·60. A third box costs £6·45.

What is the difference in price between the most and least expensive boxes?

The shop also sells packets of sweets. One packet costs £1·39. Ramesh has a £10 note and he wants to buy the chocolates costing £2·60.

How many packets of sweets can he also buy?

x and y represent whole numbers.
Their sum is 1000.
x is 250 more than y.

What are the values of x and y?

Notes:

Mastery

Choose digits to go in the empty boxes to make these number sentences true.

14 781 – 6 ☐ 53 = 8528

23·12 + 22· ☐ = 45·23

Two numbers have a difference of 2·38. The smaller number is 3·12.
What is the bigger number?

Two numbers have a difference of 2·3. They are both less than 10.
What could the numbers be?

Compare $31 + 9 \times 7$ and $(31 + 9) \times 7$
What's the same? What's different?

Choose operations to go in the empty boxes to make these number sentences true.

6 ☐ 3 ☐ 7 = 16

6 ☐ 3 ☐ 7 = 27

6 ☐ 3 ☐ 7 = 9

Put brackets in these number sentences so that they are true.

$12 - 2 \times 5 = 50$

$12 - 8 - 5 = 9$

$10 \times 8 - 3 \times 5 = 250$

Notes:

Mastery with Greater Depth

Jasmine and Kamal have been asked to work out 5748 + 893 and 5748 – 893.

Jasmine says, '893 is 7 less than 900, and 900 is 100 less than 1000, so I can work out the addition by adding on 1000 and then taking away 100 and then taking away 7.'

What answer does Jasmine get, and is she correct?

Kamal says, '893 is 7 less than 900, and 900 is 100 less than 1000, so I can work out the subtraction by taking away 1000 and then taking away 100 and then taking away 7.'

What answer does Kamal get, and is he correct?

If you disagree with either Jasmine or Kamal, can you correct their reasoning?

Can you use five of the digits 1 to 9 to make this number sentence true?

$\square\square \cdot \square + \square \cdot \square = 31{\cdot}7$

Can you find other sets of five of the digits 1 to 9 that make the sentence true?

Two numbers have a difference of 2·38. What could the numbers be if:

- the two numbers add up to 6?
- one of the numbers is three times as big as the other number?

Two numbers have a difference of 2·3. To the nearest 10, they are both 10.
What could the numbers be?

Write different number sentences using the digits 2, 3, 5 and 8 before the equals sign, using:

- one operation
- two operations but no brackets
- two operations and brackets.

Can you write a number sentence using the digits 2, 3, 5 and 8 before the equals sign, which has the same answer as another number sentence using the digits 2, 3, 5 and 8 but which is a different sentence?

Notes:

Mastery with Greater Depth

A shop sells magazines and comics. Last week Arthur bought a magazine and a comic. He can't remember exactly what he paid, but he thinks he paid £1·76. Yesterday he bought a magazine and four comics. He paid £4·30.

Do you think he is remembering correctly when he says that he paid £1·76 last week?

A shop sells boxes of chocolates costing £2·60. The shop also sells packets of sweets. One packet costs £1·39. Ramesh has a £10 note and he wants to buy one box of chocolates.

Sara says that Ramesh can work out how many packets of sweets he can buy using the number sentence $10 - 2{\cdot}60 \div 1{\cdot}39$.

Do you agree or disagree with Sara?

If you disagree, what number sentence do you think Ramesh should use?

Explain your reasoning.

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x and y represent whole numbers. Their sum is 1000.

Can the difference between x and y be:

- 100?
- any whole number?
- greater than x?

Notes:

Multiplication and Division.

Mastery

Find numbers to complete these number sentences.

736 ÷ 23 = ☐	☐ × 100 = 2400	☐ × 100 = 10 × ☐
7360 ÷ 230 = ☐	25 × ☐ = 200	25 × ☐ = 4 × ☐
230 × 24 = ☐	23 × ☐ = 161	23 × ☐ = 161 × ☐
240 × 23 = ☐	24 × ☐ = 168	24 × ☐ = 168 × ☐
1668 ÷ 8 = ☐	161 ÷ ☐ = 23	161 ÷ ☐ = 23 × ☐
208·5 × 8 = ☐	☐ ÷ 25 = 9	☐ ÷ 25 = 9 × ☐

A box of labels costs £24.
There are 100 sheets in the box.
There are 10 labels on each sheet.

Calculate the cost of one label, in pence.

Miriam and Alan each buy 12 tins of tomatoes.
Miriam buys 3 packs each containing 4 tins. A pack of 4 costs £1·40.
Alan buys 2 packs each containing 6 cans. A pack of 6 costs £1·90.

Who gets the most change from a £5 note?

Notes:

Mastery

It is correct that $273 \times 32 = 8736$. Use this fact to work out:

- $27{\cdot}3 \times 3{\cdot}2$
- $2{\cdot}73 \times 32\,000$
- $873{\cdot}6 \div 0{\cdot}32$
- $87{\cdot}36 \div 27{\cdot}3$
- $8736 \div 16$
- $4368 \div 1{\cdot}6$

Work out:

- $8{\cdot}4 \times 3 + 8{\cdot}4 \times 7$
- $6{\cdot}7 \times 5 - 0{\cdot}67 \times 50$
- $93 \times 0{\cdot}2 + 0{\cdot}8 \times 93$
- $7{\cdot}2 \times 4 + 3{\cdot}6 \times 8$

All the pupils in a school were asked to choose between an adventure park and the seaside for a school trip.

They voted, and the result was a ratio of 5:3 in favour of the adventure park.

125 children voted in favour of going to the adventure park.

How many children voted in favour of going to the seaside?

Notes:

Mastery with Greater Depth

Fill in the missing numbers to make these number sentences true.

□ × □ = 864

□ × □ × □ = 864

A box of labels costs £63.

There are 140 sheets in the box.

There are 15 labels on each sheet.

Sara, Ramesh and Trevor want to calculate the cost of one label, in pence.

Ramesh uses the number sentence (6300 ÷ 140) × 15.

Sara uses the number sentence 63 ÷ 1·4 ÷ 15.

Trevor uses the number sentence (15 × 140) ÷ 6300.

Who is using the right number sentence? Explain your choice.

Miriam buys 19 tins of soup. All the tins cost the same price.

She goes to the shop with just one note, and comes home with the tins and the change in coins. On the way home she drops the change. She looks carefully and she thinks she picks it all up. When she gets home she gives £2·23 change to her mother.

Do you think that Miriam picked up all the change that she dropped?

Explain your reasoning.

Notes:

Mastery with Greater Depth

Which calculation is the odd one out?

- $753 \times 1{\cdot}8$
- $(75{\cdot}3 \times 3) \times 6$
- $753 + 753 \div 5 \times 4$
- $7{\cdot}53 \times 1800$
- $753 \times 2 - 753 \times 0{\cdot}2$
- $750 \times 1{\cdot}8 + 3 \times 1{\cdot}8$

Explain your reasoning.

In each pair of calculations, which one would you prefer to work out?

- (a) $35 \times 0{\cdot}3 + 35 \times 0{\cdot}7$ **or** (b) $3{\cdot}5 \times 0{\cdot}3 + 35 \times 7$
- (c) $6{\cdot}4 \times 1{\cdot}27 - 64 \times 0{\cdot}1$ **or** (d) $6{\cdot}4 \times 1{\cdot}27 - 64 \times 0{\cdot}027$
- (e) $52{\cdot}4 \div 0{\cdot}7 + 524 \div 7$ **or** (f) $52{\cdot}4 \div 0{\cdot}7 - 524 \div 7$
- (g) $31{\cdot}2 \div 3 - 2{\cdot}4 \div 6$ **or** (h) $31{\cdot}2 \div 3 - 1{\cdot}2 \div 0{\cdot}3$

Explain your choices.

All the pupils in a school were asked to choose between an art gallery and a science museum for a school trip.

The result was a ratio of 12:7 in favour of the science museum.

Five pupils were off school and didn't vote.

Every pupil went on the trip to the science museum the following week.

After the trip there is a news headline on the school website that says 'All 700 pupils in the school went to the science museum.'

Do you think that this news headline is correct? Explain your reasoning.

Notes:

Fractions and Decimals

Mastery

Only a fraction of each whole rod is shown. Using the given information, identify which whole rod is longer.

Explain your reasoning.

In each number sentence, replace the boxes with different whole numbers less than 20 so that the number sentence is true:

$$\frac{1}{\square} = \frac{3}{\square}$$

$$\frac{\square}{3} = \frac{\square}{12}$$

$$\frac{\square}{\square} = \frac{\square}{\square}$$

$$\square \div \square = \square \cdot \square$$

$$\frac{30}{\square} = \frac{45}{\square}$$

Notes:

Mastery

Put the following numbers on a number line:
$\frac{3}{4}$, $\frac{3}{2}$, 0·5, 1·25, 3 ÷ 8, 0·125

On Monday I ran $1\frac{2}{3}$ km and on Tuesday I ran $2\frac{2}{5}$ km.
How far did I run altogether on these two days?

On Wednesday I ran $1\frac{2}{3}$ km and my sister ran $2\frac{2}{5}$ km.
How much further did my sister run than I did?

In each number sentence, replace the boxes with different whole numbers less than 20 so that the number sentence is true.

$$\frac{1}{\square} \times \frac{3}{\square} = \frac{\square}{\square}$$

$$\frac{\square}{\square} \times \frac{\square}{\square} = \frac{8}{15}$$

$$\frac{2}{\square} \times \frac{5}{\square} < \frac{10}{\square}$$

$$\frac{\square}{\square} \div 3 = \frac{1}{\square}$$

$$\frac{\square}{\square} \div 3 > \frac{1}{4}$$

Curtis used $\frac{1}{3}$ of a can of paint to cover 3·5 square metres of wall.

How much wall will one whole can of paint cover?

Notes:

Mastery

Sam added two fractions together and got $\frac{7}{8}$ as the answer.
Write down two fractions that Sam could have added.

Tom wrote down two fractions. He subtracted the smaller fraction from the larger and got $\frac{1}{5}$ as the answer.
Write down two fractions that Tom could have subtracted.

Tom and Sam shared equally one third of a chocolate bar.
What fraction of the chocolate bar did each child get?

Last month Kira saved $\frac{3}{5}$ of her £10 pocket money. She also saved 15% of her £20 birthday money.

How much did she save altogether?

What's the same, and what's different about these number statements?

Double one third of 15
One third of 30
2×5
$15 \times 2 \div 3$
$15 \div 3 \times 2$
$15 \times \frac{2}{3}$

Notes:

Mastery with Greater Depth

Only a fraction of each whole rod is shown. Using the given information, identify which whole rod is longer

Explain your reasoning.

Which is the odd one out?

$\frac{2}{5}$, 0·4, $\frac{4}{10}$, $\frac{3}{6}$, $\frac{6}{15}$

Explain your choice.

Put the following numbers into groups:

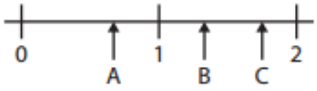
$\frac{3}{4}$, $\frac{3}{2}$, 0·5, 1·25, $\frac{3}{8}$, 0·125.

Explain your choices.

Notes:

Mastery with Greater Depth

Suggest a fraction that could be at point A, a decimal that could be at point B and an improper fraction that could be at point C on this number line.



Altogether on Monday and Tuesday I ran $3\frac{1}{2}$ km. On neither day did I run a whole number of km.

Suggest how far I ran on Monday and how far on Tuesday.

On Wednesday I ran some km and my sister ran $1\frac{1}{6}$ km further than I did. Altogether we ran $4\frac{1}{2}$ km.

How far did I run on Wednesday?

True or false?

- The sum of two fractions is always greater than their product.
- If I divide a fraction by a whole number, the quotient is always smaller than the dividend.

Explain your reasoning.

Puja shares 6 apples between some friends. Each friend gets 0·75 of an apple.

How many friends does she share the apples with?

Notes:

Mastery with Greater Depth

Roland cuts a sandwich into two pieces. First, Roland gives one piece to Ayat and the other piece to Claire. Then Claire gives Ayat half of her piece. Now Ayat has $\frac{7}{8}$ of the original sandwich.

Did Roland cut the sandwich into two equal pieces? If not, how did he cut the sandwich?

Jakob says to Peter, 'Last month I saved 0·5 of my pocket money and this month I saved $\frac{1}{3}$ of my pocket money, so altogether I've saved 40% of my pocket money'.

Do you think Peter should agree with Jakob?

Explain your decision.

Amira says, 'To work out a fraction of a number, you multiply the number by the numerator of the fraction and then divide the answer by the denominator of the fraction.'

Do you think that this is always, sometimes or never true?

Explain your reasoning.

Notes:

Ratio and Proportion.

Mastery

You can buy 3 pots of banana yoghurt for £2·40.
How much will it cost to buy 12 pots of banana yoghurt?

A child's bus ticket costs £3·70 and an adult bus ticket costs twice as much.
How much does an adult bus ticket cost?

To make a sponge cake, I need six times as much flour as I do when I'm making a fairy cake.
If a sponge cake needs 270 g of flour, how much does a fairy cake need?

Sam and Tom share 45 marbles in the ratio 2:3.

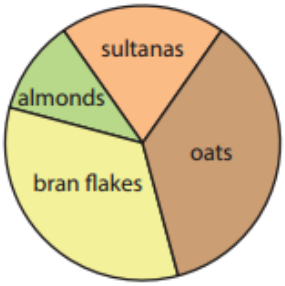
How many more marbles does Tom have than Sam?

To make a tomato pizza topping for a normal pizza, Jake uses 300 g of tomatoes, 120 g of onions and 75 g of mushrooms.
Jake wants enough sauce for a giant pizza, so he uses 900 g of tomatoes.

What mass of onions will be used?
How many 120 g boxes of mushrooms will he have to buy?

The pie chart shows the ingredients needed to make a breakfast cereal.

Estimate the percentage of the mixture that is sultanas.



Notes:

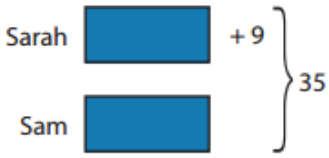
Mastery

Sam has 9 fewer sweets than Sarah. They have 35 sweets altogether.

How many sweets does Sam have?

Bar modelling can be a useful strategy for solving these type of problems as illustrated below.

For further information visit www.ncetm.org.uk/resources/44565



35 – 9 = 26
26 ÷ 2 = 13
Sam has 13
Sarah has 22

If I share equally a 3 m ribbon between 5 people, how long will each person's ribbon be?

In Year 1 there are 50 pupils, of whom 16 are boys.

What percentage of the pupils are girls?

Notes:

Mastery with Greater Depth

Make up a word puzzle that you could solve with this diagram:

Make up a word puzzle that you could solve with this diagram:

Harry and Jim share some marbles in the ratio 3:5.

Harry gets 24 more marbles than Jim does.

How many marbles did they share in total between them?

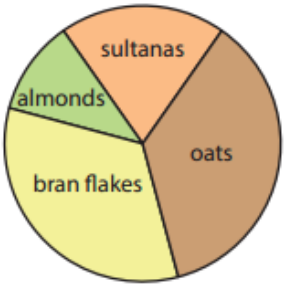
Jake has now made his giant pizza. He says, 'I made three times as much sauce to cover the giant pizza as I do to cover a normal pizza, so the giant pizza is three times as big as the normal pizza.'

Do you agree with Jake?

The pie chart shows the ingredients needed to make a breakfast cereal.

120 grams of almonds are used.

Estimate the quantity of each of the other ingredients.



Notes:

Mastery with Greater Depth

Mum is 28 years older than Anthony. Mum is 4 years younger than Dad. The total age of the three of them is 84 years.

What is Mum's age?

Bar modelling can be a useful strategy for solving these type of problems as illustrated below.

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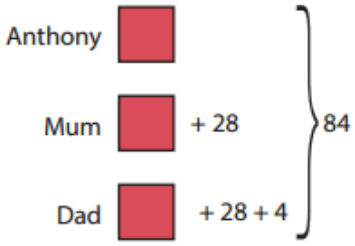


84 – (28 + 28 + 4) = 24
24 ÷ 3 = 8
Mum is 8 + 28
Mum is 36 years old

I share equally a length of ribbon between 8 people, and each person gets 0·25m of ribbon.

Can you work out how long the original piece of ribbon was?

In a class of children 25% are boys and the rest are girls. There are 18 girls.

How many children are in the class?

Notes:

Algebra.

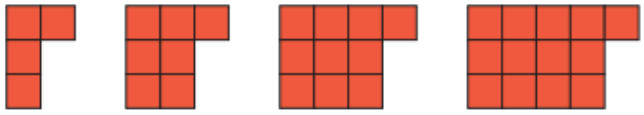
Mastery
Ramesh is exploring two sequence-generating rules. Rule A is: 'Start at 2, and then add on 5, and another 5, and another 5, and so on.' Rule B is: 'Write out the numbers that are in the five times table, and then subtract 2 from each number.' What's the same and what's different about the sequences generated by these two rules?
Roshni and Darren are using sequence-generating rules. Roshni's rule is: 'Start at 4, and then add on 5, and another 5, and another 5, and so on.' Darren's rule is: 'Write out the numbers that are multiples of 5, starting with 5, and then subtract 1 from each number.' Roshni and Darren notice that the first few numbers in the sequences generated by each of their rules are the same. They think that all the numbers in the sequences generated by each of their rules will be the same. Do you agree? Explain your decision.
On New Year's Eve, Polly has £3·50 in her money box. On 1 January she puts 30p into her money box. On 2 January she puts another 30p into her money box. She continues putting in 30p every day. How much money is in the box on 10 January? How much money is in the box on 10 February? Write a sequence-generating rule for working out the amount of money in the money box on any day in January.

Notes:

Mastery

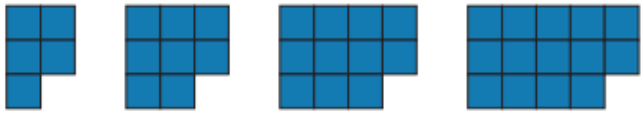
Ali has made three sequences of shapes by sticking coloured squares together.

The sequence of red shapes starts



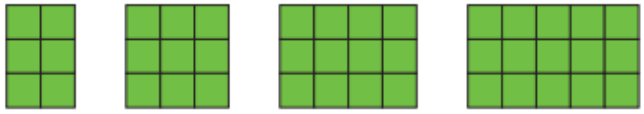
and so on.

The sequence of blue shapes starts



and so on.

The sequence of green shapes starts



and so on.

Ali says, 'If I put a red and a blue shape together, they will make a shape that is the same as one of the green shapes.'

Do you agree with Ali?

Explain your reasoning.

Notes:

Mastery

Which of the following statements do you agree with? Explain your decisions.

- The value 5 satisfies the symbol sentence $3 \times \square + 2 = 17$
- The value 7 satisfies the symbol sentence $3 + \square \times 2 = 10 + \square$
- The value 6 solves the equation $20 - x = 10$
- The value 5 solves the equation $20 \div x = x - 1$

I am going to buy some 10p stamps and some 11p stamps.

I want to spend exactly 93p. Write this as a symbol sentence and find whole number values that satisfy your sentence.

Now tell me how many of each stamp I should buy.

I want to spend exactly £1·93. Write this as a symbol sentence and find whole number values that satisfy your sentence.

Now tell me how many of each stamp I should buy.

Notes:

Mastery with Greater Depth

Ramesh is exploring three sequence-generating rules.

Rule A is: 'Start at 30, and then add on 7, and another 7, and another 7, and so on.'

Rule B is: 'Write out the numbers that are in the seven times table, and then add 2 to each number.'

Rule C is: 'Start at 51, and then add on 4, and another 4, and another 4, and so on.'

What's the same and what's different about the sequences generated by these three rules?

Explain why any common patterns occur.

Roshni and Darren are using sequence-generating rules.

Roshni's rule is: 'Start at 5, and then add on 9, and another 9, and another 9, and so on.'

Darren's rule is: 'Write out the numbers that are multiples of 3, starting with 3, and then subtract 1 from each number.'

What might Roshni and Darren notice about the numbers in the sequences generated by each of these rules?

Explain your reasoning.

On New Year's Eve, Polly has £3·50 in her money box. On 1 January she puts 30p into her money box. On 2 January she puts another 30p into her money box. She continues putting in 30p every day.

On what date is there exactly £8 in Polly's money box?

On what date does Polly's money box first contain more than £15?

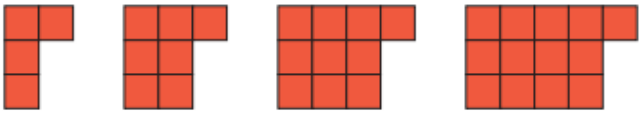
Write a sequence-generating rule for working out the amount of money in the money box on any day.

Notes:

Mastery with Greater Depth

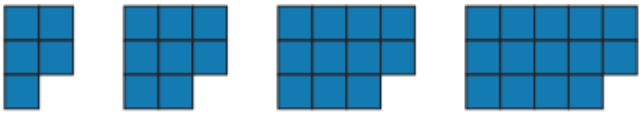
Ali has made three sequences of shapes by sticking coloured squares together.

The sequence of red shapes starts



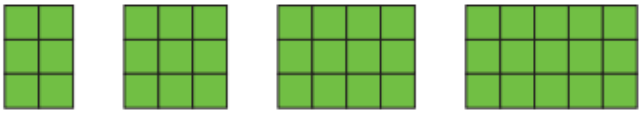
and so on.

The sequence of blue shapes starts



and so on.

The sequence of green shapes starts



and so on.

Ali says, 'If I put two shapes of the same colour together, they make a shape that is the same as one of the shapes in a different colour.'

Do you think that Ali's claim is always, sometimes or never true?

Explain your reasoning.

Notes:

Mastery with Greater Depth

Which of the following statements do you agree with? Explain your decisions.

- There is a whole number that satisfies the symbol sentence $5 \times \square - 3 = 42$
- There is a whole number that satisfies the symbol sentence $5 + \square \times 3 = 42$
- There is a whole number that solves the equation $10 - x = 4x$
- There is a whole number that solves the equation $20 \div x = x$

I am going to buy some 11p stamps and some 17p stamps.

I want to spend exactly 95p. Write this as a symbol sentence and find whole number values that satisfy your sentence.

Now tell me how many of each stamp I should buy.

I want to spend exactly £1·95. Write this as a symbol sentence and find whole number values that satisfy your sentence.

Now tell me how many of each stamp I should buy.

I want to spend exactly £1·59. Write this as a symbol number sentence.

Can you convince yourself that you can't find whole number values that satisfy your symbol sentence?

Explain your reasoning.

Notes:

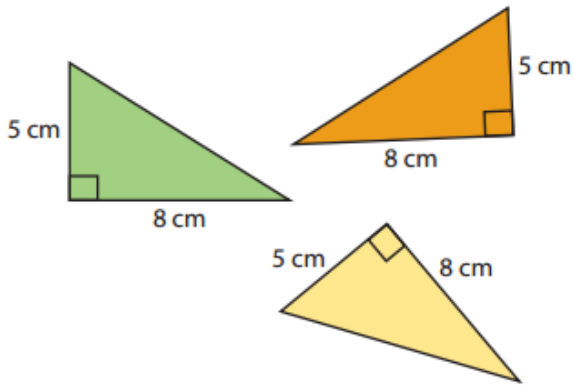
Measurement.

Mastery

Draw a clock face, then draw the hands showing that the time is 3 p.m.

Draw a second clock face, then draw the hands showing the time 12 000 seconds later.

Which of these right-angled triangles have an area of 20 cm^2?



Think about these rectangles:

- a 4 cm by 6 cm rectangle
- a 12 cm by 2 cm rectangle
- a 3 cm by 8 cm rectangle.

What's the same? What's different?

The diameter of a golf ball is 4 cm. I want to make a box which will hold six golf balls.

What size could my box be?

Is there more than one answer?

Notes:

Mastery

A train left London at 09:46 and arrived in Edinburgh later that day.
The clock in Edinburgh station showed this time:

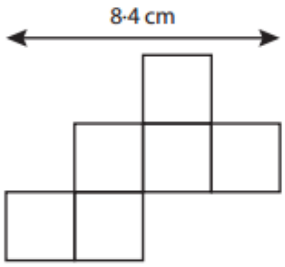
How long did the train journey last?

Sarah is 0·2 m taller than Jack.
Ella is 15 cm taller than Sarah.

Who is the tallest person?
What is the difference in height between the tallest and the shortest person?

Here is a tiled floor pattern.
It is made from squares.

Work out the perimeter of the design.
Give your answer in metres.



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10 toy bricks have a total mass of 1 kg.
A cricket ball weighs $1\frac{1}{2}$ times as much as one brick.

What is the mass of a cricket ball, in grams?

Notes:

Mastery with Greater Depth

Mehvish and Rima are looking at a clock face. They agree that at midday the hands of the clock lie on top of each other and so the angle between them is 0°. Rima thinks that at 3:15 p.m. the angle between the hands will be 90°. Mehvish thinks that the angle will be less than 90°.

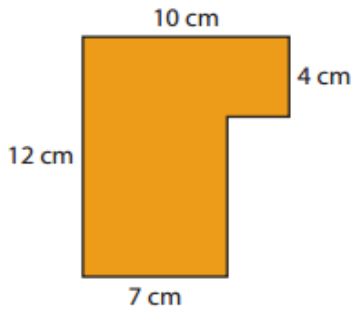
Do you agree with Rima or Mehvish?

Explain your decision.

Sami worked out the area of the orange shape as $10 \times 4 + 8 \times 7 = 96\,cm^2$.

Razina worked out the area as $12 \times 7 + 3 \times 4 = 96\,cm^2$.

Lukas worked out the area as $10 \times 10 - 2 \times 2 = 96\,cm^2$.



Are you convinced by Sami, Razina or Lukas's reasoning?

Explain your answer.

Liping says, 'If you draw two rectangles and the second one has a greater perimeter than the first one, then the second one will also have a greater area.'

Do you agree or disagree with her?

Explain your reasoning.

Can you find two or more different cuboids each with a volume of $64\,cm^3$?

What's the same and what's different about your cuboids?

Notes:

Mastery with Greater Depth

Imagine we talked about time using decimals.
Would 2·3 hours be:

- 2 hours and 3 minutes
- 2 hours and 20 minutes
- 2 and a half hours, or
- 2 hours and 18 minutes?

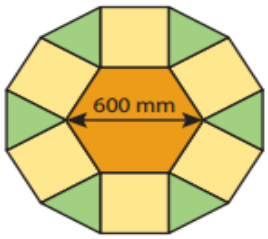
Explain your decision.

Sarah is 0·2 m taller than Jack.
Ella is 15 cm taller than Sarah.
Their combined height is 3·25 m.

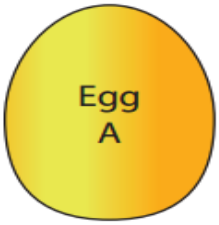
How tall is Ella?

Here is a tiled floor pattern.
It is made from equilateral triangles, squares and a regular hexagon.

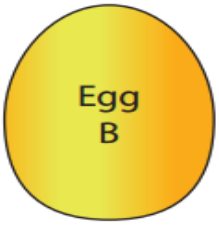
Work out the perimeter of the design.
Give your answer in metres.



In a story, Jack has to choose between two magic gold eggs to buy.
What would you advise him to do?



Mass when he buys it: 1·2 g
Mass doubles each day



Mass when he buys it: 125 g
Mass increases by 0·01 kg each day

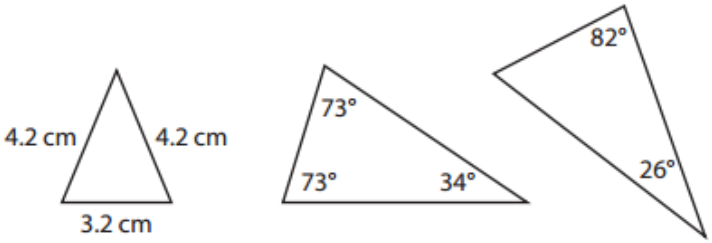
Notes:

Geometry.

Mastery

Which of these triangles are isosceles?

Explain your decisions.



Accurately draw two right-angled triangles with sides of different lengths.

Compare them and describe what's the same and what's different about them.

A square has two vertices at (0,0) and (3,3).
Work out and explain the coordinates where the other two vertices could be.

A square has two vertices at (–3,0) and (3,0).
Work out and explain the coordinates where the other two vertices could be.

Notes:

Geometry.

Mastery

Captain Conjecture says, 'The diameter of a circle is twice the length of its radius.'

Do you agree?
Explain your answer.

Captain Conjecture says, 'All circles with a radius of 4 cm have circumferences that are the same length.'

Do you agree?
Explain your answer.

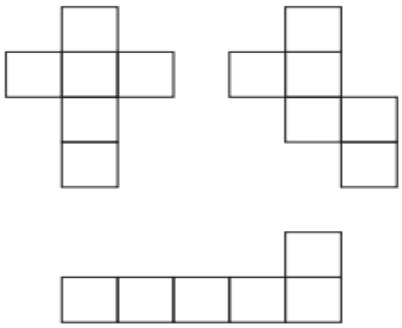
Are these statements always, sometimes or never true?

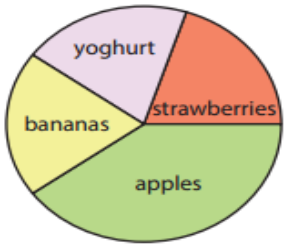
- If a shape is reflected in an axis, it stays in the same quadrant.
- If a shape is translated to the right and up, it stays in the same quadrant.
- If a shape is translated to the left and down, it stays in the same quadrant.

Explain your decisions.

Which of these could be the net of a cube?

Explain your choices.





The pie chart represents the proportions of the four ingredients in a smoothie drink.

The sector representing the amount of strawberries takes up 22% of the pie chart.

The sector representing the amount of apple is twice as big as the sector representing the amount of strawberries.

The sectors representing the amount of yoghurt and the amount of banana are identical.

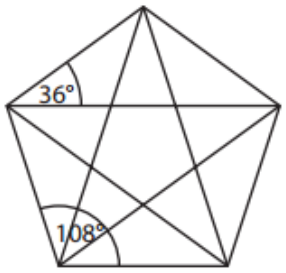
Notes:

Mastery with Greater Depth

This is a regular pentagon.
Two angles (108° and 36°) are shown.

Which other angles can you work out?

Explain your reasoning.



A triangle has been drawn carefully. You are told that the biggest angle is 20° larger than the second biggest angle and 40° larger than the smallest angle.

Work out how big each angle is.

An isosceles triangle has two vertices at (–3,2) and (3,2).

Explore where the third vertex could be.

Notes:

Mastery with Greater Depth

Compare a circle and an oval.

What's the same and what's different?

Joan says that if you reflect a shape (in an axis) and then reflect it again, the shape always ends up back where it first was as though you'd done nothing to it.

Do you agree with Joan?

Explain your decision.

Pascal says that any net made with six squares can be folded to make a cube.

Do you agree with him?

Explain your reasoning.

The pie chart represents the proportions of the four ingredients in a smoothie drink.

The sector representing the amount of strawberries takes up 22% of the pie chart.

The sector representing the amount of apple is twice as big as the sector representing the amount of strawberries.

The sectors representing the amount of yoghurt and the amount of banana are identical.

Notes:

Statistics.

Mastery
Calculate the percentage of bananas needed to make a smoothie drink. What percentage of bananas would be needed to make two smoothie drinks? Explain your reasoning.
Ten pupils take part in some races on Sports Day, and the following times are recorded. Time to run 100 m (seconds): 23, 21, 21, 20, 21, 22, 24, 23, 22, 20. Time to run 100 m holding an egg and spoon (seconds): 45, 47, 49, 43, 44, 46, 78, 46, 44, 48. Time to run 100 m in a three-legged race (seconds): 50, 83, 79, 48, 53, 52, 85, 81, 49, 84. Calculate the mean average of the times recorded in each race. For each race, do you think that the mean average of the times would give a useful summary of the ten individual times? Explain your decision.

Notes:

Statistics.

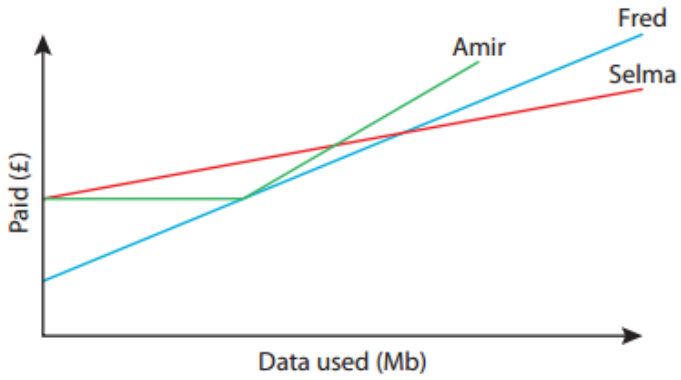
Three mobile phone companies each have different monthly pay-as-you-go contracts.

Phil's Phones: £5 fee every month and 2p for each Mb of data you use.

Manish's Mobiles: £7 fee every month and 1p for each Mb of data you use.

Harry's Handsets: £7 fee every month and 200Mb of free data, then 3p for each Mb of data after that.

Amir, Selma and Fred have mobile phones and they have recorded for one month how much data they have used (in Mb) and how much they have paid (in £). They have represented their data on this graph.



With which company do you think Amir has his contract?

With which company do you think Selma has her contract?

With which company do you think Fred has his contract?

Explain each of your choices.

Notes:

Mastery with Greater Depth

Estimate the angle of the sector representing the amount of banana.

Explain your reasoning.

Three teams are taking part in the heats of a 4 × 100 m relay race competition on Sports Day. If the mean average time of the four runners in a team is less than 30 seconds, the team will be selected for the finals.

At the start of the last leg of the relay race, the times (in seconds) of each teams' first three runners are:

Team Peacock: 27, 29, 31

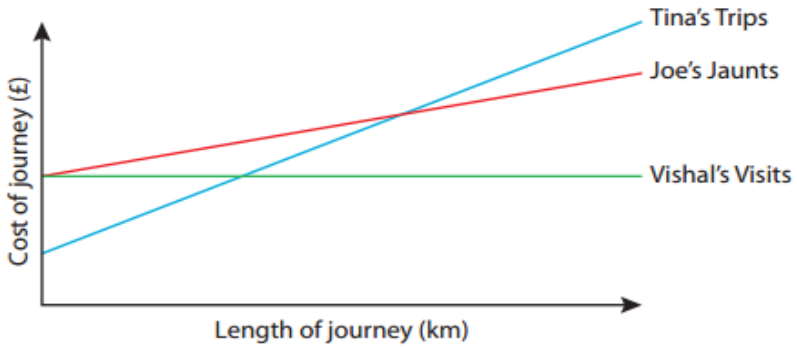
Team Farah: 45, 43, 37

Team Ennis: 29, 30, 25

Which of the teams have the best chance of being selected?

Explain your reasoning.

Three taxi companies each work out the cost of a journey in different ways. I have taken lots of journeys with each of the companies, and have recorded each time how long the journey was (in km) and the cost of the journey (in £). I have represented these data on this graph.



What's the same and what's different about the ways in which the three companies work out the cost of a journey?

Which might you choose if you wanted to book a taxi to make a journey?

Explain your reasoning.

Notes: