Place Value

Year 5 Place Value:

- Read, write, order and compare numbers to at least
- 1 000 000 and determine the value of each digit.
- Count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000.
- Interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers through zero.
- Round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000.
- Solve number problems and practical problems that involve all of the above.
- Read Roman numerals to 1000 (M) and recognise years written in Roman numerals.

Year 6 Place Value:

- Read, write, order and compare numbers up to 10 000 000 and determine the value of each digit.
- Round any whole number to a required degree of accuracy.
- Use negative numbers in context, and calculate intervals across zero.
- Solve number and practical problems that involve all of the above.

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.

- 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?

- 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?

Mastery with 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.

- Eduardo says, '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?

Addition and Subtraction

Year 5 Addition and Subtraction:

- Add and subtract whole numbers with more than 4 digits,
  including using formal written methods (columnar addition and subtraction).
- Add and subtract numbers mentally with increasingly large numbers.
- Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.
- Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.

Year 6 Addition and Subtraction:

- Perform mental calculations, including with mixed operations and large numbers.
- Use their knowledge of the order of operations to carry out calculations involving the four operations.
- Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.
- Solve problems involving addition, subtraction, multiplication and division.
- Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy.

Mastery:

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

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

  14781 – 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 × 7 and (31 + 9) × 7
  What's the same? What's different?

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

$$6 \ \square \ 3 \ \square \ 7 = 16$$

$$6 \ \square \ 3 \ \square \ 7 = 27$$

$$6\square \ 3\square \ 7 = 9$$

- Put brackets in these number sentences so that they are true.
  12 – 2 × 5 = 50
  12 – 8 – 5 = 9
  10 × 8 – 3 × 5 = 250

- 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?

Mastery with 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?

$$\Box\ \Box\ .\ \Box + \Box\ .\ \Box = 3.17$$

  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?

- 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 – 2·60 ÷ 1·39 .
  Do you agree or disagree with Sara?
  If you disagree, what number sentence do you think Ramesh should use?
  Explain your reasoning.

- 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?

Multiplication and Division

Year 5   Multiplication and Division:

- Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers.
- Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers.
- Establish whether a number up to 100 is prime and recall prime numbers up to 19.
- Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers.
- Multiply and divide numbers mentally drawing upon known facts.
- Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context.
- Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000.
- Recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3}).
- Solve problems involving addition, subtraction, multiplication and division including using their knowledge of factors and multiples, squares and cubes.
- Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign.
- Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.

Year 6 Multiplication and Division:

- Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication.
- Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context.
- Perform mental calculations, including with mixed operations and large numbers.
- Identify common factors, common multiples and prime numbers.
- Solve problems involving addition, subtraction, multiplication and division.
- Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy.

Mastery:

Find numbers to complete these number sentences.

736÷23 = ☐   ☐ x 100 = 2400   ☐ x100= 10 x ☐

7360÷230= ☐   25 x ☐ =200   25 x ☐ = 4 x ☐

230 x 24 = ☐   23 x ☐ = 161   23 x ☐ = 161 x ☐

240 x 23 = ☐   24 x ☐ = 168   24 x ☐ = 168 x ☐

1668÷8 = ☐   161 ÷ ☐ = 23   161÷ ☐ = 23 x ☐

208.5 x 8 = ☐   ☐ ÷ 25 = 9   ☐ ÷ 25 = 9 x ☐

- It is correct that 273 × 32 = 8736. Use this fact to work out:
  27·3 × 3·2
  2·73 × 32 000
  873·6 ÷ 0·32
  87·36 ÷ 27·3
  8736 ÷ 16
  4368 ÷ 1·6

- Work out:
  8·4 × 3 + 8·4 × 7
  6·7 × 5 − 0·67 × 50
  93 × 0·2 + 0·8 × 93
  7·2 × 4 + 3·6 × 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?

- 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.

Mastery with depth:

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

$$\square \times \square = 864$$

$$\square \times \square \times \square = 864$$

- Which calculation is the odd one out?
  753 × 1·8
  (75·3 × 3) × 6
  753 + 753 ÷ 5 × 4
  7·53 × 1800
  753 × 2 – 753 × 0·2
  750 × 1·8 + 3 × 1·8
  Explain your reasoning.

- In each pair of calculations, which one would you prefer to work out?
  (a) 35 × 0·3 + 35 × 0·7 **or** (b) 3·5 × 0·3 + 35 × 7
  (c) 6·4 × 1·27 – 64 × 0·1 **or** (d) 6·4 × 1·27 – 64 × 0·027
  (e) 52·4 ÷ 0·7 + 524 ÷ 7 **or** (f) 52·4 ÷ 0·7 – 524 ÷ 7
  (g) 31·2 ÷ 3 – 2·4 ÷ 6 **or** (h) 31·2 ÷ 3 – 1·2 ÷ 0·3
  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.

- 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.

Fractions and Decimals

Year 5 Fractions:
- Compare and order fractions whose denominators are all multiples of the same number.
- Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths.
- Recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number (e.g. $^2/_5 + {^4/_5} = {^6/_5} = 1{^1/_5}$) .
- Add and subtract fractions with the same denominator and multiples of the same number.
- Multiply proper fractions and mixed numbers by whole numbers.
- Read and write decimal numbers as fractions (e.g. $0.71 = {^{71}/_{100}}$).
- Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents.
- Round decimals with two decimal places to the nearest whole number and to one decimal place.
- Read, write, order and compare numbers with up to three decimal places.
- Solve problems involving number up to three decimal places.
- Recognise the per cent symbol (%) and understand that per cent relates to "number of parts per hundred", and write percentages as a fraction with denominator hundred, and as a decimal fraction.
- Solve problems which require knowing percentage and decimal equivalents of $^1/_2, {^1/_4}, {^1/_5}, {^2/_5}, {^4/_5}$ and those with a denominator of a multiple of 10 or 25.

Year 6 Fractions:

- Use common factors to simplify fractions; use common multiples to express fractions in the same denomination.
- Compare and order fractions, including fractions >1.
- Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions.
- Multiply simple pairs of proper fractions, writing the answer in its simplest form (e.g. $^1/_4 \times {^1/_2} = {^1/_8}$).
- Divide proper fractions by whole numbers (e.g. $^1/_3 \div 2 = {^1/_6}$) .
- Associate a fraction with division and calculate decimal fraction equivalents (e.g. 0.375) for a simple fraction (e.g. $^3/_8$)
- Identify the value of each digit to three decimal places and multiply and divide numbers by 10, 100 and 1000 where the answers are up to three decimal places.

- Multiply one-digit numbers with up to two decimal places by whole numbers.
- Use written division methods in cases where the answer has up to two decimal places.
- Solve problems which require answers to be rounded to specified degrees of accuracy.
- Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.

Mastery:

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

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

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

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

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

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

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

- 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?

- Sam added two fractions together and got 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 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 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 × 2 ÷ 3
  15 ÷ 3 × 2
  15 × 2/3

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

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

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

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

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

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

- Curtis used 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?

Mastery with 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.

- 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.
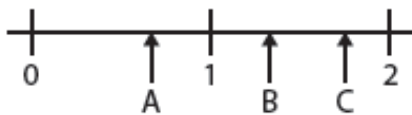
- Altogether on Monday and Tuesday I ran 3 $\frac{1}{2}$ km. On neither day did I run a whole number of km.
  Suggest how far I ran on Monday and how far on Tuesday.
  On Wednesday I ran some km and my sister ran 1 1/6 km further than I did.
  Altogether we ran 4 $\frac{1}{2}$ km.
  How far did I run on Wednesday?

- 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 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 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.

- 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?

Ratio and Proportion

Year 6 Ratio and Proportion:
- solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts
- solve problems involving the calculation of percentages (e.g. of measures) such as 15% of 360 and the use of percentages for comparison
- solve problems involving similar shapes where the scale factor is known or can be found
- solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.

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 has 9 fewer sweets than Sarah. They have 35 sweets altogether.
  How many sweets does Sam have?

- 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?

- 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.

Mastery with depth:

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

$= 60$

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

£3·25 change

$= £10·00$

- 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?

- 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?

- 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.

Measurement

Year 5 Measures:

- Convert between different units of metric measure (e.g. kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre).
- Understand and use equivalences between metric units and common imperial units such as inches, pounds and pints.
- Measure and calculate the perimeter of composite rectilinear shapes in cms and metres.
- Calculate and compare the area of rectangles (including squares) and including using standard units, square centimetres (cm^2) and square metres (m^2) and estimate the area of irregular shapes.
- Estimate volume (e.g. using 1 cm^3 blocks to build cubes and cuboids) and capacity (e.g. using water).
- Solve problems involving converting between units of time.
- Use all four operations to solve problems involving measure (e.g. length, mass, volume, money) using decimal notation including scaling.

Year 6 Measures:

- Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate.
- Use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places.
- Convert between miles and kilometres.
- Recognise that shapes with the same areas can have different perimeters and vice versa.
- Recognise when it is possible to use formulae for area and volume of shapes.
- Calculate the area of parallelograms and triangles.
- Calculate, estimate and compare volume of cubes and cuboids using standard units, including centimetre cubed (cm^3) and cubic metres (m^3), and extending to other units such as mm^3 and km^3.

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.

- 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.

8·4 cm
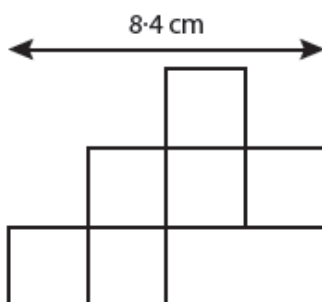
Which of these right-angled triangles have an area of 20 cm²?
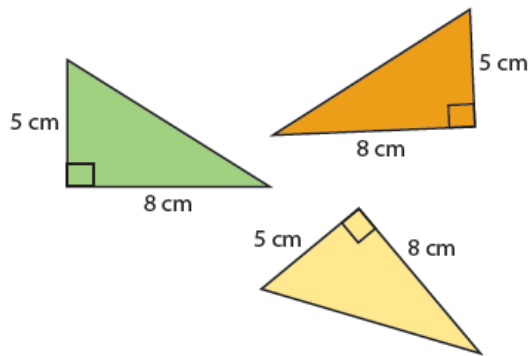
- Think about these rectangles:
  a 4 cm by 6 cm rectangle
  a 12 cm by 2 cm rectangle
  a 3 cm by 8 cm rectangle.
  What's the same? What's different?

- 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?

- 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?

Mastery with 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.

- 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.
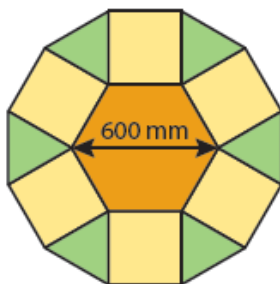
- Sami worked out the area of the orange shape as $10 \times 4 + 8 \times 7 = 96\,cm^2$.
  Razina worked out the area as $12 \times 7 + 3 \times 4 = 96\,cm^2$.
  Lukas worked out the area as $10 \times 10 - 2 \times 2 = 96\,cm^2$.
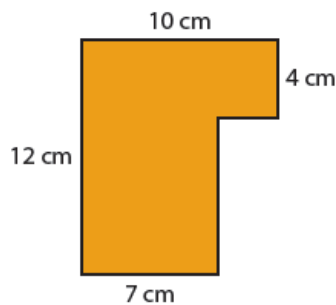

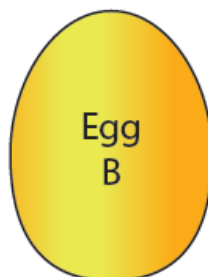
Are you convinced by Sami, Razina or Lukas's reasoning?

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 cm3?
  What's the same and what's different about your cuboids?

- In a story, Jack has to choose between two magic gold eggs to buy.
  What would you advise him to do?
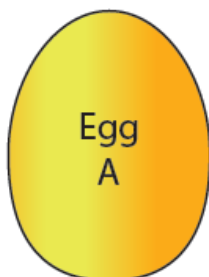
Mass when he buys it: 1·2 g   Mass when he buys it: 125 g
Mass doubles each day   Mass increases by 0·01 kg
each day

Geometry

Year 5 Geometry:

- Identify 3-D shapes, including cubes and other cuboids, from 2-D representations
- Know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles
- Draw given angles, and measure them in degrees ($^{\circ}$)
- Identify: angles at a point and one whole turn (total 360°)

    angles at a point on a straight line and ½ a turn (total 180°)

    other multiples of 90°
- Use the properties of rectangles to deduce related facts and find missing lengths and angles
- Distinguish between regular and irregular polygons based on reasoning about equal sides and angles.
- Identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed

Year6 Geometry:

- Draw 2-D shapes using given dimensions and angles
- Recognise, describe and build simple 3-D shapes, including making nets
- Compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons
- Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius
- Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.
- Describe positions on the full coordinate grid (all four quadrants)
- Draw and translate simple shapes on the coordinate plane, and reflect them in the axes.

Mastery:

-

Which of these triangles are isosceles?

Explain your decisions.
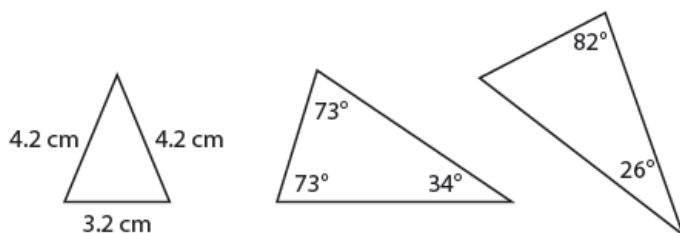
- Accurately draw two right-angled triangles with sides of different lengths.
  Compare them and describe what's the same and what's different about them.

- 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.

- 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.
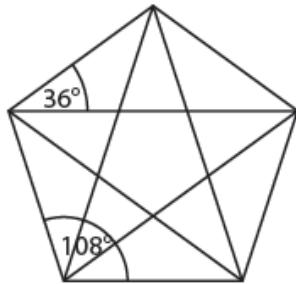 Explain your decisions.

- Which of these could be the net of a cube?

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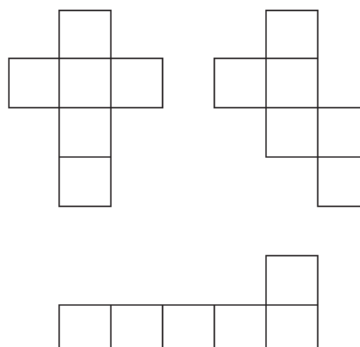
- This is a regular pentagon.
  Two angles (108° and 36°) are shown.

  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.

- 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.

Statistics

Year 5 Statistics:

- Solve comparison, sum and difference problems using information presented in a line graph
- Complete, read and interpret information in tables, including timetables.

Year6 Statistics:

- Interpret and construct pie charts and line graphs and use these to solve problems
- Calculate and interpret the mean as an average.

Mastery:

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.

- 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.

- 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.
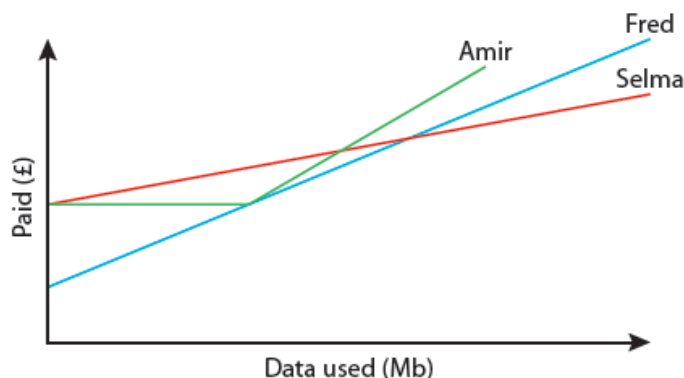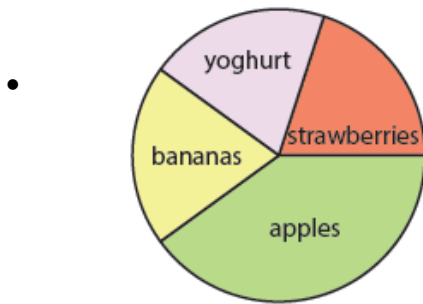

  With which company do you think Amir has his contract?
  With which company do you think Selma has her contract?
  With which company do you think Fred has his contract?

  Explain each of your choices.

Mastery with depth:

-

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 ch

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.

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.
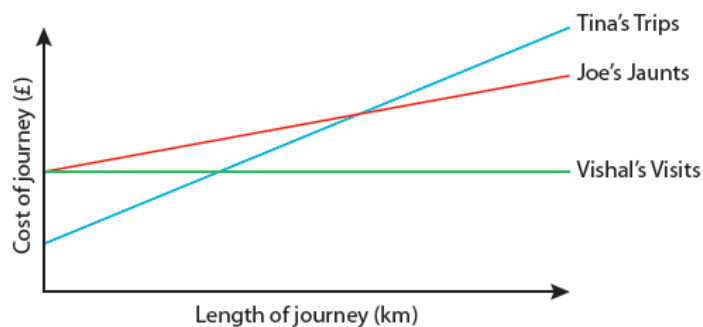
What's the same and what's different about the ways in which the three companies work out the cost of a journey?
Which might you choose if you wanted to book a taxi to make a journey?
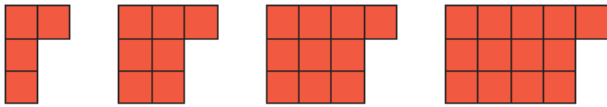Explain your reasoning.

Algebra

Year 6 Algebra:

- Use simple formulae
- Generate and describe linear number sequences
- Express missing number problems algebraically
- Find pairs of numbers that satisfy number sentences involving two unknowns
- Enumerate all possibilities of combinations of two variables.

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.
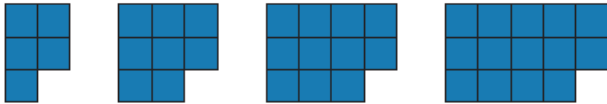
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  Ali has made three sequences of shapes by sticking coloured squares together.
  The sequence of red shapes starts

  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.'
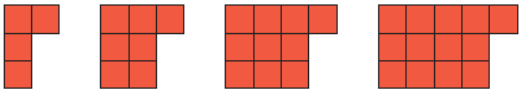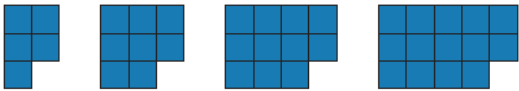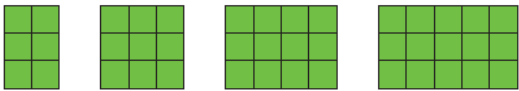
  Do you agree with Ali?

  Explain your reasoning.

- Which of the following statements do you agree with? Explain your decisions.
  - The value 5 satisfies the symbol sentence $3 \times \boxed{} + 2 = 17$
  - The value 7 satisfies the symbol sentence $3 + \boxed{} \times 2 = 10 + \boxed{}$
  - 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.

Mastery with 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.

- 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 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.

- Which of the following statements do you agree with? Explain your decisions.
  - There is a whole number that satisfies the symbol sentence $5 \times \boxed{} - 3 = 42$
  - There is a whole number that satisfies the symbol sentence $5 + \boxed{} \times 3 = 42$
  - 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.