Stage 5 Exemplification

Examples of what children should be able to do, in relation to each (boxed) Programme of Study statement

Number and Place Value

read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit

- Explain what each digit represents in whole numbers and decimals with up to two places and partition, round and order these numbers.
- Answer problems such as
  - What is the value of the 7 in 3 274 105?
  - Write in figures forty thousand and twenty.
  - A number is partitioned like this:

    4 000 000 + 200 000 + 60 000 + 300 + 50 + 8

    Write the number. Now read it to me.

  - A car costs more than £8600 but less than £9100. Tick the prices that the car might cost.

    £8569 □ £9090 □ £9130 □ £8999 □

count forwards or backwards in steps of powers of 10 for any given number up to

1 000 000

- Count from any given number in powers of 10 and decimal steps extending beyond zero when counting backwards; relate the numbers to their position on a number line
- Answer problems such as:
  - Write the next number in this counting sequence: 110 000, 120 000, 130 000 …
  - Create a sequence that goes backwards and forwards in tens and includes the number 190. Describe your sequence.
  - Here is part of a sequence: 30, 70, 110, □, 190, □. How can you find the missing numbers?

interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through 0

- Count from any given number in whole-number and decimal steps extending beyond zero when counting backwards; relate the numbers to their position on a number line.

round any number up to 1 000 000 to the nearest 10 100 1 000 10 000 and 100 000

- Explain what each digit represents in whole numbers and decimals with up to two places and partition round and order these numbers and answer questions such as: What is 4773 rounded to the nearest hundred?

solve number problems and practical problems that involve all of the above

- Partition decimals using both decimal and fraction notation for example recording 6.38 as 6 + $^{3}/_{10}$ + $^{8}/_{100}$ and as 6 + 0.3 + 0.08. They write a decimal given its parts: e.g. they record the number that is made from 4 wholes 2 tenths and 7 hundredths as 4.27. They apply their understanding in activities such as:
    - Find the missing number in 17.82 – □ = 17.22.
    - Play 'Zap the digit': In pairs choose a decimal to enter into a calculator e.g. 47.25. Take turns to 'zap' (remove) a particular digit using subtraction. For example to 'zap' the 2 in 47.25 subtract 0.2 to leave 47.05.
- The children explain how they work out calculations showing understanding of the place value that underpins written methods.

read Roman numerals to 1000 (M) and recognise years written in Roman numerals

- Recognise Roman numerals in their historical context
- Read and write Roman numerals to one thousand

Addition and Subtraction

add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)

Children should be able to use standard written methods for addition and subtraction,

e.g. calculate 14 136 + 3258 + 487 or 23 185 – 2078

Use written methods to find missing numbers in addition and subtraction calculations,

e.g. 6432 + □ = 8025

Use written methods to add and subtract numbers with different numbers of digits,

e.g. Find all the different totals that can be made using any three of these five numbers:
14 721, 76, 9534, 788, 6

add and subtract numbers mentally with increasingly large numbers

Children should be able to respond rapidly to oral or written questions, explaining the strategy used,

e.g. 750 take away 255, take 400 from 1360, 4500 minus 1050, subtract 3250 from 7600, 1800 less than 3300, 4000 less than 11 580

Derive quickly related facts,

e.g. 80 + 50 = 130, 130 – 50 = 80, 800 + 500 = 1300, 1300 – 800 = 500

Derive quickly number pairs that total 100 or pairs of multiples of 50 that total 1000,

e.g. 32 + 68 = 100 or 150 + 850 = 1000

Identify and use near doubles,

e.g. work out 28 + 26 = 54 by doubling 30 and subtracting first 2, then 4, or by doubling 26 and adding 2

Add or subtract the nearest multiple of 10, 100 or 1000 and adjust,

e.g. adding or subtracting 9, 19, 29 ... to/from any two-digit number

Work out mentally by counting up from a smaller to a larger number e.g. 8000 – 2785 is 5 + 10 + 200 + 5000 = 5215

Understand and use language associated with addition and subtraction, e.g. difference, sum, total

use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy

Children should be able to use rounding to approximate and check e.g. 2593 + 6278 must be more than 2500 + 6200, 2403 – 1998 is about 2400 – 2000

Write approximate answers to calculations, e.g. write an approximate answer for 516 ÷ (15 + 36)

solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

Children should be able to choose the appropriate operations to solve multi-step problems, decide whether the calculations can be done mentally or using a written method and explain and record how the problem was solved using numbers, signs and symbols.

e.g. 13 502 people were at the match last week and there are 2483 more this week, how many more people need to attend to bring the total to the club's target of 20 000 people?

Identify and obtain the necessary information to solve the problem and determine if there is any important information missing,

e.g. calculating total cost of a holiday for a family, given prices for adults and children and surcharges for particular resorts.

Mulitplication and Division

identify multiples and factors, including finding all factor pairs of a number, and common factors of 2 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

- Use the vocabulary factor, multiple and product. They identify all the factors of a given number; for example, the factors of 20 are 1, 2, 4, 5, 10 and 20. They answer questions such as:
    - Find some numbers that have a factor of 4 and a factor of 5. What do you notice?

    - My age is a multiple of 8. Next year my age will be a multiple of 7. How old am I?
- They recognise that numbers with only two factors are prime numbers and can apply their knowledge of multiples and tests of divisibility to identify the prime numbers less than 100. They explain that 73 children can only be organised as 1 group of 73 or 73 groups of 1, whereas 44 children could be organised as 1 group of 44, 2 groups of 22, 4 groups of 11, 11 groups of 4, 22 groups of 2 or 44 groups of 1. They explore the pattern of primes on a 100-square, explaining why there will never be a prime number in the tenth column and the fourth column.

multiply and divide numbers mentally, drawing upon known facts

- Rehearse multiplication facts and use these to derive division facts, to find factors of two-digit numbers and to multiply multiples of 10 and 100, e.g. 40 × 50. They use and discuss mental strategies for special cases of harder types of calculations, for example to work out 274 + 96,< 8006 – 2993, 35 × 11, 72 ÷ 3, 50 × 900. They use factors to work out a calculation such as 16 × 6 by thinking of it as 16 × 2 × 3. They record their methods using diagrams (such as number lines) or jottings and explain their methods to each other. They compare alternative methods for the same calculation and discuss any merits and disadvantages.

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

- Develop and refine written methods for multiplication. They move from expanded layouts (such as the grid method) towards a compact layout for HTU × U and TU × TU calculations. They suggest what they expect the approximate answer to be before starting a calculation and use this to check that their answer sounds sensible. For example, 56 × 27 is approximately 60 × 30 = 1800.

multiply and divide whole numbers and those involving decimals by 10, 100 and 1,000

- Recall quickly multiplication facts up to 10 × 10 and use them to multiply pairs of multiples of 10 and 100. They should be able to answer problems such as:
    - the product is 400. At least one of the numbers is a multiple of 10. What two numbers could have been multiplied together? Are there any other possibilities?

recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3})

- solve problems involving multiplication and division, including using their knowledge of factors and multiples, squares and cubes
- use knowledge of multiplication facts to derive quickly squares of numbers to 12 × 12 and the corresponding squares of multiples of 10. They should be able to answer problems such as:
- tell me how to work out the area of a piece of cardboard with dimensions 30 cm by 30 cm
- find two square numbers that total 45

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

- Extend written methods for division to include HTU ÷ U, including calculations with remainders. They suggest what they expect the approximate answer to be before starting a calculation and use this to check that their answer sounds sensible. They increase the efficiency of the methods that they are using. For example:

  196 ÷ 6 is approximately 200 ÷ 5 = 40

  3 2 r4 or 4/6 or 2/3

  6 196

Children know that, depending on the context, answers to division questions may need to be rounded up or rounded down. They explain how they decided whether to round up or down to answer problems such as:

- Egg boxes hold 6 eggs. A farmer collects 439 eggs. How many boxes can he fill
- Egg boxes hold 6 eggs. How many boxes must a restaurant buy to have 200 eggs?

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

- Use written methods to solve problems and puzzles such as:

275	382	81	174
206	117	414	262
483	173	239	138
331	230	325	170

  - Choose any four numbers from the grid and add them. Find as many ways as possible of making 1000.
  - Place the digits 0 to 9 to make this calculation correct: ☐☐☐☐ – ☐☐☐ = ☐☐☐.
  - Two numbers have a total of 1000 and a difference of 246. What are the two numbers?

Fractions (including decimals and percentages)

compare and order fractions whose denominators are all multiples of the same number

Children should be able to circle the two fractions that have the same value, or choose which one is the odd one out and justify their decision.
$^{6}/_{10}$, $^{3}/_{5}$, $^{18}/_{20}$, $^{9}/_{15}$

recognise mixed numbers and improper fractions and convert from one form to the other. Write mathematical statements >1 as a mixed number

Put the correct symbol, < or >, in each box.

3.03 ☐ 3.3
0.37 ☐ 0.327
Order these numbers: 0.27 0.207 0.027 2.07 2.7

(e.g. ⅖ + ⅘ = $^{6}/_{5}$ = 1⅕)

How many halves in: 1 ½ 3 ½ 9 ½ …?

How many quarters in 1 ¼ 2 ¼ 5 ¼ ….?

multiply proper fractions and mixed numbers by whole numbers

What is $^{3}/_{10}$ of: 50, 20, 100…?

What is ⅘ of 50, 35, 100….?

read and write decimal numbers as fractions (e.g. 0.71 = $^{71}/_{100}$)

What decimal is equal to 25 hundredths?

Write the total as a decimal:

4 + $^{6}/_{10}$ + $^{2}/_{100}$ =

Children partition decimals using both decimal and fraction notation, for example, recording 6.38 as 6 + $^{3}/_{10}$ + $^{8}/_{100}$ and as 6 + 0.3 + 0.08.

recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents

Recognise that
0.007 is equivalent to $^{7}/_{1000}$
6.305 is equivalent to $^{6305}/_{100}$

read, write, order and compare numbers with up to three decimal places

Write these numbers in order of size, starting with the smallest. 1.01, 1.001, 1.101, 0.11

solve problems involving numbers with up to three decimal places

$$\begin{array}{r} 72.8 \\ +\ 54.6 \\ \hline 127.4 \\ \hline 1 \end{array}$$

8 tenths add 6 tenths makes 14 tenths, or 1 whole and 4 tenths. The 1 whole is 'carried' into the units column and the 4 tenths is written in the tenths column

recognise the per cent symbol (%) and understand that per cent relates to ‘number of parts per hundred’

Write in the missing numbers. 30% of 60 is ☐
30% of ☐ is 60

write percentages as a fraction with denominator 100, and as a decimal

Shade 10% of this grid.

Which is bigger: 65% or ¾? How do you know?

What percentage is the same as $^{7}/_{10}$? Explain how you know?

What is $^{31}/_{100}$ as a percentage?

Which is a better mark in a test: 61% , or 30 out of 50? How do you know?

Measurement

convert between different units of metric measure (for example, kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre

What is two hundred and seventy six centimetres to the nearest metre?

How many millimetres are in 3 centimetres?

understand and use approximate equivalences between metric units and common imperial units such as inches, pounds and pints

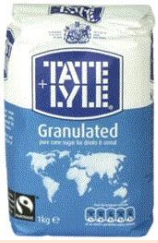
This bag of sugar weighs 1kg. Approximately how many pounds (lb) of sugar would fit into another empty bag of the same size as this one? Tick the correct answer.

20lb

14lb

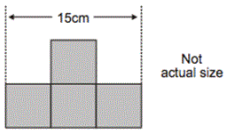
2lb

4lb

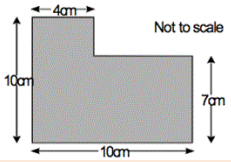


measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres

This shape is made from 4 shaded squares



Calculate the perimeter of the shape



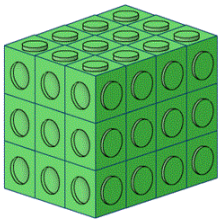
calculate and compare the area of rectangles (including squares), and including using standard units, square centimetres (cm2) and square metres (m2) and estimate the area of irregular shapes

Calculate the area of a rectangle which is eleven metres long by 5 metres wide.

Which has the greatest area – a square with sides 6 cm long or a rectangle which is 7 cm long by 5 cm? How much greater is the area?

estimate volume [for example, using 1 cm3 blocks to build cuboids (including cubes)] and capacity [for example, using water]

Fitting it in is an activity to fill cuboid shapes with multilink cubes. It ends with a 'create' challenge that will test children's knowledge in this area



solve problems involving converting between units of time

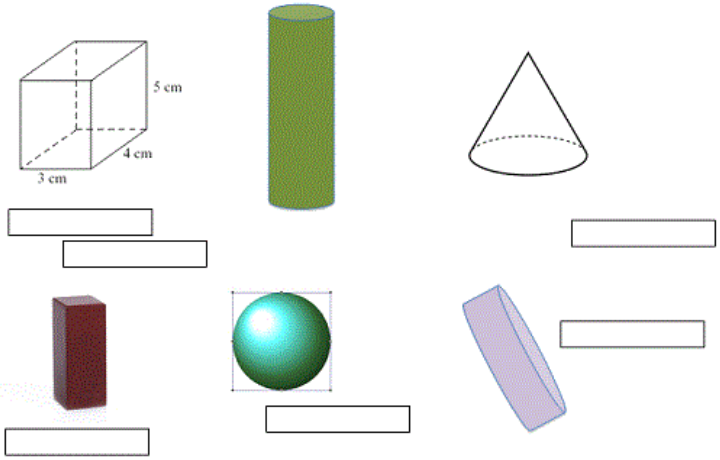
5 on the clock is a problem that requires children to be able to convert between 12 and 24 hour clocks confidently.

use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation,

A day with Grandpa. Is an engaging problem using imperial units that challenges children's understanding of the concept of area rather than simply requiring them to follow a rule for finding areas of rectangles. These calculations should also help learners to see the advantages of the metric system as well as understand it more fully!

Geometry – properties of shapes

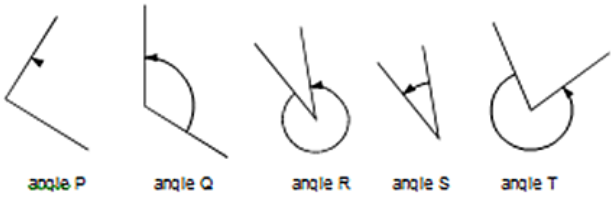
Identify 3-D shapes, including cubes and other cuboids, from 2D representations



These are pictures of 3D shapes. Which 3D shapes are pictured here? Put the names in the boxes.

Know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles

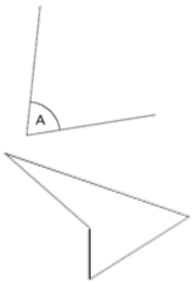
Look at these angles.



Label each angle acute, obtuse or reflex. List the 5 angles in order from smallest to largest.

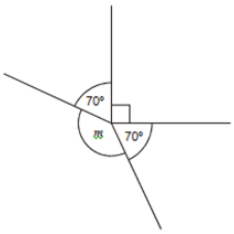
Draw given angles, and measure them in degrees (°)

Measure A accurately. Use a protractor (angle measurer).



Measure accurately the smallest angle in the above shape. Use a protractor (angle measurer).

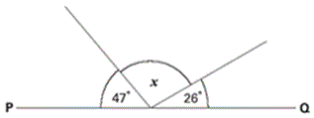
This diagram is not drawn accurately. Calculate the size of angle m



Identify:

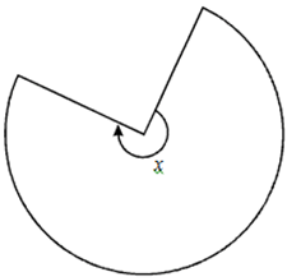
- Angles at a point and one whole turn (total 360°)
- Angles at a point on a straight line and ½ a turn (total 180°)
- Other multiples of 90°

PQ is a straight line. Not drawn accurately.



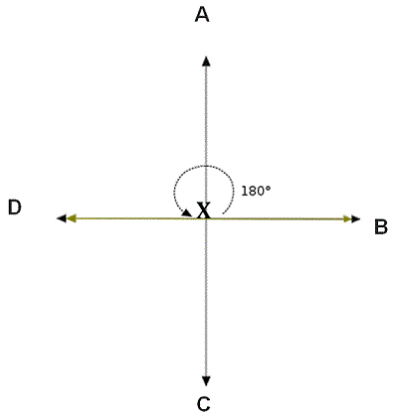
Calculate the size of angle x. Do not use a protractor (angle measurer).

This shape is three-quarters of a circle.



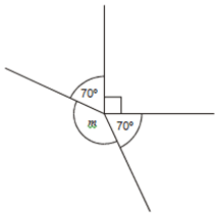
How many degrees is angle x?

In the diagram below, if you were standing at X, facing A, what angle would you turn through if you turn and face C?



Use the properties of rectangles to deduce related facts and find missing lengths and angles

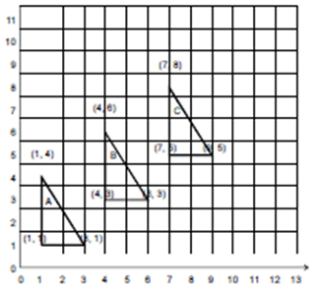
This diagram is not drawn accurately. Calculate the size of angle m



Distinguish between regular and irregular polygons based on reasoning about equal sides and angles

Geometry – position and direction

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



Write the co-ordinates of the next triangle in the sequence.

Statistics

complete, read and interpret information in tables, including timetables

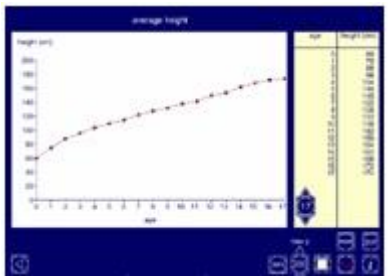
I can find the information in a table or graph to answer a question

		Hull	York	Leeds
Adult	single	£12.50	£15.60	£10.25
	return	£23.75	£28.50	£19.30
Child	single	£8.50	£10.80	£8.25
	return	£14.90	£17.90	£14.75

The table shows the cost of coach tickets to different cities.

What is the total cost for a return journey to York for one adult and two children?

Solve comparison, sum and difference problems using information presented in a line graph.



What is the average height of children of different ages?

Are there differences for boys and girls?

This screen shot is from the Interactive Teaching Programme 'Data Handling', using the 'Average Height' data set.