North Yorkshire County Council

# National Curriculum for Mathematics 2014

# Exemplification of the Programmes of Study for

# YEAR 4

This document brings together the exemplification materials that are available on the NCETM website. Where there were gaps on the website, we have included other examples from past SATs papers and NCETM Mastery documents. We have also included appropriate links to Nrich problems, games and investigations. Click on ☑ in each section to access the weblinks which relate to the programmes of study statements.

***fluency, reasoning and problem-solving***

# Contents

## Purpose of study

Mathematics is a creative and highly inter-connected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.

## Aims

The national curriculum for mathematics aims to ensure that all pupils:

become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.

**reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language

can **solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. The programmes of study are, by necessity, organised into apparently distinct domains, but pupils should make rich connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. They should also apply their mathematical knowledge to science and other subjects.

The expectation is that the majority of pupils will move through the programmes of study at broadly the same pace. However, decisions about when to progress should always be based on the security of pupils' understanding and their readiness to progress to the next stage. Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content. Those who are not sufficiently fluent with earlier material should consolidate their understanding, including through additional practice, before moving on.

## The School Curriculum

The programmes of study for mathematics are set out year-by-year for key stages 1 & 2. Schools are, however, only required to teach the relevant programme of study by the end of the key stage. Within each key stage, schools therefore have the flexibility to introduce content earlier or later than set out in the programme of study.

# YEAR 4 – Number and Place Value

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

**count in multiples of 6, 7, 9, 25 and 1000**

Children should be able to:

Explain how to work out the 6 times-table from the 3 times-table or the 9 times-table from the 3 times-table.

Know that 9 × 8 = 72 so that 72 ÷ 9 = 8 and deduce 720 ÷ 9.

Explain the relationship between 8 × 7 = 56, 6 × 7 = 42 and 14 × 7 = 98.

**find 1000 more or less than a given number**

Children should be able to:

Answer questions such as, what is the missing number in the number sentence and how do you know? 5742 + ≤ = 9742

**count backwards through zero to include negative numbers**

Children should be able to:

Create a sequence that includes the number –5 and then describe the sequence to the class.

Explain how to find the missing numbers in a sequence eg. _ *–9, –5, –1,* _ and explain the rule.

Answer questions eg What number can you put in the box to make this statement true? __ < –2

**recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones)**

Children should be able to:

Give the value of a digit in a given number e.g. the 7 in 3 274

Write in figures a given number e.g. four thousand and twenty.

Recognise a number partitioned like this: 4 000 + 200 + 60 + 3 and be able to read and write the number.

Create the biggest and smallest whole number given four digits eg. 3, 0, 6, 5

Find missing numbers in a number sentence e.g. _ +_ = 1249

## order and compare numbers beyond 1000

Children can find numbers that could go in the boxes to make these correct

□ + □ < 2000, 3000 > □ – □

## identify, represent and estimate numbers using different representations

Children can answer questions such as –

which of these numbers is closest to the answer of 342 – 119: 200 220 230 250 300

Identify what the digit 7 represents in each of these amounts: £2.70, 7.35m, £0.37, 7.07m

## round any number to the nearest 10, 100 or 1000

Children should be able to explain tips to give someone who is learning how to round numbers to the nearest 10, or 1000.

I rounded a number to the nearest 10. The answer is 340. What number could I have started with?

Know what to look for first when you order a set of numbers and know which part of each number to look at to help you.

## solve number and practical problems that involve all of the above and with increasingly large positive numbers

Children should be able to sort problems into those they would do mentally and those they would do with pencil and paper and explain their decisions.

There are 70 children on a camping trip. Each tent can accommodate up to 6 children. What is the smallest number of tents they will need?

The distance to the park is 5 km when rounded to the nearest kilometre. What is the longest/shortest distance it could be?

## read Roman numerals to 100 (I to C) and know that over time, the numeral system changed to include the concept of zero and place value

Know what each letter represents in Roman numerals

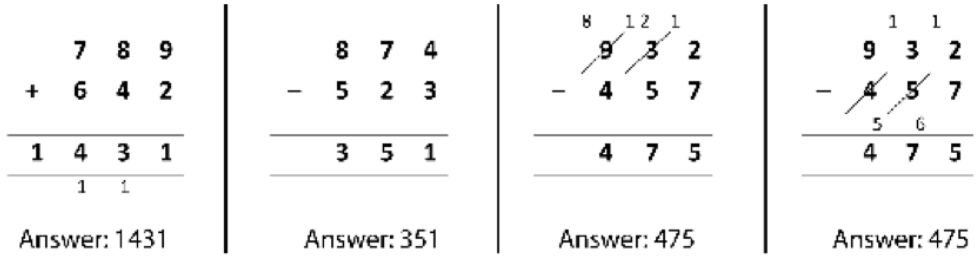
Convert from Roman numeral to our current system (Arabic) and from Arabic to Roman e.g. 76 = _ *in Roman numerals, CLXIX* = _ Arabic numerals.

Know that the current western numeral system is the modified version of the Hindu numeral system developed in India to include the concept of zero and place value.

# YEAR 4 – Addition and Subtraction

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

**add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate**




**estimate and use inverse operations to check answers to a calculation**

Tina has read the first 85 pages in a book that is 150 pages long. Which number sentence could Tina use to find the number of pages she must read to finish the book?

A 150 + 85 = ☐

B ☐ – 85 = 150

C 150 ÷85 = ☐

D 150 – 85 = ☐

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

Children should be able to carry out practical tasks such as to run the class market stall. They were told they could use mental strategies or the whiteboard provided to assist them in their calculations. The customer (their teacher) would come to purchase some items. Each child was asked to solve a transaction problem involving a single item (calculating change – subtraction) and then a transaction involving two items (adding together values and then calculating change or two subsequent subtractions). They were also asked to explain their thinking and asked how to give the change in a different way (representing money values in various ways).

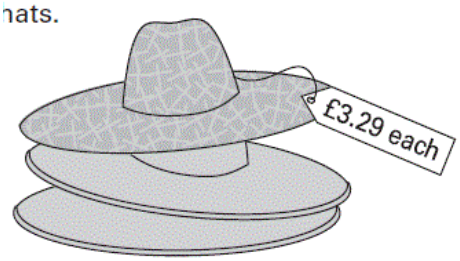
Children should be able to solve problems such as:

- I have read 134 of the 512 pages of my book. How many more pages must I read to reach the middle?
- There are 8 shelves of books. 6 of the shelves hold 25 books each. 2 of the shelves have 35 books each. How many books altogether are on the shelves?
- I think of a number, subtract 17, and divide by 6. The answer is 20. What was my number?
- You start to read a book on Thursday. On Friday you read 10 more pages than on Thursday. You reach page 60. How many pages did you read on Thursday?

A shop sells sunglasses


What is the difference between the cheapest and most expensive?

Ryan buys sunglasses at £4.69 and a sun hat




He pays with £10 note.

How much change will he get?

# YEAR 4 – Multiplication and Division

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

**recall multiplication and division facts for multiplication tables up to 12 × 12**

Children should be able to continue to practise recalling and using multiplication tables and related division facts to aid fluency.

- One orange costs nineteen pence. How much will three oranges cost/
- What is twenty-one multiplied by nine? How many twos are there in four hundred and forty?

**use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers**

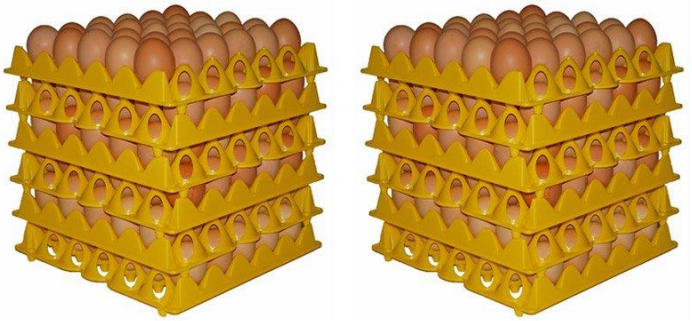
Children should be able to practise mental methods and extend this to three-digit numbers to derive facts, for example 200 × 3 = 600 into 600 ÷ 3 = 200.

Plants are sold in trays of 20.

Hannah buys 7 trays.


How many plants does she buy?

Eggs are sold in trays of 30 eggs.



The trays can be stacked in six layers.

How many eggs are in this picture?

**recognise and use factor pairs and commutativity in mental calculations**

Children should be able to write statements about the equality of expressions (e.g. use the distributive law 39 × 7 = 30 × 7 + 9 × 7 and associative law (2 × 3) × 4 = 2 × (3 × 4)). They combine their knowledge of number facts and rules of arithmetic to solve mental and written calculations e.g. 2 x 6 x 5 = 10 x 6.

*e.g. Understand and use when appropriate the principles (but not the names) of the commutative, associative and distributive laws as they apply to multiplication:*

*Example of commutative law 8 × 15 = 15 × 8*

*Example of associative law 6 × 15 = 6 × (5 × 3) = (6 × 5) × 3 = 30 × 3 = 90*

*Example of distributive law 18 × 5 = (10 + 8) × 5 = (10 × 5) + (8 × 5) = 50 + 40 = 90*

**solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects**

Children should be able to solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as the numbers of choices of a meal on a menu, or three cakes shared equally between 10 children.

*e.g. 185 people go to the school concert. They pay £l.35 each. How much ticket money is collected?*

*Programmes cost 15p each. Selling programmes raises £12.30. How many programmes are sold?*

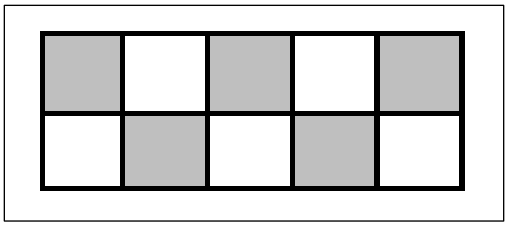
# YEAR 4 – Fractions

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

**recognise and show, using diagrams, families of common equivalent fractions**

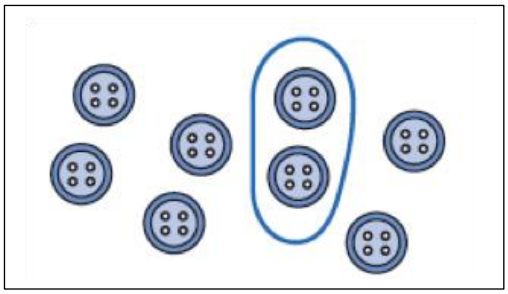
Recognise that five tenths ($^5/_{10}$)

or one half of this diagram is shaded.



Recognise that two eighths ($^2/_8$) or

one quarter ($^1/_4$) of the set of buttons is ringed



Recognise that one whole is equivalent to two halves, three thirds, four quarters…

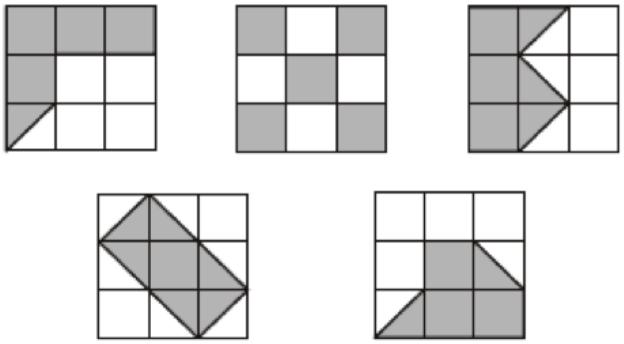
For example, build a fraction 'wall' using a computer program and then estimate parts.

Recognise patterns in equivalent fractions -

$^1/_2 = {}^2/_4 = {}^3/_6 = {}^4/_8 = {}^5/_{10}$

And similar patterns for -

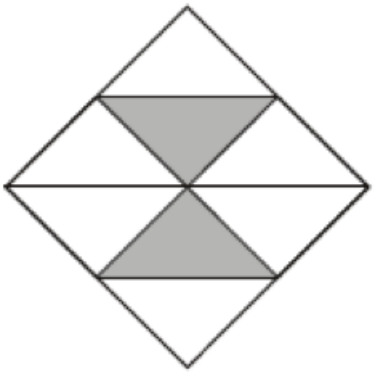
$^1/_3$, $^1/_4$, $^1/_5$, $^1/_6$, $^1/_{10}$



Here are five diagrams. Look at each one. Put a tick (✓) on the diagram is exactly ½ of it is shaded. Put a cross (X) if it us not.

Here is a square.

What fraction is shaded?



**count up and down in hundredths; recognise that hundredths arise when dividing an object by a hundred and dividing tenths by ten**

What does the digit 6 in 3.64 represent? The 4?

What is the 4 worth in the number 7.45? The 5?

Write the decimal fraction equivalent to:

two tenths and five hundredths; twenty-nine hundredths; fifteen and nine hundredths.

Continue the count 1.91, 1.92, 1.93, 1.94 ...

Suggest a decimal fraction between 4.1 and 4.2

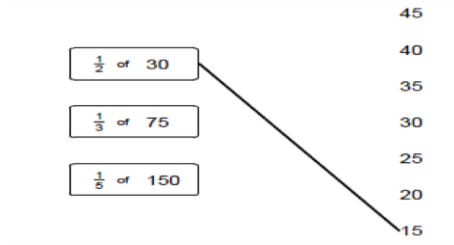
Know how many 10 pence pieces equal £1, how many 1 pence pieces equal £1, how many centimetres make a metre.

**solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number**

What is one-fifth of twenty-five?

Write the missing number to make this correct.

$$\frac{1}{4} \text{ of } 24 = \frac{1}{2} \text{ of } \square$$




Match each box to the correct number.

**add and subtract fractions with the same denominator**

For example:

½ + ½ ¼ + ¾ ⅜ + ⅝ ⅗ + ⅘ + ⅕

¾ - ⅓ ⅔- ⅘ ⁹⁄₁₀ + ⁴⁄₁₀ – ³⁄₁₀

**recognise and write decimal equivalents of any number of tenths or hundredths**

Recognise 0.07 is equivalent to $^{7}/_{100}$ and 6.35 is equivalent to 6 $^{35}/_{100}$ etc

Which of these decimals is equal to $^{19}/_{100}$? 1.9 10.19 0.19 19.1

Write each of these as a decimal fraction: $^{27}/_{100}$ $^{3}/_{100}$ $2\ ^{33}/_{100}$

## recognise and write decimal equivalents to ¼; ½; ¾

Know that, for example

0.5 is equivalent to ½, 0.25 is equivalent to ¼, 0.75 is equivalent to ¾, 0.1 is equivalent to $\frac{1}{10}$

Particularly in the context of money and measurement.

## find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as units, tenths and hundredths

Write a two-digit number on the board. Keep dividing by 10 and record the answer. Describe the pattern.

| |
|---|
| 26 |
| 2.6 |
| 0.26 |
| 0.026 |

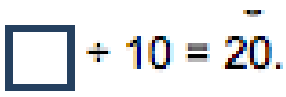
Respond to oral or written questions such as:

How many times larger is 2600 than 26?

How many £1 notes are in £120, £1200?

Divide three hundred and ninety by ten.

Write in the missing number



## round decimals with one decimal place to the nearest whole number

Round these to the nearest whole number: 9.7, 25.6, 148.3

Round these lengths to the nearest metre: 1.5m, 6.7m, 4.1m, 8.9m

Round these costs to the nearest £: £3.27, £12.60, £14.05, £6.50

**compare numbers with the same number of decimal places up to two decimal places**

Place these decimals on a line from 0 to 2: 0.3, 0.1, 0.9, 0.5, 1.2, 1.9


Which is lighter: 3.5kg or 5.5kg? 3.72kg or 3.27kg? Which is less: £4.50 or £4.05?

Put in order, largest/smallest first: 6.2, 5.7, 4.5, 7.6, 5.2, 99, 1.99, 1.2, 2.1

Convert pounds to pence and vice versa. For example: Write 578p in £.

How many pence is £5.98, £5.60, £7.06, £4.00? Write the total of ten £1 coins and seven 1p coins (£10.07)

Write centimetres in metres. For example, write: 125 cm in metres (1.25 metres)

**solve simple measure and money problems involving fractions and decimals to two decimal places.**

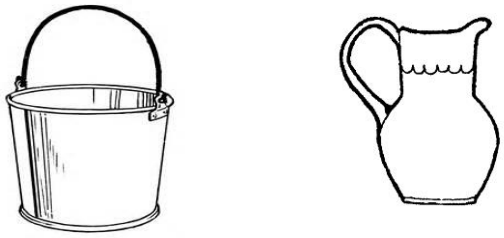
These are the prices in a shoe shop


How much more do the boots cost than the trainers? Rosie buys a pair of trainers and a pair of sandals. How much change does she get from £50?


A box of four balls costs £2.96. How much does each ball cost?

Dean and Alex buy 3 boxes of balls between them. Dean pays £4.50. How much must Alex pay?

A full bucket holds 5½ litres



A full jug holds ½ a litre. How many jugs full of water will fill the bucket?

Harry spent one quarter of his savings on a book. What did the book cost if he saved:

£8…£10…£2.40…?

Max jumped **2.25 metres** on his **second** try at the long jump.

This was **75 centimetres** longer than on his **first** try.

How far in **metres** did he jump on his **first** try?

# YEAR 4 - Measurement

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

## Convert between different units of measure [for example, kilometre to metre; hour to minute]

Children learn the relationships between familiar units of measurement. They learn that kilo means one thousand to help them remember that there are 1000 grams in 1 kilogram and 1000 metres in 1 kilometre.

A bag of flour weighs 2 kg. How many grams is this?

Children can suggest suitable units to measure length, weight and capacity; for example, they suggest a metric unit to measure the length of their book, the weight of a baby, the capacity of a mug. They suggest things that you would measure in kilometres, metres, litres, kilograms, etc.

Children can record lengths using decimal notation, for example recording 5 m 62 cm as 5.62 m, or 1 m 60 cm as 1.6 m. They identify the whole-number, tenths and hundredths parts of numbers presented in decimal notation and relate the whole number, tenths and hundredths parts to metres and centimetres in length.

## measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres

Children can measure the edges of a rectangle and then combine these measurements. They realise that by doing this they are calculating its perimeter.

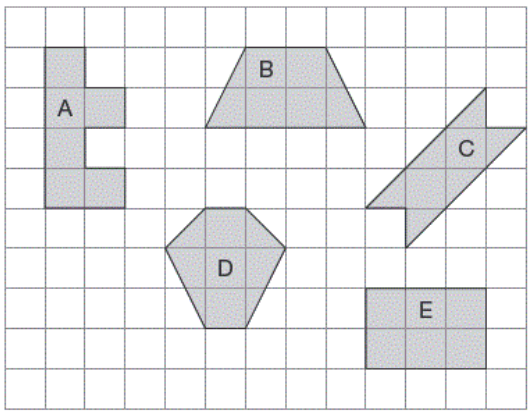
Given the perimeter of a rectangle they investigate what the lengths of its sides could be.

Children can work out the perimeter of irregular shapes drawn on a centimetre square grid.

## Find the area of rectilinear shapes by counting squares

Draw irregular shapes on centimetre square grids, and compare their areas and perimeters.

Here are some shapes




1. What is the perimeter of shape A?
2. What is the area of shape B?
3. Which shape has the smallest area?

**estimate, compare and calculate different measures, including money in pounds and pence**

Use calculation strategies to solve one- and two-step word problems, including those involving money and measures.

Use rounding to estimate the solution, choose an appropriate method of calculation (mental, mental with jottings, written method) and then check to see whether their answer seems sensible. Throw a beanbag three times and find the difference between their longest and shortest throws. After measuring their height, children work out how much taller they would have to grow to be the same height as their teacher.

Solve problems such as:

- Dad bought three tins of paint at £5.68 each. How much change does he get from £20?
- A family sets off to drive 524 miles. After 267 miles, how much further do they still have to go?
- Tins of dog food cost 42p. They are put into packs of 10. How much does one pack of dog food cost? 10 packs?
- A can of soup holds 400 ml. How much do 5 cans hold? Each serving is 200 ml. How many cans would I need for servings for 15 people?
- I spent £4.63, £3.72 and 86p. How much did I spend altogether?
- A string is 6.5 metres long. I cut off 70 cm pieces to tie up some balloons. How many pieces can I cut from the string?
- A jug holds 2 litres. A glass holds 250 ml. How many glasses will the jug fill?
- Dean saves the same amount of money each month. He saves £149.40 in a year. How much money does he save each month?

**read, write and convert time between analogue and digital 12- and 24-hour clocks**

**solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days.**

Raiza got into the pool at 2:26 pm. She swam until 3 o'clock. How long did she swim?

Count on to find the difference between two given times, using a number line or time line where appropriate and use the 24-hour clock to measure time.

Dev leaves school at 15.25

He arrives home at ten past four pm

How many minutes did it take Dev to walk home?

Here are some flights from Manchester

| Flight number | Destination | Take-off time |
|---|---|---|
| AX40 | Paris | 13:35 |
| BH253 | Berlin | 14:05 |
| CG008 | Rome | 15:25 |
| DP369 | Paris | 15:40 |
| EZ44 | Lisbon | 16:15 |
| FJ994 | Dublin | 17:25 |

The flight to Dublin takes fifty minutes.

At what time will the Dublin flight arrive?

The Paris flight lands at 2.45pm, how long does the flight take?

# YEAR 4 – Geometry: Properties of Shape

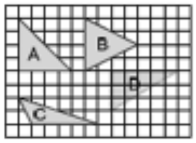
**Examples of what children should be able to do, in relation to each (boxed) Programme of Study statement**

## compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes

Pupils should be able to complete this sentence: All equilateral triangles have …

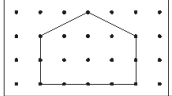
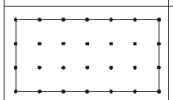
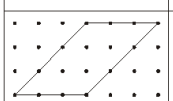
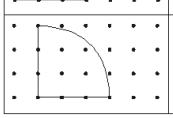
## identify acute and obtuse angles; compare and order angles up to two right angles by size

Here are four triangles drawn on a square grid.




Write the letter for each triangle in the correct region of the sorting diagram. One has been done for you.

| | has a right angle | has an obtuse angle | has an acute angle |
|---|---|---|---|
| is isosceles | A | | |
| is not isosceles | | | |

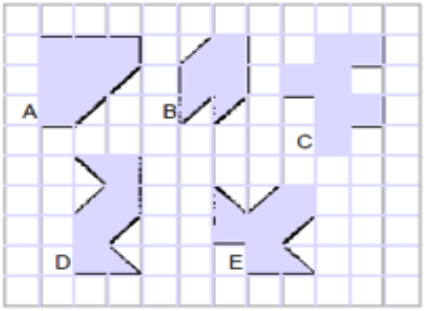
| Shape | It is a quadrilateral | It has one or more right angles |
|---|---|---|
|  | × | ✓ |
|  | | |
|  | | |
|  | | |

Put a tick or a cross in each box.

The first one has been done for you.

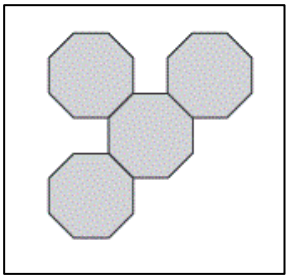
## identify lines of symmetry in 2-D shapes presented in different orientations

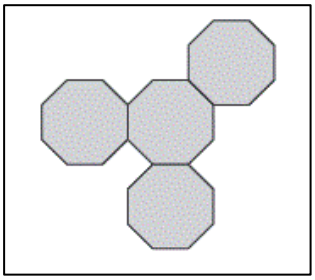
Here are five shapes on a square grid.




Write the letters of the two shapes which have a line of symmetry.

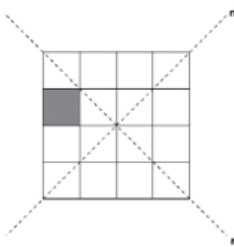
Draw a line of symmetry on each diagram below.
Use a ruler.



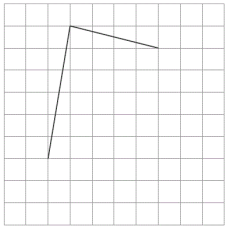


## complete a simple symmetric figure with respect to a specific line of symmetry

Here is a shaded square on a grid. Shade in 3 more squares so that the design is symmetrical in both mirror lines.




Two sides of a kite are drawn on the grid.



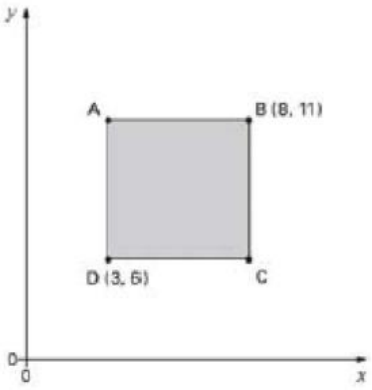
Complete the shape. Use a ruler.

# YEAR 4 – Geometry: Position and Direction

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

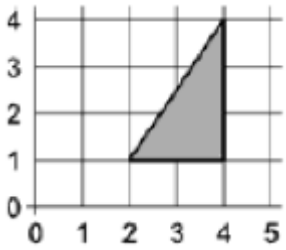
## describe positions on a 2-D grid as coordinates in the first quadrant

Here is a shaded square.



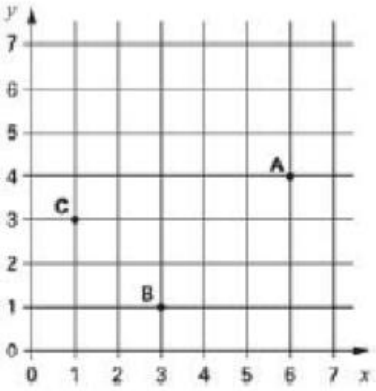

Write the coordinates for point A.

## describe movements between positions as translations of a given unit to the left/right and up/down

| | | |
|---|---|---|
| I can describe where a shape will be after translation | This triangle is translated two squares to the left and one square down.<br><br>Give the coordinates of its vertices in the new position. |  |



## plot specified points and draw sides to complete a given polygon




A, B and C are three corners of a rectangle. What are the coordinates of the fourth corner?

# YEAR 4 - Statistics

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

**interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs**

- Collect data, measuring where necessary. They work with a range of data, such as shoe size and width of shoe across the widest part of the foot, the number of letters in children's names, the width of their hand spans, the distance around their neck and wrist, data from nutrition panels on cereal packets, and so on.
- They decide on a suitable question or hypothesis to explore for each data set they work on. For example, 'We think that…boys have larger shoes than girls', '…our neck measurements are twice as long as our wrist measurements', '…girls' names have more letters than boys' names' or '…children in our class would prefer to come to school by car but they usually have to walk'.
- Children consider what data to collect and how to collect it. They collect their data and organise it in a table. They choose a Venn or Carroll diagram, or a horizontal or vertical pictogram or bar chart to represent the data. Where appropriate, they use the support of an ICT package. They justify their choice within the group so that they can present it.
- They understand that they can join the tops of the bars on the bar-line chart to create a line graph because all the points along the line have meaning.

**solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs**

Undertake one or more of three enquiries:

- What vehicles are very likely to pass the school gate between 10:00 am and 11:00 am? Why? What vehicles would definitely not pass by? Why not? What vehicles would be possible but not very likely? Why? What if it were a different time of day? What if the weather were different?
- Does practice improve estimation skills? Children estimate the lengths of five given lines and record the estimate, measured length and difference. They repeat the activity with five more lines to see whether their estimation skills have improved after feedback.
- What would children in our class most like to change in the school? Children carry out a survey after preliminary research to whittle down the number of options to a sensible number, e.g. no more than five.
- Children identify a hypothesis and decide what data to collect to investigate their hypothesis. They collect the data they need and decide on a suitable representation. In groups, they consider different possibilities for their representation and explain why they have made their choice.
- In the first enquiry, children use tallies and bar charts. In the second, they use tables and bar charts to compare the two sets of measurements. In the third, they use a range of tables and charts to show their results, including Venn and Carroll diagrams. They use ICT where appropriate.

Acknowledgements –

This resource has been collated by the North Yorkshire Mathematics Team using the exemplification of the 2014 National Curriculum which is freely available from NCETM website. The resource has been adapted and revised where there were gaps; errors or further clarification seemed appropriate. We have also included weblinks to appropriate Nrich activities.

Here is a list of other resources you may find useful –

Archimedes Maths Hub/NYCC Mixed age planning:
http://carmelarchimedesmathshub.org.uk/mixed-age-planning/

NCETM Resource Tool:
https://www.ncetm.org.uk/resources/41211

NCETM Teaching for Mastery Y4:
https://www.ncetm.org.uk/public/files/23305615/Mastery_Assessment_Y4_High_Res.pdf

Nrich Curriculum Maps for KS1 and KS2:
http://nrich.maths.org/8935

STEM centre resources:
https://www.stem.org.uk/audience/primary#section--resources

Testbase:
http://www.testbase.co.uk/sec/index.php

White Rose Maths Hub Resources:
https://www.tes.com/teaching-resource/reasoning-and-problem-solving-questions-collection-ks1-and-ks2-11249968

http://www.trinitytsa.co.uk/maths-hub/free-learning-schemes/