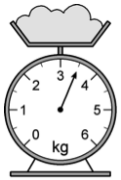
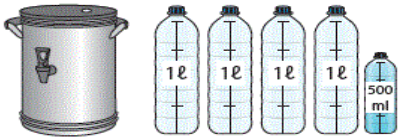
Unit Overview and Guidance

- The exemplification has been taken from the NCETM online 'Resource Toolkit', with additions in order to ensure full coverage.
- Links to the White Rose Maths hubs schemes of work (with questions categorised into the three aims of the national curriculum i.e. fluency, problem solving and reasoning) are hyperlinked to each of the objectives. Many thanks go to the White Rose Maths hub for permission to include their resources.
- The NCETM reasoning questions have also been incorporated into each unit and are identified in pale purple boxes underneath the group of the most relevant objectives.
- The 'big Ideas' sections from the NCETM 'Teaching for Mastery' documents have been included at the start of each unit. Hyperlinks to the full NCETM 'Teaching for Mastery' documents have also been included for easy reference.
- Hyperlinks to NRich activities have also been added to this version. These are found by clicking on the blue buttons like this one at the bottom of relevant objective.
- Some additional content has been added in order to support mixed-aged planning. Any additional content is in *italics*. Occasionally ~~strikethrough~~ has been used to identify when an objective has been altered and this is primarily where an objective has been split between two units.
- Each unit is sub-divided into sections for ease of planning. Sub-categories in this unit are;
    1. Estimate, measure, weigh, compare and convert units
    2. Perimeter, area, volume and capacity
    3. Time

	Yr 3	Yr 4	Yr 5	Yr 6
NCETM Teaching for Mastery Questions, tasks and activities to support assessment	**The Big Ideas** Developing benchmarks to support estimation skills is important as pupils become confident in their use of standard measures. The height of a door frame, for example, is approximately 2 metres, and a bag of sugar weighs approximately 1 kilogram.	**The Big Ideas** The smaller the unit, the greater the number of units needed to measure (that is, there is an inverse relationship between size of unit and measure).	**The Big Ideas** The relationship between area and perimeter is not a simple one. Increasing or decreasing area does not necessarily mean the perimeter increases or decreases respectively, or vice versa. Area is measured in square units. For rectangles, measuring the length and breadth is a shortcut to finding out how many squares would fit into each of these dimensions.	**The Big Ideas** To read a scale, first work out how much each mark or division on the scale represents. The unit of measure must be identified before measuring. Selecting a unit will depend on the size and nature of the item to be measured and the degree of accuracy required.
	Teaching for Mastery Year 3	Teaching for Mastery Year 4	Teaching for Mastery Year 5	Teaching for Mastery Year 6

MEASUREMENT (MEA - 7 weeks)

Strand		Yr3	Yr4	Yr5	Yr6
Estimate, measure, weigh, compare and convert units	Measuring	**measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/m)** Length: children should be able to find something that they think is just shorter/longer than a metre/centimetre/millimetre. They should be able to check whether they are right. What is the difference in length between the pen and the pencil? Mass: Say which object in the classroom is heavier than 100 g/kilogram/half-kilograms and know how to check if they are correct. What is the weight of the flour shown by this scale?  Here is a tea urn and a teapot. The bottles show how much water each can hold.  How much more does the tea urn hold? Capacity: Find a container that they think would hold one litre and check to find out if they were correct. Say what each division on this scale is worth and explain how they worked this out. 1 2 3	**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? 1	**use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation, including scaling** **A day with Grandpa.** (http://nrich.maths.org/5983) 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!	**solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate** Children should be able to draw a flow chart to help someone else convert between mm, cm, m and km. They should know the approximate equivalence between commonly used imperial units and metric units: • 1 litre is approximately 2 pints (more accurately, 1 ¾ pints) • 4.5 litres is approximately 1 gallon or 8 pints • 1 kilogram is approximately 2 lb (more accurately, 2.2 lb) • 30 grams is approximately 1 oz They should be able to answer questions such as: approximately how many litres are there in 3 gallons? Give your answer to the nearest litre.

MEASUREMENT (MEA - 7 weeks)

Estimate, measure, weigh, compare and convert units

Converting Units

add and subtract amounts of money to give change, using both £ and p in practical contexts

Jake wants to buy a comic that costs £1. He saves 25p one week and 40p the next. How much more money does he need to buy the comic?

Add these prices: £6.73, £9.10 and £7.00 to find the total. Find out how much more do you need to add to get £23?

Convert between different units of measure [for example, kilometre to metre;

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.

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

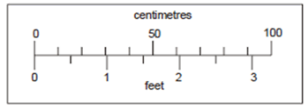
convert between miles and kilometres

Children should know that 8 kilometres is approximately 5 miles

Children should be able to use conversion graphs that show miles/kilometres. They should be able to use it to estimate a distance of 95 miles in kilometres.

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

This scale (not actual size) shows length measurements in centimetres and feet.



Look at the scale. Estimate the number of centimetres that are equal to 2 ½ feet.

Estimate the difference in centimetres between 50 cm and 1 foot.

NCETM Reasoning

Top Tips

Put these measurements in order starting with the largest. Explain your thinking

Half a litre; Quarter of a litre; 300 ml

Position the symbols Place the correct symbol between the measurements > or <

306cm ☐ Half a metre

930 ml ☐ 1 litre

Write more statements

If there are 630ml of water in a jug. How much water do you need to add to end up with a litre of water? What if there was 450 ml to start with?

Position the symbols

Place the correct symbols between the measurements > or < Explain your thinking

£23.60 2326p 2623p

Top Tips

Put these amounts in order starting with the largest. Explain your thinking

Half of three litres; Quarter of two litres; 300 ml

Write more statements

One battery weighs the same as 60 paperclips; One pencil sharpener weighs the same as 20 paperclips.

Write down some more things you know.

How many pencil sharpeners weigh the same as a battery?

The answer is ….

225 metres

What is the question?

Top Tips

Put these amounts in order starting with the largest.

130000cm^2

1.2 m^2

13 m^2

Explain your thinking

The answer is ….

0.3km What is the question?

Write more statements

Mr Smith needs to fill buckets of water. A large bucket holds 6 litres and a small bucket holds 4 litres.

If a jug holds 250 ml and a bottle holds 500 ml suggest some ways of using the jug and bottle to fill the buckets.

Top Tips

Put these amounts in order starting with the largest. Explain your thinking

100 cm^3 1000000 mm^3 1 m^3

What do you notice? 8 km = 5 miles

16km = ☐ miles

4 km = ☐ miles

Fill in the missing number of miles.

Write down some more facts connecting kilometres and miles.

Write more statements

Chen, Megan and Sam have parcels. Megan's parcel weighs 1.2kg and Chen's parcel is 1500g and Sam's parcel is half the weight of Megan's parcel. Write down some other statements about the parcels. How much heavier is Megan's parcel than Chen's parcel?

MEASUREMENT (MEA - 7 weeks)

Perimeter, area, volume and capacity

Perimeter

measure the perimeter of simple 2-D shapes

Measure the sides of regular polygons in centimetres and millimetres and find their perimeters in centimetres and millimetres

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

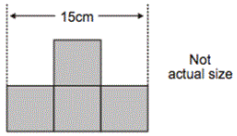
Children can measure the edges of a rectangle and then combine these measurements. They realise that by doing this they are calculating its perimeter.

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

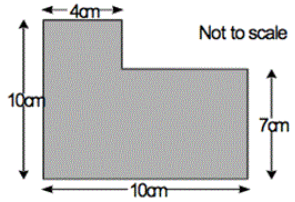
Children can work out the perimeter of irregular shapes drawn on a centimetre square grid.

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



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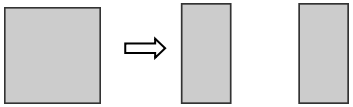
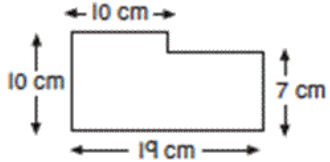
recognise that shapes with the same areas can have different perimeters and vice versa

The perimeter of this square is 72 centimetres. The square is cut in half to make two identical rectangles



What is the perimeter of one rectangle?

Children should be able to calculate the perimeters of compound shapes that can be split into rectangles. What is the perimeter of this shape?



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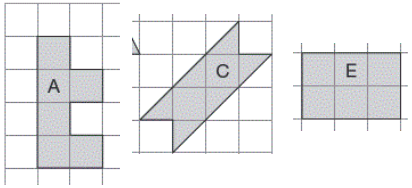
Area

(Y4 adapted) find the area of rectilinear shapes by counting squares(full and half squares only

Here are some shapes

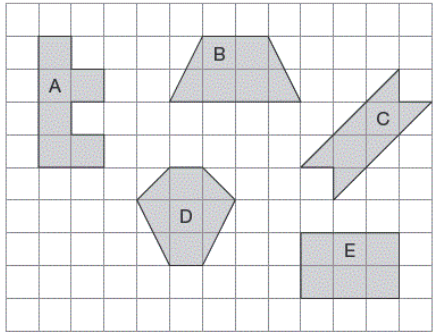


What is the area of each shape? Put them in order from smallest to largest area.

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?

1 2

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

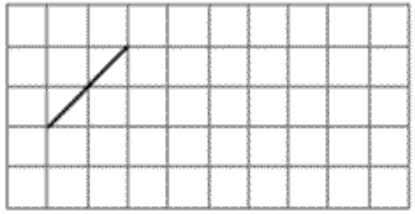
Calculate the area of a rectangle which is eleven metres long by 5 metres wide.

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?

1 2 3 4 5 6 7

calculate the area of parallelograms and triangles

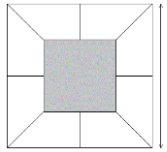
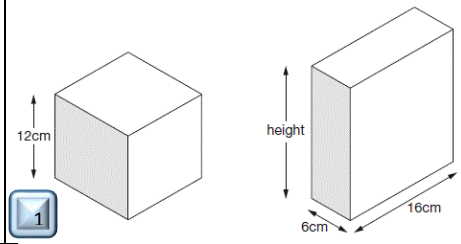
This is a centimetre grid



Draw 3 more lines to make a parallelogram with an area of 10cm^2.

Use a ruler.

MEASUREMENT (MEA - 7 weeks)

Perimeter, area, volume and capacity	Volume			**estimate volume - for example, using 1 cm3 blocks to build cuboids (including cubes) and capacity (for example, using water)** Fill various containers with water. Ask children to order them by smallest to largest volume of water. Estimate the volume of water in each container and check by emptying into a measuring jug and checking	**recognise when it is possible to use formulae for area and volume of shapes** The shaded square is surrounded by 8 identical trapeziums to make a bigger square. The larger square has a side length of 12cm. The shaded square has a side length of 6cm. What is the area of one of the trapeziums?  12 cm^2 **Calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres and cubic metres, and extend to other units (eg mm^3)** This cube and cuboid have the same volume. What is the height of the cuboid? 
	NCETM Reasoning	**Testing conditions** A square has sides of a whole number of centimetres. Which of the following measurements could represent its perimeter?8cm 18cm 24cm 25cm	**Testing conditions** If the width of a rectangle is 3 metres less than the length and the perimeter is between 20 and 30 metres, what could the dimensions of the rectangle lobe? Convince me. **Always, sometimes, never?** If you double the area of a rectangle, you double the perimeter. *See also Geometry Properties of Shape*	**Testing conditions** Shape A is a rectangle that is 4m long and 3m wide. Shape B is a square with sides 3m. The rectangles and squares are put together side by side to make a path which has perimeter between 20 and 30 m. e.g. Can you draw some other arrangements where the perimeter is between 20 and 30 metres? **Always, sometimes, never?** When you cut off a piece of a shape you reduce its area and perimeter. **Other possibilities** A cuboid is made up of 36 smaller cubes. If the cuboid has the length of two of its sides the same what could the dimensions be?	**Testing conditions** A square has the perimeter of 12 cm. When 4 squares are put together, the perimeter of the new shape can be calculated. e.g. What arrangements will give the maximum perimeter? **Always, sometimes, never?** The area of a triangle is half the area of the rectangle that encloses it **Other possibilities** A cuboid has a volume between 200 and 250 cm cubed. Each edge is at least 4cm long. List four possibilities for the dimensions of the cuboid. **The answer is ….** 24 metres cubed, What is the question?

MEASUREMENT (MEA - 7 weeks)

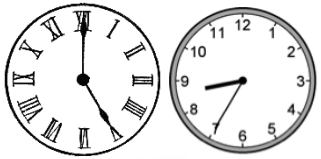
Time

Telling the time

tell and write the time from an analogue clock, including Roman numerals from I to XII, and 12-hour and 24-hour clocks

Read times like this in analogue and digital formats, including those with Roman numerals.

What time does each clock show?



Ben's clock says 7:50 when he gets up. Show this time on a clock face.

estimate and read time with increasing accuracy to the nearest minute,

record and compare time in terms of seconds, minutes, hours and o'clock;

use vocabulary such as a.m./p.m., morning, afternoon, noon and midnight

Kevin leaves home at quarter past 8 and arrives in school at 20 to 9. How long is his journey? How did you work this out?

How long is it between the times shown on these two clocks? How did you work it out?

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

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?

MEASUREMENT (MEA - 7 weeks)

Time

Calculating with time

know the number of seconds in a minute and the number of days in each month, year and leap year

How many minutes is 140 seconds?

What is the date of the day after 30th November?

How many days are they in January?

compare durations of events, for example to calculate the time taken by particular events or tasks

Estimate how long your favourite TV programme lasts. Use a television guide to work out how close your estimation was.

It takes 35 minutes to walk from home to school. I need to be there by 8.55 am. What time do I need to leave home?

How much does it cost to hire a rowing boat for three hours?

Boat Hire	
Motor boats £1.50 for 15 minutes	Rowing boats £2.50 for 1 hour

Sasha pays £3.00 to hire a motor boat. She goes out at 3:20 pm. By what time must she return? Explain how you solved this problem. Could you have done it in a different way?

Sally and Maria both went to the gym on Saturday. Sally was there from 2 pm until 3.30pm. Maria was there from 12.30 pm until 3.15 pm. Who spent the longer time at the gym? How much longer was she there than her friend?

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?

solve problems involving converting between units of time

Kirsty ran a race in one and half minutes.

Mina took ten seconds longer to finish.

How many seconds did Mina take?

Stefan's watch shows the time five minutes past nine.

Stefan's watch is 12 minutes fast.

What is the correct time?

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?

(Y5 extended) solve problems involving converting between units of time

A clock shows the correct time twice a day.

Tick the two digital clocks that show this time.

03:45 02:45 09:45

21:45 14:45

(Y5extended) complete, read and interpret information in tables, including timetables

Here is part of a timetable from Riverdale to Mott Haven.

Riverdale	10:02	10:12	10:31	10:48
Kingsbridge	10:11	10:21	10:38	10:55
Fordham	10:28	10:38	10:54	11:11
Tremont	10:36	10:44	11:00	11:17
Mott Haven	10:53	11:01	11:17	11:34

How many minutes does it take the 10:31 bus from Riverdale to reach Mott Haven?

Mr Evans is at Fordham at 10:30. What is the earliest time he can reach Tremont on the bus?

MEASUREMENT (MEA - 7 weeks)

Time	NCETM Reasoning	**Undoing** A programme lasting 45 minutes finishes at 5.20. At what time did it start? Draw the clock at the start and finish time. **Explain thinking** Salha says that 100 minutes is the same as 1 hour. Is Salha right? Explain why. **Working backwards** Tom's bus journey takes half an hour. He arrives at his destination at 9:25. At what time did his bus leave? 9:05 8:55 8:45 **The answer is ….** 25 minutes What is the question? **What do you notice?** What do you notice? 1 minute = 60 seconds 2 minutes = 120 seconds Continue the pattern Write down some more time facts like these	**Undoing** Imran's swimming lesson lasts 50 minutes and it takes 15 minutes to change and get ready for the lesson. What time does Imran need to arrive if his lesson finishes at 6.15pm? **Explain thinking** The time is 10:35 am. Jack says that the time is closer to 11:00am than to 10:00am. Is Jack right? Explain why. **Working backwards** Put these times of the day in order, starting with the earliest time. A: Quarter to four in the afternoon B: 07:56 C: six minutes to nine in the evening D: 14:36 **What do you notice?** What do you notice? 1:00pm = 13:00 2:00pm = 14:00 Continue the pattern	**Undoing** A school play ends at 6.45pm. The play lasted 2 hours and 35 minutes. What time did it start? **Working backwards** Put these lengths of time in order starting with the longest time. 105 minutes 1 hour 51 minutes 6360 seconds **What do you notice?**What do you notice? 1 minute = 60 seconds 60 minutes = ☐ seconds Fill in the missing number of seconds down some more time facts like this.	**Undoing** A film lasting 200 minutes finished at 17:45. At what time did it start?