Measurement with Reasoning

National Centre for Excellence in the Teaching of Mathematics

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
COMPARING AND ESTIMATING					
compare, describe and solve practical problems for: * lengths and heights [e.g. long/short, longer/shorter, tall/short, double/half] * mass/weight [e.g. heavy/light, heavier than, lighter than] * capacity and volume [e.g. full/empty, more than, less than, half, half full, quarter] * time [e.g. quicker, slower, earlier, later]	compare and order lengths, mass, volume/capacity and record the results using >, < and =		estimate, compare and calculate different measures, including money in pounds and pence (also included in Measuring)	calculate and compare the area of squares and rectangles including using standard units, square centimetres (cm^2) and square metres (m^2) and estimate the area of irregular shapes (also included in measuring) estimate volume (e.g. using 1 cm^3 blocks to build cubes and cuboids) and capacity (e.g. using water)	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.
Top tips How do you know that this (object) is heavier / longer / taller than this one? Explain how you know.	**Top tips** Put these measurements in order starting with the smallest. 75 grammes 85 grammes 100 grammes Explain your thinking **Position the symbols** Place the correct symbol between the measurements > or < 36cm ▭ 63cm	**Top Tips** Put these measurements in order starting with the largest. Half a litre Quarter of a litre 300 ml Explain your thinking **Position the symbols** Place the correct symbol between the measurements > or <	**Top Tips** Put these amounts in order starting with the largest. Half of three litres Quarter of two litres 300 ml Explain your thinking **Position the symbols** Place the correct symbols between the measurements > or <	**Top Tips** Put these amounts in order starting with the largest. 130000cm^2 1.2 m^2 13 m^2 Explain your thinking	**Top Tips** Put these amounts in order starting with the largest. 100 cm^3 1000000 mm^3 1 m^3 Explain your thinking

Measurement with Reasoning

National Centre for Excellence in the Teaching of Mathematics

	130ml ☐ 103ml Explain your thinking	306cm ☐ Half a metre 930 ml ☐ 1 litre Explain your thinking	£23.61 2326p 2623p Explain your thinking		
sequence events in chronological order using language [e.g. before and after, next, first, today, yesterday, tomorrow, morning, afternoon and evening]	compare and sequence intervals of time	compare durations of events, for example to calculate the time taken by particular events or tasks			
		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 (appears also in Telling the Time)			
Explain thinking Ask pupils to reason and make statements about to the order of daily routines in school e.g. daily timetable e.g. we go to PE **after** we go to lunch. Is this true or false?	**Undoing** The film finishes two hours after it starts. It finishes at 4.30. What time did it start? Draw the clock at the start and the finish of the film.	**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.	**Undoing** Imran's swimming lesson lasts 50 mins and it takes 15 mins to change and get ready for the lesson. What time does Imran need to arrive if his lesson finishes at 6.15pm?	**Undoing** A school play ends at 6.45pm. The play lasted 2 hours and 35 minutes. What time did it start?	**Undoing** A film lasting 200 minutes finished at 17:45. At what time did it start?

Measurement with Reasoning

National Centre for Excellence in the Teaching of Mathematics

What do we do before break time? etc.	**Explain thinking** The time is 3:15pm. Kate says that in two hours she will be at her football game which starts at 4:15. Is Kate right? Explain why.	**Explain thinking** Salha says that 100 minutes is the same as 1 hour. Is Salha right? Explain why.	**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.	**Other possibilities** (links with geometry, shape and space) 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? Convince me	**Other possibilities** (links with geometry, shape and space) 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..
MEASURING and CALCULATING					
measure and begin to record the following: * **lengths and heights** * **mass/weight** * **capacity and volume** * **time** (hours, minutes, seconds**)**	choose and use appropriate standard units to estimate and measure **length/height** in any direction (m/cm); **mass** (kg/g); **temperature** (°C); **capacity** (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels	measure, compare, add and subtract: **lengths** (m/cm/mm); **mass** (kg/g); **volume/capacity** (l/ml)	estimate, compare and calculate **different measures,** including **money in pounds and pence** (appears also in Comparing)	use all four operations to solve problems involving measure (e.g. **length, mass, volume, money**) using decimal notation including scaling.	solve problems involving the calculation and conversion of **units of measure**, using decimal notation up to three decimal places where appropriate (appears also in Converting)
Application (Can be practical) Which two pieces of string are the same length as this book?	**Application** (Practical) Draw two lines whose lengths differ by 4cm.	**Write more statements** (You may choose to consider this practically) 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	**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	**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	**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

Measurement with Reasoning

National Centre for Excellence in the Teaching of Mathematics

		to start with? Make up some more questions like this	sharpeners weigh the same as a battery?	fill the buckets.	parcels. How much heavier is Megan's parcel than Chen's parcel?
		measure the **perimeter** of simple 2-D shapes	measure and calculate the **perimeter** of a rectilinear figure (including squares) in centimetres and metres	measure and calculate the **perimeter** of composite rectilinear shapes in centimetres and metres	recognise that shapes with the same areas can have different **perimeters** and vice versa
		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.	**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. For example  Can you draw some other arrangements where the perimeter is between 20 and 30 metres?	**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. For example:  What arrangements will give the maximum perimeter?
recognise and know the value of different denominations of **coins and notes**	recognise and use symbols for pounds **(£) and pence (p)**; combine amounts to make a particular value	add and subtract amounts of **money** to give change, using both £ and p in practical contexts			

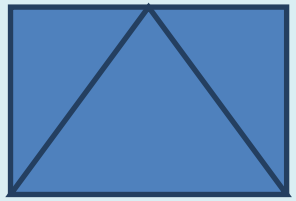
Measurement with Reasoning

National Centre for Excellence in the Teaching of Mathematics

	find different combinations of coins that equal the same amounts of money **solve simple problems** in a practical context involving addition and subtraction of money of the same unit, including giving change				
Possibilities Ella has two silver coins. How much money might she have?	**Possibilities** How many different ways can you make 63p using only 20p, 10p and 1p coins?	**Possibilities** I bought a book which cost between £9 and £10 and I paid with a ten pound note. My change was between 50p and £1 and was all in silver coins. What price could I have paid?	**Possibilities** Adult tickets cost £8 and Children's tickets cost £4. How many adult and children's tickets could I buy for £100 exactly? Can you find more than one way of doing this?		

Measurement with Reasoning

National Centre for Excellence in the Teaching of Mathematics

			find the area of rectilinear shapes by counting squares	calculate and compare the area of squares and rectangles including using standard units, square centimetres (cm^2) and square metres (m^2) and estimate the area of irregular shapes *recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3})* (copied from Multiplication and Division)	calculate the area of parallelograms and triangles calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm^3) and cubic metres (m^3), and extending to other units [e.g. mm^3 and km^3]. recognise when it is possible to use formulae for area and volume of shapes
			Always, sometimes, never If you double the area of a rectangle, you double the perimeter. *See also Geometry Properties of Shape*	**Always, sometimes, never** When you cut off a piece of a shape you reduce its area and perimeter. *See also Geometry Properties of Shape*	**Always, sometimes, never** The area of a triangle is half the area of the rectangle that encloses it: 

Measurement with Reasoning

National Centre for Excellence in the Teaching of Mathematics

					See also Geometry Properties of Shape
TELLING THE TIME					
tell the time to the hour and half past the hour and draw the hands on a clock face to show these times.	tell and write the time to five minutes, including quarter past/to the hour and draw the hands on a clock face to show these times.	tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks	read, write and convert time between analogue and digital 12 and 24-hour clocks (appears also in Converting)		
recognise and use language relating to dates, including days of the week, weeks, months and years	know the number of minutes in an hour and the number of hours in a day. (appears also in Converting)	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 (appears also in Comparing and Estimating)			
			solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days (appears also in Converting)	solve problems involving converting between units of time	

Measurement with Reasoning

National Centre for Excellence in the Teaching of Mathematics

	Working backwards Draw hands on the clock faces to show when break started and when it finished 15 minutes later at 10:35.	**Working backwards** Tom's bus journeytakes half an hour. He arrives at his destination at 9:25. At what time did his bus leave? 9:05 8:55 8:45	**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	**Working backwards** Put these lengths of time in order starting with the longest time. 105 minutes 1 hour 51 minutes 6360 seconds	
CONVERTING					
	know the number of minutes in an hour and the number of hours in a day. (appears also in Telling the Time)	know the number of seconds in a minute and the number of days in each month, year and leap year	convert between different units of measure (e.g. kilometre to metre; hour to minute)	convert between different units of metric measure (e.g. kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre)	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
			read, write and convert time between analogue and digital 12 and 24-hour clocks (appears also in Converting)	solve problems involving converting between units of time	solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate (appears also in Measuring and Calculating)
			solve problems involving converting from hours to	understand and use equivalences between	convert between miles and kilometres

Measurement with Reasoning

National Centre for Excellence in the Teaching of Mathematics

			minutes; minutes to seconds; years to months; weeks to days (appears also in Telling the Time)	metric units and common imperial units such as inches, pounds and pints	
	The answer is …. 3 hours What is the question? **What do you notice?** What do you notice? 1 hour = 60 minutes ½ hour = 30 minutes ¼ hour = 15 minutes Write down some more time facts like these	**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	**The answer is ….** 225 metres What is the question? **What do you notice?** What do you notice? 1:00pm = 13:00 2:00pm = 14:00 Continue the pattern	**The answer is ….** 0.3km What is the question? **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.	**The answer is ….** 24 metres cubed What is the question? **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.