

Level3opaedia

‘A level is a level’

Compiled for www.glosmaths.org, 2009

Please note that Using and Applying assessment criteria are not included within the Levelopaedia

Numbers and the Number System

Understand place value in numbers to 1000	
<p>Represent / compare numbers using number lines, 100-squares, base 10 materials etc.</p> <p>Recognise that some numbers can be represented as different arrays</p> <p>Use understanding of place value to multiply/ divide whole numbers by 10 (whole number answers)</p>	<p>What is wrong: $37 \times 10 = 3700$</p> <p>True/Never/Sometimes: 65 is closer to 70 than it is to 60</p>
Use place value to make approximations	
<p>Round whole numbers to the nearest 10, 100 or 1000.</p>	<p>Show me a number that is 50, when rounded to the nearest 10</p> <p>True/Never/Sometimes: 65 is closer to 70 than it is to 60</p> <p>Convince me that 490 is 0 when rounded to the nearest 1000</p>
Recognise negative numbers in contexts such as temperature	
<p>Order positive and negative whole numbers on a number line.</p> <p>Fill in missing temperatures on a number line from -10°C to 10°C.</p> <p>Order temperatures from coldest to hottest.</p>	<p>Show me a number smaller than 1, and another, and another ...</p> <p>Show me an example of when you would need to use negative numbers</p> <p>True/Never/Sometimes: -4 is bigger than -2</p> <p>Convince me that -9 is smaller than -4</p>
Use simple fractions that are several parts of a whole and recognise when two simple fractions are equivalent	
<p>Understand and use unit fractions such as $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{5}$, $\frac{1}{10}$ and find those fractions of shapes and sets of objects</p> <p>Recognise and record fractions that are several parts of the whole such as $\frac{3}{4}$, $\frac{2}{5}$</p> <p>Recognise some fractions that are equivalent to $\frac{1}{2}$</p>	<p>Show me half of (these items), a third of, a quarter of, ...</p> <p>What is the same/different: $\frac{1}{2}$ and $\frac{5}{10}$</p> <p>Convince me that</p> <ul style="list-style-type: none"> ▪ a half is bigger than a quarter ▪ a half is the same as two quarters
Begin to use decimal notation in contexts such as money	
<p>Know that £3.06 equals 306p</p> <p>Place these long jump results in order, starting with the shortest: 2.07m, 1.89m, 2.65m, 2.30m</p>	<p>Show me a number:</p> <ul style="list-style-type: none"> ▪ between 0.4 and 0.9, and another, ... ▪ smaller than 1, and another, and another ... <p>What is the same/different: 1.4, £1.40, 1.40 and 1.4m</p> <p>True/Never/Sometimes: 3.6 is the same as 3.60</p> <p>Convince me that 6.2 is halfway between 5.9 and 6.5</p>

Calculating

Derive associated division facts from known multiplication facts	
<p>Use mental recall of the 2, 3, 4, 5 and 10 multiplication tables</p> <p>Given a number sentence, use understanding of operations to create related sentences, e.g. given $14 \times 5 = 70$, create $5 \times 14 = 70$, $70 \div 5 = 14$, $70 \div 14 = 5$, $14 \times 5 = 10 \times 5$ add 4×5</p> <p>Use inverses to find missing whole numbers in problems such as, 'I think of number, double it and add 5. The answer is 35. What was my number?'</p>	<p>$7 \times 3 = 21$. What else does this tell you?</p> <p>Here is a multiplication: $6 \times 10 = 60$. Show me a division using the same three numbers</p> <p>$? \div 4 = 23$. Convince me that ? is 92</p>
Add and subtract two-digit numbers mentally	
<p>Calculate $36 + 19$, $63 - 26$, and complements to 100 such as $100 - 24$</p>	<p>Show me 2 two digit numbers with a sum of 73</p> <p>What's wrong with this statement: $91 - 74 = 23$</p> <p>Convince me that $91 - 74 = 17$</p>
Add and subtract three digit numbers using written methods	
<p>Use written methods that involve bridging 10 or 100</p> <p>Add and subtract decimals in the context of money, where bridging is not required</p>	<p>Show me 2 three digit numbers with a sum of 473</p> <p>What's wrong with this statement: $191 - 174 = 23$</p> <p>Convince me that $191 - 174 = 17$</p>
Multiply and divide two digit numbers by 2, 3, 4 or 5 as well as 10 with whole number answers and remainders	
<p>Calculate</p> <ul style="list-style-type: none"> ▪ 49×3 ▪ $52 \div 4$ ▪ 13×10 ▪ $42 \div 10$ 	<p>Show me an example of a number when you divide by 5 gives a remainder of 1</p> <p>What's wrong: $19 \div 3 = 6.1$</p>
Use mental recall of addition and subtraction facts to 20 in solving problems involving larger numbers	
<p>Choose to calculate mentally, on paper or with apparatus</p> <p>Solve one-step whole number problems appropriately</p> <p>Solve two-step problems that involve addition and subtraction</p>	<p>Solve this $13 + ? = ! - 2$. Show me a similar example using number facts to 20</p> <p>$116 + 104 = 210$. How can you correct this?</p> <p>Convince me that $119 - 13 = 106$</p> <p>Convince me that $116 + 104 = 220$</p>
Solve whole-number problems involving multiplication or division, including those that give rise to remainders and round up or down, depending on context	
<p>Identify appropriate operations to use</p> <p>Round up or down after simple division, depending on context</p> <p>Understand finding a quarter of a number of objects as halving the number and halving again.</p> <p>Begin to know multiplication facts for 6, 8, 9 and 7x tables</p>	<p>Always, sometimes or never true: Finding a quarter is halving and halving again?</p>

Algebra

Recognise a wider range of sequences

Continue arithmetic sequences in either direction

Recognise a wider range of sequences including multiples of 2, 5 and 10

Show me an example of a number sequence:

- with an increasing pattern
- with a decreasing pattern

What is the same/different:

4, 7, 10, 13, ... and 13, 10, 7, 4, ...

True/Never/Sometimes: A sequence always goes up in equal steps

Convince me that the number '___' is in this sequence

Begin to understand the role of '=' (the 'equals' sign)

Find the missing numbers in the following: $12 + ? =$
 $\$ + 73 = 100$

Show me two numbers that total 100. Show me a number problem that can be solved using your solution.

What is the same/different about $38 + ? = 100$ and $62 + ? = 100$

True/Never/Sometimes: There are 100 different pairs of numbers that total 100

Shape, Space and Measures

Classify 3-D and 2-D shapes in various ways using mathematical properties such as reflective symmetry for 2-D shapes

Sort objects and shapes using more than one criterion, e.g. pentagon, not pentagon and all edges the same length/not the same length

Sort the shapes which have all edges the same length and all angles the same size from a set of mixed shapes and begin to understand the terms 'regular' and 'irregular'

Recognise right angled and equilateral triangles

Demonstrate that a shape has reflection symmetry by folding and recognise when a shape does not have a line of symmetry

Recognise common 3-D shapes e.g. triangular prism, square-based pyramid

Relate 3-D shapes to drawings and photographs of them, including from different viewpoints

Show me a triangle/quadrilateral/cuboid, and another, and another ...

Show me a shape with one right angle/two equal sides, and another, and another...

What is the same different about (diagrams of) these triangles / quadrilaterals, ...

True/Never/Sometimes: A triangle has a right-angle/obtuse angle, ...

Begin to recognise nets of familiar 3-D shapes, e.g. cube, cuboid, triangular prism, square-based pyramid

Describe the faces on familiar 3-D shapes, e.g. A square-based pyramid has one square face and four triangular faces.

Use nets to make 3-D shapes.

Show me an example of a net of a ..., and another...

What is the same / different about these two nets?

- different nets of the same shape
- of different shapes

How can you change this to make it the net of a ...? (start with an incorrect net)

How can you change this net (e.g. cuboid) to make it the net for this shape (e.g. cube)? How many / which faces do you need to change / add / remove?

True / Never / Sometimes:

- A cuboid has 2 square faces and 4 rectangular faces.
- A triangular prism has 2 triangular faces and 3 rectangular faces.
- The square faces of a cube are all the same size.

Convince me that this cannot be the net of the ...

Recognise shapes in different orientations and reflect shapes, presented on a grid, in a vertical or horizontal mirror line

Recognise angles which are bigger/smaller than 90° and begin to know the terms 'obtuse' and 'acute'

Show me a right/acute/obtuse angle, and another, and another ...

Show me a shape with one right angle/two acute-angles/... , and another, and another...

What is the same different about (diagrams of) these triangles / quadrilaterals, ...

True/Never/Sometimes: A triangle can have an obtuse angle

Convince me that a triangle cannot have two obtuse angles

Describe position and movement

Use everyday words to describe position and

Show me an example of the instructions you could

<p>movement.</p> <p>Use coordinates to describe position on a grid.</p> <p>Use the eight compass directions N, S, E, W, NE, NW, SE, SW.</p>	<p>use to get someone (in classroom) to move from ... to ... Give different instructions for the same movement.</p> <p>Show me an example of the instructions you could use to get from this square to this square (on a grid). Give different instructions for the same movement.</p> <p>Show me an example of the compass directions you could use to get from ... to ... (on a map). Give different instructions for the same movement.</p> <p>How can you change these directions so they start at / end at / avoid going past the ... ?</p> <p>True / Never / Sometimes, using a map of the school:</p> <ul style="list-style-type: none"> ▪ To get to the office, I must go past the staff room. ▪ I can get from Class 2 to Class 5 without turning right. ▪ I will have to turn 4 times on my way from the hall to the Class 3. ▪ Each classroom is next to the corridor. ▪ When I'm facing the notice board, the head teacher's office is on the right. ▪ The stockroom is between the front door and the toilets.
<p><i>Use a wider range of measures including non-standard units and standard metric units of length, capacity and mass in a range of contexts</i></p>	
<p>When measuring objects or reading scales</p> <p>Begin to select appropriate units</p> <p>Begin to understand area as a measure of surface and perimeter as a measure of length</p> <p>Begin to find areas of shapes by counting squares and explain answers as a number of squares even if not using standard units such as cm² or m²</p> <p>Recognise angles as a measure of turn and know that one whole turn is 360 degrees</p>	<p>Show me 3 masses (in grams) with a total of 1kg, where all the masses are greater than 200g</p> <p>True/Never/Sometimes: Large containers have a greater capacity than small ones</p>
<p><i>Use standard units of time</i></p>	
<p>Read a 12-hour clock and generally calculate time durations that do not go over the hour</p>	<p>Show me 2 times with a difference of 30 minutes</p> <p>Show me all 5 times between 2 o'clock and 3 o'clock with a difference of half an hour</p> <p>True/Never/Sometimes: You should use a stop watch in seconds to time a running race</p>

Handling Data

<i>Gather information</i>	
Decide what data to collect to answer a question such as 'what is the most common way to travel to school?'	Show me how we could record this data
Make appropriate choices for recording data, e.g. a tally chart or frequency table	Show me how we could represent this data
	True/Never/Sometimes: The best way to collect information is to ask your friends
<i>Construct bar charts and pictograms, where the symbol represents a group of units</i>	
Decide how best to represent data, for example whether a bar chart, Venn diagram or pictogram would show the information most clearly	Show me a way to represent this data in a chart
Decide upon an appropriate scale for a graph, for example labelled divisions of 2, or, for a pictogram, one symbol to represent 2 or 5	What is wrong with this bar chart (constructed incorrectly using a given table)
	How can you change this bar chart to show that (for example) 12 pupils travel to school by bike
	True/Never/Sometimes: A pictogram is the best way to represent data
<i>Use Venn and Carroll diagrams to record their sorting and classifying of information</i>	
Represent sorting using one or two criteria typical of level 2 and 3 mathematics such as shapes sorted using properties of number of right angles and number of equal sides	Show me an example of a number / shape / object that could go in this space of the Venn / Carroll diagram. Show me another...
	What is wrong:
	<ul style="list-style-type: none"> ▪ There will be no two-digit numbers in this part of the diagram. ▪ Only 3-D shapes will be in this part of the diagram. ▪ The label for this part of the diagram could be ...
	How can you change this label so that this number / shape / object can go in this part of the diagram?
	True / Never / Sometimes:
	<ul style="list-style-type: none"> ▪ A number in the three times table will always go here. ▪ 2-D shapes will go here or here.
	Convince me that this number / shape / object must / cannot go here.
<i>Extract and interpret information presented in simple tables, lists, bar charts and pictograms</i>	
Use a key to interpret represented data	Give me an example of (given an appropriate bar chart/pictogram) a popular pet
Read scales labelled in twos, fives and tens, including reading between labelled divisions such as a point halfway between 40 and 50 or 8 and 10	What is the same/different between this bar chart and this pictogram (constructed from the same data)
Compare data e.g. say how many more... than... and recognise the category that has most/least	Convince me that (given an appropriate bar chart/pictogram) most people in your class have at least one pet
Respond to questions of a more complex nature such as 'How many children took part in this survey altogether?' or 'How would the data differ if we asked the children in year 6?'	