

Ordered strictly alphabetically

p2 2D,

p2 3D,

p2 angle,

p3 area,

p3 changeUnits,

p4 coordinates,

p4 enlarge,

p4 perimeter,

p5 reflect,

p5 rotate,

p6 scaleInterpret,

p6 shapeProblemNC,

p7 translateANDvector,

p7 volume.

2D

11. parts of circles: centre, circumference, diameter, radius: write down the name
10. mixed polygons: 5, 6, 8 or 10 sides: write down the name
7. equilateral, isosceles, right, scalene: recognise or count or write down the name
5. pentagon or hexagon: recognise or count or write down the name
4. square or rectangle: recognise or count or write down the name {NOT that square is special type of rectangle}
3. triangle: recognise or count or write down the name
2. circle: recognise or count or write down the name
1. **scaffold to** write down the mathematical name of a polygon **scaffold is** reminder to count sides and look up table of number of sides and polygon names

3D

12. plan, side and front elevations: recognise solid from or draw or complete {for solids other than a cuboid}
10. count the number of edges, faces, vertices and name e.g. the edge AB or the face ABCD
9. 3D net: name solid
8. 3D solid: write down the mathematical name
7. **scaffold to** work out the surface area of cuboid **scaffold is** given net
6. **scaffold to** name prism or pyramid **scaffold is** given one prism and one pyramid with similar base from similar view point
4. cone or cylinder: recognise or count or write down the name
3. cuboid or sphere: recognise or count or write down the name
2. cube: recognise or count or write down the name
1. use words: solid, flat, 2D and 3D to describe shapes or solids

angle

8. use conventional angle naming e.g. ABC to solve missing angle problems {use skills from layers 4 to 7}
7. use angles in quadrilateral = 360° : to calculate a missing angle {and give reason}
6. use angles in triangle = 180° : to calculate a missing angle {and give reason}
5. use straight line = 180° : to calculate a missing angle {and give reason}
4. use whole turn = 360° : to calculate a missing angle {and give reason}
3. name these types of angle: acute, obtuse, reflex

area

12. work out the area of right triangle {can't count $1/2$ squares}
10. work out the area of parallelogram
8. work out the area of rectangle {width and height labelled, no square grid, so not possible to count squares}
7. work out the area of rectangle {partially obscured rectangle so hard to be accurate without using multiply}
6. work out the area of irregular shape or triangle {by counting squares and half squares}
5. **scaffold to** work out the area of rectangle **scaffold is** given multiplication table
4. **scaffold to** work out the area of rectangle **scaffold is** example which leads from systematically counting squares to using a multiplication table
3. work out the area of irregular shape {by counting squares}
2. **scaffold to** work out the area of rectangle **scaffold is** easy to count squares
1. **scaffold to** state area shape {whole number of cm^2 } **scaffold is** given example

changeUnits

15. convert mm to cm or mm to m or cm to m
14. convert grams to kg, or m to km or millilitres to litres
13. convert kg to grams or km to m or litres to ml
8. convert m to cm
6. **scaffold to** recall metric conversion constants **scaffold is** blank proportional triangle, conversion stick and function diagram
4. convert cm to mm
3. **scaffold to** convert e.g. 7.2 cm to mm {not whole number of cm} **scaffold is** proportional triangle, conversion stick and function diagram {encourage learners to use the scaffold they prefer}
2. **scaffold to** convert e.g. 7 cm to mm {only whole number of cm} **scaffold is** proportional triangle, conversion stick and function diagram {encourage learners to use the scaffold they prefer}
1. **scaffold to** convert cm to mm **scaffold is** correctly aligned measuring stick marked in cm on one edge, the other edge has 0 and 10 mm labelled

coordinate

10. write down the midpoint between 2 coordinates {only first quadrant}
9. plot and write down coordinate {only on x or y axis}
8. write down coordinate {any except on x or y axis}
7. plot coordinate {any except on x or y axis}
5. plot and write down coordinate {only 2nd or 4th quadrants, i.e. only one negative}
4. write down coordinate e.g. (3, 1) {only first quadrant}
3. plot coordinate at e.g. (3, 1) {only first quadrant}
2. **scaffold to** write down coordinate e.g. (3, 1) {only first quadrant} **scaffold is** (,)
labelled with x and y
1. **scaffold to** plot coordinate at e.g. (3, 1) {only first quadrant} **scaffold is** coordinate
labelled with x and y

enlarge

6. describe transformation {always enlargement, scale factor is small positive integer}
5. enlarge shape {has sloping sides}
4. enlarge shape {with only vertical and horizontal lines}
3. **scaffold to** enlarge shape **scaffold is** formula $\text{edge} \times \text{scale factor} = \text{EDGE}$ and one
vertex for enlarged shape drawn {for non rectangles hints on measuring or drawing sloping
side}
2. **scaffold to** enlarge shape {only rectangle} **scaffold is** example calculation and one side
of enlarged shape drawn
1. **scaffold to** enlarge shape {only rectangle} **scaffold is** enlarged edges calculated and 2
enlarged sides drawn

perimeter

8. write down perimeter of square {given length of one side}
7. write down perimeter of rectangle {width and/or height a decimal - no square grid, so not
possible to count}
6. write down perimeter of odd shape {on cm grid}
4. write down perimeter of rectangle {width and height labelled - no square grid, so not
possible to count}
2. write down perimeter of rectangle {on cm grid}

reflect

12. reflect a shape in line $y = x$ or $y = -x$
11. reflect a shape in e.g. the line $x = 3$ or $y = -2$ or $x = 0$ or $y = 0$
10. complete a pattern by shading triangles or squares for the requested number of lines of symmetry {easier as no choice of lines of symmetry}
9. draw on all lines of symmetry or state number of lines of symmetry or choose the shapes with a given number of lines of symmetry {including rectangle and parallelogram}
8. **scaffold to** draw only correct lines of symmetry on parallelogram or rectangle **scaffold is** to reflect/think about reflecting 2 sides of a parallelogram or rectangle in line which is **not** a line of symmetry
7. reflect shape in x or y axis
6. reflect shape {mirror line is diagonal}
5. draw on **all** lines of symmetry {polygons but not hard ones e.g. parallelogram or rectangle}
4. reflect shape {mirror line is horizontal or vertical but NOT on an edge of the shape}
3. **scaffold to** draw a line of symmetry on each shape {there may be more than one} **scaffold is** reminder that some shapes do not have a line of symmetry
2. reflect shape {mirror line is horizontal or vertical and along one edge of shape}
1. **scaffold to** reflect shape {mirror line is horizontal or vertical and along one edge of shape} **scaffold is** instructions on how to use tracing paper

rotate

8. rotate a shape 90/180/270 anti/clockwise about a coordinate {which is **not** on the vertex of the shape - on edge or away from shape}
6. rotate a shape 90/180/270 anti/clockwise about a coordinate {which is on the vertex of the shape}
4. **scaffold to** write down order of rotational symmetry of a shape **scaffold is** worked example
3. rotate a shape 90 anti/clockwise about a symbol
2. complete a shape/shading on a shape with given rotational order of symmetry
1. **scaffold to** complete a shape/shading on a shape with given rotational order of symmetry **scaffold is** instructions to use tracing paper

scaleInterpret

14. measure bearing and interpret length given scale {1 cm represents 1 km or 1m or 100 km or 10 km or 100m or 10m}
13. measure angle {only from horizontal}
12. **scaffold to** measure angle {only from horizontal} **scaffold is** correctly aligned angle measurer given
11. measure bearing
9. **scaffold to** measure bearing {includes 0 to 99} **scaffold is** correctly aligned angle measurer and instructions
8. **scaffold to** measure bearing {only 100 to 359} **scaffold is** correctly aligned angle measurer and instructions
6. measure length in cm {line not horizontal and/or part of a shape}
5. measure length in cm {horizontal line}
4. **scaffold to** use ruler correctly **scaffold is** to explain why Name is incorrect {ONLY use when errors in layer 5}
3. **scaffold to** measure length in cm and mm **scaffold is** pictures of 2 correctly aligned rulers one marked in cm and one marked in mm
2. **scaffold to** measure length of line, {whole number of cm} **scaffold is** ruler placed correctly
1. **scaffold to** measure length of line {whole number of cm} **scaffold is** ruler placed correctly NO mm on ruler

shapeProblemNC

8. draw a rectangle of a given area {paper not large enough for $1 \times$ width or sometimes $2 \times$ width}
4. find missing coordinate vertex {use properties of e.g. rhombus}
3. find area of shape given area clue in pattern {requires multiply or divide}
2. find radius/diameter given pattern of touching circles and radius/diameter clue
1. find missing length in a composite rectangle {requires subtraction only}

translateANDvector

12. write down the vector e.g. $3\mathbf{a} + 2\mathbf{b}$ {but not e.g $3\mathbf{a} - 2\mathbf{b}$ } as a column vector given column vectors \mathbf{a} and \mathbf{b}
11. write down the vector $\mathbf{a} + \mathbf{b}$ as a column vector given column vectors \mathbf{a} and \mathbf{b}
10. write down a vector {shown in diagram} in terms of vectors \mathbf{a} or \mathbf{b} {shown in diagram} e.g. $2\mathbf{a}$ or $3\mathbf{b}$ {but not e.g $-2\mathbf{a}$ }
9. write down the column vector e.g. $2\mathbf{a}$ or $3\mathbf{b}$ given \mathbf{a} and \mathbf{b} as column vectors
8. translate a shape by a column vector
7. write a column vector given a diagram
5. **scaffold to** translate a shape by a column vector **scaffold is** no negatives in column vector
3. translate a shape{in horizontal and vertical direction} description given in words
2. translate a shape{in horizontal or vertical direction} description given in words

volume

9. find the volume of cuboid $\{w \times d \times h$, individual cubes NOT shown}
8. find the volume of odd shape prism {cross section may be counted}
7. **scaffold to** find the volume of odd shape prism {cross section may be counted} **scaffold is** 1 dimension of prism = 1 cm
6. find the volume of cuboid $\{1 \times m \times n$, individual cubes shown, either width or depth = 1} FYI: for some learners this is a trivial extension of layer 3, other learners need to develop their ability to see in 3D
5. find the volume of cuboid $\{w \times d \times h$, individual cubes shown}
4. **scaffold to** find the volume of cuboid $\{w \times d \times h\}$ **scaffold is** alternate layers shaded and asked to complete number of cubes on top layer = ... and number of layers = ...
3. find volume of cuboid: $\{w \times d \times 1\}$
2. find volume of cuboid: $\{1 \times 1 \times n\}$
1. **scaffold to** find volume of cuboid: $\{1 \times 1 \times n\}$ **scaffold is** example given with alternate cubes shaded