Learn with Tayo: Understanding Geometry Answer Booklet for parents

Module 1: Exploring Angles

Worksheet, Ages 8–11 (21 items)

1. Shape maths: 1. 110°; 2. 90°; 3. 60°; 4. 180°

2. Order: 1. Estimate; 2. Line up; 3. Read; 4. Check

3. True or false: 1. True; 2. False; 3. True; 4. False

4. Match up: Vertex = B; Acute angle = D; Obtuse angle = A; Parallel = C

5. Short answers

1. What do we call the point where two arms of an angle meet?
   The vertex.
2. Name an object with a right angle.
   Any: a book corner, a door corner, a window frame, a sheet of paper.
3. Is 150° acute or obtuse?
   Obtuse, because it is between 90° and 180°.
4. Explain in your own words: Explain what an angle measures, in your own words.
   Open answer: the idea explained simply in the learner's own words, with one correct fact.
5. Stretch: How can you tell if you read the wrong scale on a protractor?
   Open answer: a clear explanation using one or two facts from the module.

Worksheet, Ages 12–15 (26 items)

1. Shape maths: 1. 142°; 2. 75°; 3. 47°; 4. 150°; 5. 242°

2. Order: 1. Estimate; 2. Centre; 3. Line up; 4. Choose scale; 5. Read; 6. Check

3. Case study

1. What mistake did Tayo make?
   He read the wrong scale; an acute angle cannot be 140°.
2. What is the correct size of the angle?
   40°

3. What habit would stop this mistake?
   Estimate first and use the scale that starts at 0 on the arm lined up with the zero line.

4. Key terms: Vertex = The point where the two arms of an angle meet.; Acute angle = An angle smaller than 90°.; Obtuse angle = An angle between 90° and 180°.; Parallel = Lines that are always the same distance apart and never meet.; Perpendicular = Lines that meet at a right angle (90°).

5. Think it through

1. Explain why vertically opposite angles are equal.
   Each pair sits on a straight line with the same neighbour angle, so each equals 180° minus that neighbour; they must be equal.
2. Explain how to draw a reflex angle of 290° with a 180° protractor.
   Draw 360° – 290° = 70°, then mark the larger outside angle as the 290° reflex angle.

6. Longer answers and 7. Extended answer

1. Describe the five types of angle with an example size for each.
   Acute 40°, right 90°, obtuse 120°, straight 180°, reflex 250°.
2. Explain the difference between parallel and perpendicular lines.
   Parallel lines stay the same distance apart and never meet; perpendicular lines meet at 90°.
3. At 2 o'clock, what angle do the clock hands make and why?
   60°, because each hour mark is 360° ÷ 12 = 30° and the hands are 2 marks apart.
4. Explain in your own words: Why do angles on a straight line add up to 180°?
   Open answer: an accurate explanation in the learner's own words, with supporting detail.
5. Extended answer: 'You can always measure an angle by just looking at it.' How far do you agree?
   Open answer: an introduction, points for and against with examples and numbers from the module, and a reasoned conclusion.

Quiz

1. An angle of 90° is called...
   B. Right

2. Which angle is obtuse?
   C. 130°
3. Angles on a straight line add up to...
   B. 180°
4. Two lines that never meet are...
   B. Parallel
5. Angles around a point add up to...
   C. 360°
6. Where does the protractor's centre mark go?
   B. On the vertex
7. Explain how to measure an angle with a protractor, step by step.
   Model answer: Estimate the type of angle, put the centre mark on the vertex, line the zero line up with one arm, use the scale starting at 0 on that arm, read where the other arm crosses, and check against the estimate.
8. Find three right angles in your home and describe them.
   Model answer: For example the corner of a door, the corner of a book and where a wall meets the floor: each makes a square corner of 90°.

Checkpoints

Open answers. Look for the learner explaining the idea in their own words, with at least one accurate fact or number from the lesson.

Module 2: Triangles

Worksheet, Ages 8–11 (21 items)

1. Shape maths: 1. 50°; 2. 60°; 3. 30°; 4. 15 cm

2. Order: 1. Look at sides; 2. Name by sides; 3. Name by angles; 4. Check the sum

3. True or false: 1. True; 2. False; 3. True; 4. False

4. Match up: Equilateral = B; Isosceles = D; Scalene = A; Right-angled triangle = C

5. Short answers

1. How many sides and angles does a triangle have?
   Three sides and three angles.
2. Name the triangle with two equal sides.
   Isosceles.
3. What is special about a right-angled triangle?
   It has one angle of exactly 90°.
4. Explain in your own words: How do you name a triangle by its sides?
   Open answer: the idea explained simply in the learner's own words, with one correct fact.
5. Stretch: Why can a triangle not have two right angles?
   Open answer: a clear explanation using one or two facts from the module.

Worksheet, Ages 12–15 (25 items)

1. Shape maths: 1. 20°; 2. 76°; 3. 63°; 4. 14 cm; 5. 68°

2. Order: 1. Look at sides; 2. Name by sides; 3. Look at angles; 4. Name by angles; 5. Check the sum

3. Case study

1. Why did 12, 7 and 4 cm fail?
   7 + 4 = 11, which is less than 12, so the short sides cannot meet.
2. Classify the 12, 7, 9 cm triangle by its sides.
   Scalene: no two sides are equal.

3. Give a whole-number range for the third stick with 12 cm and 7 cm.
   More than 5 cm and less than 19 cm, so 6 cm to 18 cm.

4. Key terms: Equilateral = A triangle with three equal sides and three 60° angles.; Isosceles = A triangle with two equal sides and two equal angles.; Scalene = A triangle with no equal sides.; Right-angled triangle = A triangle with one angle of 90°.; Base = The side a shape stands on, used with the height.

5. Think it through

1. Explain why an exterior angle equals the two opposite interior angles added.
   Exterior + interior = 180° on a line, and the three interior angles also make 180°, so the exterior equals the other two interior angles.
2. Explain why a triangle can have at most one obtuse angle.
   Two obtuse angles would already be more than 180°, leaving nothing for the third angle.

6. Longer answers and 7. Extended answer

1. Classify a triangle with angles 90°, 45° and 45° in two ways.
   Right-angled and isosceles.
2. Explain the triangle inequality with your own example.
   The two shorter sides must add to more than the longest: 5, 6 and 10 works because 11 > 10; 2, 3 and 6 fails.
3. Why are the base angles of an isosceles triangle equal?
   The shape is symmetrical about the line from the top vertex to the middle of the base, so the base angles match.
4. Explain in your own words: Explain why 3 cm, 4 cm and 9 cm cannot make a triangle.
   Open answer: an accurate explanation in the learner's own words, with supporting detail.
5. Extended answer: 'Triangles are the most important shape in building.' How far do you agree?
   Open answer: an introduction, points for and against with examples and numbers from the module, and a reasoned conclusion.

Quiz

1. A triangle with no equal sides is…
   C. Scalene
2. The angles in a triangle add up to…
   B. 180°
3. Each angle of an equilateral triangle is…
   B. 60°
4. Angles 90° and 35°. The third angle is…
   A. 55°
5. Which lengths can make a triangle?
   C. 4, 6, 8 cm
6. An isosceles triangle has…
   B. Two equal sides
7. Can a triangle be both right-angled and isosceles? Explain.
   Model answer: Yes: angles 90°, 45° and 45°, with the two sides next to the right angle equal.
8. Explain how tearing off corners shows the angle sum is 180°.
   Model answer: The three torn corners fit together along a straight line, and angles on a straight line make 180°.

Checkpoints

Open answers. Look for the learner explaining the idea in their own words, with at least one accurate fact or number from the lesson.

Module 3: Quadrilaterals and Polygons

Worksheet, Ages 8–11 (21 items)

1. Shape maths: 1. 80°; 2. 8; 3. 2; 4. 24 cm

2. Order: 1. Count sides; 2. Split; 3. Multiply; 4. Share

3. True or false: 1. True; 2. False; 3. True; 4. False

4. Match up: Polygon = B; Quadrilateral = D; Diagonal = A; Regular polygon = C

5. Short answers

1. Name a quadrilateral with four equal sides.
   A square or a rhombus.
2. What is a diagonal?
   A line joining two corners that are not next to each other.
3. What do the angles in a quadrilateral add up to?
   360°.
4. Explain in your own words: What makes a polygon regular?
   Open answer: the idea explained simply in the learner's own words, with one correct fact.
5. Stretch: Explain why a square is also a rectangle.
   Open answer: a clear explanation using one or two facts from the module.

Worksheet, Ages 12–15 (25 items)

1. Shape maths: 1. 900°; 2. 144°; 3. 20; 4. 90°; 5. 9

2. Order: 1. Count sides; 2. Split; 3. Count triangles; 4. Multiply; 5. Share

3. Case study

1. What is each angle of a regular pentagon?
   108°
2. Why do pentagons leave gaps?
   3 × 108° = 324° and 4 × 108° = 432°; neither is exactly 360°.

3. Why do hexagons work?
   Each angle is 120°, and 3 × 120° = 360° exactly.

4. Key terms: Polygon = A flat closed shape with straight sides.; Quadrilateral = A polygon with four sides.; Diagonal = A line joining two corners that are not next to each other.; Regular polygon = A polygon with all sides and all angles equal.; Trapezium = A quadrilateral with exactly one pair of parallel sides.

5. Think it through

1. Explain the formula n × (n − 3) ÷ 2 for diagonals.
   Each of n corners joins to n − 3 others (not itself or its two neighbours); each diagonal is counted twice, so divide by 2.
2. Explain how diagonals can tell a rhombus from a rectangle.
   Rhombus diagonals cross at right angles; rectangle diagonals are equal in length. A square has both.

6. Longer answers and 7. Extended answer

1. Sort the quadrilateral family by their properties.
   Square: 4 equal sides, 4 right angles. Rectangle: 4 right angles. Rhombus: 4 equal sides. Parallelogram: 2 pairs of parallel sides. Trapezium: 1 pair. Kite: 2 pairs of adjacent equal sides.
2. Explain why (n − 2) × 180° gives the angle sum.
   From one corner the diagonals split the polygon into n − 2 triangles, each with 180°.
3. Find each exterior angle of a regular hexagon and check it with the interior angle.
   360° ÷ 6 = 60°, and 180° − 120° = 60°.
4. Explain in your own words: Why do the angles of a quadrilateral add up to 360°?
   Open answer: an accurate explanation in the learner's own words, with supporting detail.
5. Extended answer: 'A square is just a special kind of rhombus.' How far do you agree?
   Open answer: an introduction, points for and against with examples and numbers from the module, and a reasoned conclusion.

Quiz

1. A polygon with 6 sides is a...
   B. Hexagon

2. Angles in a quadrilateral add up to…
   C. 360°
3. How many diagonals does a pentagon have?
   B. 5
4. A shape with exactly one pair of parallel sides is a…
   B. Trapezium
5. Each angle of a regular hexagon is…
   C. 120°
6. Which is NOT a polygon?
   B. Circle
7. Is every rhombus a square? Explain.
   Model answer: No. A rhombus has four equal sides but its angles need not be 90°; only a rhombus with right angles is a square.
8. Explain how to find the angle sum of a decagon.
   Model answer: Split it into 10 − 2 = 8 triangles from one corner; 8 × 180° = 1440°.

Checkpoints

Open answers. Look for the learner explaining the idea in their own words, with at least one accurate fact or number from the lesson.

Module 4: Perimeter

Worksheet, Ages 8–11 (21 items)

1. Shape maths: 1. 36 cm; 2. 20 cm; 3. 18 cm; 4. 18 cm

2. Order: 1. Units; 2. Missing sides; 3. Add; 4. Label

3. True or false: 1. True; 2. False; 3. True; 4. False

4. Match up: Perimeter = B; Length = D; Regular = A; Rectangle = C

5. Short answers

1. Write the formula for the perimeter of a square.
   $P = 4 \times s$.
2. A rectangle is 6 cm by 4 cm. What is its perimeter?
   20 cm.
3. Why do we need to change mm into cm before adding?
   So all lengths are in the same unit and the total is correct.
4. Explain in your own words: What is perimeter, in your own words?
   Open answer: the idea explained simply in the learner's own words, with one correct fact.
5. Stretch: Why must all sides be in the same unit?
   Open answer: a clear explanation using one or two facts from the module.

Worksheet, Ages 12–15 (25 items)

1. Shape maths: 1. 8 cm; 2. 7.5 cm; 3. 960 cm; 4. 8 cm; 5. 36 cm

2. Order: 1. Units; 2. Missing sides; 3. Mark a start; 4. Add; 5. Label

3. Case study

1. What must length + width add up to?
   12 m, because $24 \div 2 = 12$.
2. List three rectangles he could make.
   Any three: 1×11, 2×10, 3×9, 4×8, 5×7, 6×6 m.

3. Which gives the most space, and how much?
   6 m by 6 m, a square, giving 36 m².

4. Key terms: Perimeter = The total distance around the edge of a flat shape.; Length = How long something is, measured in mm, cm, m or km.; Regular = Having all sides and angles equal.; Rectangle = A quadrilateral with four right angles.; Isoperimetric = Having the same perimeter.

5. Think it through

1. Explain why removing a corner rectangle from a rectangle keeps the same perimeter.
   The two new inside edges are exactly as long as the two pieces of outside edge that were removed, so the total stays the same.
2. Explain how to find a rectangle's width from its perimeter and length.
   Halve the perimeter to get length + width, then subtract the length.

6. Longer answers and 7. Extended answer

1. Compare the perimeters of a 4 × 9 cm rectangle and a 6 × 6 cm square.
   Rectangle 26 cm, square 24 cm.
2. Explain why P = n × s works for regular polygons.
   All n sides have the same length s, so adding them is n lots of s.
3. A rectangle's length is three times its width and its perimeter is 48 cm. Find its sides.
   l + w = 24 and l = 3w, so 4w = 24: width 6 cm, length 18 cm.
4. Explain in your own words: Explain how two shapes can have the same perimeter but look different.
   Open answer: an accurate explanation in the learner's own words, with supporting detail.
5. Extended answer: 'Shapes with the same perimeter are the same size.' How far do you agree?
   Open answer: an introduction, points for and against with examples and numbers from the module, and a reasoned conclusion.

Quiz

1. Perimeter is measured in...
   A. cm

2. Perimeter of a square with 6 cm sides
   B. 24 cm
3. Rectangle 10 cm by 3 cm. Perimeter?
   B. 26 cm
4. A square has perimeter 28 cm. Each side?
   B. 7 cm
5. Regular pentagon, sides 3 cm. Perimeter?
   C. 15 cm
6. Which rectangle has perimeter 20 cm?
   B. 6 cm × 4 cm
7. Explain how to find the perimeter of an L-shape.
   Model answer: Work out the missing sides from the known lengths, change to the same unit, then add all six sides once each.
8. Why does a fence company need the perimeter, not the area?
   Model answer: Fencing goes round the edge, so they need the distance around the outside.

Checkpoints

Open answers. Look for the learner explaining the idea in their own words, with at least one accurate fact or number from the lesson.

Module 5: Area

Worksheet, Ages 8–11 (21 items)

1. Shape maths: 1. 24 cm²; 2. 49 cm²; 3. 20 cm²; 4. 300 mm²

2. Order: 1. Name the shape; 2. Same units; 3. Calculate; 4. Square units

3. True or false: 1. True; 2. False; 3. True; 4. False

4. Match up: Area = B; Square centimetre = D; Height = A; Apothem = C

5. Short answers

1. Write the formula for the area of a rectangle.
   A = length × width.
2. What is the area of a parallelogram with base 5 cm and height 3 cm?
   15 cm².
3. Name a unit for measuring a big field.
   Hectare (or m², km²).
4. Explain in your own words: Explain the difference between area and perimeter.
   Open answer: the idea explained simply in the learner's own words, with one correct fact.
5. Stretch: Why is the area of a triangle half of base × height?
   Open answer: a clear explanation using one or two facts from the module.

Worksheet, Ages 12–15 (26 items)

1. Shape maths: 1. 72 cm²; 2. 45 cm²; 3. 172.5 cm²; 4. 3500 cm²; 5. 7 cm

2. Order: 1. Name the shape; 2. Find measures; 3. Same units; 4. Substitute; 5. Calculate; 6. Square units

3. Case study

1. What is the area of the whole wall?
   13 m²
2. What area needs painting after taking off the door?
   13 − 1.8 = 11.2 m²

3. How many tins do they need for one coat, and why?
   2 tins, because 11.2 m² is more than one tin's 10 m².

4. Key terms: Area = The amount of flat space inside a shape.; Square centimetre = A unit of area: a square with 1 cm sides (cm²).; Height = The perpendicular distance between a base and the opposite side or vertex.; Apothem = The distance from the centre of a regular polygon to the middle of a side.; Hectare = A unit of land area equal to 10,000 m².

5. Think it through

1. Explain how the trapezium formula comes from two triangles or a parallelogram.
   Two identical trapeziums, one turned over, make a parallelogram with base a + b and height h; one trapezium is half of that: (a + b) × h ÷ 2.
2. Explain why a regular polygon's area is perimeter × apothem ÷ 2.
   It splits into n identical triangles with base s and height the apothem; n × s × a ÷ 2 = perimeter × apothem ÷ 2.

6. Longer answers and 7. Extended answer

1. Convert 2.5 dm² to cm² and to mm².
   250 cm² and 25,000 mm².
2. A rectangle and a triangle share a base of 10 cm and a height of 4 cm. Compare their areas.
   Rectangle 40 cm², triangle 20 cm²: the triangle is half.
3. Find the area of a kite with diagonals 14 cm and 9 cm and explain the method.
   14 × 9 ÷ 2 = 63 cm², because the kite fills half of the rectangle around its diagonals.
4. Explain in your own words: Why is 1 m² equal to 10,000 cm² and not 100 cm²?
   Open answer: an accurate explanation in the learner's own words, with supporting detail.
5. Extended answer: 'If you know the perimeter of a shape, you know its area.' How far do you agree?
   Open answer: an introduction, points for and against with examples and numbers from the module, and a reasoned conclusion.

Quiz

1. Area of a 7 cm by 5 cm rectangle
   C. 35 cm²

2. Area of a triangle, base 10 cm, height 6 cm
   B. 30 cm²
3. Rhombus with diagonals 8 cm and 5 cm
   B. 20 cm²
4. 1 m² is equal to...
   C. 10,000 cm²
5. Parallelogram base 9 m, height 4 m
   D. 36 m²
6. 1 hectare is...
   C. 10,000 m²
7. Explain how cutting and sliding shows a parallelogram's area is base × height.
   Model answer: Cut the triangle off one slanted end and move it to the other end; it becomes a rectangle with the same base and height, so the area is base × height.
8. A floor is 4 m by 3 m. How many 50 cm square tiles are needed? Explain.
   Model answer: Each tile is 0.5 × 0.5 = 0.25 m²; the floor is 12 m²; 12 ÷ 0.25 = 48 tiles (8 by 6).

Checkpoints

Open answers. Look for the learner explaining the idea in their own words, with at least one accurate fact or number from the lesson.

Module 6: Circles

Worksheet, Ages 8–11 (21 items)

1. Shape maths: 1. 12 cm; 2. 9 cm; 3. 6.28 cm; 4. 360°

2. Order: 1. Find r; 2. Choose; 3. Area; 4. Units

3. True or false: 1. True; 2. False; 3. True; 4. False

4. Match up: Radius = B; Diameter = D; Circumference = A; Pi (π) = C

5. Short answers

1. What is the circumference of a circle?
   The distance all the way around it.
2. A circle has diameter 20 cm. What is its radius?
   10 cm.
3. Name two circles in your kitchen.
   Any: plate, cup rim, pan, clock, lid.
4. Explain in your own words: What is the difference between radius and diameter?
   Open answer: the idea explained simply in the learner's own words, with one correct fact.
5. Stretch: What does π tell us about every circle?
   Open answer: a clear explanation using one or two facts from the module.

Worksheet, Ages 12–15 (25 items)

1. Shape maths: 1. 94.2 cm; 2. 50.24 cm²; 3. 10 cm; 4. 25.12 cm²; 5. 18.84 cm²

2. Order: 1. Find r; 2. Choose; 3. Circumference; 4. Area; 5. Units

3. Case study

1. How far does the wheel travel in one turn (π ≈ 3.14)?
   157 cm
2. How far did Tayo ride in metres?
   400 × 157 = 62,800 cm = 628 m

3. How many turns for 1 km, to the nearest whole turn?
   100,000 ÷ 157 ≈ 637 turns

4. Key terms: Radius = The distance from the centre of a circle to its edge.; Diameter = A line through the centre from edge to edge; twice the radius.; Circumference = The distance around a circle.; Pi (π) = The circumference divided by the diameter, about 3.14.; Chord = A straight line joining two points on a circle.

5. Think it through

1. Explain why the area of a circle is π r², using the slice method.
   Slices rearranged make a near-rectangle with height r and length half the circumference, π r; area = π r × r.
2. Explain why doubling the radius makes the area four times bigger.
   Area uses r × r; doubling r gives 2r × 2r = 4 r², so four times the area.

6. Longer answers and 7. Extended answer

1. Find the perimeter of a semicircle with diameter 10 cm (π ≈ 3.14).
   Half circumference 15.7 cm + diameter 10 cm = 25.7 cm.
2. Explain the difference between a chord, a radius and a diameter.
   A radius goes from centre to edge; a chord joins two edge points; a diameter is a chord through the centre.
3. A pizza of diameter 30 cm or two of diameter 20 cm: which gives more pizza (π ≈ 3.14)?
   One 30 cm: 706.5 cm²; two 20 cm: 2 × 314 = 628 cm². The single big pizza gives more.
4. Explain in your own words: Why do we square the radius to find the area?
   Open answer: an accurate explanation in the learner's own words, with supporting detail.
5. Extended answer: 'Circles are the most useful shape humans have ever used.' How far do you agree?
   Open answer: an introduction, points for and against with examples and numbers from the module, and a reasoned conclusion.

Quiz

1. Radius 4 cm. Diameter?
   B. 8 cm

2. π is about…
   B. 3.14
3. Circumference of a circle with d = 10 cm (π ≈ 3.14)
   A. 31.4 cm
4. Area of a circle with r = 10 cm (π ≈ 3.14)
   C. 314 cm²
5. The longest chord is the…
   C. Diameter
6. A 90° sector is what fraction of a circle?
   C. 1/4
7. Explain how you could find π using a tin can, string and a ruler.
   Model answer: Wrap string round the can to measure the circumference, measure the diameter, then divide circumference by diameter: about 3.14.
8. Why does a wheel with a bigger diameter travel further in one turn?
   Model answer: Distance in one turn is the circumference, π × d, so a bigger diameter gives a bigger circumference.

Checkpoints

Open answers. Look for the learner explaining the idea in their own words, with at least one accurate fact or number from the lesson.

Module 7: Solids and Nets

Worksheet, Ages 8–11 (21 items)

1. Shape maths: 1. 12; 2. 8; 3. 5; 4. 24 cm³

2. Order: 1. Identify; 2. Count faces; 3. Check folding; 4. Add areas

3. True or false: 1. True; 2. False; 3. True; 4. False

4. Match up: Face = B; Edge = D; Vertex = A; Net = C

5. Short answers

1. Name a solid with only one curved surface and no edges.
   A sphere.
2. What shapes make the net of a cylinder?
   Two circles and a rectangle.
3. Name an everyday object shaped like a cuboid.
   Any: a box, a brick, a book.
4. Explain in your own words: What is the difference between a face, an edge and a vertex?
   Open answer: the idea explained simply in the learner's own words, with one correct fact.
5. Stretch: What is a net, and why does not every arrangement of squares make a cube?
   Open answer: a clear explanation using one or two facts from the module.

Worksheet, Ages 12–15 (25 items)

1. Shape maths: 1. 108 cm²; 2. 343 cm³; 3. 30 litres; 4. 18; 5. 18

2. Order: 1. Identify; 2. Count faces; 3. Draw a net; 4. Check folding; 5. Add areas

3. Case study

1. What is the surface area of the box?
   2 × (80 + 50 + 40) = 340 cm²
2. What is its volume?
   400 cm³

3. Is the sheet big enough in area? Explain.
   The sheet is 600 cm², more than 340 cm², but the net must also fit its shape, so he should sketch it first.

4. Key terms: Face = A flat surface of a solid.; Edge = A line where two faces meet.; Vertex = A corner where edges meet (plural: vertices).; Net = A flat shape that folds up to make a solid.; Prism = A solid with two identical ends joined by rectangles.

5. Think it through

1. Explain why some arrangements of six squares are not cube nets.
   When folded, two squares land on the same face and one face is left open.
2. Explain why volume uses cubic units.
   Volume counts how many unit cubes fit inside, using length, width and height.

6. Longer answers and 7. Extended answer

1. Check Euler's rule for a square-based pyramid.
   5 faces + 5 vertices − 8 edges = 2.
2. Find the surface area and volume of a cube with 4 cm edges.
   Surface area 96 cm², volume 64 cm³.
3. Compare a prism and a pyramid with the same base.
   A prism has two bases and rectangular sides; a pyramid has one base and triangular sides meeting at an apex.
4. Explain in your own words: How is surface area different from volume?
   Open answer: an accurate explanation in the learner's own words, with supporting detail.
5. Extended answer: 'A net is the best way to understand a 3D shape.' How far do you agree?
   Open answer: an introduction, points for and against with examples and numbers from the module, and a reasoned conclusion.

Quiz

1. How many faces does a cube have?
   B. 6
2. A pyramid's point is called the...
   B. Apex

3. Volume of a 5 × 2 × 3 cm cuboid
   B. 30 cm³
4. Which solid has a curved surface?
   C. Cylinder
5. Faces + vertices − edges for a polyhedron equals…
   C. 2
6. How many different cube nets are there?
   C. 11
7. Describe the net of a triangular prism.
   Model answer: Two identical triangles and three rectangles, joined edge to edge so they fold up to close.
8. Why might a box company care about surface area?
   Model answer: Surface area is the amount of card needed, which affects the cost and waste.

Checkpoints

Open answers. Look for the learner explaining the idea in their own words, with at least one accurate fact or number from the lesson.

Module 8: Moving Shapes on a Grid

Worksheet, Ages 8–11 (21 items)

1. Shape maths: 1. 6; 2. 2; 3. 15 cm; 4. 3

2. Order: 1. Start at origin; 2. Go across; 3. Mark the point; 4. Join

3. True or false: 1. True; 2. False; 3. True; 4. False

4. Match up: Origin = B; Coordinates = D; Translation = A; Reflection = C

5. Short answers

1. What are the coordinates of the origin?
   (0, 0).
2. Name the transformation that turns a shape.
   Rotation.
3. How many lines of symmetry does a circle have?
   Infinitely many: any line through the centre.
4. Explain in your own words: How do you plot the point (4, −2)?
   Open answer: the idea explained simply in the learner's own words, with one correct fact.
5. Stretch: What is the difference between a translation and a reflection?
   Open answer: a clear explanation using one or two facts from the module.

Worksheet, Ages 12–15 (25 items)

1. Shape maths: 1. 7; 2. 9; 3. 1500 m; 4. 6; 5. 7

2. Order: 1. Start at origin; 2. Go across; 3. Go up or down; 4. Mark the point; 5. Join

3. Case study

1. Where does Q(2, 1) go after reflecting in the y-axis?
   (−2, 1), which is S.
2. Why does the kite land on itself?
   The y-axis is its line of symmetry.

3. Translate the kite 5 right. Give the new P.
   (5, 4)

4. Key terms: Origin = The point (0, 0) where the axes cross.; Coordinates = A pair of numbers (x, y) giving a point's position.; Translation = A slide of a shape without turning or flipping.; Reflection = A flip of a shape in a mirror line.; Rotation = A turn of a shape about a centre point.

5. Think it through

1. Explain why areas multiply by k × k in an enlargement.
   Both the length and the width are multiplied by k, so the area is multiplied by k × k.
2. Explain how to rotate a point 180° about the origin.
   Change the sign of both coordinates: (x, y) becomes (–x, –y).

6. Longer answers and 7. Extended answer

1. Plot and name the shape A(1, 1), B(5, 1), C(5, 4), D(1, 4).
   A rectangle 4 by 3 units.
2. Describe two different transformations that move (2, 3) to (–2, 3).
   A reflection in the y-axis, or a translation 4 left.
3. A map scale is 1 : 100,000. How far is 3.5 cm in real life?
   350,000 cm = 3.5 km.
4. Explain in your own words: Why is an enlargement not an isometry?
   Open answer: an accurate explanation in the learner's own words, with supporting detail.
5. Extended answer: 'Transformations are just for maths lessons.' How far do you agree?
   Open answer: an introduction, points for and against with examples and numbers from the module, and a reasoned conclusion.

Quiz

1. The origin is...
   B. (0, 0)
2. In (5, 2), which number goes across?
   A. 5
3. A slide without turning is a...
   C. Translation

4. Lines of symmetry in a square
   C. 4
5. Reflect (3, 4) in the y-axis
   B. (–3, 4)
6. Scale factor 2 makes lengths…
   C. Twice as long
7. Explain why rotations, reflections and translations are called isometries.
   Model answer: They move a shape without changing its lengths or angles, so the image is identical in size and shape.
8. Design a shape with exactly one line of symmetry and describe it.
   Model answer: For example an isosceles triangle or a heart: one mirror line down the middle, the two halves match.

Checkpoints

Open answers. Look for the learner explaining the idea in their own words, with at least one accurate fact or number from the lesson.