Worksheet - Angles and parallel lines

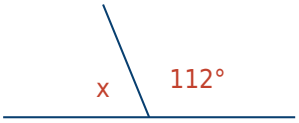
Year: Year 7 · 20

Show your working.

Question 1

Question 1 – Angles on a line and at a point *(Section A · Skills practice)*

Work out the size of each unknown angle. Give a reason for each answer.



a. Angles on a straight line: one angle is 112°. Find x.
b. Three angles on a straight line are 48°, 75° and y. Find y.
c. Angles around a point are 130°, 95°, 70° and z. Find z.
d. Two angles on a straight line are in the ratio 2 : 7. Find both angles.

Question 2

Question 2 – Triangles *(Section A · Skills practice)*

Find the missing angle in each triangle. State the type of triangle.

a. Angles 52°, 68° and a.
b. Angles 90°, 35° and b.
c. An isosceles triangle has a top angle of 40°. Find the two equal base angles.
d. An isosceles triangle has one base angle of 72°. Find the other two angles.

Question 3

Question 3 – Quadrilaterals *(Section A · Skills practice)*

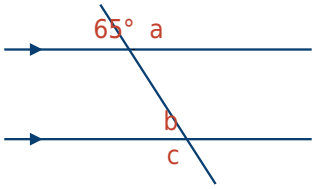
Find the unknown angle in each quadrilateral.

a. Angles 85°, 110°, 95° and p.
b. A parallelogram has one angle of 65°. Find the other three angles.
c. A kite has angles 120°, 70°, 70° and q. Find q.
d. A trapezium has two angles of 90° and one angle of 54°. Find the fourth angle.

Question 4

Question 4 – Parallel lines *(Section A · Skills practice)*

Two parallel lines are cut by a transversal. One of the angles is 65°.



a. Write the size of a and give the reason.
b. Write the size of b and give the reason.
c. Write the size of c and give the reason.

Question 5

Question 5 – Naming and measuring angles *(Section A · Skills practice)*

Answer these questions about angle types.

a. Name the type of angle: 35°, 90°, 140°, 200°.
b. Estimate the size of an angle that is just under a right angle.
c. What angle does the minute hand of a clock turn through between 2:00 and 2:20?
d. What is the smallest angle between the hands of a clock at 4:00?

Question 6

Question 6 – Using algebra with angles *(Section A · Skills practice)*

Form an equation and solve it to find x.

a. Angles on a straight line: 3x and 2x + 30.
b. Angles in a triangle: x, 2x and 3x.
c. Angles in a quadrilateral: x, x + 20, 2x and 100.

Question 7

Question 7 – The roof truss *(Section B · Real-life practice)*

A carpenter builds the roof of a garden shed. The triangular end of the roof is isosceles. The angle at the top (the apex) is 100°.

a. Work out the size of each base angle.
b. The carpenter wants a different roof with base angles of 35°. What is the apex angle?
c. A support beam goes from the apex to the middle of the base and makes a right angle with the base. Work out the angles it makes with the sloping sides in the first roof.

Question 8

Question 8 – Sails on a boat *(Section B · Real-life practice)*

The main sail of a dinghy is a triangle. Two of its angles are 78° and 57°. The third angle is at the top of the mast.

a. Work out the angle at the top of the mast.
b. A smaller sail has angles 78°, 57° and 45°. Is it the same shape as the main sail? Explain.
c. The jib is an isosceles triangle with a 38° angle at the top. Find the base angles.
d. What type of triangle is the main sail?

Question 9

Question 9 – The clock face *(Section B · Real-life practice)*

A clock on a school wall has a diameter of 40 cm. The hour hand is shorter than the minute hand.

a. What angle does the minute hand turn through in 10 minutes?
b. What angle does the hour hand turn through in 1 hour?
c. What is the angle between the hour hand and the minute hand at 3:00?
d. At what time between 12:00 and 1:00 are the hands at 180° to each other? Work out in minutes, to the nearest minute.

Question 10

Question 10 – Bearings and compass directions *(Section B · Real-life practice)*

A hiker walks north. She then turns clockwise through 90° and walks east. After lunch she turns clockwise through a further 135°.

a. In which direction is she facing after the first turn?
b. What direction is she facing after the second turn? (N, NE, E, SE, S, SW, W, NW)
c. Through what angle must she turn to face north again if she turns clockwise from her new direction?
d. She turns anticlockwise through 45° from facing north. What direction is that?

Question 11

Question 11 – Parallel lines on a map *(Section B · Real-life practice)*

On a map two straight roads are parallel. A third road crosses them. At the first crossing the angle between the new road and the first parallel road, on the left of the new road and above the first road, is 48°.

a. Write down the size of the corresponding angle at the second crossing.
b. Work out the size of the alternate angle (inside the two parallel roads, on the opposite side of the new road).
c. Work out the size of the co-interior angle (inside the roads, on the same side of the new road).
d. Explain why the two co-interior angles add up to 180°.

Question 12

Question 12 – The kite *(Section B · Real-life practice)*

Ben builds a kite from wooden sticks. The kite is a quadrilateral with two pairs of equal adjacent sides. Work out the missing angles.

a. The angles at the two sides of the kite where the sides are different lengths are both 70°. The top angle is 100°. Work out the bottom angle.
b. A second kite has top angle 90°, side angles 85°, 85°. Find the bottom angle.
c. A kite has a line of symmetry. Explain why the two side angles are equal.

Question 13

Question 13 – Floor tiles *(Section B · Real-life practice)*

Regular polygons can tile a floor if their angles fit together around a point. A decorator wants to use regular hexagons and equilateral triangles.

a. What is the size of each angle in an equilateral triangle?
b. The angle of a regular hexagon is 120°. How many hexagons fit around a point?
c. How many triangles fit around a point?
d. Show that two hexagons and two triangles fit round a point.

Question 14

Question 14 – The ladder and the wall *(Section B · Real-life practice)*

A window cleaner leans a ladder against a vertical wall on flat ground. The ladder makes an angle of 68° with the ground. The wall and the ground meet at a right angle.

a. Work out the angle between the ladder and the wall.
b. For safety the angle with the ground should be between 70° and 80°. Is the ladder safe? Explain.
c. The cleaner moves the base closer to the wall so the angle with the ground increases by 9°. What is the new angle with the ground and with the wall?
d. The ladder, the wall and the ground make a triangle. Name the type of triangle.

Question 15

Question 15 – Multi-step angle problem *(Section C · Problem solving)*

In triangle ABC, angle A is 50°. Angle B is 20° more than angle C. Point D is on the line BC extended beyond C.

a. Write angle B in terms of C and form an equation.
b. Solve it to find angles B and C.
c. Work out the exterior angle ACD.
d. Explain why the exterior angle equals the sum of the two opposite interior angles.

Question 16

Question 16 – Find the angles *(Section C · Problem solving)*

Lines AB and CD are parallel. A transversal crosses them at P and Q. Angle APQ is (3x + 10)° and angle PQD is (5x - 30)° and they are alternate angles.

a. Write an equation and solve it for x.
b. Work out the size of the angles.
c. Work out the co-interior angle to angle APQ.
d. The transversal makes the same angle with line AB as with line CD (corresponding). Write this angle.

Question 17

Question 17 – Bearings problem *(Section C · Problem solving)*

A ship sails 10 km on a bearing of 060° then turns and sails 10 km on a bearing of 180°. Draw a sketch of the journey (a triangle).

a. Work out the angle between the first leg and the second leg of the journey (inside the triangle).
b. The triangle is isosceles. Work out its other two angles.
c. What is the bearing from the end point back to the start? (Hint: you need the angle between north and the line.)

Question 18

Question 18 – Spot the mistake *(Section C · Problem solving)*

Each pupil made one mistake. Find it and correct it.

a. Ali: angles on a straight line are 130° and x, so x = 230°.
b. Beth: the angles of a triangle are 60°, 70°, 80°.
c. Carl: co-interior angles are equal.
d. Dina: the angles in a quadrilateral are 90°, 90°, 90° and 100°.

Question 19

Question 19 – The parallelogram garden *(Section C · Problem solving)*

A garden bed is a parallelogram ABCD. Angle A is (2x + 5)° and angle B is (4x - 5)°.

a. Explain why angles A and B add to 180°.
b. Form and solve an equation for x.
c. Work out all four angles.
d. Opposite angles are equal. Check your answer for angles C and D.

Question 20

Question 20 – Challenge: angles in a polygon *(Section D · Challenge)*

The sum of the interior angles of a polygon with n sides is 180(n - 2) degrees.

a. Work out the sum of the angles of a pentagon and a hexagon.
b. Work out each angle of a regular pentagon.
c. A regular polygon has interior angles of 150°. How many sides does it have?
d. Explain why the exterior angles of any polygon add up to 360°.