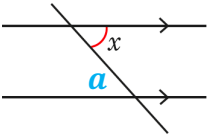
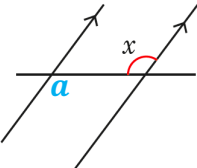
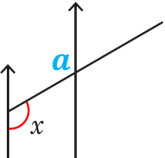
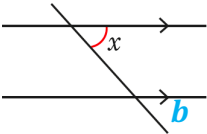
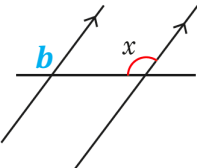
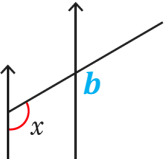
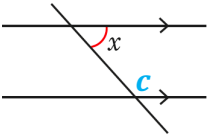
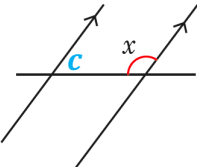
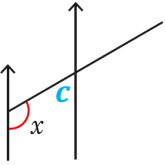


Question	Answer
1	<p>a) i) </p> <p>ii) </p> <p>iii) </p> <p>b) They are equal because alternate angles are equal.</p>
2	<p>a) $w = 39^\circ$ b) $w = 119^\circ$ c) $w = 82^\circ$ d) $w = 79^\circ$</p>
3	<p>a) i) </p> <p>ii) </p> <p>iii) </p> <p>b) They are equal because corresponding angles are equal.</p>
4	<p>a) $y = 131^\circ$ b) $y = 89^\circ$ c) $y = 76^\circ$ d) $y = 63^\circ$</p>

Question	Answer
5	<p>a) i) </p> <p>ii) </p> <p>iii) </p> <p>b) They sum to 180° because co-interior angles sum to 180°.</p>
6	<p>a) $p = 127^\circ$ b) $q = 39^\circ$ c) $r = 47^\circ$ d) $s = 68^\circ$</p>
7	<p>a) $x = 57^\circ$ alternate angles are equal. b) $y = 109^\circ$ co-interior angles sum to 180°</p>
8	<p>a) Huan has assumed that the angles are either alternate or corresponding. b) $z = 49^\circ$ Students may have used different methods, e.g.: angles on a straight line sum to 180°, then alternate angles are equal alternate angles are equal, then angles on a straight line sum to 180° vertically opposite angles are equal, then co-interior angles sum to 180°</p>

Y9 – Spring – Block 4 – Step 2 – Solve angle problems (using chains of reasoning) Answers

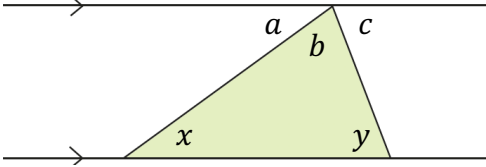
Question	Answer
1	a) equal vertically opposite angles are equal b) sum to 180° angles on a straight line sum to 180° c) equal corresponding angles are equal d) equal alternate angles are equal e) sum to 180° co-interior angles sum to 180° f) sum to 360° angles round a point sum to 360°
2	a) 49° angles on a straight line sum to 180° b) 49° alternate angles are equal
3	$x = 111^\circ$ angles on a straight line sum to 180° , followed by corresponding angles are equal or corresponding angles are equal, followed by angles on a straight line sum to 180°
4	a) 83° angles on a straight line sum to 180° b) 26° angles in a triangle sum to 180° c) 71° alternate angles are equal
5	a) $g = 36^\circ$ vertically opposite angles are equal, corresponding angles are equal and angles in a triangle sum to 180° b) $q = 241^\circ$ co-interior angles sum to 180° and angles round a point sum to 360° c) $t = 47^\circ$ corresponding angles are equal, angles on a straight line sum to 180° , vertically opposite angles are equal and angles in a triangle sum to 180° d) $m = 38^\circ$ corresponding angles are equal, angles on a straight line sum to 180° and base angles in an isosceles triangle are equal. e) $n = 165^\circ$ angles on a straight line sum to 180° , alternate angles are equal and angles in a triangle sum to 180° Students may have used a different chain of reasoning.

Y9 - Spring - Block 4 - Step 3 - Angle problems with algebra Answers

Question	Answer
1	a) $5x + 90 = 180$ $x = 18^\circ$ b) $a + 23 = 78$ $a = 55^\circ$ c) $2y + 5y + 3y = 180$ $y = 18^\circ$ d) $2b + 3b + b = 180$ $b = 30^\circ$ e) $10p = 60, 12q = 60$ $p = 6^\circ, q = 5^\circ$ f) $m + 19 = 37, 37 + m + 19 + 2k = 180$ $k = 53^\circ, m = 18^\circ$
2	a) $3x + 10 = x + 54$ $x = 22^\circ$ b) $2(5x - 9) + 90 = 180$ $x = 10.8^\circ$ c) $7x - 31 = 4x + 26$ $x = 19^\circ$ d) $8x - 3 + 6x + 1 = 180$ $x = 13^\circ$
3	Yes. $3x - 7 + 4x - 1 + 5x + 20 = 180$ $12x + 12 = 180$ $12x = 168$ $x = 14^\circ$ $3x - 7 = 35, 4x - 1 = 55, 5x + 20 = 90$ So the three angles are $35^\circ, 55^\circ, 90^\circ$.
4	$m = 107^\circ$
5	87°
6	$3n - 7 = 5n - 37 \quad n = 15^\circ$ $4y + 3 \times 15 - 7 = 180 \quad y = 35.5^\circ$ So $y - 2.5 = 33^\circ$, which is equal to the angle shown as 33° . So these two angles are alternate angles between the parallel lines AB and CD.
7	$z = 88^\circ$
8	$s = 0.85^\circ$

Y9 – Spring – Block 4 – Step 4 – Conjectures with angles Answers

Question	Answer
1	<p>a) multiple possible answers, e.g.: $80^\circ + 80^\circ = 160^\circ$, which is not acute.</p> <p>b) When the transversal is perpendicular to the parallel lines, both co-interior angles are 90°.</p> <p>c) multiple possible answers, e.g.: A triangle can have angles $20^\circ, 20^\circ$ and 140°. 140° is not acute.</p> <p>d) multiple possible answers, e.g.: $100^\circ + 100^\circ = 200^\circ$, which is less than a full turn.</p> <p>Apart from part b), students are likely to have chosen different counterexamples.</p>
2	<p>Yes. An obtuse angle is between 90° and 180°. Let the two angles be $90 + a$ and $90 + b$, where a and b are both less than 90°. $90 + a + 90 + b = 180 + a + b$, which is greater than an obtuse angle.</p>
3	<p>multiple possible answers, e.g.:</p> <p>a) The sum of two reflex angles is greater than a full turn.</p> <p>b) A reflex angle is between 180° and 360°. Let the two angles be $180 + a$ and $180 + b$, where a and b are both less than 180°. $180 + a + 180 + b = 360 + a + b$, which is greater than 360°.</p> <p>c) The sum of two reflex angles is greater than a full turn.</p> <p>An alternative conjecture could be: The sum of two reflex angles cannot be a reflex angle.</p>
4	<p>a) i) One angle is 90°, so the other two angles sum to 90°. Therefore both these angles are less than 90°, so are acute. ii) Dora's conjecture is correct.</p> <p>b) i) If one angle is a right angle, the other two angles sum to 90°. An angle cannot be 0°, so both these angles are less than 90°, so neither of them can be a right angle. ii) Kim's conjecture is not correct.</p> <p>c) student's conjecture and investigation</p>
5	<p>a) multiple possible answers, e.g.: Split a circle into six equal sectors. Each angle is 60°. 60 is a factor of 360</p> <p>b) multiple possible answers, e.g.: Split a circle into one hundred equal sectors. Each angle is 3.6°. 3.6 is not a factor of 360</p>

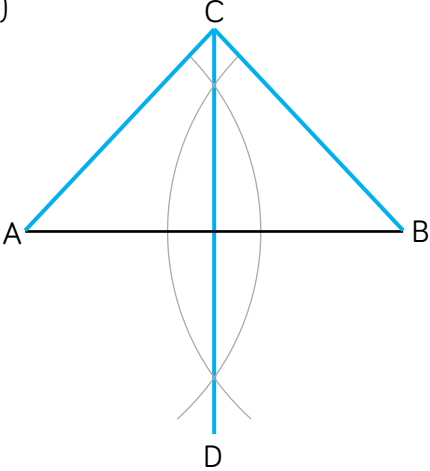
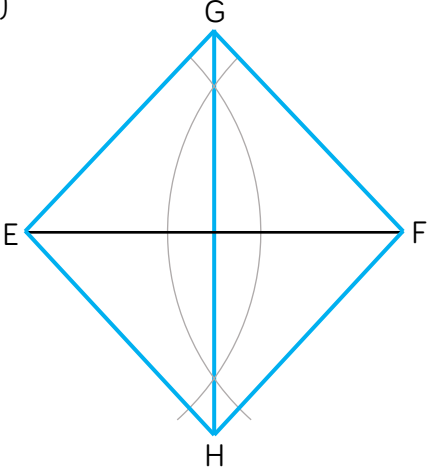
Question	Answer
<p>6</p>	 <p>Let the angles at the top of the diagram be a, b and c. $a + b + c = 180^\circ$ (angles on a straight line sum to 180°) $x = a$ (alternate angles are equal) $y = c$ (alternate angles are equal) So sum of angles in a triangle = $x + y + b = a + c + b = 180^\circ$</p>

Y9 – Spring – Block 4 – Step 5 – Conjectures with shapes Answers

Question	Answer
1	<p>a) drawing of a quadrilateral with no parallel sides, e.g. kite or scalene quadrilateral b) drawing of a six-sided figure with at least one right angle, e.g. L shape c) drawing of a pentagon with a reflex interior angle d) drawing of a prism with an irregular polygon for cross-section</p> <p>The are multiple possible answers for all parts, so students are unlikely to have drawn the same shapes.</p>
2	<p>No. a counterexample, e.g.: A regular hexagon with sides of 1 cm has a perimeter of 6 cm. An equilateral triangle with sides of 5 cm has a perimeter of 15 cm.</p>
3	<p>a) multiple possible answers, e.g.: a rectangle measuring 4 cm by 6 cm has perimeter 20 cm and area 24 cm² a rectangle measuring 5 cm by 6 cm has perimeter 22 cm and area 30 cm² Both the perimeter and area have increased.</p> <p>b) multiple possible answers, e.g.: a rectangle measuring 4 cm by 6 cm has perimeter 20 cm and area 24 cm² a rectangle measuring 1 cm by 10 cm has perimeter 22 cm and area 10 cm² The perimeter has increased, but the area has decreased.</p> <p>Students are likely to have different answers for both parts a) and b).</p>
4	<p>a) sometimes true true example: a cuboid measuring 1 cm by 2 cm by 3 cm has volume 6 cm³ counterexample: a cuboid measuring 0.5 cm by 2 cm by 3 cm has volume 3 cm³</p> <p>b) sometimes true true example: many special quadrilaterals, e.g. kite, square, rectangle counterexample: a scalene quadrilateral</p> <p>c) always true If the triangles are joined along a corresponding edge, they will form a quadrilateral.</p> <p>d) always true surface area = number of sides × area of one side = $6x^2$</p> <p>e) Always true A regular polygon with an even number of sides has a line of symmetry through each pair of opposite vertices and each pair of opposite sides, giving n lines of symmetry. A regular polygon with an odd number of sides has a line of symmetry through each vertex and opposite side, giving n lines of symmetry.</p> <p>For the statements that are sometimes true, students' examples and counterexamples are likely to be different.</p>
5	<p>Let the squares have side a. When the squares are joined, the rectangle has sides a and $2a$. perimeter of square = $4a$ perimeter of rectangle = $6a$ perimeter of square : perimeter of rectangle = $4a : 6a = 2 : 3$</p>

Y9 – Spring – Block 4 – Step 5 – Conjectures with shapes Answers (continued)

Question	Answer
6	<p>a) Yes. The height of the triangle is the distance between the base and the horizontal line, so the area will be the same for C anywhere on the horizontal line.</p> <p>b) the line parallel to AB and an equal distance below AB to the distance of the given line above AB</p>

Question	Answer
1	<p>a) accurate construction of an equilateral triangle with side of 5 cm b) all three angles labelled as 60° c) accurate construction of an angle of 60°</p>
2	<p>a) i), ii)</p>  <p>iii) sides and angles labelled on student's construction iv) $AB = AC$ angle $CAB = \text{angle } CBA$ Triangle ABC is isosceles.</p> <p>b) i), ii)</p>  <p>iii) sides and angles labelled on student's construction iv) $EG = GF = FH = HE$ angle $HEG = \text{angle } HFG$ angle $EGF = \text{angle } EHF$ EGFH is a rhombus.</p>

Question	Answer
3	<p>a) kite constructed by: constructing the perpendicular from a point to a line marking a point on the perpendicular that is the other side of the line and a different distance from the line than the point joining the points to each end of the line</p> <p>b) kite constructed by: drawing an angle with equal length arms constructing the angle bisector joining the end of each arm of the angle to a point on the angle bisector</p> <p>c) Rosie's method: The diagonals of a kite intersect at right angles, so the perpendicular from P through the line is one diagonal and the line is the other diagonal. Dexter's method: One of the diagonals of a kite is a line of symmetry and so intersects the angle of the kite. The two sides either side of the angle are equal length sides.</p> <p>d) Students need to justify why they prefer one method over the other.</p>
4	<p>a) accurate construction of an isosceles triangle b) accurate construction of a rhombus c) accurate construction of an angle of 120°</p> <p>Students may have used different methods for their constructions. The shapes may have different dimensions but still be the correct shape.</p>