

WA6MMGTW4

Two-dimensional space and structures

Core + Challenge

Finding Unknown Angles — Marking Key

I can find unknown angles using right angles, straight lines, angles at a point and vertically opposite angles.

For tutors and parents. Award method marks for correct working even if the final answer is wrong.

Marks summary

A Warm up: 16 B Practise: 21 C Think it through: 10 D Challenge: 9 **Total: 56**

Gold shading in this key shows what the child should have shaded or drawn. Accept any correct arrangement unless the question fixes it.

A

Warm up *answers*

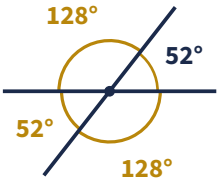
/ 16 marks

Q	Answer	Model answer / notes	Marks
1	$a = 55^\circ$	Angles in a right angle add to 90° : $90 - 35 = 55^\circ$.	1
2	$b = 28^\circ$	Angles in a right angle add to 90° : $90 - 62 = 28^\circ$.	1
3	$c = 24^\circ$	Angles in a right angle add to 90° : $90 - 66 = 24^\circ$.	1
4	$d = 30^\circ$	Angles in a right angle add to 90° : $90 - 32 - 28 = 30^\circ$.	1
5	$e = 55^\circ$	Angles on a straight line add to 180° : $180 - 125 = 55^\circ$.	1
6	$f = 72^\circ$	Angles on a straight line add to 180° : $180 - 108 = 72^\circ$.	1
7	$g = 35^\circ$	Angles on a straight line add to 180° : $180 - 145 = 35^\circ$.	1
8	$h = 65^\circ$	Angles on a straight line add to 180° : $180 - 40 - 75 = 65^\circ$.	1
9	$j = 100^\circ$	Angles at a point add to 360° : $360 - 140 - 120 = 100^\circ$.	1
10	$k = 55^\circ$	Angles at a point add to 360° : $360 - 100 - 110 - 95 = 55^\circ$.	1
11	$m = 160^\circ$	Angles at a point add to 360° : $360 - 200 = 160^\circ$.	1
12	$n = 125^\circ$	Angles at a point add to 360° : $360 - 55 - 90 - 90 = 125^\circ$.	1
13	$p = 40^\circ$	Vertically opposite angles are equal: 40° .	1
14	$q = 140^\circ$	The two angles sit on a straight line: $180 - 40 = 140^\circ$.	1
15	$r = 115^\circ$	Vertically opposite angles are equal: 115° .	1
16	$s = 115^\circ$	The two angles sit on a straight line: $180 - 65 = 115^\circ$.	1

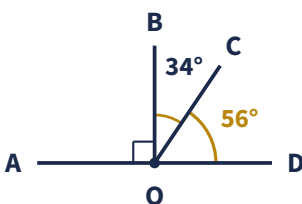
B

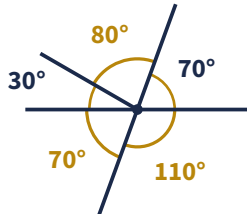
Practise *answers and working*

/ 21 marks

Q	Answer	Working / sample response	Marks
1	$x = 75^\circ$	Angles on a straight line add to 180°. $x = 180 - 38 - 67 = 75^\circ$. <i>1 mark: 75°.</i> <i>1 mark: names the straight-line fact.</i>	2
2	$y = 80^\circ$	Angles at a point add to 360°. $360 - 110 - 90 = 160^\circ$. The two y angles share 160°, so $y = 160 \div 2 = 80^\circ$. <i>1 mark: 160° for the two together.</i> <i>1 mark: $y = 80^\circ$.</i>	2
3	$a = 128^\circ, b = 52^\circ, c = 128^\circ$	 a: angles on a straight line: $180 - 52 = 128^\circ$. b: vertically opposite the 52° angle, so $b = 52^\circ$. c: vertically opposite a, so $c = 128^\circ$. <i>1 mark for each angle with a fact.</i>	3
4	$a = 35^\circ, b = 145^\circ$	a measures 35°. Angles on a straight line: $b = 180 - 35 = 145^\circ$. <i>1 mark: $a = 35^\circ$ (accept 33°–37°).</i> <i>1 mark: $b = 145^\circ$ calculated (follow through: $180 - \text{their } a$).</i>	2
5	$t = 22^\circ$	The two angles fill the right angle in the corner of the frame. Angles in a right angle add to 90°: $t = 90 - 68 = 22^\circ$. <i>1 mark: uses the right angle (90°).</i> <i>1 mark: 22°.</i>	2
6	$p = 70^\circ$	Angles at a point add to 360°. $70 + 85 + 60 + 75 = 290$. $p = 360 - 290 = 70^\circ$. <i>1 mark: 290° (or correct subtraction).</i> <i>1 mark: 70°.</i>	2

Finding Unknown Angles · WA6MMGTW4

Q	Answer	Working / sample response	Marks
7	angle COD = 56°, angle AOC = 124°	 Angle BOD is also a right angle ($180 - 90 = 90^\circ$), so angle COD = $90 - 34 = 56^\circ$. Angle AOC = $90 + 34 = 124^\circ$ (or $180 - 56 = 124^\circ$). <i>1 mark: uses angle BOD = 90° (or a straight line).</i> <i>1 mark: angle COD = 56°.</i> <i>1 mark: angle AOC = 124°.</i>	3
8	a) 45° b) 36°	a) Angles at a point: $360 \div 8 = 45^\circ$. b) $360 \div 10 = 36^\circ$. <i>1 mark each.</i>	2

9	$g = 80^\circ$, $h = 70^\circ$, $k = 110^\circ$	 g: angles on a straight line: $180 - 70 - 30 = 80^\circ$. h: vertically opposite the 70° angle, so $h = 70^\circ$. k: on a straight line with h: $180 - 70 = 110^\circ$. <i>1 mark for each angle with a correct fact.</i>	3
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C Think it through *sample answers and criteria*

/ 10 marks

Q	Answer	Working / sample response	Marks
1	No, $x = 130^\circ$	The two angles are on a straight line, so they add to 180°, not 360°. $x = 180 - 50 = 130^\circ$. (x is obtuse, not a reflex angle.) <i>1 mark: explains he used 360° instead of 180°.</i> <i>1 mark: $x = 130^\circ$.</i>	2
2	False	Vertically opposite angles are equal, e.g. 40° and 40°, which add to 80°. It is the angles next to each other on a straight line that add to 180°. (It only works when both are 90°.) <i>1 mark: False.</i> <i>1 mark: counter-example or explains they are equal (it is neighbouring angles that make 180°).</i>	2

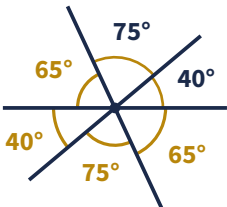
Finding Unknown Angles · WA6MMGTW4

Q	Answer	Working / sample response	Marks
		Always Sometimes Never	
3	Sometimes	If the lines cross at right angles, all four angles are 90°. Otherwise, e.g. 40°, 140°, 40°, 140°: they are not all equal. <i>1 mark: Sometimes.</i> <i>1 mark: the right-angle example and one counter-example.</i>	2
4	Set C	Angles at a point add to 360°. A: $90 + 90 + 180 = 360$. B: three angles of 120° fit. D: $360 - 45 - 135 = 180$, so the two equal angles are 90° each, and they fit. C: the third angle is 100°, and $100 + 150 + 100 = 350^\circ$, leaving a 10° gap. <i>1 mark: Set C.</i> <i>1 mark: shows Set C makes 350° (and that B and D can be completed to 360°).</i>	2
5	$a + b = 180$ and $b + c = 180$	a and b are on a straight line, so $a + b = 180^\circ$. b and c are also on a straight line, so $b + c = 180^\circ$. Both a and c are what is left when you take b from 180°, so $a = c$. (Here $a = c = 65^\circ$, $b = 115^\circ$.) <i>1 mark: uses both straight lines.</i> <i>1 mark: concludes $a = c$ because both equal $180^\circ - b$.</i>	2

D

Challenge solutions and criteria

/ 9 marks

Q	Answer	Working / sample response	Marks
1	$p = 65^\circ$, $q = 40^\circ$, $r = 75^\circ$, $s = 65^\circ$	 p: straight line: $180 - 40 - 75 = 65^\circ$. q, r and s are vertically opposite 40°, 75° and p: $q = 40^\circ$, $r = 75^\circ$, $s = 65^\circ$. Check: $40 + 75 + 65 + 40 + 75 + 65 = 360^\circ$. <i>1 mark: $p = 65^\circ$.</i> <i>1 mark: q and r.</i> <i>1 mark: s, with reasons.</i>	3
2	A 36° , B 72° , C 108° , D 144°	A, B, C and D are $1 + 2 + 3 + 4 = 10$ equal parts of 360°. One part = $360 \div 10 = 36^\circ$. A = 36°, B = 72°, C = 108°, D = 144°. Check: $36 + 72 + 108 + 144 = 360^\circ$. <i>1 mark: 10 parts (or a correct trial).</i> <i>1 mark: A = 36°.</i> <i>1 mark: B, C and D.</i>	3

Finding Unknown Angles · WA6MMGTW4

Q	Answer	Working / sample response	Marks
3	(20°, 40°, 120°); (20°, 60°, 100°); (40°, 60°, 80°)	The three angles add to 180°, and $180 \div 20 = 9$, so we need three different numbers that add to 9 (then $\times 20$). Start with the smallest: $1 + 2 + 6$, $1 + 3 + 5$, $2 + 3 + 4$. That gives (20°, 40°, 120°), (20°, 60°, 100°), (40°, 60°, 80°). Starting with 3 or more is too big ($3 + 4 + 5 = 12$), so there are no more. <i>2 marks: all three sets (1 mark for two).</i> <i>1 mark: systematic explanation.</i>	3