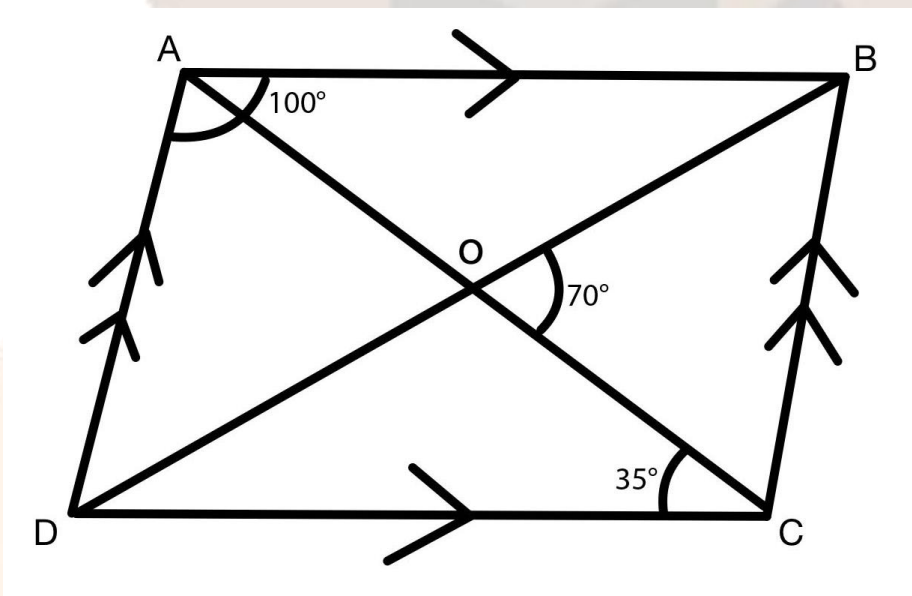
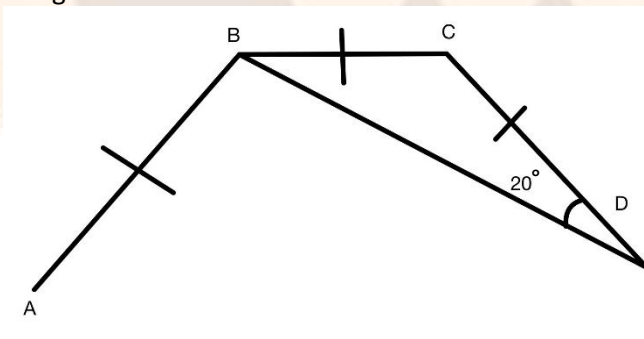


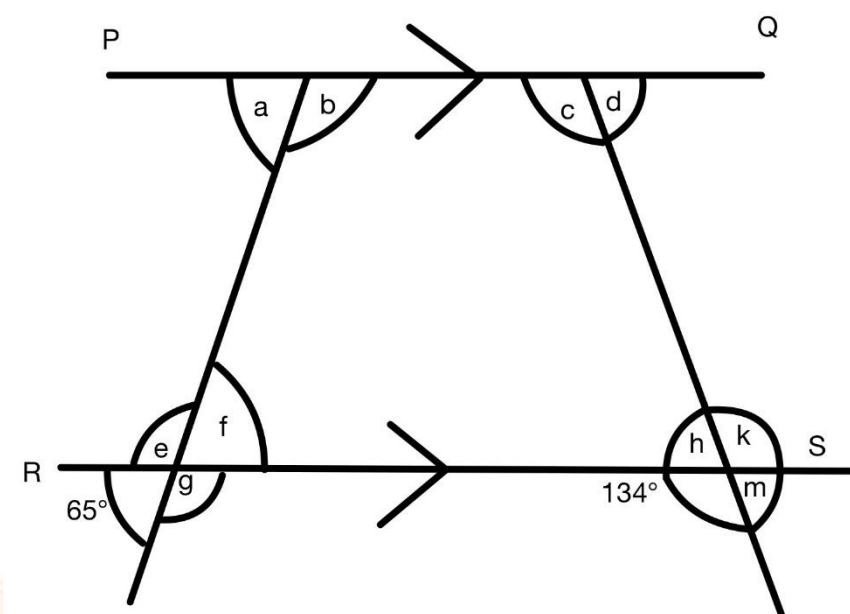
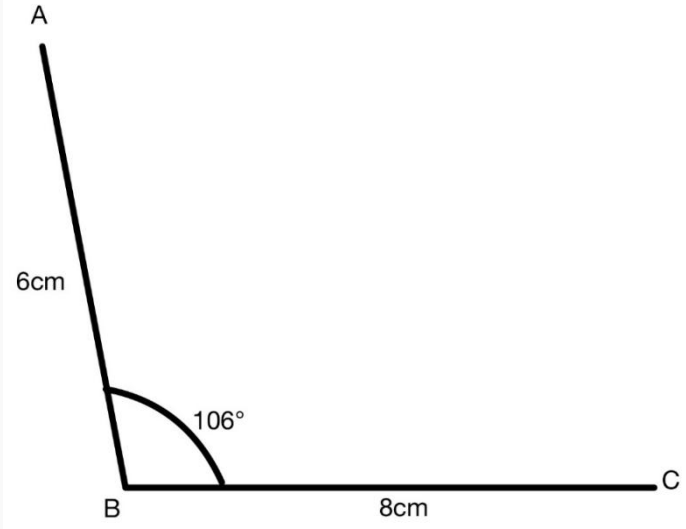


8 ESSENTIAL QUESTIONS TO MASTER

POLYGONS & GEOMETRICAL CONSTRUCTIONS

1	The diagram shows a parallelogram ABCD. $\angle DAB = 100^\circ$, $\angle ACD = 35^\circ$ and $\angle BOC = 70^\circ$.  Giving your reasons, find (a) $\angle DAC$ (b) $\angle ADC$	[2] [1]
2	The diagram below shows part of a regular n-sided polygon, ABCD. It is given that $\angle BDC = 20^\circ$.  (a) Find the exterior angle of the regular polygon. (b) Calculate the number of sides that the polygon has.	[1] [1]



3	In the diagram, PQ is parallel to RS. 	[4]
4	Calculate the sum of the angles b and c. Write your reasons clearly.	[3]
5	Cindy is drawing a triangle. The first angle is x°. The second angle is 6° more than the first angle. The third angle is four times the size of the second angle. Form an equation and solve it to find the size of the third angle.  The quadrilateral ABCD is such that $AB=6$ cm, $BC=CD=8$ cm, $AD=9$ cm and $\angle ABC=106^\circ$. AB and BC are drawn below. (a) Complete the quadrilateral. (b) Construct the perpendicular bisector of line BC.	[1] [2] [2]



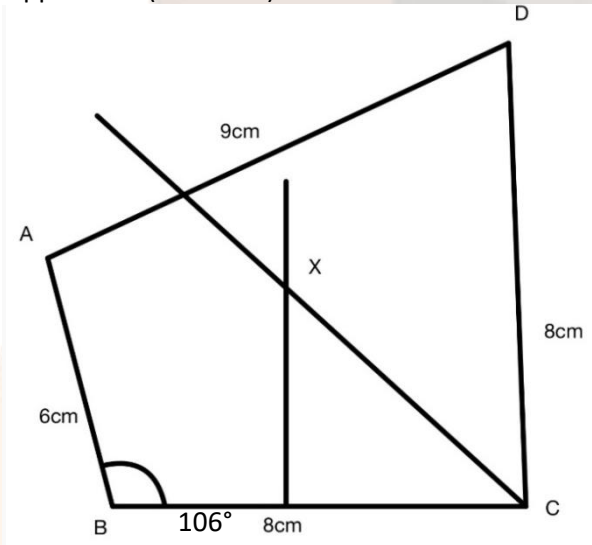
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	(c) Construct the angle bisector of $\angle BCD$. (d) Measure $\angle BCD$. (e) Mark the point X where the two bisectors in (b) and (c) meet. (f) Measure and write down the length of CX .	[2] [1] [2]
6	ABC is a triangle where $AB=7$ cm, $\angle BAC=75^\circ$ and $AC=10$ cm. (a) Construct triangle ABC (b) Measure the length of BC (c) Construct the (i) perpendicular bisector of BC (ii) angle bisector of $\angle BAC$ (d) The perpendicular bisector of BC and the angle bisector of $\angle BAC$ intersect at X . Mark the point X .	[2] [1] [1] [1] [1]
7	Susan measured an interior angle of a regular polygon to be 153.5° . Tom knows immediately that the angle has been measured incorrectly. Explain, with clear working steps, why Tom knows Susan's measurement was incorrect.	[3]
8	(a) A regular M -sided polygon has an exterior angle of y° (i) Find an expression of M in terms of y° (ii) if the size of the interior angle is 3 times the size of the exterior angle y° , find the size of the exterior angle. (iii) Hence, find M . (b) A polygon has k sides. When the number of sides is doubled, the interior angle is increased by 20° . Find the value of k .	[1] [2] [1] [3]

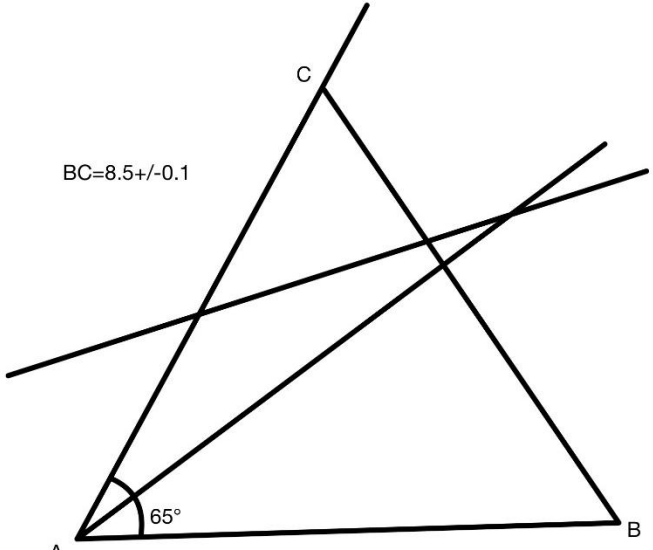
Answer Key:

1	(a) $\angle BAC=35^\circ$ (alt. $\angle$ s, $// DC$) $\angle DAC = 100^\circ - 35^\circ = 65^\circ$ (b) $\angle ADC=180^\circ - 65^\circ - 35^\circ = 80^\circ$ ($\angle$ s sum of Δ) Ans: (a) 65° (b) 80°	
2	(a) $\angle EAC=180^\circ - 20^\circ - 20^\circ = 140^\circ$ Exterior $\angle = 40^\circ$ (b) No. of sides = $360 \div 40 = 9$ Ans: (a) 30° (b) 9	
3	$f=65^\circ$ (vertically opposite angles) $b=180^\circ - 65^\circ = 115^\circ$ (interior angles) $c=134^\circ$ (corresponding angles) $b+c=115^\circ + 134^\circ = 249^\circ$ Ans: 249°	
4	Let the first angle be x° . The second angle is 6° more than the first angle, so it is $(x + 6)^\circ$. The third angle is four times the size of the second angle, so it is $4(x + 6)^\circ$ The sum of the angles in a triangle is 180° , so we have the equation $x + (x + 6) + 4(x + 6) = 180$ $x + x + 6 + 4x + 24 = 180$ $6x + 30 = 180$ $6x = 150$	



	$x = \frac{150}{6} = 25$ The first angle is $x^\circ = 25^\circ$. The second angle is $(x + 6)^\circ = (25 + 6)^\circ = 31^\circ$ The third angle is $4(x + 6)^\circ = 4(31)^\circ = 124^\circ$ We can check that the sum of the angles is $25 + 31 + 124 = 180$, as expected. The size of the third angle is 124°.	
5	Ans: Appendix 1 ($BC=8\text{ cm}$)  (a) See Appendix 1 (b) Perpendicular bisector correctly constructed (c) Angle bisector correctly constructed (d) $\angle BCD=108^\circ$, for $BC=8\text{ cm}$ $\angle BCD=104^\circ$, for $BC=8.1\text{ cm}$ (e) Point X marked. (f) $CX=6.0\text{ cm } (\pm 0.2)$, for $BC=8\text{ cm}$ $CX=6\text{ cm } (\pm 0.2)$, for $BC=8.1\text{ cm}$	



6		
7	Susan measured an interior angle of a regular polygon to be 153.5°. Tom knows immediately that the angle has been measured incorrectly. Explain, with clear working steps, why Tom knows Susan's measurement was incorrect. - Calculate the corresponding exterior angle: - The interior and exterior angles are supplementary (they add up to 180 degrees). - Exterior angle = $180^\circ - 153.5^\circ = 26.5^\circ$ - Check if 360 is divisible by the exterior angle: - For a regular polygon, 360 degrees must be perfectly divisible by the measure of the exterior angle in other words, $\frac{360}{\text{exterior angle}}$ must be an integer. $\frac{360}{26.5} = 13.58$ - Conclusion - Since $\frac{360}{26.5}$ is not an integer, 26.5 is not a factor of 360. Therefore, an interior angle of 153.5° is not possible for a regular polygon. Answer the exterior angle is 26.5 degree. $360/26.5$ is not an integer, so the measurement is incorrect.	
8	(a) A regular M-sided polygon has an exterior angle of y° (i) Find an expression of M in terms of y° - The sum of the exterior angles of any polygon is 360 degrees. For a regular polygon with m sides, all exterior angles are equal, Therefore, $m \cdot y = 360$ - Solving for M : $M = \frac{360}{y}$ Answer: $M = \frac{360}{y}$ (ii) if the size of the interior angle is 3 times the size of the exterior angle y°, find the size of the exterior angle. - Let the exterior angle by y . the interior angle is 3y - The interior and exterior angles are supplementary, so $y + 3y = 180$ $4y = 180$ $y = \frac{180}{4} = 45$	



Answer 45°

(iii) Hence, find M.

- Substitute $y = 45$ into the expression $m = \frac{360}{y}$
- $M = \frac{360}{45} = 8$

Answer : 8

(b) A polygon has k sides. When the number of sides is doubled, the interior angle is increased by 20° . Find the value of k .

- The interior angle of a polygon with k sides is $\frac{(k-2)*180}{k}$
- When the number of sides is double (to $2k$), the interior angle is $\frac{(2k-2)*180}{2k}$
- The problem states that the new interior angle is 20° larger than the original interior angle: $\frac{(2k-2)*180}{2k} = \frac{(k-2)*180}{k} + 20$
- Multiply both sides by $2k$ to eliminate the fractions:
- Expand $360k - 360 = 360k - 720 + 40k$
- Simplify: $-360 = -720 + 40k$
- $360 = 40k$
- $k = \frac{360}{40} = 9$

Answer : 9