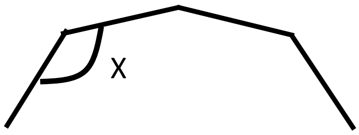
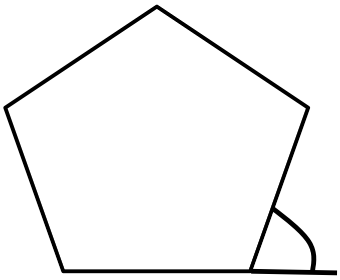
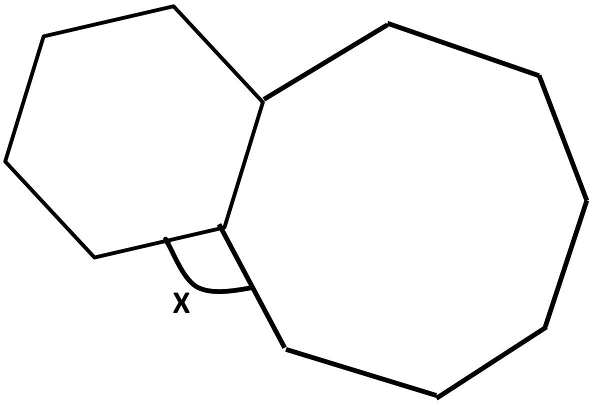
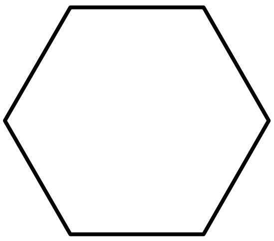
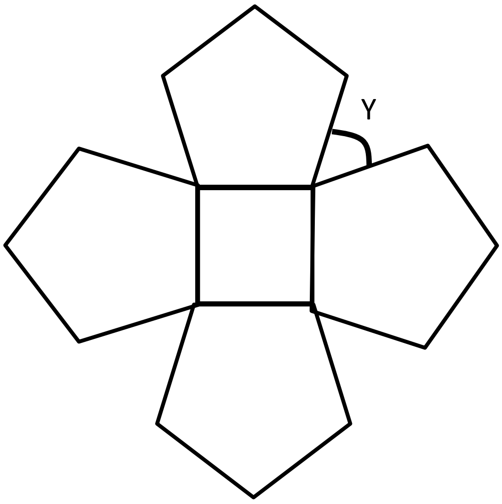
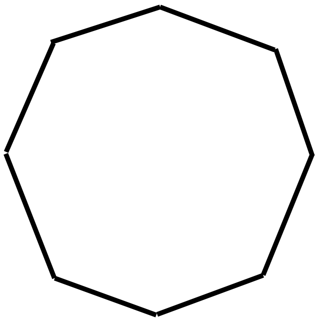
Name:

Test yourself: Angles in polygons!

Foundation	Higher
Each exterior angle of a regular polygon is 30°. Work out the number of sides of the polygon.	The diagram shows a regular 10-sided shape. Work out the size of the angle X. 
Calculate the size of this shapes exterior angles. 	The diagram shows a regular hexagon and a regular octagon. Calculate the size of the angle marked X. 
Calculate the size of exterior angle of a regular hexagon. 	The diagram shows a square and 4 regular pentagons. Work out the size of the angle marked Y. 

<table>
<tr>
<td>Work out the size of each interior angles of a regular octagon.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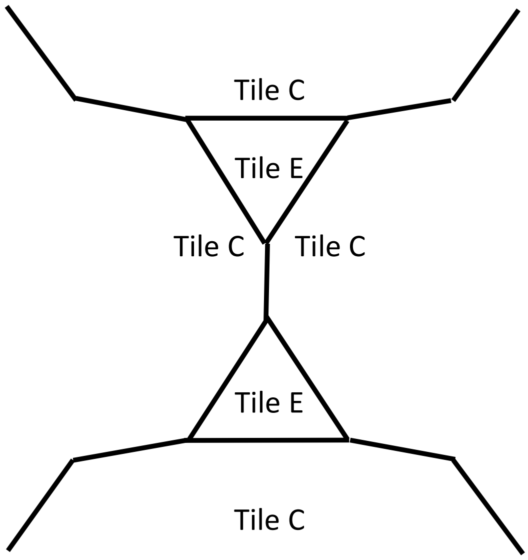
<td>The pattern is made from two types of tiles, tile C and tile E.
Both tile C and tile E are regular polygons.
Work out the number of sides tile C has.



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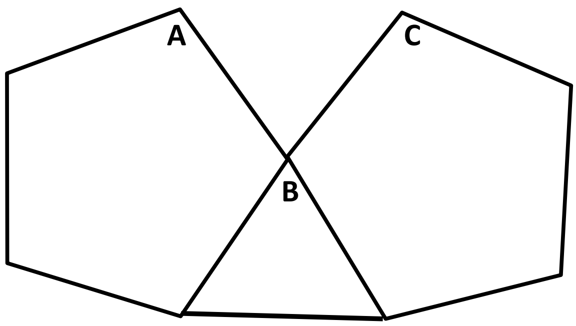
<tr>
<td>The size of each interior angle of a regular polygon is 156°. Work out the number of sides of the polygon.</td>
<td>ABCDE and EHJKL are regular pentagons. AEL is an equilateral triangle. Work out the size of angle ABC.



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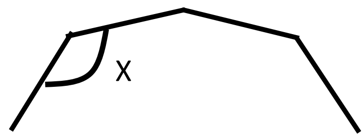
Solutions!

<table>
<tr><th>Foundation</th><th>Higher</th></tr>
<tr>
<td>
Each exterior angle of a regular polygon is 30°.
<u>Work out the number of sides of the polygon.</u>

Firstly, we know the sum of exterior angles adds up to 360°.
Therefore 30 x n = 360 where n is the number of sides of the polygon.
Dividing both sides by 30:
n = 360/30
n = 12
</td>
<td>
The diagram shows a regular 10-sided shape.
<u>Work out the size of the angle X.</u>


Firstly, we know the equation for interior angles in a polygon is:
$$\frac{(n-2)\times 180}{n}$$
Where n is the number of sides. In this case n = 10
Interior angles
$$=\frac{(10-2)\times 180}{10}$$
$$=\frac{8\times 180}{10}$$
Interior angles = 144°
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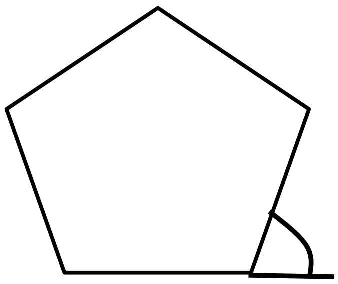
<td>
<u>Calculate the size of this shapes exterior angles.</u>

Firstly, we know the sum of exterior angles adds up to 360°.
Therefore, the exterior angle x n = 360 where n is the number of sides.
Exterior angle x 5 = 360
Dividing both sides by 5:
Exterior angle = 360/5
Exterior angle = 72°
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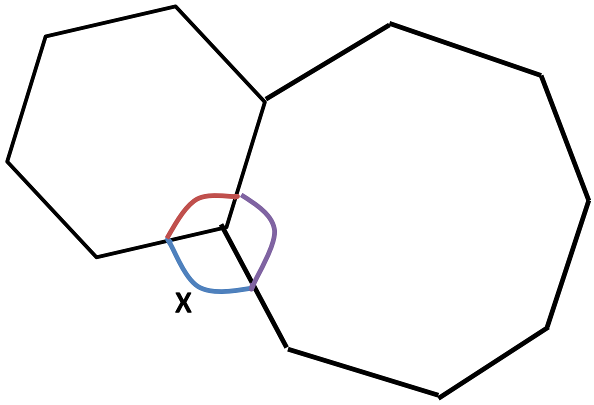
The diagram shows a regular hexagon and a regular octagon.
<u>Calculate the size of the angle marked X.</u>


Firstly, we know that all the angles around that point equals 360°. We need to find the interior angle in the 6-sided shape and the 8-sided shape and take it away from 360°.

Firstly, we know the equation for interior angles in a polygon is:
$$\frac{(n-2)\times 180}{n}$$
Where n is the number of sides. In this case n = 6
Interior angles
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<td>
$$= \frac{(6-2) \times 180}{6}$$
$$= \frac{4 \times 180}{6}$$
Interior angles = 120°

Firstly, we know the equation for interior angles in a polygon is:
$$\frac{(n-2) \times 180}{n}$$
Where n is the number of sides. In this case n = 10
Interior angles
$$= \frac{(8-2) \times 180}{8}$$
$$= \frac{6 \times 180}{8}$$
Interior angles = 135°

Finally, we need to subtract these angles from 360:
360 – 135 – 120 = 105
x = 105°
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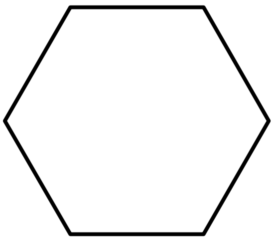
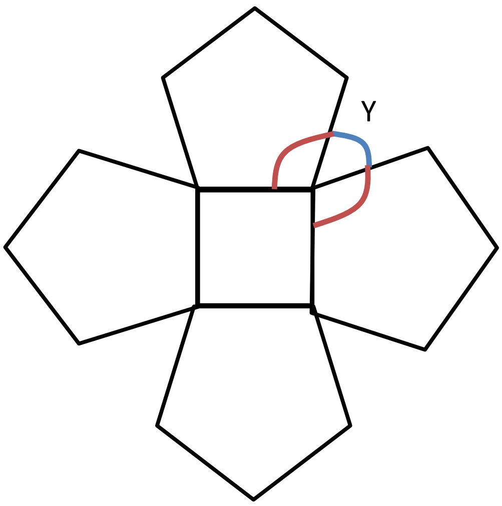
<td>
<u>Calculate the size of exterior angle of a regular hexagon.</u>

Firstly, we know the sum of exterior angles adds up to 360°.
Therefore, the exterior angle x n = 360 where n is the number of sides.
Exterior angle x 6 = 360
Dividing both sides by 6:
Exterior angle = 360/6
Exterior angle = 60°
</td>
<td>
The diagram shows a square and 4 regular pentagons. <u>Work out the size of the angle marked Y.</u>


Firstly, we know that all the angles around that point equals 360°. We know the interior angle in a square is 90°. We need to find the interior angle in the 5-sided shape and take this value as well as 90° away from 360°.

Firstly, we know the equation for interior angles in a polygon is:
$$\frac{(n-2) \times 180}{n}$$
Where n is the number of sides. In this case n = 5
Interior angles
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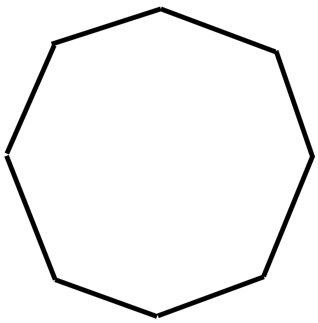
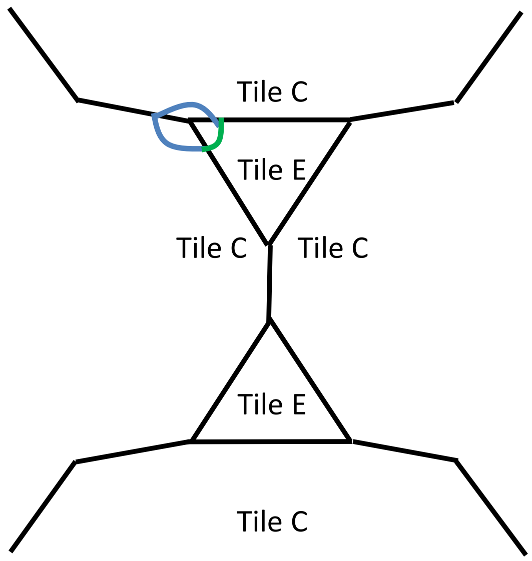
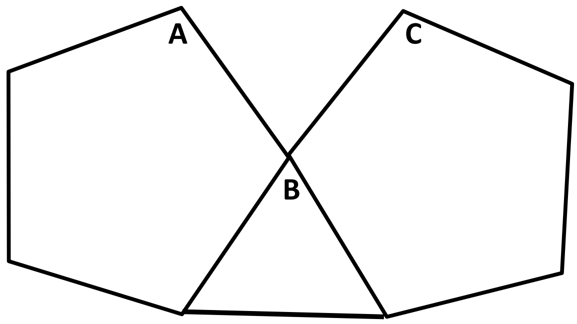
</table>

	$= \frac{(5-2)\times 180}{5}$ $= \frac{3\times 180}{5}$ Interior angles = 108° Finally, we need to subtract two lots of 108° as there are two lots of the interior angle of the pentagon, and the 90° away from 360: 360 – 108 – 108 - 90 = 54° x = 54º
Work out the size of each interior angles of a regular octagon.  Firstly, we know the equation for interior angles in a polygon is: $\frac{(n-2)\times 180}{n}$ Where n is the number of sides. In this case n = 8 Interior angles $= \frac{(8-2)\times 180}{8}$ $= \frac{6\times 180}{8}$ Interior angles = 135°	The pattern is made from two types of tiles, tile C and tile E. Both tile C and tile E are regular polygons. Work out the number of sides tile C has.  To find the number of sides of tile C we need to look at one point that includes edges from both Tile E and Tile C. The angles around a point consist of two interior angles of Tile C and one interior angle of tile E. We know that tile E is a triangle and has an interior angle of 60°. The value of two interior angles of tile C is 360 – 60 = 300° Therefore, one interior angle of tile C would be: 300/2 = 150°

	The equation for interior angles in a polygon is: $\frac{(n-2)\times 180}{n}$ Where n is the number of sides. $150 = \frac{(n-2)\times 180}{n}$ First, we can multiply both sides by n: 150n = (n – 2) x 180 Expand the right side: 150n = 180n – 360 Collect like terms: 30n = 360 Divide both sides by 30. n = 360/30 n = 12 There are 12 sides in Tile C.
The size of each interior angle of a regular polygon is 156°. <u>Work out the number of sides of the polygon.</u> Firstly, we know the equation for interior angles in a polygon is: $\frac{(n-2)\times 180}{n}$ Where n is the number of sides. $156 = \frac{(n-2)\times 180}{n}$ First, we can multiply both sides by n: 156n = (n – 2) x 180 Expand the right side: 156n = 180n – 360 Collect like terms: 24n = 360 Divide both sides by 24. n = 360/24 n = 15 There are 15 sides in this polygon.	ABCDE and EHJKL are regular pentagons. AEL is an equilateral triangle. <u>Work out the size of angle ABC.</u>  Firstly, we know that all the angles around that point equals 360°. We know the interior angles in a triangle are 60°. We need to find the interior angle in the 5-sided shape and take this value away from 360° twice as well as 60°. Firstly, we know the equation for interior angles in a polygon is: $\frac{(n-2)\times 180}{n}$ Where n is the number of sides. In this case n = 5 Interior angles $= \frac{(5-2)\times 180}{5}$ $= \frac{3\times 180}{5}$ Interior angles = 108° Finally, we need to subtract two lots of 108° as there are two lots of the interior angle of the pentagon, and the 60° away from 360: 360 – 108 – 108 - 60 = 84° x = 84°