

## 7.3 Angle Relationships in Polygons - Worksheets

MPM1D

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ANSWERS

1. Find the sum of the interior angles of a polygon with...  $= 180(n-2)$

a) 10 sides

$$= 180(10-2)$$

$$= 180(8)$$

$$= 1440^\circ$$

b) 15 sides

$$= 180(15-2)$$

$$= 180(13)$$

$$= 2340^\circ$$

c) 20 sides

$$= 180(20-2)$$

$$= 180(18)$$

$$= 3240$$

2. Find the measure of each interior angle of a regular polygon with...  $= \frac{180(n-2)}{n}$

a) 7 sides

$$= \frac{180(7-2)}{7}$$

$$= \frac{900}{7}$$

$$= 128.6^\circ$$

b) 12 sides

$$= \frac{180(12-2)}{12}$$

$$= \frac{1800}{12}$$

$$= 150^\circ$$

3. How many sides does a polygon have if the sum of its interior angles is...  $\text{sum of interior} = 180(n-2)$

a)  $540^\circ$

$$540 = 180(n-2)$$

$$540 = 180n - 360$$

$$540 + 360 = 180n$$

$$900 = 180n$$

$$5 = n$$

b)  $1800^\circ$

$$\frac{1800}{180} = \frac{180(n-2)}{180}$$

$$10 = n - 2$$

$$12 = n$$

c)  $3060^\circ$

$$\frac{3060}{180} = \frac{180(n-2)}{180}$$

$$17 = n - 2$$

$$19 = n$$

4. What properties does a regular polygon have?

- all interior angles equal
- all exterior angles equal
- all sides equal.

5. Complete the following table

# of Sides	Interior Angle Sum	Measure of One Interior Angle (regular polygon)	Sum of Exterior Angles	Measure of One Exterior Angle (regular polygon)
$n$	$180(n-2)$	$\frac{180(n-2)}{n}$	360	$\frac{360}{n}$
14	2160	154.3	360	25.7
24	3960	165	360	15
17	2700	158.8	360	21.2
8	1080°	135	360	45
7	900°	128.6	360	51.4
30	5040°	168	360	12
11	1620°	147.3	360	32.7
12	1800	150°	360	30
6	720	120°	360	60
15	2340	156°	360	24
36	6120	170	360	10°
50	8640	172.8	360	7.2°
4	360	90	360	90°
72	12600	175	360	5°

6. A furniture-maker is designing a hexagonal table.

a) At what angle will the adjacent sides of the table meet if its shape is a regular hexagon?

$$\text{interior angle} = \frac{180(6-2)}{6} = \frac{720}{6} = 120^\circ$$

b) Do you think the angles between the adjacent sides of the table will all be equal if one pair of opposite sides are twice as long as the other sides.

No, because it is not a regular polygon.

7. Find the measure of each interior angle of...  $\frac{180(n-2)}{n}$

a) A regular 10-sided polygon

$$= \frac{180(10-2)}{10}$$
$$= 144^\circ$$

b) A regular 16-sided polygon

$$= \frac{180(16-2)}{16}$$
$$= 157.5^\circ$$

c) A regular 20-sided polygon

$$= \frac{180(20-2)}{20}$$
$$= 162$$

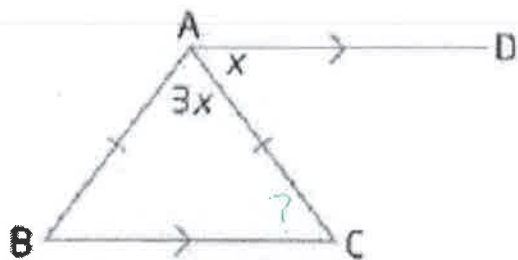
d) A regular polygon with  $n$  sides

$$= \frac{180(n-2)}{n}$$

8. Can you determine the number of sides a polygon has from the sum of its exterior angles? Explain your reasoning.

No; the sum is  $360^\circ$  for all convex polygons.

9. Determine the measure of angle BCA



$$\angle BCA = x \quad (\text{alternate interior})$$

$$\angle ABC = x \quad (\text{isosceles triangle})$$

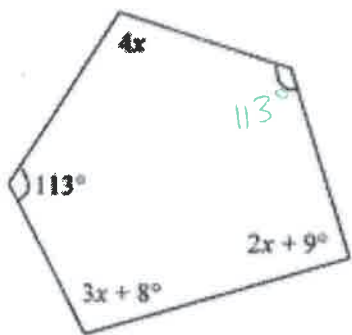
$$3x + x + x = 180 \quad (\text{sum of angles in a triangle})$$

$$5x = 180$$

$$x = 36^\circ$$

$$\therefore \angle BCA = x = 36^\circ$$

10. Find the value of  $x$



$$\text{sum of interior angles} = 180(n-2) = 180(5-2) = 540^\circ$$

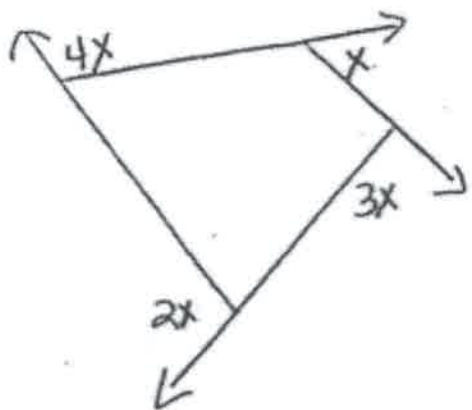
$$4x + 2(113) + 3x + 8 + 2x + 9 = 540$$

$$9x + 243 = 540$$

$$9x = 297$$

$$x = 33^\circ$$

11. Find the value of  $x$



$$x + 4x + 2x + 3x = 360$$

$$10x = 360$$

$$x = 36^\circ$$