

Perimeter of regular polygons

Lesson 42

1. Complete the table by giving the name of each regular polygon.

n	Name	6 hexagon	5 Pentagon	8 Octagon	7 heptagon	12 Dodecagon
S	Side Length	9.3cm	5.6cm	13.5cm	4.7cm	8.1cm
P	Perimeter	55.8cm	28cm	108 cm	32.9cm	97.2cm

$$n = P/6$$

2. Complete the table.

polygon	n=4 Square	n=5 Pentagon	n=6 Hexagon	n=8 Octagon	n=10 Decagon
Side Length (cm)	7.5	4.3	13.7	9.8	8.26
Perimeter (cm)	30	21.5	82.2	78.4	82.6

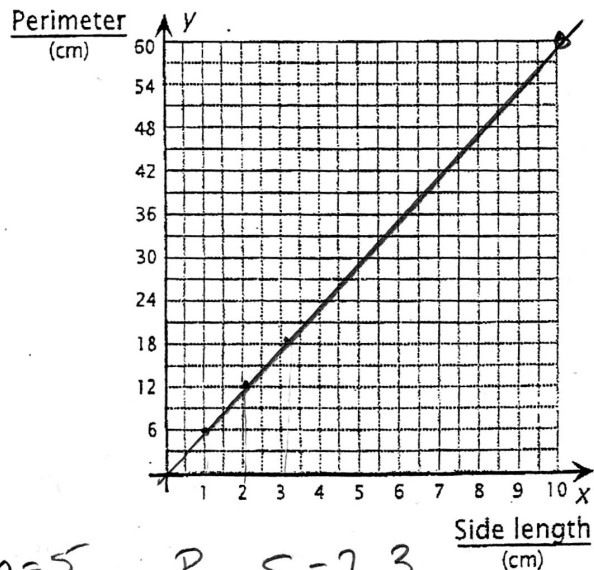
$$S = \frac{P}{n}$$

$$P = n \cdot S$$

3. a) Complete the table (the values given are for regular hexagons) $n=6$

Side Length (cm)	1	1.5	2	3	8.4	10
Perimeter (cm)	6	9	12	18	50.4	60

- b) Draw the graph of this situation on the grid.



- c) Is this a proportional situation?

yes

4. A regular pentagon has a perimeter of 36.5cm.

$$n=5$$

$$\frac{P}{n} = 5 = 7.3$$

- a) Find the perimeter of a regular decagon with the same side length.

$$n=10$$

73 cm

- b) Give the ratio: decagon perimeter/pentagon perimeter.

73 : 36.5

2 : 1

5. An equilateral triangle has a perimeter of 18cm.

- a) Determine the side length of a regular octagon with the same perimeter.

$$\frac{P}{n} = S \quad 18/8 = 2.25 \text{ cm.}$$

- b) Determine the perimeter of a square whose sides are twice the length of the sides of the triangle.

$$S = 12 \text{ cm} \quad P = 12 \times 4 = 48 \text{ cm}$$

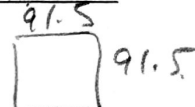
Δ is
3 cm.

6. A regular heptagon has a perimeter of 84cm. Find the side length.

$$\downarrow \\ n = 7$$

$$S = \frac{P}{n} = \frac{84}{7}$$

$$S = 12 \text{ cm}$$



7. The traffic signs indicating a turn are shaped like squares. Some have 61cm sides, and others have 91.5cm sides.

- a) Calculate the perimeter of each type of sign.

$$4 \times 61 = 244 \text{ cm.}$$

$$4 \times 91.5 = 366 \text{ cm.}$$

- b) What is the ratio of these perimeters?

$$366 : 244$$

$$91.5 : 61$$

$$1.5 : 1$$

- c) Is the ratio of the perimeters equal to the ratio of sides?

yes

8. Julie spent \$102 fencing in her garden which is shaped like a regular octagon. The fence costs \$4.25 a metre. Determine the length of one side of her garden.

$$n = 8$$

$$\frac{102}{4.25} = 24 \text{ m}$$

$$\frac{24}{8} = 3$$

3m each side

9. The Canadian dollar (the famous loony) is shaped like a regular hendecagon (11 sides) with each side measuring approximately 7mm.

- a) Determine the perimeter of a \$1 coin?



$$11 \times 7$$

$$77 \text{ mm.}$$

- b) To the nearest unit, give the measure of an interior angle of such a polygon.

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

$$\frac{(11-2)180}{11}$$

$$= 147.27^\circ$$

10. Calculate the perimeter of a regular hexagon with 6.5cm sides.

$$6 \times 6.5 =$$

$$39 \text{ cm.}$$

11. True or false?

- a) Two regular polygons with the same number of sides will always have proportional sides.
- b) A regular pentagon and its image are associated by a similarity transformation with ratio 3. The ratio of perimeters is therefore 15.
- c) When the length of the sides of a regular polygon are reduced by 20%, its perimeter is also reduced by 20%.

yesFalseyes

12. What is the side length of a regular octagon with a perimeter of 70cm?

8.75 cm

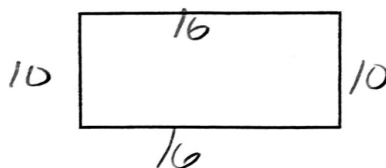
$$S = \frac{P}{n} = \frac{70}{8}$$

13. Write an expression for the perimeter of each regular hexagon for the side length given by the following algebraic expressions. $n=6$ a) r units: $6r$ unitsc) $(2y - 5)$ units: $6(2y - 5) = 12y - 30$ unitsb) $3v$ units: $6(3v) = 18v$ unitsd) $(x + 4)$ units: $6(x + 4) = 6x + 24$ units

14. A regular pentagon has a perimeter of 43 cm. what would its perimeter be if its side lengths were doubled?

perimeter doubles86 cm

15. A rectangle has a 16cm base and a 10cm height. Give the side length of a regular pentagon with the same perimeter as this rectangle.

 $n=5$  $P = 52 \text{ cm}$

$$\frac{P}{n} = s$$

$$\frac{52}{5} = 10.4 \text{ cm.}$$

16. A regular decagon with a 70cm perimeter is linked to another regular decagon by a similarity transformation centred at O and with a ratio of 0.4. What is the side length of the image decagon? $n=10$

$$S = \frac{P}{n} = \frac{70}{10} = 7 \text{ cm}$$

Image $7 \text{ cm} \times 0.4$ 2.8 cm