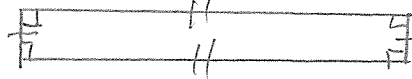


Geometry (H)  
Section 3.5 – Angles of a Polygon More Problems

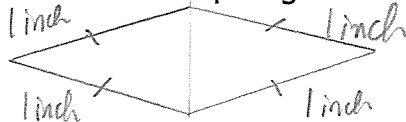
Name: KEY & Notes

1. Sketch the polygon described. If no such polygon exists, write *not possible*.

a. A quadrilateral that is equiangular but not equilateral.



b. A quadrilateral that is equilateral but not equiangular.



c. A regular pentagon, one of whose angles has measure 120.

$$\frac{(5-2)180}{5} = \frac{540}{5} = 108^\circ$$

← for a regular polygon NOT possible b/c each  $\angle$  must be  $108^\circ$ .

d. A regular polygon, one of whose angles has measure 130.

$$\frac{(n-2)180}{n} = 130 \rightarrow 180n - 360 = 130n$$

$$50n = 360$$

$$n = 7.2 \text{ sides}$$

Not possible

2. The sum of the measures of the interior angles of a polygon is five times the sum of the measures of its exterior angles, one angle at each vertex. How many sides does the polygon have?

$$(n-2)180 = 5(360)$$

$$180n - 360 = 1800$$

$$n = 12$$

12 sides

3. The measure of each interior angle of a regular polygon is eleven times that of an exterior angle. How many sides does the polygon have?

$$\frac{(n-2)180}{n} = 11\left(\frac{360}{n}\right)$$

24 sides

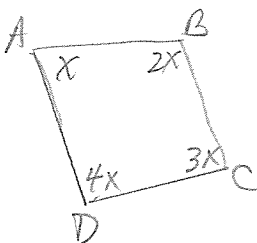
4. What is the measure of each interior angle of a regular pentagon? Can you tile the floor with tiles shaped like regular pentagons? Why or why not?

$$\frac{(5-2)180}{5} = 108^\circ \leftarrow \text{each interior } \angle$$

$$\frac{360^\circ}{108^\circ} = 3\frac{1}{3}$$

No; 3 tiles will leave gaps; 4 tiles will overlap.

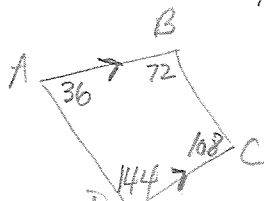
5. In quadrilateral ABCD,  $m\angle A = x$ ,  $m\angle B = 2x$ ,  $m\angle C = 3x$  and  $m\angle D = 4x$ . Find the value of  $x$  and then state which pair of sides of ABCD must be parallel.



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

$$10x = 360$$

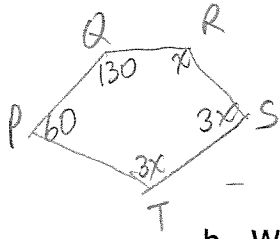
$$x = 36$$



$\overline{AB} \parallel \overline{CD}$

6. In pentagon PQRST,  $m\angle P = 60$  and  $m\angle Q = 130$ .  $\angle S$  and  $\angle T$  are each three times as large as  $\angle R$ .

- a. Find the measures of  $\angle R$ ,  $\angle S$  and  $\angle T$ .



Sum of  $\angle$ s of pentagon = 540

$$60 + 130 + x + 3x + 3x = 540$$

$$7x = 350$$

$$x = 50$$

$$m\angle R = 50$$

$$m\angle S = 150$$

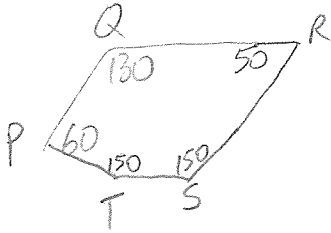
$$m\angle T = 150$$

text #22

Do a check:

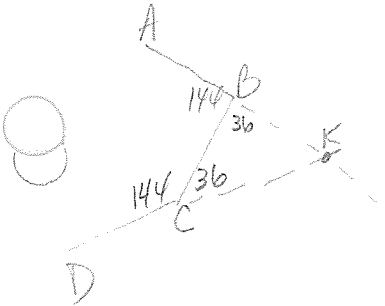
$$50 + 150 + 150 + 130 + 60 = 540$$

- b. Which pair of sides of PQRST must be parallel?



$$\overline{PQ} \parallel \overline{SR}$$

7. ABCDEFGHIJ is a regular decagon. If sides  $\overline{AB}$  and  $\overline{CD}$  are extended to meet at K, find the measure of  $\angle K$ .



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

$$m\angle K = 108^\circ$$

text #23

8. The measure of each interior angle of a regular  $n$ -gon is  $x$  times that of an exterior angle.

- a. Express  $x$  in terms of  $n$ .

$$\frac{(n-2)180}{n} = \frac{360}{n}x$$

$$x = \left( \frac{180n - 360}{n} \right) \frac{n}{360}$$

$$x = \frac{1}{2}n - 1$$

text #28

- b. For what values of  $n$  will  $x$  be an integer?

All even numbers greater than 2.

9. Find the sum of the measures of the interior angles of a 40-gon.

$$(40-2)180 = 6840^\circ$$

10. How many sides does a polygon have if the sum of the measures of its interior angles is 2880?

$$(n-2)180 = 2880$$

$$n-2 = 16$$

$$n = 18$$

18 sides

11. Find the measure of each exterior angles of a 20-gon.

$$\frac{360}{20} = 18^\circ$$

12. How many sides does a regular polygon have if each exterior angle is  $2^\circ$ ?

$$\frac{360}{n} = 2$$

$$2n = 360$$

$$n = 180 \text{ sides}$$

13. How many sides does a polygon have if each interior angles measures 162?

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

$$180n - 360 = 162n$$

$$18n = 360$$

$$n = 20$$

20 sides

14. If the sum of the measures of the angles on the interior of a polygon increases by 900, how many sides will have been added to the polygon?

5 sides added

Let's take a  $\Delta$  - it has  $180^\circ$ .

$$(n-2)180 = 180 + 900$$

$$n-2 = 6$$

$$n = 8$$

Compare 8 to 3 and the difference of 5.

13) another method

$\frac{162}{18^\circ}$  exterior  $\Delta$

$$\frac{360}{n} = 18$$

$$18n = 360$$

$$n = 20 \text{ sides}$$

$$\textcircled{3} \quad \frac{(n-2)180}{n} = 11\left(\frac{360}{n}\right)$$

OR use a diagram

$$n(n-2)180 = 3960n$$

$$180n^2 - 360n = 3960n$$

$$180n^2 - 4320n = 0$$

$$n(180n - 4320) = 0$$

$$n=0 \quad \left| \quad \begin{array}{l} 180n - 4320 = 0 \\ 180n = 4320 \\ n = 24 \end{array} \right.$$



$$x + 11x = 180$$

$$x = 15$$

↳ each exterior angle = 15

So,  $\frac{360}{15} = 24$  angles  $\rightarrow$  24 sides