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Warmup 2/(The 28th smallest whole number)

Get a calculator!!!

1. Explain why the $(n - 2) \cdot 180$ works for finding the sum of the interior angles in a polygon.
2. Find the sum of the measures of the interior angles in a decagon.
3. Find the measure of one interior angle in a **regular** decagon.

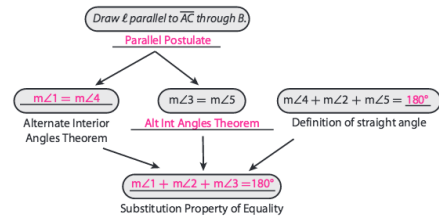
Homework Answers pg. 1090 (1-7)

1. Consider the Triangle Sum Theorem in relation to a right triangle. What conjecture can you make about the two acute angles of a right triangle? Explain your reasoning.
They must be complementary. One angle of the right triangle measures 90°. So the sum of the remaining two angles is $180^\circ - 90^\circ = 90^\circ$.

2. Complete a flow proof for the Triangle Sum Theorem.

Given $\triangle ABC$

Prove $m\angle 1 + m\angle 2 + m\angle 3 = 180^\circ$



3. Given a polygon with 13 sides, find the sum of the measures of its interior angles.

$$(n - 2)180^\circ = (13 - 2)180^\circ = (11)180^\circ = 1980^\circ$$

A polygon with 13 sides has an interior angle measure sum of 1980°.

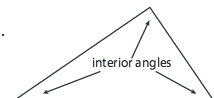
4. A polygon has an interior angle sum of 3060°. How many sides must the polygon have?
 $3060 = (n - 2)180$
 $19 = n$
The polygon must have 19 sides.
5. Two of the angles in a triangle measure 50° and 27°. Find the measure of the third angle.
 $50 + 27 + x = 180$
 $x = 103$
The measure of the third angle is 103°.
6. A pentagon has angle measures of 100°, 105°, 110° and 115°. Find the fifth angle measure.
 $(5 - 2)180^\circ = (3)180^\circ = 540^\circ$
 $540 = 100 + 105 + 110 + 115 + x$
 $110 = x$
The measure of the fifth angle is 110°.
7. The measures of 13 angles of a 14-gon add up to 2014°. Find the fourteenth angle measure?
 $(14 - 2)180^\circ = (12)180^\circ = 2160^\circ$
 $2014 + x = 2160$
 $x = 146$
The measure of the 14th angle is 146°.

Objective:

Explore Interior and Exterior Angles

Review: Interior Angles

- An interior angle is an angle formed by two sides of a polygon with a common vertex.
- A triangle has three interior angles



Review

1. Find the sum of the interior angle measures of a convex heptagon. 900°

2. Find the measure of each interior angle of a regular 16-gon.

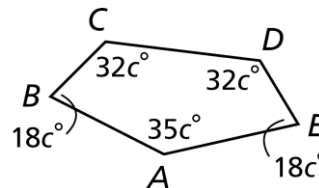
$$\frac{2520^\circ}{16} = 157.5^\circ$$

3. If a polygon has an interior angle sum of 1800° , what type of polygon is it?

Dodecagon

Review

- Find the measure of each interior angle of pentagon ABCDE.



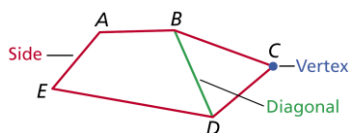
$$c = 4$$

$$m\angle A = 35(4) = 140^\circ$$

$$m\angle B = m\angle E = 18(4) = 72^\circ$$

$$m\angle C = m\angle D = 32(4) = 128^\circ$$

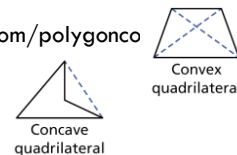
Each segment that forms a polygon is a **side of the polygon**. The common endpoint of two sides is a **vertex of the polygon**. A segment that connects any two nonconsecutive vertices is a **diagonal**.



A polygon is **concave** if any part of a diagonal contains points in the exterior of the polygon. If no diagonal contains points in the exterior, then the polygon is **convex**.

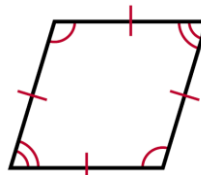
OR we can say a polygon is concave if it has one or more interior angles greater than 180° , convex if it does not

<http://www.mathopenref.com/polygonconco>



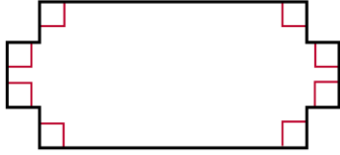
All the sides are congruent in an equilateral polygon. All the angles are congruent in an equiangular polygon. A **regular polygon** is one that is both equilateral and equiangular. If a polygon is not regular, it is called irregular.

Tell whether the polygon is regular or irregular. Tell whether it is concave or convex.



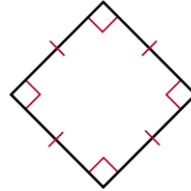
irregular, convex

Tell whether the polygon is regular or irregular. Tell whether it is concave or convex.



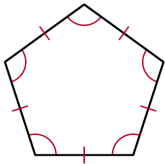
irregular, concave

Tell whether the polygon is regular or irregular. Tell whether it is concave or convex.



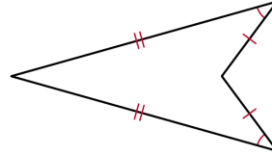
regular, convex

Tell whether the polygon is regular or irregular. Tell whether it is concave or convex.



regular, convex

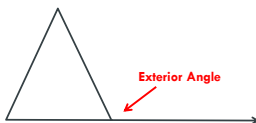
Tell whether the polygon is regular or irregular. Tell whether it is concave or convex.



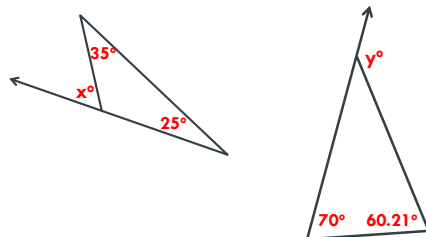
irregular, concave

EXTERIOR Angles

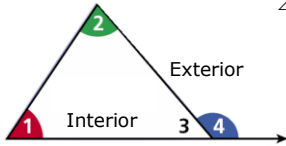
- An exterior angle is formed by extending a side of a figure further.



What is the measure of the exterior angle?



Each exterior angle has two remote interior angles. A **remote interior angle** is an interior angle that is not adjacent to the exterior angle.

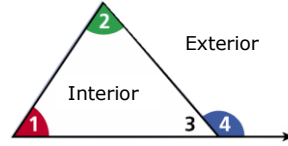


$\angle 4$ is an exterior angle.

The remote interior angles of $\angle 4$ are $\angle 1$ and $\angle 2$.

$\angle 3$ is an interior angle.

What is the relationship between angle 4 and angles 1 and 2?

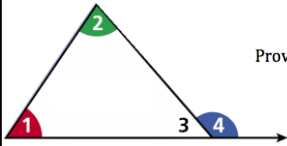


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Exterior Angle Theorem

The measure of an exterior angle of a triangle is equal to the sum of the measures of its remote interior angles.

Write a Paragraph Proof!



Prove: $m\angle 1 + m\angle 2 = m\angle 4$

pg. 1087

By the **Triangle Sum Theorem**, $m\angle 1 + m\angle 2 + m\angle 3 = 180^\circ$.

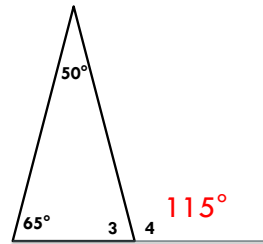
Also, $m\angle 3 + m\angle 4 = 180^\circ$ because they are supplementary and make a straight angle.

By the Substitution Property of Equality, then, $m\angle 1 + m\angle 2 + m\angle 3 = m\angle 3 + m\angle 4$.

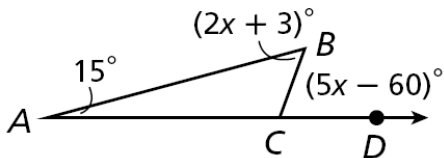
Subtracting $m\angle 3$ from each side of this equation leaves $m\angle 1 + m\angle 2 = m\angle 4$.

This means that the measure of an exterior angle of a triangle is equal to the sum of the measures of the remote interior angles.

Find $m\angle 4$



Find $m\angle B$

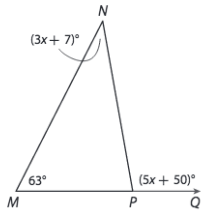


$x = 26$

$m\angle B = 2x + 3 = 2(26) + 3 = 55^\circ$

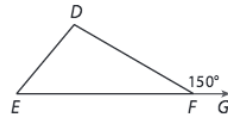
Your turn! pg. 1089 11 and 12

11. Determine $m\angle N$ in $\triangle MNP$.



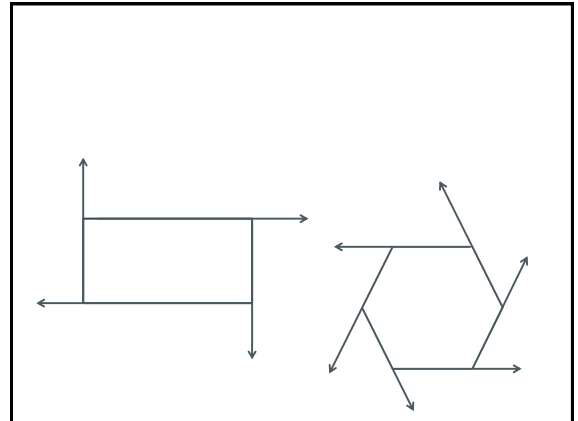
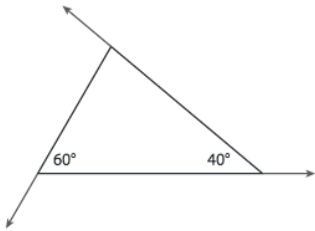
$$\begin{aligned} 5x + 50 &= (3x + 7) + 63 \\ 5x + 50 &= 3x + 70 \\ 2x &= 20 \\ x &= 10 \\ m\angle N &= (3x + 7)^\circ = (3(10) + 7)^\circ = 37^\circ \end{aligned}$$

12. If the exterior angle drawn measures 150° , and the measure of $\angle D$ is twice that of $\angle E$, find the measure of the two remote interior angles.

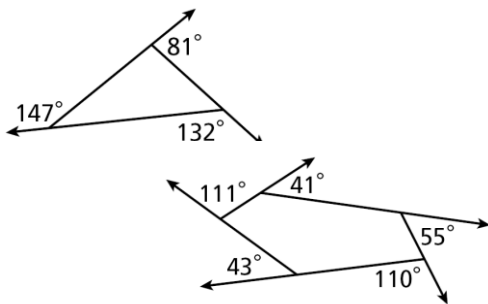


$$\begin{aligned} x + 2x &= 150 \\ 3x &= 150 \\ x &= 50 \\ m\angle E = x^\circ &= 50^\circ \\ m\angle D = 2x^\circ &= 100^\circ \end{aligned}$$

Find the measure of all exterior angles.
What is their sum?



Find the measure of all exterior angles.
What is their sum?



<http://www.mathsisfun.com/geometry/exterior-angles-polygons.html>

**Find the measure of each exterior angle
of a regular 20-gon.**

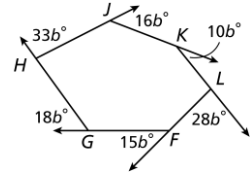
A 20-gon has 20 sides and 20 vertices.

sum of ext. \angle s = 360° .

$$\text{measure of one ext. } \angle = \frac{360^\circ}{20} = 18^\circ$$

The measure of each exterior angle of a regular 20-gon is 18° .

**Find the value of b in
polygon $FGHJKL$.**



$$15b^\circ + 18b^\circ + 33b^\circ + 16b^\circ + 10b^\circ + 28b^\circ = 360^\circ$$

$$120b = 360$$

$$b = 3$$

Homework

- Pg. 1091-1092 (11-15, 13 should be $6x - 1$)
- Angle Chasing Worksheet