

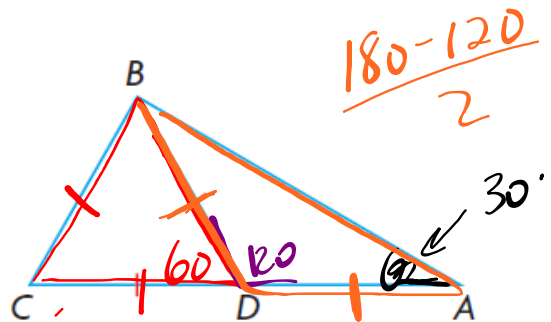
Questions... Section 2.3: #1 - 13

2. Marcel says that it is possible to draw a triangle with two right angles. Do you agree? Explain why or why not.

Agree... $90^\circ + 90^\circ = 180^\circ$
3rd angle?

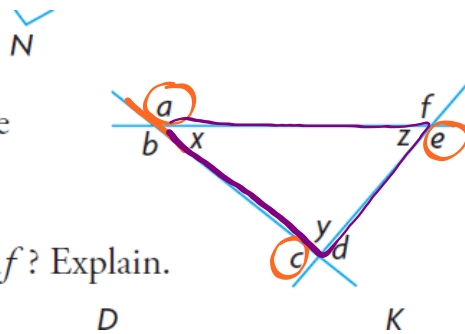
5. Prove: $\angle A = 30^\circ$

S	J
$\angle BDC = 60^\circ$	Equilateral
$\angle BDA = 120^\circ$	SAT
$\angle A = 30^\circ$	ITT



8. Each vertex of a triangle has two exterior angles, as shown.

- Make a conjecture about the sum of the measures of $\angle a$, $\angle c$, and $\angle e$.
- Does your conjecture also apply to the sum of the measures of $\angle b$, $\angle d$, and $\angle f$? Explain.
- Prove or disprove your conjecture.



a)

$$\angle a + \angle x = 180^\circ$$

$$\angle c + \angle y = 180^\circ$$

$$\angle e + \angle z = 180^\circ$$

c)

$$\angle x + \angle y + \angle z = 180^\circ$$

$$(180^\circ - \angle a) + (180^\circ - \angle c) + (180^\circ - \angle e) = 180^\circ$$

$$360^\circ = \angle a + \angle c + \angle e$$

b) yes

*****ADD this one to your notes...**

converse

A statement that is formed by switching the premise and the conclusion of another statement.

EXAMPLES...

Conjecture: If it is raining outside, then the grass is wet.

CONVERSE: If the grass is wet, then it is raining.

THEOREM: If you have parallel lines, then the corresponding angles are equal.

CONVERSE: If the corresponding angles are equal, then the lines are parallel.

2.4

Angle Properties in Polygons

GOAL

Determine properties of angles in polygons, and use these properties to solve problems.

EXPLORE...

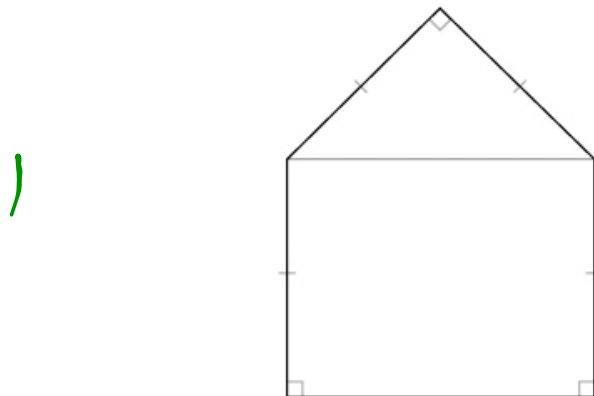
- A pentagon has three right angles and four sides of equal length, as shown. What is the sum of the measures of the angles in the pentagon?

# of sides	3	4	5	6
Sum	180	360	540	720


\downarrow +180 \downarrow +180 \downarrow +180

SAMPLE ANSWER

I drew a diagonal joining the two angles that are not right angles. This cut the pentagon into a rectangle and a triangle. I knew that the quadrilateral was a rectangle, not a trapezoid, because the two right angles share an arm, so their other arms must be parallel. As well, the other arms are equal length. I knew that the sum of the measures of the angles in a rectangle is 360° and the sum of the measures of the angles in a triangle is 180° , so the sum of the measures of the angles in the pentagon must be 540° .



convex polygon
 A polygon in which each interior angle measures less than 180° .



convex non-convex (concave)

* function notation $S(6) = 180(6-2)$
 \uparrow
 6 sided = 720°

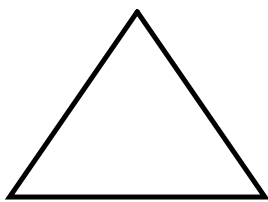
Sum = $180(n-2)$

This is my conjecture: The sum of the measures of the interior angles in a polygon, $S(n)$, is:

$S(n) = 180^\circ(n - 2)$

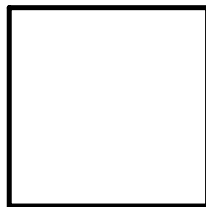
\uparrow # of sides

Regular Polygon → all angles / sides are equal

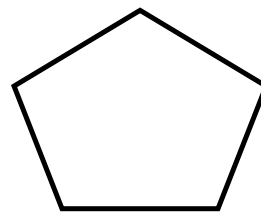


Equilateral

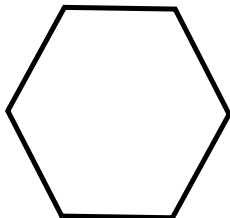
Triangle



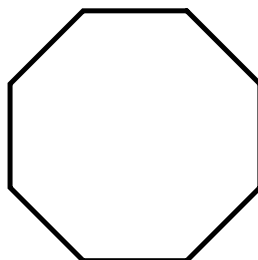
Square



Pentagon



Hexagon



Octagon



Undecagon

[11 sided]

EXAMPLE 2 Reasoning about angles in a regular polygon

Outdoor furniture and structures like gazebos sometimes use a regular hexagon in their building plan. Determine the measure of each interior angle of a regular hexagon.



Nazra's Solution

Let $S(n)$ represent the sum of the measures of the interior angles of the polygon, where n is the number of sides of the polygon.

$S(n) = 180^\circ(n - 2)$ ----- A hexagon has six sides, so $n = 6$.

$S(6) = 180^\circ[(6) - 2]$

• $S(6) = 720^\circ$

$\frac{720^\circ}{6} = 120^\circ$ -----

The measure of each interior angle of a regular hexagon is 120° .

Since the measures of the angles in a regular hexagon are equal, each angle must measure $\frac{1}{6}$ of the sum of the angles.

Reg. Hexagon vs Reg. Octagon

120°

vs

135°

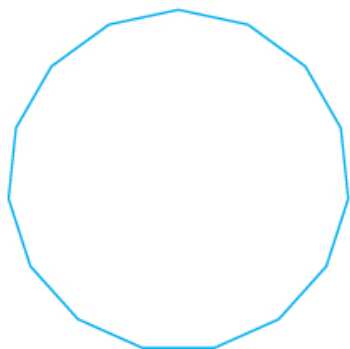
Carpenter



90 + 45°

Your Turn

Determine the measure of each interior angle of a regular 15-sided polygon (a pentadecagon).



$S(n)$ represents the sum of the measures of the interior angles of any convex polygon, where n is the number of sides of the polygon.

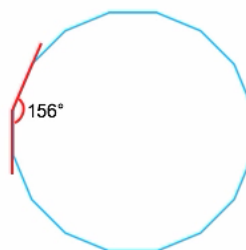
$$S(n) = 180^\circ(n - 2)$$

$$S(15) = 180^\circ(15 - 2)$$

$$S(15) = 180^\circ(13)$$

$$S(15) = 2340^\circ$$

$$\frac{2340^\circ}{15} = 156^\circ$$



The measure of each interior angle of a regular pentadecagon is 156° .

Answer



Tiling Using Regular Polygons...

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

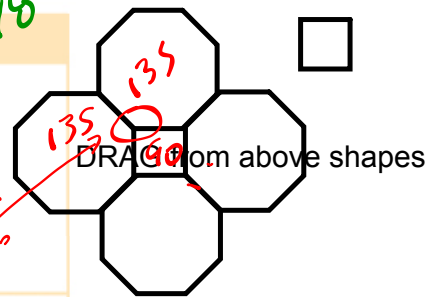
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Regular Polygon	Measure of Interior Angle (degrees)
Equilateral Triangle	60
Square	90
Pentagon	108
Hexagon	120
Heptagon (7 sided)	128.3
Octagon	135
Nonagon (9 sided)	140
Decagon (10 sided)	144

EXAMPLE 3 Visualizing tessellations

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A floor tiler designs custom floors using tiles in the shape of regular polygons. Can the tiler use congruent regular octagons and congruent squares to tile a floor, if they have the same side length?



Vanessa's Solution

$$S(n) = 180^\circ(n - 2)$$

$$S(8) = 180^\circ[(8) - 2]$$

$$S(8) = 1080^\circ$$

$$\frac{1080^\circ}{8} = 135^\circ$$

Since an octagon has eight sides, $n = 8$.

First, I determined the sum of the measures of the interior angles of an octagon. Then I determined the measure of each interior angle in a regular octagon.

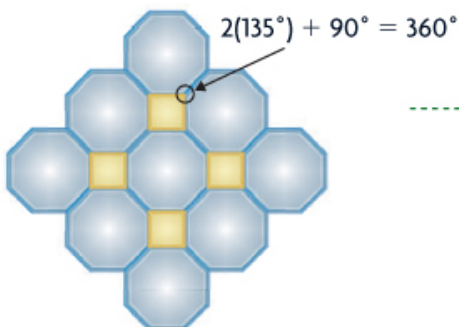
The measure of each interior angle in a regular octagon is 135° .
The measure of each internal angle in a square is 90° .

Two octagons fit together, forming an angle that measures:
 $2(135^\circ) = 270^\circ$.

This leaves a gap of 90° .
 $2(135^\circ) + 90^\circ = 360^\circ$

I knew that three octagons would not fit together, as the sum of the angles would be greater than 360° .

A square can fit in this gap if the sides of the square are the same length as the sides of the octagon.



I drew what I had visualized using dynamic geometry software.

The tiler can tile a floor using regular octagons and squares when the polygons have the same side length.

Your Turn

Can a tiling pattern be created using regular hexagons and equilateral triangles that have the same side length? Explain.

Answer

In Summary

Key Idea

- You can prove properties of angles in polygons using other angle properties that have already been proved.

Need to Know

- The sum of the measures of the interior angles of a convex polygon with n sides can be expressed as $180^\circ(n - 2)$.
- The measure of each interior angle of a regular polygon is $\frac{180^\circ(n - 2)}{n}$.
- The sum of the measures of the exterior angles of any convex polygon is 360° .

HOMEWORK...

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HISTORY on Buckyball Do A, B and C

Attachments

2s4e2 finalt.mp4

2s4e3 finalt.mp4