Lesson 2.1/2.2 Angles

Wednesday, October 2, 2024 10:30 PM

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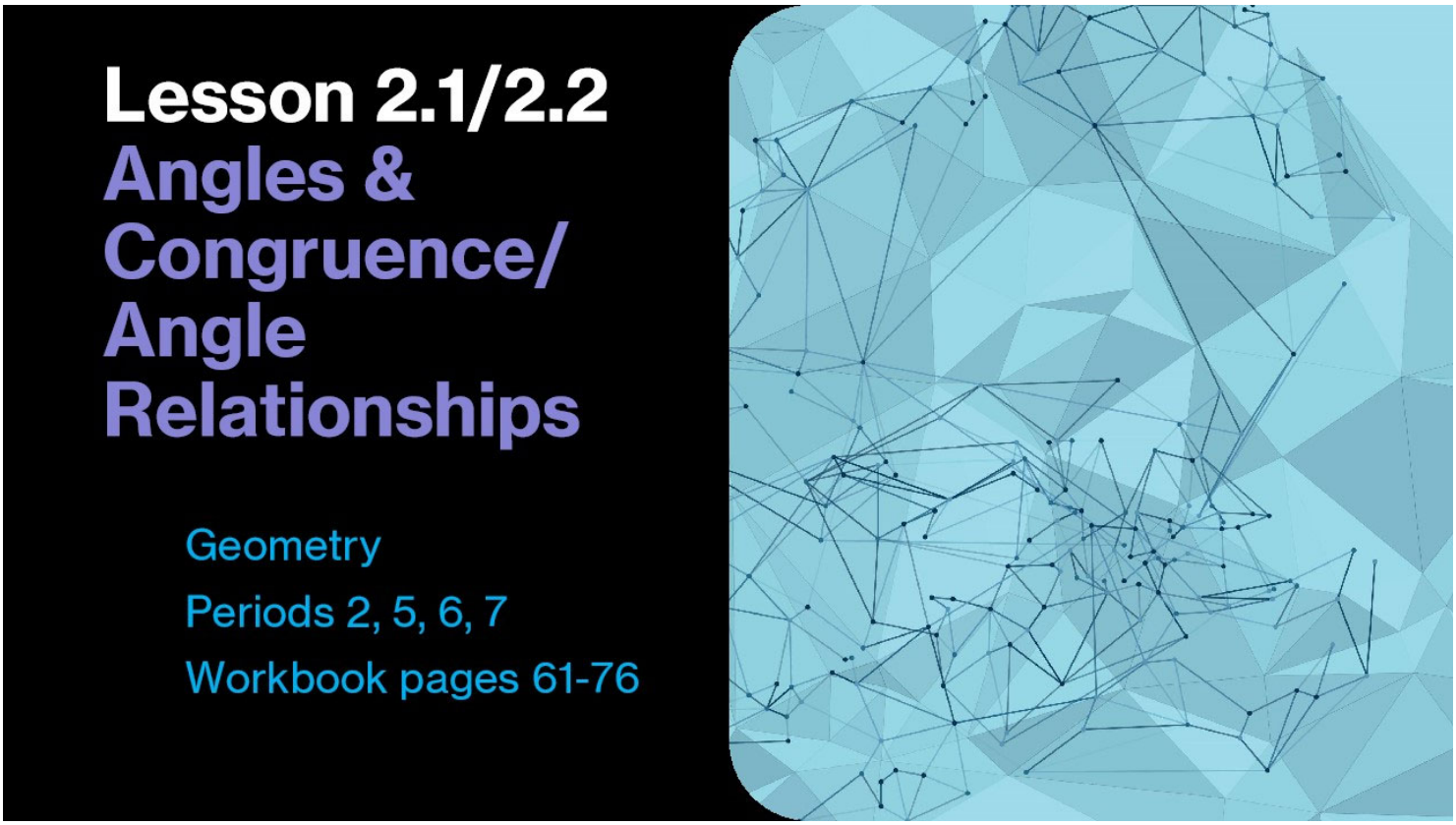
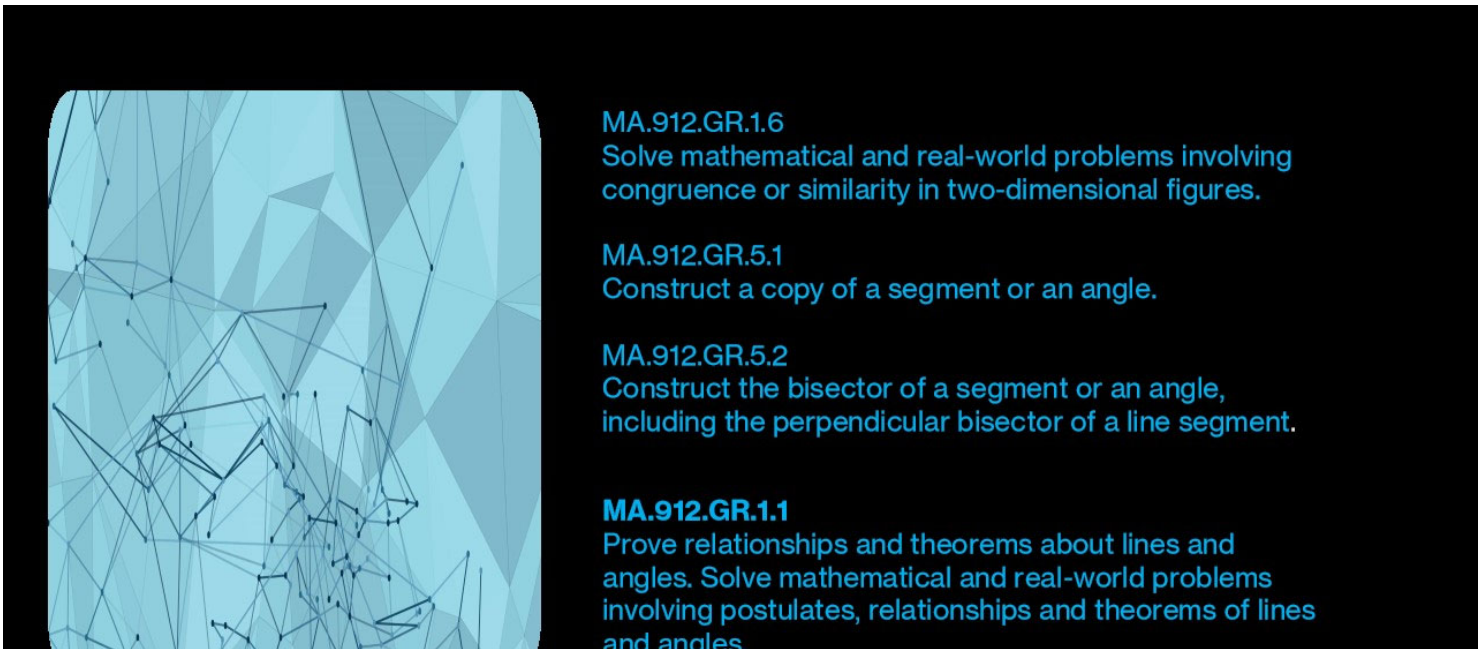
Geometry Lesson 2....



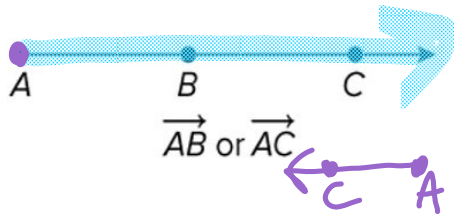


angles. Solve mathematical and real-world problems involving postulates, relationships and theorems of lines and angles.

Content Objective
Students identify and use angles, angle parts, and special angle pairs.

Content Objective
Students use the properties of perpendicular lines to find the measures of angles.

A **ray** is the part of a line consisting of a point on the line, called the *endpoint of the ray,* together with all of the collinear points on one side of the endpoint.



Rays are named by stating the endpoint first and then another point on the ray.

Students, draw anywhere on this slide!

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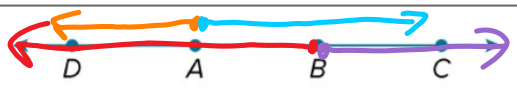
Two collinear rays with a common endpoint are **opposite rays**. Opposite rays form a **straight angle**, which has a measure of 180°. Line

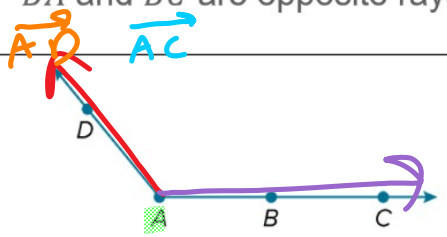


$\overrightarrow{BA}$ and $\overrightarrow{BC}$ are opposite rays.

An **angle** is a pair of rays that have a common endpoint.

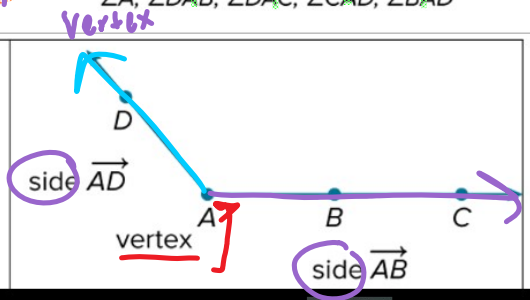
$\overrightarrow{AD}$ & $\overrightarrow{AB}$

vertex Point A



∠A, ∠DAB, ∠DAC, ∠CAD, ∠BAD

The rays are called **sides** of the angle. The common endpoint is the **vertex**.



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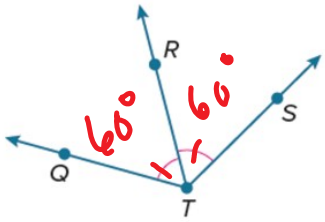
Congruent Angles

The measure of an angle is the measure in degrees of the space between the sides of the angle. Angles that have the same measure are **congruent angles**. Congruent angles are indicated on the figure by a matching number of arcs.



∠QTR ≅ ∠STR

$\frac{120}{2} = 60$

A ray or segment that divides an angle into two congruent angles is an **angle bisector**. You can create the angle bisector of any angle without knowing the measure of the angle.

Ray TR is
The Angle Bisector
Of <QTS

*Challenge – if <QTS = 120 degrees what degrees is <RTS?

Complementary Angles	Supplementary Angles
Definition	
two angles with measures that have a sum of 90°	two angles with measures that have a sum of 180°

90° C

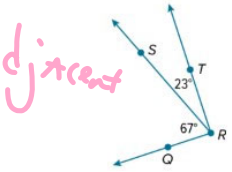
180 S

Linear Pair
Adjacent

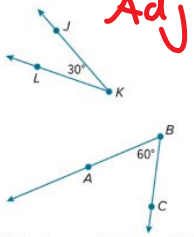
Examples of Complementary Angles

non Adj

Adjacent



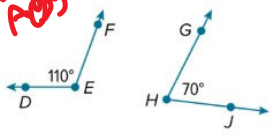
$m\angle QRS + m\angle SRT = 90°$
$67° + 23° = 90°$



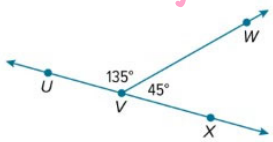
$m\angle JKL + m\angle ABC = 90°$
$30° + 60° = 90°$

Examples of Supplementary Angles

non Adj

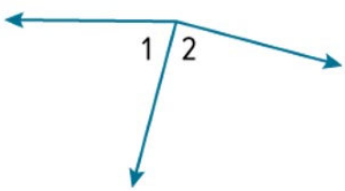
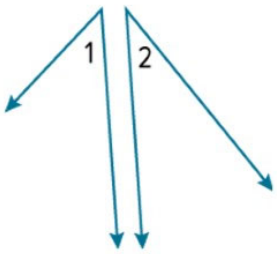


$m\angle DEF + m\angle GHJ = 180°$
$110° + 70° = 180°$

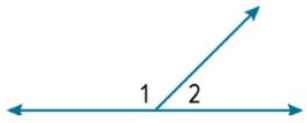
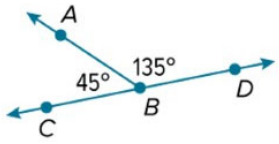
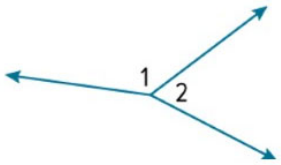


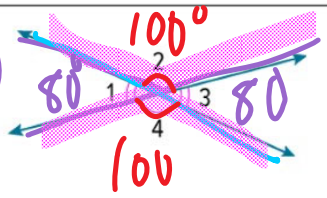
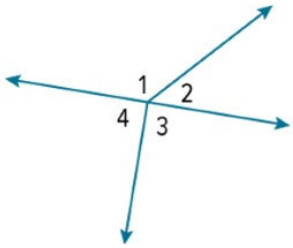
$m\angle UVW + m\angle WVX = 180°$
$135° + 45° = 180°$

Special Angle Pairs

Special Angle Pair Definition	Examples	Nonexamples
Adjacent angles are two angles that lie in the same plane, have a common vertex and a common side, but have no common interior points.	 ∠1 and ∠2 are adjacent angles.	

Special Angle Pairs

Special Angle Pairs		
Special Angle Pair Definition	**Examples**	**Nonexamples**
A **linear pair** is a pair of adjacent angles with noncommon sides that are opposite rays. The sum of the angle measures is 180°.	 ∠1 and ∠2 are a linear pair. 	

Special Angle Pairs		
Special Angle Pair Definition	**Examples**	**Nonexamples**
Vertical angles are the two nonadjacent (opposite) angles formed by two intersecting lines. Vertical angles are congruent.	all 4 ∠'s = 360  ∠1 and ∠3 are vertical angles. ∠2 and ∠4 are vertical angles.	

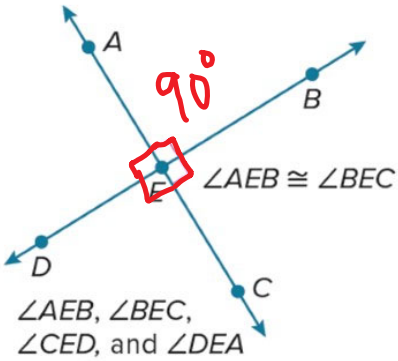
Lines, segments, or rays that intersect at right angles are **perpendicular**. Segments or rays can be perpendicular to lines or other line segments and rays. The right angle symbol indicates that the lines are perpendicular.

90°

symbol indicates that the lines are perpendicular.

Perpendicular lines intersect to form four right angles.

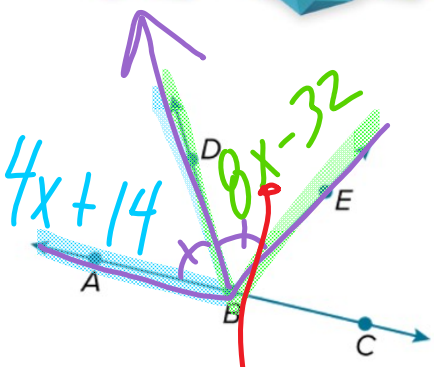
Perpendicular lines intersect to form congruent adjacent angles.



∠AEB, ∠BEC, ∠CED, and ∠DEA are right angles.

Example 2
Congruent Angles and Angle Bisectors

In the figure, $\overrightarrow{BA}$ and $\overrightarrow{BC}$ are opposite rays and $\overrightarrow{BD}$ bisects ∠ABE. If $m\angle ABD = (4x + 14)°$ and $m\angle DBE = (8x - 32)°$, find $m\angle DBE$.



$4x + 14 = 8x - 32$

$-4x \quad -4x$

$14 = 4x - 32$

$+32 \quad +32$

$\frac{46}{4} = \frac{4x}{4}$

$x = 11.5$

$8(11.5) - 32 =$

$92 - 32$

60

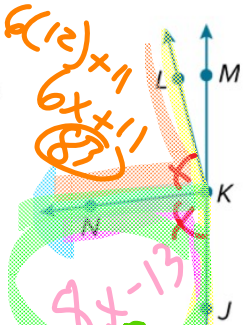
Example 2
Congruent Angles and Angle Bisectors

Check

In the figure, $\overrightarrow{KJ}$ and $\overrightarrow{KM}$ are opposite rays, and $\overrightarrow{KN}$ bisects ∠JKL. If $m\angle JKN = (8x - 13)°$ and $m\angle NKL = (6x + 11)°$, find $m\angle JKN$.

$8(12) - 13$

$96 - 13 = 83$



$6x + 11 = 8x - 13$

$+13 \quad +13$

$6x + 24 = 8x$

$-6x \quad -6x$

$24 = 2x$

96-13 = 83

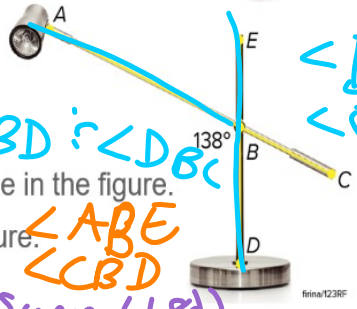
9x-13

J

$\frac{24}{2} = \frac{2x}{2}$ $x = 12$

Example 3
Vertical Angles and Angle Pairs

HOME DECOR The office lamp is made using two intersecting metal bars.



a. List a pair of adjacent angles that you see in the figure.

b. Identify a pair of vertical angles in the figure.

c. List a linear pairs of angles in the figure.

d. Find $m\angle EBC$.

e. Find $m\angle ABE$.

next

$\angle ABD$ & $\angle DBC$

$\angle DBC$
$\angle EBC$

$\angle ABD$ & $\angle EBC$

=

opposite

$\angle ABE$
$\angle CBD$

138 (vertical)

Supp (180)

180 - 138 = 42° (linear Supp.)

Example 3
Vertical Angles and Angle Pairs

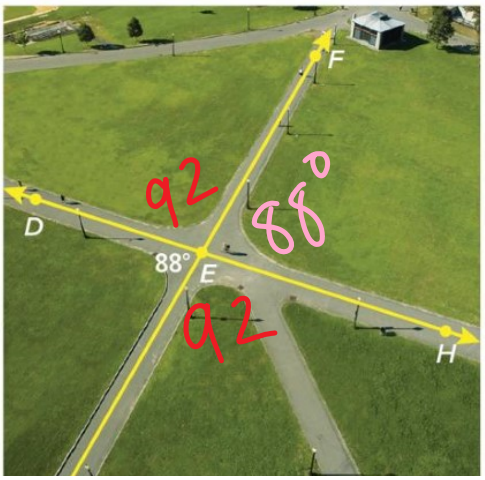
Check

PARK A city planner is designing a park. He wants to place two pathways that intersect near the center of the park. If $m\angle GED = 88°$, identify the true statement(s).

A. $m\angle DEF = 92°$

B. $m\angle DEG = 92°$

C. $m\angle FEH = 88°$



92

88°

92

B. $m\angle DEG = 92°$

C. $m\angle FEH = 88°$

D. $m\angle DEH = 92°$

E. $m\angle GEH = 88°$

90° Find the measures of two complementary angles if the measure of the larger angle is five more than four times the measure of the smaller angle.

x (+) x

$4x + 5 + 1x = 90$

$5x + 5 = 90$

$-5 \quad -5$

$\frac{5x}{5} = \frac{85}{5}$

$x = 17$

17°

Larger

$4x + 5 = 73°$

$4(17) + 5$

$x = 17°$ Smaller

180° The difference between the measures of two supplementary angles is 18°. Find the measure of each angle.

81 | 99

$x - 18$

$x = 99$

81°

99°

$x - 18 + x = 180$

$2x - 18 = 180$

$+18 \quad +18$

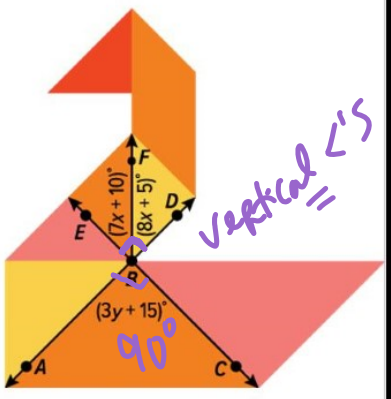
$2x = 198$

$\frac{2x}{2} = \frac{198}{2}$

$x = 99$

Example 2
Perpendicular Lines

TANGRAMS The tangram is a puzzle consisting of eight flat shapes called *tans* which are put together to form images. Find the values of x and y such that $\overleftrightarrow{AD}$ and $\overleftrightarrow{EC}$ in the tangram are perpendicular.



Right ∠'s 90°

vertical ∠'s =

90°

$7x + 10 + 8x + 5 = 90$

$15x + 15 = 90$

$-15 = -15$

$\frac{15x}{15} = \frac{75}{15} = 5$

$3y + 15 = 90$

$-15 \quad -15$

$\frac{3y}{3} = \frac{75}{3}$

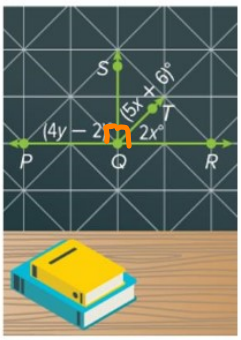
$y = 25$

$\frac{5y}{5} = \frac{25}{5}$ $y = 25$

Example 2
Perpendicular Lines

Check

DESIGN Find the values of x and y such that $\overleftrightarrow{PR}$ and $\overleftrightarrow{QS}$ are perpendicular.



Right $\angle = 90°$

$\angle SQP$

$4y - 2 = 90$
$+2 \quad +2$

$\frac{4y}{4} = \frac{92}{4}$ $y = 23$

$\angle SQR$

$5x + 6 + 2x = 90$
$7x + 6 = 90$
$-6 \quad -6$

$\frac{7x}{7} = \frac{84}{7}$ $x = 12$