3.2 Parallel Lines and Transversals

Bellwork:
Solve each system of equations.

$$2 \begin{cases} (6x - 5y = -16) \\ -12x + 4y = -16 \end{cases} \qquad \begin{cases} 3x + 2y = 4 \\ 4x - 2y = -18 \end{cases}$$

$$12x - 10y = -32 \qquad 6x - 5(8) = -16 \qquad 7x = -14$$
$$-12x + 4y = -16 \qquad 6x - 40 = -16 \qquad \boxed{x = -2}$$
$$\underline{} \qquad 6x = 24$$
$$\dfrac{-6y}{-6} = \dfrac{-48}{-6} \qquad \boxed{x = 4} \qquad 3(-2) + 2y = 4$$
$$\qquad\qquad\qquad -6 + 2y = 4$$
$$\boxed{y = 8} \qquad\qquad 2y = 10$$

Warm Up

$$\boxed{y = 5}$$

1

If two parallel lines are cut by a transversal, then...

Corresponding Angles are congruent (Corresponding Angles Postulate/ Theorem)

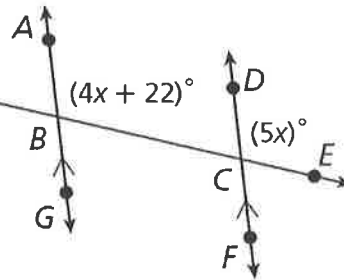**Find each angle measure.**

A. m∠ECF

$4x + 22 = 5x$

$22 = X$

m∠DCE = $5(22) = 110°$

m∠ECF = $180 - 110$

   = $70°$

B. m∠DCE

m∠DCE = $110°$

A

$(4x + 22)°$ • D

B

$(5x)°$ • E

C

G

F

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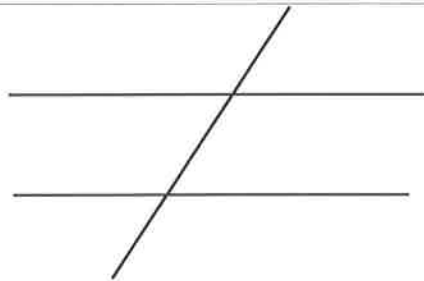
If two parallel lines are cut by a transversal, then...

Alternate Interior Angles Are Congruent (Alternate Interior Angles Theorem)

Alternate Exterior Angles Are Congruent (Alternate Exterior Angles Theorem)

Consecutive Interior Angles Are Supplementary (Consecutive Interior Angles Theorem)

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2

Theorems

Theorem 3.1 Corresponding Angles Theorem

If two parallel lines are cut by a transversal, then the pairs of corresponding angles are congruent.

Examples In the diagram at the left, $\angle 2 \cong \angle 6$ and $\angle 3 \cong \angle 7$.

Proof Ex. 36, p. 180

Theorem 3.2 Alternate Interior Angles Theorem

If two parallel lines are cut by a transversal, then the pairs of alternate interior angles are congruent.

Examples In the diagram at the left, $\angle 3 \cong \angle 6$ and $\angle 4 \cong \angle 5$.

Proof Example 4, p. 134

Theorem 3.3 Alternate Exterior Angles Theorem

If two parallel lines are cut by a transversal, then the pairs of alternate exterior angles are congruent.

Examples In the diagram at the left, $\angle 1 \cong \angle 8$ and $\angle 2 \cong \angle 7$.

Proof Ex. 15, p. 136

Theorem 3.4 Consecutive Interior Angles Theorem

If two parallel lines are cut by a transversal, then the pairs of consecutive interior angles are supplementary.

Examples In the diagram at the left, $\angle 3$ and $\angle 5$ are supplementary, and $\angle 4$ and $\angle 6$ are supplementary.

Proof Ex. 16, p. 136

Theorems

The measures of three of the numbered angles are 120°. Identify the angles. Explain your reasoning.

$m\angle 4 = m\angle 5 = m\angle 8 = 120°$

$m\angle 3 = m\angle 2 = m\angle 7 = m\angle 6 = 60°$

Find each angle measure.

A. m∠EDG

$2x - 135 = 75$

$2x = 210$

$x = 105$

$m\angle EDG = 105 - 30 = 75°$

B. m∠BDG

$m\angle BDG = 105°$
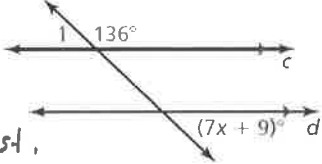
Example 1

Find the value of x.

$m\angle 1 = 7x + 9$ by alt. ext. ∠'s thm

$7x + 9 + 136 = 180°$ by lin. pair post.

$7x + 145 = 180$

$\dfrac{7x}{7} = \dfrac{35}{7}$
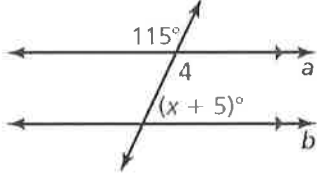
$\boxed{X = 5}$

Find the value of x.

$m\angle 4 = 115$ by vert. ∠'s thm

$X + 5 + 115 = 180$ by cons. int. ∠'s thm

$X + 120 = 180$

$-120 \quad -120$

$\boxed{X = 60}$

Example 2

Find x and y in the diagram.

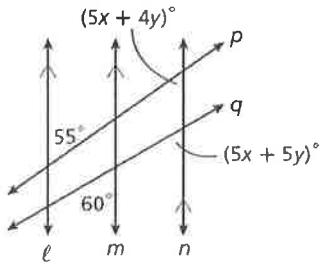$5x + 4y = 55 \rightarrow -5x - 4y = -55$

$5x + 5y = 60 \qquad 5x + 5y = 60$

$\boxed{Y = 5}$

$5x + 4(5) = 55$

$5x + 20 = 55$

$5x = 35$

$\boxed{X = 7}$

~~**Find the measures of the acute angles in the diagram.**~~   Find X and Y

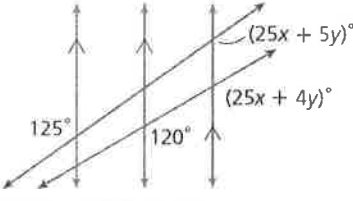$25x + 5y = 125 \qquad 25x + 5(5) = 125$

$-25x + 4y = 120 \qquad 25x + 25 = 125$

$\qquad\qquad\qquad\qquad 25x = 100$

$\boxed{Y = 5} \qquad\qquad \boxed{X = 4}$

Bass strings   Treble strings

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4

5x+y

2x+y

120   60
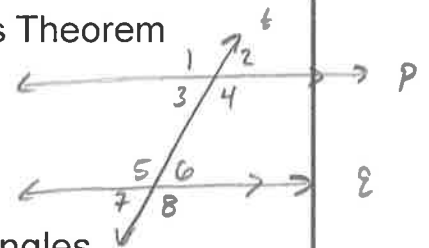
$5x + y = 120$
$-2x + y = 60$
$3x = 60$
$X = 20$

$5(20) + y = 120$
$100 + y = 120$
$y = 20$

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Write a Proof of the Alternate Interior Angles Theorem

1 2 / 3 4 → P

5 6 / 7 8 → ε

Write a Proof of the Consecutive Interior Angles Theorem

Statement	Reason
p ∥ t	Given
∠3 + ∠6 are alt. int. ∠'s	Def. of alt. int. ∠'s
∠2 ≅ ∠6	Corr. ∠'s Post.
∠2 ≅ ∠3	Vert. ∠'s Thm
∠3 ≅ ∠6	Transitive POL

Statement	Reason
p ∥ t	Given
∠4 + ∠6 cons. int ∠'s	Def. of cons. int. ∠'s
∠3 ≅ ∠6	alt. int ∠'s - 4 nm
∠3 + ∠4 Form Lin. Pair	Def. of Lin. Pair
∠3 + ∠4 are supp.	Linear Pair Post.
m∠3 + m∠4 = 180	Def. of supp.
m∠3 = m∠6	Def. of ≅
m∠6 + m∠4 = 180	Sub
∠6 and ∠4 are supp.	Def. of supp.

Example 4

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Homework:

WS 3.2B - Parallel Lines and Transversals

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