Lesson 3.7 Parallel Lines & Transversals

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Lesson 3.7
Parallel Li...

Lesson 3.7
Parallel Lines and Transversals

Content Objective
Students identify and use relationships between parallel lines and transversals

MA.912.GR.1.1
Prove relationships and theorems about lines and angles. Solve mathematical and real-world problems involving postulates, relationships and theorems of lines and angles
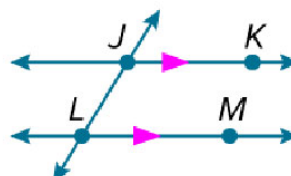
McGraw Hill

Learn
Parallel Lines and Transversals

If two lines do not intersect, then they are either parallel or skew.

Parallel and Skew	
Parallel lines are coplanar lines that do not intersect. **Example** $\overleftrightarrow{JK} \parallel \overleftrightarrow{LM}$	

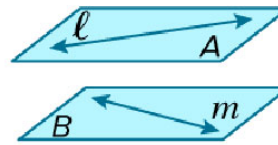**Example** $\overrightarrow{JK} \parallel \overleftrightarrow{LM}$

Learn
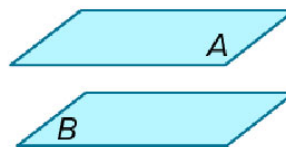Parallel Lines and Transversals

Parallel and Skew	
Skew lines are lines that do not intersect and are not coplanar. **Example** Lines ℓ and m are skew.	
Parallel planes are planes that do not intersect. **Example** Planes $\mathcal{A}$ and $\mathcal{B}$ are parallel.	

Example 1
Identify Parallel and Skew Relationships

Identify each of the following using the cube shown. Assume lines and planes that appear to be parallel or perpendicular are parallel or perpendicular, respectively.
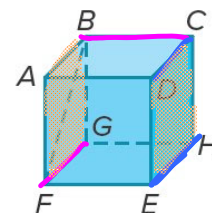
a. one line skew to $\overleftrightarrow{BC}$ $\overleftrightarrow{FG}$

b. two lines parallel to $\overleftrightarrow{EH}$ $\overleftrightarrow{FG}$ $\overleftrightarrow{CD}$
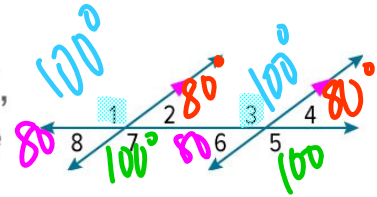
c. one plane parallel to plane DCH Plane ABG

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Angles and Parallel Lines

If two lines are parallel and cut by a transversal, then there are special relationships in the angle pairs formed by the lines.

(handwritten on diagram: $100°$, $80°$, $100°$, $80°$, 80, $100°$, $80°$, 100; angles labeled 1, 2, 3, 4, 8, 7, 6, 5)

Theorem 3.14: Corresponding Angles Theorem

If two parallel lines are cut by a transversal, then each pair of corresponding angles is congruent.

$\angle 1 \cong \underline{3}$,
$\underline{\angle 2} \cong \angle 4$,
$\angle 5 \cong \underline{\angle 7}$,
$\underline{\angle 6} \cong \angle 8$

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Angles and Parallel Lines

(handwritten on diagram: 80, 100, 100, 80; angles labeled 1, 2, 3, 4, 8, 7, 6, 5)

Theorem 3.15: Alternate Interior Angles Theorem

If two parallel lines are cut by a transversal, then each pair of alternate interior angles is congruent.

$\angle 2 \cong \underline{\angle 6}$,
$\underline{\angle 3} \cong \angle 7$

(handwritten: "Same side")

Theorem 3.16: Consecutive Interior Angles Theorem

If two parallel lines are cut by a transversal, then each pair of consecutive interior angles is supplementary.

$\angle 2$ and $\underline{\angle 3}$,
$\underline{\angle 6}$ and $\angle 7$

(handwritten: $180°$)

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Angles and Parallel Lines

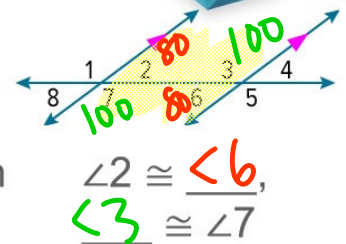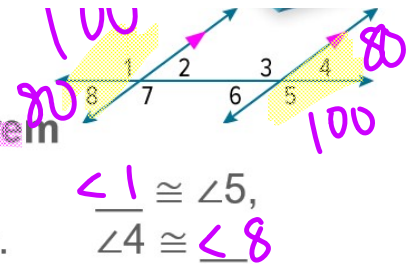*(handwritten on diagram: 100, 80, 80; angles labeled 1, 2, 3, 4, 8, 7, 6, 5)*

Angles and Parallel Lines

Theorem 3.17: Alternate Exterior Angles Theorem

If two parallel lines are cut by a transversal, then each pair of alternate exterior angles is congruent.

$\angle 1 \cong \angle 5,$
$\angle 4 \cong \angle 8$

Handwritten on figure: 100, 80, 80, 100
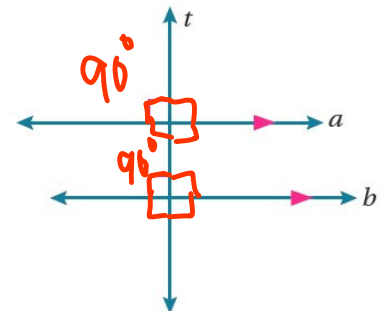
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Angles and Parallel Lines

A special relationship also exists when the transversal of two parallel lines is a perpendicular line.

Theorem 3.18: Perpendicular Transversal Theorem

In a plane, if a line is perpendicular to one of two parallel lines, then it is *perpendicular* to the other.

Example If $a \parallel b$ and $a \perp t$, then $b \perp t$.

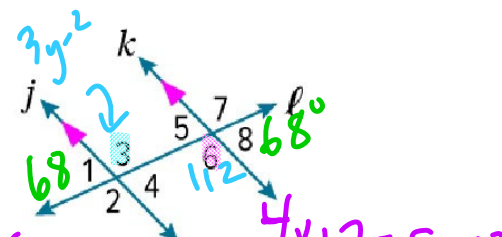*Handwritten:* Parallel, perpendicular 90°, 90°, 90°
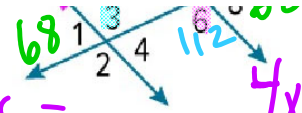
Example 5
Find Values of Variables

Use the figure to find the value of the indicated variable. Justify your reasoning.

a. If $m\angle 3 = (4x + 7)°$ **and** $m\angle 6 = (5x - 13)°$, **find the value of x.**

Handwritten: $4(20)+7$, $5(20)-13 = 87$, 87, alternate interior angles, $3y^2$, $68°$, 68, 112

a. If $m\angle3 = (4x + 7)°$ and $m\angle6 = (5x - 13)°$, find the value of x.

alternate interior angles =

$4x+7=5x-13$

$-4x \quad -4x$

$7 = x - 13$

$+13 \quad +13$

$(20 = x)$

b. Find the value of y if $m\angle8 = 68°$ and $m\angle3 = (3y - 2)°$.

$180 - 68 = 112$

$3y - 2 = 112$

$+2 \quad +2$

$3y = 114$

$\frac{3y}{3} = \frac{114}{3}$

$(y = 38)$

Students, draw anywhere on this slide!

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Do not remove this bar