Lesson 3.7 Parallel Lines & Transversals

Thursday, October 23, 2025 10:20 PM

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Lesson 3.7 Parallel Li...

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Parallel Lines and Transversals

Content Objective

Students identify and use relationships between parallel lines and transversals

MA.912.GR.1.1

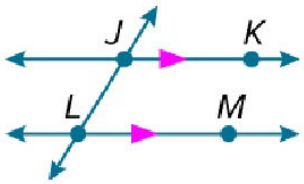
Prove relationships and theorems about lines and angles. Solve mathematical and real-world problems involving postulates, relationships and theorems of lines and angles

Learn

Parallel Lines and Transversals

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

90° ⊥ perpendicular ≠

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

parallel

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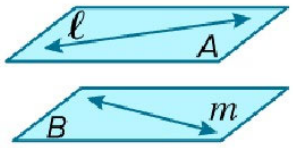
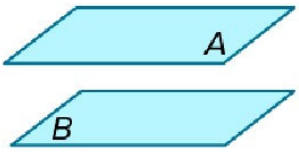
Parallel Lines and Transversals

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.	

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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.

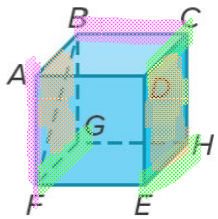
a. one line skew to $\overleftrightarrow{BC}$ 2 letters to name a line $\overleftrightarrow{AF}$

b. two lines parallel to $\overleftrightarrow{EH}$ $\overleftrightarrow{CD}$ $\overleftrightarrow{FG}$

c. one plane parallel to plane *DCH*

3 points to name a plane

Plane ABG



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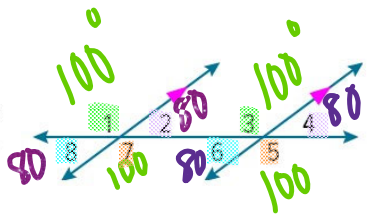
Angles and Parallel Lines

supplementary

linear pair $\angle 1 + \angle 8 = 180$

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



$\angle 1 \cong \angle 7$

vertical $\angle$s

Theorem 3.14: Corresponding Angles Theorem

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

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

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Angles and Parallel Lines

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.

$\angle 2 \cong$ 6,
3 $\cong \angle 7$

Theorem 3.16: Consecutive Interior Angles Theorem

next to

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

$\angle 2$ and 3,
6 and $\angle 7$

inside parallel lines

not linear

same side of transversal

180

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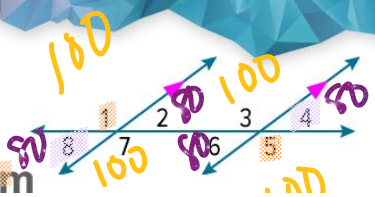
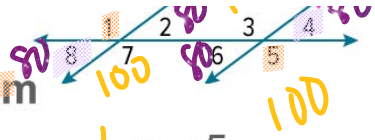
Angles and Parallel Lines



Theorem 3.17: Alternate Exterior Angles Theorem

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.

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

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Angles and Parallel Lines

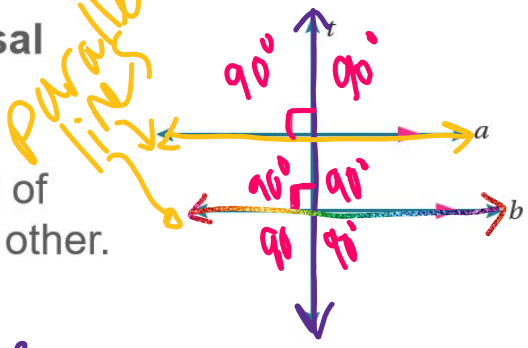
A special relationship also exists when the transversal of two parallel lines is a perpendicular line.

transversal

parallel lines

Theorem 3.18: Perpendicular Transversal Theorem

90°



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 $b \perp t$.

parallel

perpendicular

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Example 5

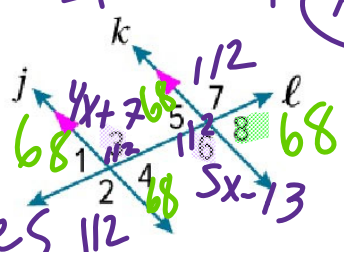
Find Values of Variables

$4x + 7 = 5x - 13$
$-5x \quad -5x$
$-1x + 7 = -13$
$-7 \quad -7$

$\frac{-1x}{-1} = \frac{-20}{-1}$

$x = 20$

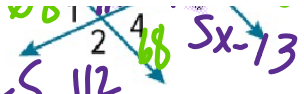
Use the figure to find the value of the indicated variable. Justify your reasoning.



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

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

Alt Interior Angles



b. Find the value of y if $m\angle 8 = 68°$ and $m\angle 3 = (3y - 2)°$.

$= 112$

$+2 \quad +2$

$3y = 114$

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

$y = 38$

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