

Honors Geometry Chapter 3 Topics

3-1 Parallel Lines and Transversal

- Identify the relationship between two lines or two planes.
- Name angles formed by a pair of lines and a transversal.

3-2 Angles and Parallel Lines

- Use properties of parallel lines to determine congruent angles.
- Use the theorems, postulates, auxiliary lines, and algebra to find measures of angles.

3-3 Slopes of Lines

- Find slopes of lines.
- Use slope to identify parallel and perpendicular lines.

3-4 Equations of Lines

- Write equations in slope intercept form.
- Graph equations given a point and a parallel or perpendicular slope.

3-5 Proving Lines Parallel

- Recognize angle conditions that occur with parallel lines.
- Use the converse of postulates and theorems to prove lines parallel.

3-6 Perpendiculars and Distance

- Find the distance between a point and a line.
- Find the distance between parallel lines.

3-1 Parallel Lines and Transversals

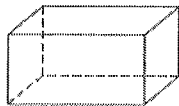
Introduction: Draw a Rectangular Prism using the steps below (p. 126)

A rectangular prism can be drawn using parallel lines and parallel planes.

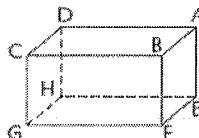
Step 1 Draw two parallel planes to represent the top and bottom of the prism.



Step 2 Draw the edges. Make any hidden edges of the prism dashed.



Step 3 Label the vertices.



Parallel lines: _____ lines that do not intersect. (Segments and rays contained within \parallel lines are also \parallel).

Ex: The lines \parallel to \overleftrightarrow{BF} are

Parallel Planes: planes that do not _____.

Ex: The pairs of \parallel planes are

Skew lines: _____ lines that do not intersect.

Ex: The segments skew to \overleftrightarrow{BF} are

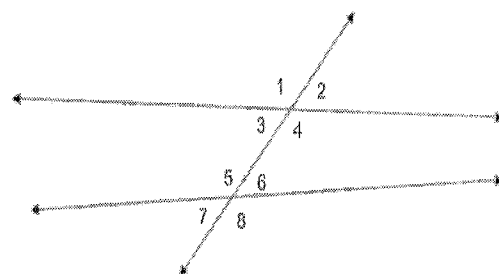
Other segments that exist for the points but are not shown are

Transversal: a line that intersects _____ or more lines in a plane at different points

Ex: \overleftrightarrow{BF} is a transversal in plane CBF of

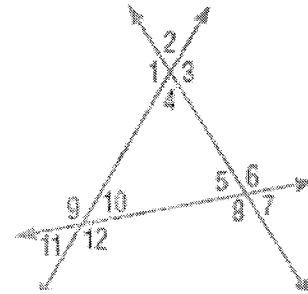
Other lines that exist for the points but are not shown are

Name	Definition	Example
corresponding angles		
alternate interior angles		
alternate exterior angles		
consecutive interior angles		



Example: Name the transversal that forms each pair of angles. Then identify the special name for the angle pairs.

- a. $\angle 4$ and $\angle 10$
- b. $\angle 2$ and $\angle 6$
- c. $\angle 11$ and $\angle 6$
- d. $\angle 3$ and $\angle 5$



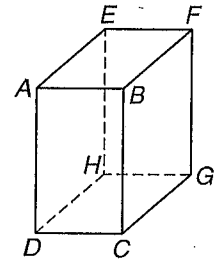
Closure: In your homework, draw the figures. When asked to name the lines/segments, you only need to write the segments that are drawn.

3-1

Skills Practice

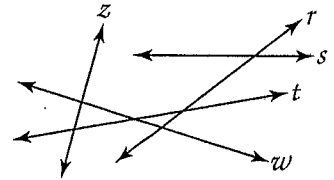
Parallel Lines and Transversals

For Exercises 1–4, refer to the figure at the right.



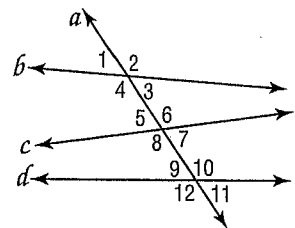
1. Name all planes that are parallel to plane DEH .
2. Name all segments that are parallel to \overline{AB} .
3. Name all segments that intersect \overline{GH} .
4. Name all segments that are skew to \overline{CD} .

Identify the sets of lines to which each given line is a transversal.



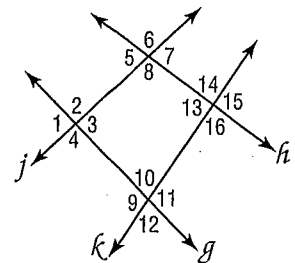
5. r
6. s
7. w

Identify each pair of angles as *alternate interior*, *alternate exterior*, *corresponding*, or *consecutive interior* angles.



- | | |
|--------------------------------|--------------------------------|
| 8. $\angle 2$ and $\angle 8$ | 9. $\angle 3$ and $\angle 6$ |
| 10. $\angle 1$ and $\angle 9$ | 11. $\angle 3$ and $\angle 9$ |
| 12. $\angle 6$ and $\angle 12$ | 13. $\angle 7$ and $\angle 11$ |

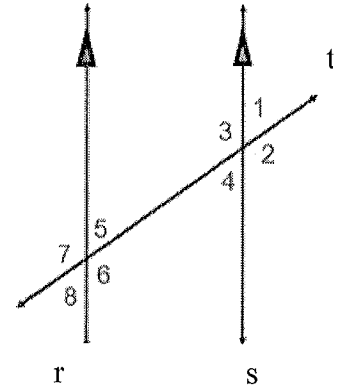
Name the transversal that forms each pair of angles. Then identify the special name for the angle pair.



- | | |
|--------------------------------|---------------------------------|
| 14. $\angle 4$ and $\angle 10$ | 15. $\angle 2$ and $\angle 12$ |
| 16. $\angle 7$ and $\angle 3$ | 17. $\angle 13$ and $\angle 10$ |
| 18. $\angle 8$ and $\angle 14$ | 19. $\angle 6$ and $\angle 14$ |

3-2 Angles and Parallel Lines

	If two parallel lines are cut by a transversal, ...	Example
3.1 Corresponding Angles Postulate		
3.1 Alternate Interior Angles Theorem		
3.2 Consecutive Interior Angles Theorem		
3.3 Alternate Exterior Angles Theorem		



Proof of the Alternate Interior Angles Theorem:

Given: Parallel lines r and s are cut by transversal t

Prove: $\angle 4 \cong \angle 5$

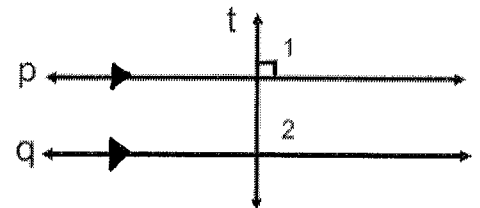
Statement	Reason
1. Parallel lines r and s are cut by transversal t	1. Given
2.	2. Corresponding Angles Postulate
3.	3.
4.	4.

Perpendicular Transversal Theorem: If a line is perpendicular to one of two parallel lines, then it is perpendicular to the other.

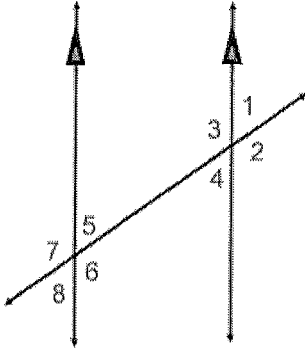
Given: $t \perp p$; $p \parallel q$

Prove:

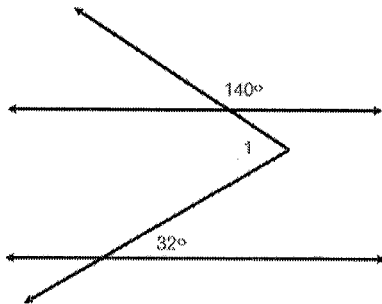
Statement	Reason



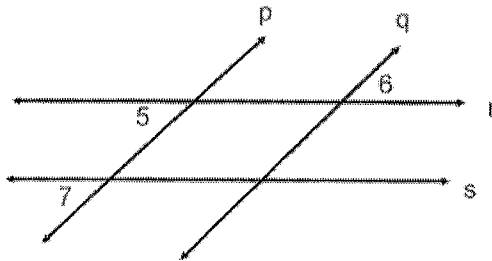
Ex 1: If $m\angle 3 = 115$, find $m\angle 8$.



Ex 2: Find $m\angle 1$.



Ex 3: If $m\angle 5 = 2x - 10$, $m\angle 6 = 4(y - 25)$, and $m\angle 7 = x + 15$, find x and y .



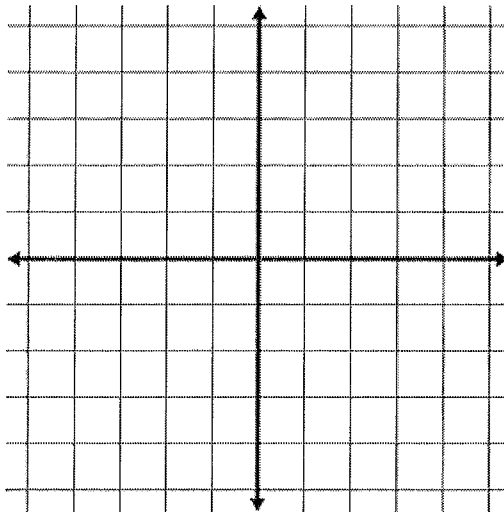
3-3 Slopes of Lines

Whiteboard Activity:

1. What is the slope formula?
2. What is the slope of a vertical line?
3. What is the slope of a horizontal line?
4. Define rate of change.
5. For one manufacturer of camping equipment, between 1990 and 2000 annual sales increased by \$7.4 million per year. In 2000, the total sales were \$85.9 million. If sales increase at the same rate, what will be the total sales in 2010?

Postulates

- 3.2 Two nonvertical lines have the same slope if and only if...
- 3.3 Two nonvertical lines are perpendicular if and only if...
6. Graph the line that contains $Q(5,1)$ and is parallel to line MN with $M(-2,4)$ and $N(2,1)$.

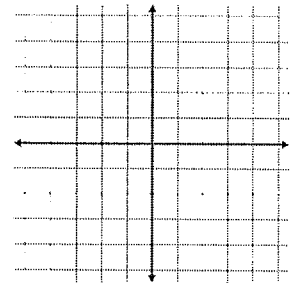


7. Write the equation of the line drawn in slope-intercept form.

3-4 Equations of Lines

Whiteboard Activity:

1. What is the **slope-intercept form** of a linear equation?
2. Define all the variables in the equation.
3. Write an equation in **slope-intercept form** of the line with the slope of 6 and y-intercept of 3.
4. What is the **point-slope form** of a line?
5. Define all the variables in the equation.
6. Write an equation in **point-slope form** of the line whose slope is $-3/5$ that contains the point $(-10,8)$
7. Which form should we use when graphing a line given the slope and a point on the line?
8. Write an equation in slope-intercept form for the line passing through $(4,9)$ and $(-2,0)$. Then graph it.



9. Write an equation in slope-intercept form for the line containing $(1,7)$ that is perpendicular to $y = -1/2x + 1$
10. An apartment complex charges \$525 per month plus a \$750 security deposit.
 - a. Write an equation to represent the total annual cost A for r months of rent.
 - b. Another apartment complex \$600 per month plus a \$200 security deposit. After one year which is less expensive?

3.5 Proving Lines Parallel

Postulate 3.4: If two lines in a plane are cut by a transversal so that corresponding angles are congruent, then the lines are _____.

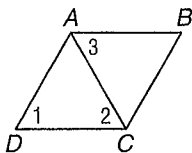
Parallel Postulate (3.5): If given a line and point not on the line, then there exists exactly one line through the point that is _____ to the given line.

If two lines in a plane are cut by a transversal and ...

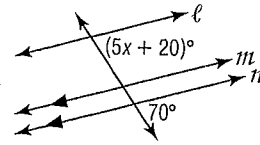
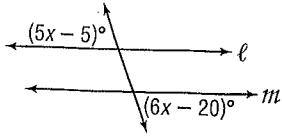
Theorem	Example	Figure
3.5 If alt. ext. \angle s are \cong , then lines are \parallel .		
3.6 If cons. int. \angle s are \cong , then lines are \parallel .		
3.7 If alt. int. \angle s are \cong , then lines are \parallel .		
3.8 If 2 lines are \perp to the same line, then lines are \parallel .		

Ex 1: Determine which lines, if any are parallel.

Given: $\angle 1 \cong \angle 2$, $\angle 1 \cong \angle 3$



Ex 2: Find x so that $\ell \parallel m$.

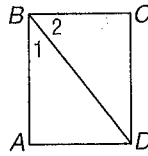


Ex 3: Prove Lines Parallel

Given: $\angle 1$ and $\angle 2$ are complementary.

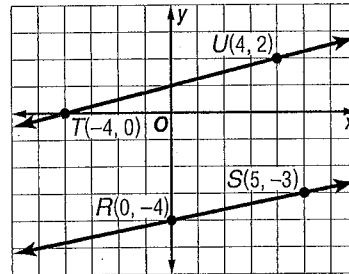
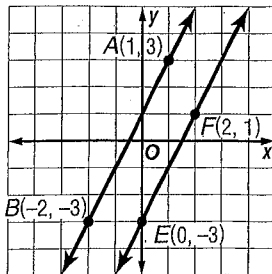
$$\overline{BC} \perp \overline{CD}$$

Prove: $\overline{BA} \parallel \overline{CD}$



Statement	Reason

Ex 4: Determine whether each pair of lines is parallel. Explain why or why not.



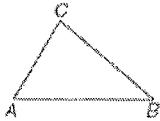
3-6 Perpendiculars and Distance

Distance between and point (not on the line) and a line is the length of the segment _____ to the line from the point. "Shortest Distance"

Picture:

Example 1: Draw a segment that represents the distance indicated.

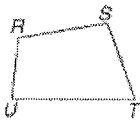
1. C to \overline{AB}



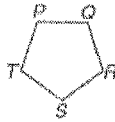
2. D to \overline{AB}



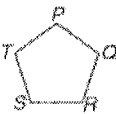
3. T to \overline{RS}



4. S to \overline{PQ}



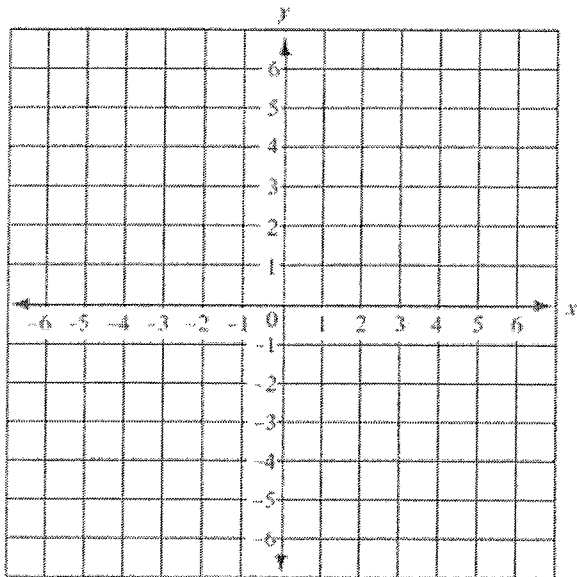
5. S to \overline{QR}



6. S to \overline{RT}



Example 2: Construct a line perpendicular to line q ($y=-x$) through $V(1,5)$ not on q . Then find the distance from V to q .



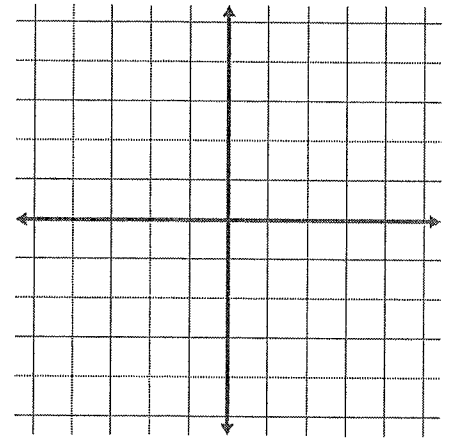
Distance between two parallel lines is the distance between one of the lines and any point on the other line. *Draw picture:*

Theorem 3.9: In a plane, if two lines are equidistant from a third line, then the two lines are parallel to each other.

Equidistant- the distance between two lines measured along a perpendicular line to the line is always the same.

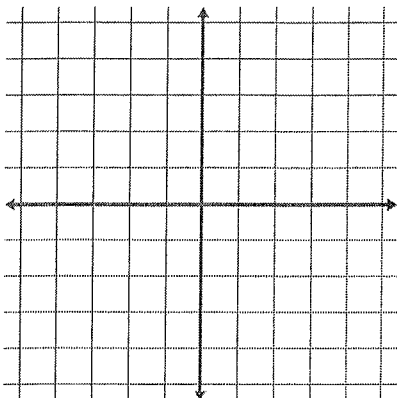
Example 3: Find the distance between the parallel lines a and b whose equations are $y = 2x + 3$ and $y = 2x - 3$ respectively.

1. A. Select a y -intercept on one of the lines:
B. Identify the perpendicular slope:
C. Write an equation of a line p perpendicular to the two lines passing through the selected point:
2. Use a system of equations to find the intersection of line p and the other line:



3. Use the distance formula to find the distance between the two points:

Example 4: Find the distance between the parallel lines $y = x + 3$ and $y = x - 1$.



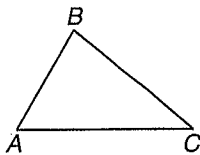
3-6

Skills Practice

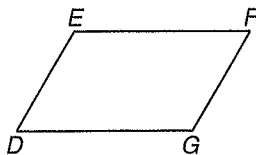
Perpendiculars and Distance

Draw the segment that represents the distance indicated.

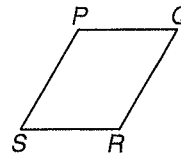
1. B to \overline{AC}



2. G to \overline{EF}

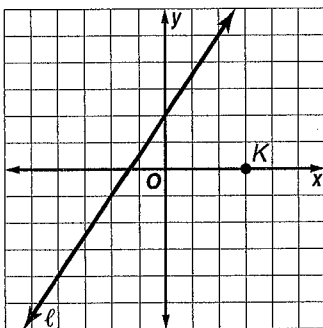


3. Q to \overline{SR}

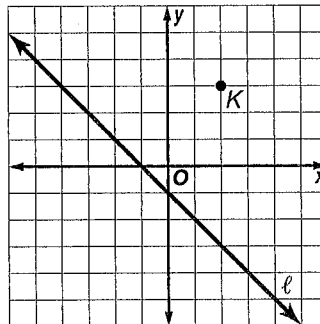


Construct a line perpendicular to ℓ through K . Then find the distance from K to ℓ .

4.



5.



Find the distance between each pair of parallel lines.

6. $y = 7$
 $y = -1$

7. $x = -6$
 $x = 5$

8. $y = 3x$
 $y = 3x + 10$

9. $y = -5x$
 $y = -5x + 26$

10. $y = x + 9$
 $y = x + 3$

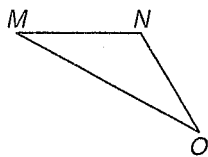
11. $y = -2x + 5$
 $y = -2x - 5$

3-6 Practice

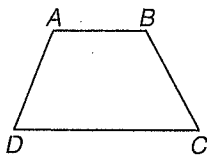
Perpendiculars and Distance

Draw the segment that represents the distance indicated.

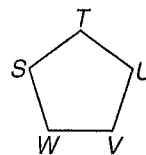
1. O to \overline{MN}



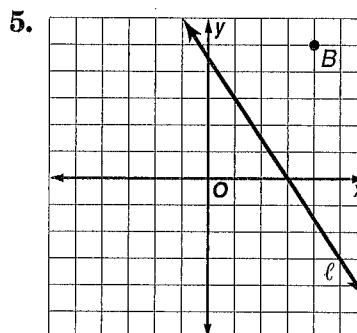
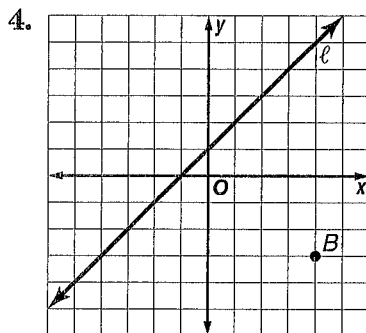
2. A to \overline{DC}



3. T to \overline{VU}



Construct a line perpendicular to ℓ through B . Then find the distance from B to ℓ .



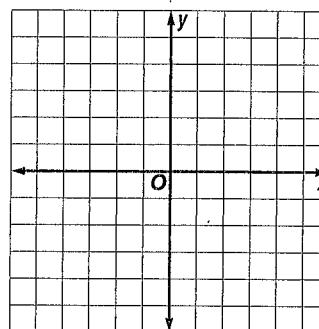
Find the distance between each pair of parallel lines.

6. $y = -x$
 $y = -x - 4$

7. $y = 2x + 7$
 $y = 2x - 3$

8. $y = 3x + 12$
 $y = 3x - 18$

9. Graph the line $y = -x + 1$. Construct a perpendicular segment through the point at $(-2, -3)$. Then find the distance from the point to the line.



10. **CANOEING** Bronson and a friend are going to carry a canoe across a flat field to the bank of a straight canal. Describe the shortest path they can use.