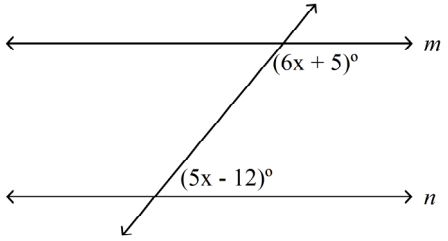
Name: _____ **Class:** _____ **Date:** _____ **ID: A**

Chapter 3 Study Guide

Numeric Response

1. A right triangle is formed by the x-axis, the y-axis and the line $y = -2x + 3$. Find the length of the hypotenuse. Round your answer to the nearest hundredth.

2. Find the value of x so that $m \parallel n$.



Matching

Match each vocabulary term with its definition.

a. parallel lines
b. parallel planes
c. perpendicular lines
d. skew lines
e. perpendicular bisector
f. perpendicular planes
g. angle bisector

____ 3. lines that are not coplanar
____ 4. planes that do not intersect
____ 5. lines in the same plane that do not intersect
____ 6. a line perpendicular to a segment at the segment's midpoint
____ 7. lines that intersect at 90° angles

Match each vocabulary term with its definition.

a. vertical angles
b. alternate interior angles
c. corresponding angles
d. supplementary angles
e. transversal
f. same-side interior angles
g. alternate exterior angles

____ 8. a line that intersects two coplanar lines at two different points
____ 9. for two lines intersected by a transversal, a pair of angles that are on the same side of the transversal and on the same sides of the other two lines
____ 10. for two lines intersected by a transversal, a pair of angles that are on the same side of the transversal and between the two lines
____ 11. for two lines intersected by a transversal, a pair of angles that are on opposite sides of the transversal and outside the other two lines
____ 12. for two lines intersected by a transversal, a pair of angles that are on opposite sides of the transversal and between the other two lines

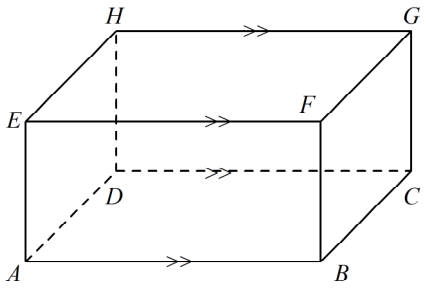
Match each vocabulary term with its definition.

a. x-intercept
b. point-slope form
c. rise
d. run
e. y-intercept
f. distance from a point to a line
g. slope-intercept form
h. slope

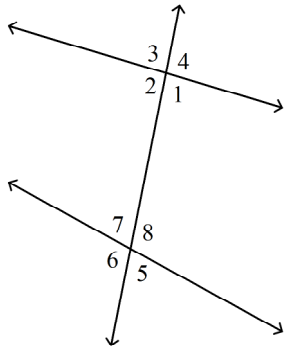
____ 13. $y - y_1 = m(x - x_1)$, where m is the slope and (x_1, y_1) is a point on the line
____ 14. the difference in the y-values of two points on a line
____ 15. a line with slope m and y-intercept b can be written in the form $y = mx + b$
____ 16. a measure of the steepness of a line
____ 17. the length of the perpendicular segment from the point to the line
____ 18. the difference in the x-values of two points on a line

Short Answer

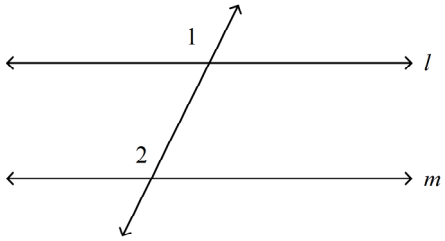
19. Identify a pair of parallel segments.



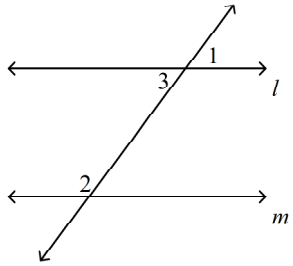
20. Give an example of corresponding angles.



21. Use the Converse of the Corresponding Angles Postulate and $\angle 1 \cong \angle 2$ to show that $l \parallel m$.



22. **Given**: $m\angle 1 + m\angle 2 = 180°$
Prove: $l \parallel m$

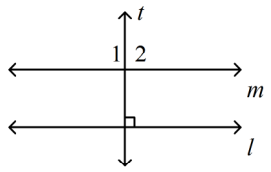


Complete the proof.

Proof:

Statements	Reasons
1. $m\angle 1 + m\angle 2 = 180°$	1. Given
2. $m\angle 1 = m\angle 3$	2. [1]
3. $m\angle 3 + m\angle 2 = 180°$	3. Substitution (Steps 1 and 2)
4. $l \parallel m$	4. [2]

23. Write a two-column proof.
Given: $t \perp l, \angle 1 \cong \angle 2$
Prove: $m \parallel l$



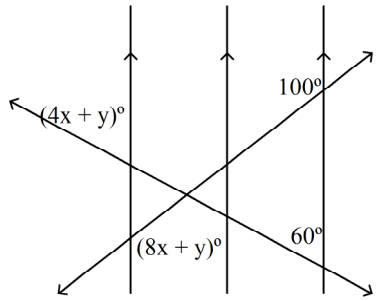
Complete the proof.

Proof:

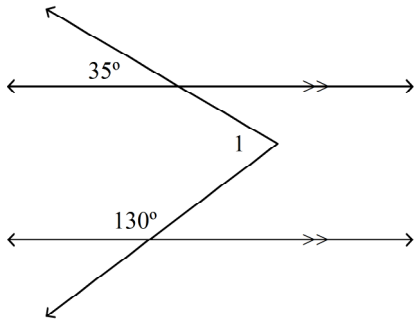
Statements	Reasons
1. [1]	1. Given
2. $t \perp m$	2. [2]
3. $m \parallel l$	3. [3]

24. Draw two lines and a transversal such that $\angle 1$ and $\angle 2$ are alternate interior angles, $\angle 2$ and $\angle 3$ are corresponding angles, and $\angle 3$ and $\angle 4$ are alternate exterior angles. What type of angle pair is $\angle 1$ and $\angle 4$?

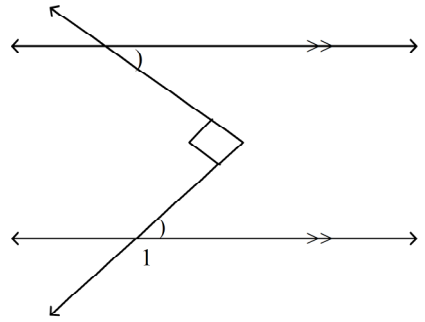
25. Violin strings are parallel. Viewed from above, a violin bow in two different positions forms two transversals to the violin strings. Find x and y in the diagram.



26. Find m$\angle 1$ in the diagram. (Hint: Draw a line parallel to the given parallel lines.)

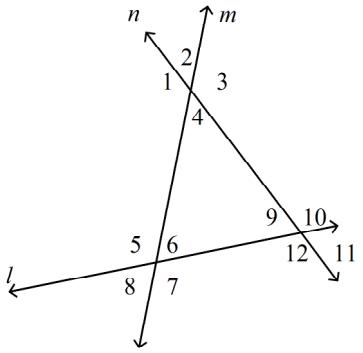


27. Find m$\angle 1$ in the diagram. (Hint: Draw a line parallel to the given parallel lines.)

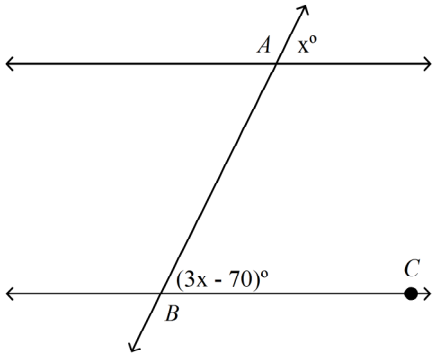


28. $\overline{AB} \parallel \overline{CD}$ for $A(4, -5)$, $B(-2, -3)$, $C(x, -2)$, and $D(6, y)$. Find a set of possible values for x and y.

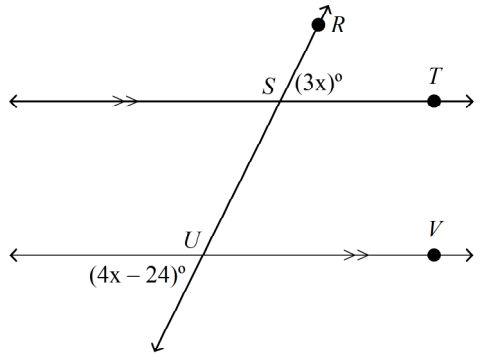
29. Identify the transversal and classify the angle pair $\angle 11$ and $\angle 7$.



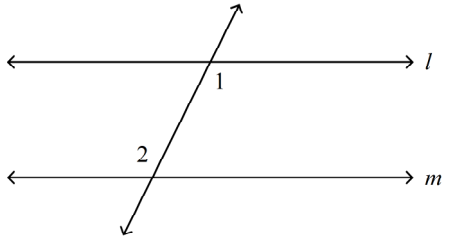
30. Find m$\angle ABC$.



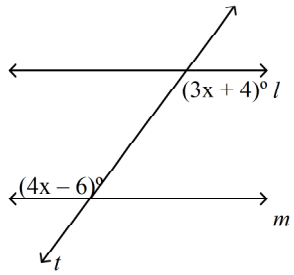
31. Find m∠*RST*.



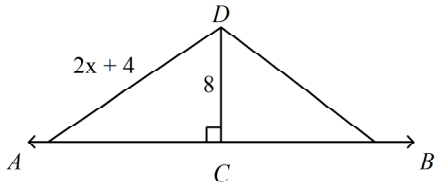
32. Use the information m∠1 = (3*x* + 30)°, m∠2 = (5*x* – 10)°, and *x* = 20, and the theorems you have learned to show that *l* ∥ *m*.



33. In a swimming pool, two lanes are represented by lines *l* and *m*. If a string of flags strung across the lanes is represented by transversal *t,* and *x* = 10, show that the lanes are parallel.

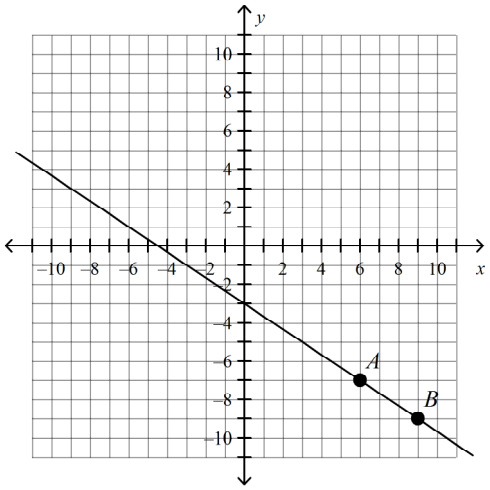


34. Write and solve an inequality for *x*.



35. From the ocean, salmon swim perpendicularly toward the shore to lay their eggs in rivers. Waves in the ocean are parallel to the shore. Why must the salmon swim perpendicularly to the waves?

36. Use the slope formula to determine the slope of the line containing points $A(6, -7)$ and $B(9, -9)$.



37. Milan starts at the bottom of a 1000-foot hill at 10:00 am and bikes to the top by 3:00 PM. Graph the line that represents Milan's distance up the hill at a given time. Find and interpret the slope of the line.

38. Use slopes to determine whether the lines are parallel, perpendicular, or neither.

$\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ for $A(3,5)$, $B(-2,7)$, $C(10,5)$, and $D(6,15)$

39. Write the equation of the line with slope 2 through the point (4, 7) in point-slope form.

40. Graph the line $y - 3 = 4(x - 6)$.

41. Determine whether the pair of lines $12x + 3y = 3$ and $y = 4x + 1$ are parallel, intersect, or coincide.

42. Both stores see the same number of people. How many customers must both stores have before the total amount of money they have is equal?

	Jala's Yogurt Shop	**Ela's Salad Store**
Starting Money	\$20	\$30
Money per Customer	\$6	\$4

Chapter 3 Study Guide
Answer Section

NUMERIC RESPONSE

1. ANS: 3.35

   PTS: 1 DIF: Advanced NAT: 12.3.3.d STA: GE15.0
   TOP: 3-6 Lines in the Coordinate Plane
2. ANS: 17

   PTS: 1 DIF: Average NAT: 12.2.1.f STA: GE7.0
   TOP: 3-3 Proving Lines Parallel

MATCHING

3. ANS: D PTS: 1 DIF: Basic REF: Page 146
   TOP: 3-1 Lines and Angles
4. ANS: B PTS: 1 DIF: Basic REF: Page 146
   TOP: 3-1 Lines and Angles
5. ANS: A PTS: 1 DIF: Basic REF: Page 146
   TOP: 3-1 Lines and Angles
6. ANS: E PTS: 1 DIF: Basic REF: Page 172
   TOP: 3-4 Perpendicular Lines
7. ANS: C PTS: 1 DIF: Basic REF: Page 146
   TOP: 3-1 Lines and Angles

8. ANS: E PTS: 1 DIF: Basic REF: Page 147
   TOP: 3-1 Lines and Angles
9. ANS: C PTS: 1 DIF: Basic REF: Page 147
   TOP: 3-1 Lines and Angles
10. ANS: F PTS: 1 DIF: Basic REF: Page 147
    TOP: 3-1 Lines and Angles
11. ANS: G PTS: 1 DIF: Basic REF: Page 147
    TOP: 3-1 Lines and Angles
12. ANS: B PTS: 1 DIF: Basic REF: Page 147
    TOP: 3-1 Lines and Angles

13. ANS: B PTS: 1 DIF: Basic REF: Page 190
    TOP: 3-6 Lines in the Coordinate Plane
14. ANS: C PTS: 1 DIF: Basic REF: Page 182
    TOP: 3-5 Slopes of Lines
15. ANS: G PTS: 1 DIF: Basic REF: Page 190
    TOP: 3-6 Lines in the Coordinate Plane
16. ANS: H PTS: 1 DIF: Basic REF: Page 182
    TOP: 3-5 Slopes of Lines

17. ANS: F PTS: 1 DIF: Basic REF: Page 172
TOP: 3-4 Perpendicular Lines
18. ANS: D PTS: 1 DIF: Basic REF: Page 182
TOP: 3-5 Slopes of Lines

SHORT ANSWER

19. ANS:
$\overline{AB} \parallel \overline{HG}$
Parallel lines are coplanar and do not intersect. Segments are parallel if the lines that contain them are parallel. Also, parallel lines and segments are indicated by arrows on the drawing.

PTS: 1 DIF: Basic REF: Page 146
OBJ: 3-1.1 Identifying Types of Lines and Planes NAT: 12.3.3.g
STA: GE7.0 TOP: 3-1 Lines and Angles
20. ANS:
$\angle 8$ and $\angle 4$
Corresponding angles lie on the same side of a transversal, on the same sides of the two lines the transversal crosses. So, $\angle 8$ and $\angle 4$ are corresponding angles.

PTS: 1 DIF: Basic REF: Page 147 OBJ: 3-1.2 Classifying Pairs of Angles
NAT: 12.3.3.g STA: GE7.0 TOP: 3-1 Lines and Angles
21. ANS:
$\angle 1 \cong \angle 2$ is given. From the diagram, $\angle 1$ and $\angle 2$ are corresponding angles. So by the Converse of the Corresponding Angles Postulate, $l \parallel m$.
$\angle 1 \cong \angle 2$ is given. From the diagram, $\angle 1$ and $\angle 2$ are corresponding angles. So by the Converse of the Corresponding Angles Postulate, $l \parallel m$.

PTS: 1 DIF: Basic REF: Page 162
OBJ: 3-3.1 Using the converse of the Corresponding Angles Postulate
NAT: 12.3.3.g STA: GE7.0 TOP: 3-3 Proving Lines Parallel
22. ANS:
[1] Vertical Angle Theorem
[2] Converse of the Same-Side Interior Angles Theorem
Proof:

Statements	Reasons
1. $m\angle 1 + m\angle 2 = 180°$	1. Given
2. $m\angle 1 = m\angle 3$	2. Vertical Angle Theorem
3. $m\angle 3 + m\angle 2 = 180°$	3. Substitution (Steps 1 and 2)
4. $l \parallel m$	4. Converse of the Same-Side Interior Angles Theorem

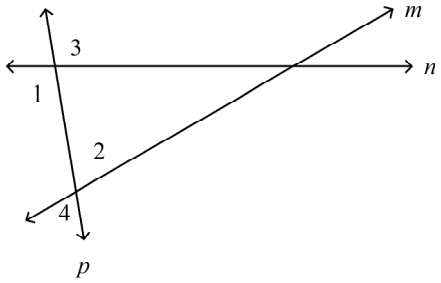
PTS: 1 DIF: Basic REF: Page 164 OBJ: 3-3.3 Proving Lines Parallel
NAT: 12.3.5.a STA: GE7.0 TOP: 3-3 Proving Lines Parallel

23. ANS:
[1] $t \perp l, \angle 1 \cong \angle 2$
[2] 2 intersecting lines form linear pair of $\cong \angle$s $\rightarrow$ lines $\perp$.
[3] 2 lines $\perp$ to the same line $\rightarrow$ lines $\parallel$.
Proof:

Statements	Reasons
1. $t \perp l, \angle 1 \cong \angle 2$	1. Given
2. $t \perp m$	2. If 2 intersecting lines form linear pair of $\cong$ $\angle$s $\rightarrow$ lines $\perp$.
3. $m \parallel l$	3. If 2 lines $\perp$ to the same line $\rightarrow$ lines $\parallel$.

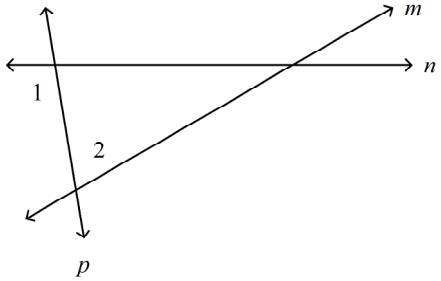
PTS: 1 DIF: Basic REF: Page 173 OBJ: 3-4.2 Proving Properties of Lines
NAT: 12.3.5.a STA: GE2.0 TOP: 3-4 Perpendicular Lines

24. ANS:

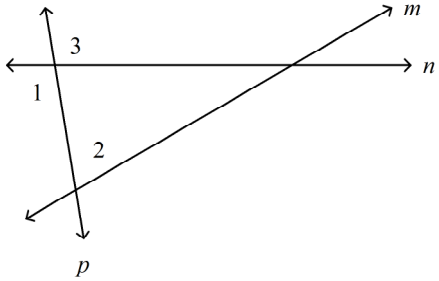


$\angle 1$ and $\angle 4$ are corresponding angles.

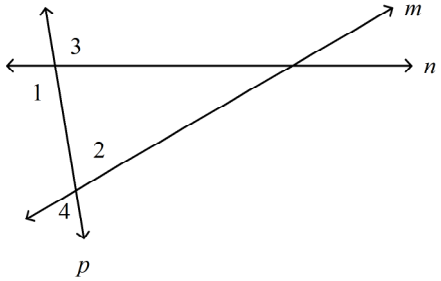
Step 1 Draw two lines m, n, and a transversal p such that $\angle 1$ and $\angle 2$ are alternate interior angles. They should lie on opposite sides of the transversal p between lines m and n.



Step 2 $\angle 2$ and $\angle 3$ are corresponding angles. Corresponding angles lie on the same side of the transversal p and on the same sides of lines m and n. Add $\angle 3$ to the drawing.



Step 3 $\angle 3$ and $\angle 4$ are alternate exterior angles. They should lie on opposite sides of the transversal p and outside lines m and n. Add $\angle 4$ to the drawing.



$\angle 1$ and $\angle 4$ are corresponding angles. They lie on the same side of the transversal p and on the same sides of lines m and n.

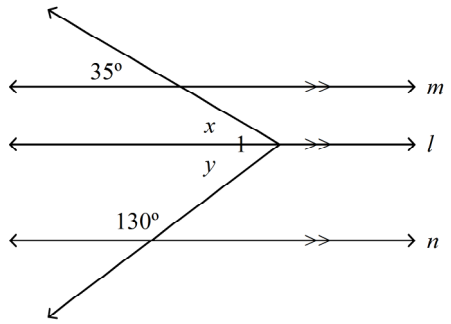
PTS: 1 DIF: Advanced NAT: 12.2.1.f STA: GE7.0
TOP: 3-1 Lines and Angles KEY: multi-step

25. ANS:
$x = 10, y = 20$
By the Corresponding Angles Postulate, $(4x + y)° = 60°$.
By the Alternate Interior Angle Postulate, $(8x + y)° = 100°$.

$8x + y$	$= 100$	
$-(4x + y)$	$= -60$	Subtract the first equation from the second.
$4x$	$= 40$	
x	$= 10$	Divide both sides by 4.
$8(10) + y$	$= 100$	Substitute 10 for x.
y	$= 20$	Simplify.

PTS: 1 DIF: Advanced REF: Page 157 OBJ: 3-2.3 Application
NAT: 12.3.3.g STA: GE7.0 TOP: 3-2 Angles Formed by Parallel Lines and Transversals

26. ANS:
$m\angle 1 = 85°$
Step 1 Draw line l parallel to lines m and n.
$m\angle 1 = m\angle x + m\angle y$



Step 2 Find $m\angle x$.
Use the Corresponding Angles Postulate with lines m and l. $m\angle x = 35°$**.**

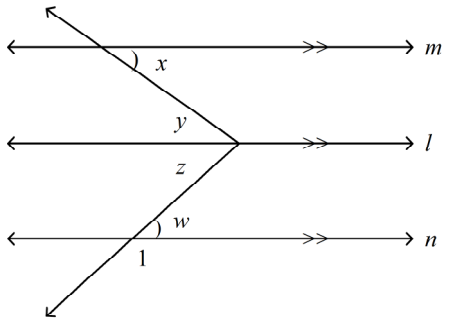
Step 3 Find $m\angle y$.
Use the Same-Side Interior Angles Theorem with lines l and n. $m\angle y = 180 - 130 = 50°$**.**

Step 4 Find $m\angle 1$.
$m\angle 1 = m\angle x + m\angle y = 35 + 50 = 85°$

PTS: 1 DIF: Advanced NAT: 12.2.1.f STA: GE7.0
TOP: 3-2 Angles Formed by Parallel Lines and Transversals KEY: multi-step

27. ANS:
$m\angle 1 = 135°$

Step 1 Draw line l parallel to lines m and n.
Given: $m\angle y + m\angle z = 90°$, $\angle x \cong \angle w$,
$m \parallel n \parallel l$



Step 2 Use the Alternate Interior Angles Theorem to find pairs of congruent angles.

$$\angle y \cong \angle x,\ \angle z \cong \angle w$$

$$m\angle y = m\angle x,\ m\angle z = m\angle w$$

Step 3 Substitute x for y and w for z in the given $m\angle y + m\angle z = 90°$.

$$m\angle x + m\angle w = 90°$$

Step 4 Use the definition of congruent angles and the given $\angle x \cong \angle w$.

$$m\angle x = m\angle w$$

Step 5 To find $m\angle w$, substitute w for x.

$$m\angle x + m\angle w = 90°$$
$$m\angle w + m\angle w = 90°$$
$$2 \cdot m\angle w = 90°$$
$$m\angle w = 45°$$

Step 6 Find $m\angle 1$.
$\angle 1$ and $\angle w$ are supplementary.

$$m\angle 1 + m\angle w = 180°$$
$$m\angle 1 + 45° = 180°$$
$$m\angle 1 = 135°$$

PTS: 1 DIF: Advanced NAT: 12.2.1.f STA: GE7.0
TOP: 3-4 Perpendicular Lines KEY: multi-step

28. ANS:
$\left\{(x, y) \middle| y = \frac{1}{3}x - 4,\ x \neq 6\right\}$

slope of $\overline{AB} = \dfrac{-3-(-5)}{-2-4} = \dfrac{2}{-6} = -\dfrac{1}{3}$

slope of $\overline{CD} = \dfrac{y-(-2)}{6-x} = \dfrac{y+2}{6-x},\ x \neq 6$

$\dfrac{y+2}{6-x} = -\dfrac{1}{3}$	Parallel lines have the same slope. Write an equation comparing the slopes of $\overline{AB}$ and $\overline{CD}$.
$-3(y+2) = 1(6-x)$	Cross multiply.
$-3y - 6 = 6 - x$	Distribute.
$-3y = 12 - x$	Simplify.
$y = \frac{1}{3}x - 4$	

The set of possible values for x and y is $\left\{(x, y) \middle| y = \frac{1}{3}x - 4,\ x \neq 6\right\}$.

PTS: 1 DIF: Advanced NAT: 12.3.3.g STA: 1A8.0
TOP: 3-5 Slopes of Lines

29. ANS:
The transversal is line l. The angles are corresponding angles.
To determine which line is the transversal for a given angle pair, locate the line that connects the vertices.

Corresponding angles lie on the same side of the transversal l, on the same sides of lines n and m.

PTS: 1 DIF: Average REF: Page 147
OBJ: 3-1.3 Identifying Angle Pairs and Transversals NAT: 12.3.3.g
STA: GE7.0 TOP: 3-1 Lines and Angles

30. ANS:
$m\angle ABC = 35°$

$(x)° = (3x - 70)°$	Corresponding Angles Postulate
$0 = 2x - 70$	Subtract x from both sides.
$70 = 2x$	Add 70 to both sides.
$35 = x$	Divide both sides by 2.

$m\angle ABC = 3x - 70$
$m\angle ABC = 3(35) - 70 = 35°$ Substitute 35 for x. Simplify.

PTS: 1 DIF: Average REF: Page 155
OBJ: 3-2.1 Using the Corresponding Angles Postulate NAT: 12.3.3.g
STA: GE7.0 TOP: 3-2 Angles Formed by Parallel Lines and Transversals

31. ANS:
$m\angle RST = 72°$

$(3x)° = (4x - 24)°$	Alternate Exterior Angles Theorem
$-x = -24$	Subtract $4x$ from both sides.
$x = 24$	Divide both sides by -1.

$m\angle RST = 3x = 3(24) = 72°$ Substitute 24 for x.

PTS: 1 DIF: Average REF: Page 156 OBJ: 3-2.2 Finding Angle Measures
NAT: 12.3.3.g STA: GE7.0 TOP: 3-2 Angles Formed by Parallel Lines and Transversals

32. ANS:
By substitution, $m\angle 1 = 3(20) + 30 = 90°$ and $m\angle 2 = 5(20) - 10 = 90°$.
By the Substitution Property of Equality, $m\angle 1 = m\angle 2 = 90°$.
By the Converse of the Alternate Interior Angles Theorem, $l \parallel m$.

$m\angle 1 = 3(20) + 30 = 90°$; $m\angle 2 = 5(20) - 10 = 90°$	Substitute 20 for x.
$m\angle 1 = m\angle 2 = 90°$	Substitution Property of Equality
$l \parallel m$	Converse of the Alternate Interior Angles Theorem

PTS: 1 DIF: Average REF: Page 164
OBJ: 3-3.2 Determining Whether Lines are Parallel NAT: 12.3.3.g
STA: GE7.0 TOP: 3-3 Proving Lines Parallel

33. ANS:
$3x + 4 = 3(10) + 4 = 34°$;
$4x - 6 = 4(10) - 6 = 34°$
The angles are alternate interior angles, and they are congruent, so the lanes are parallel by the Converse of the Alternate Interior Angles Theorem.
Substitute 10 for x in each expression:
$3x + 4 = 3(10) + 4 = 34°$
$4x - 6 = 4(10) - 6 = 34°$
The angles are alternate interior angles, and they are congruent, so the lanes are parallel by the Converse of the Alternate Interior Angles Theorem.

PTS: 1 DIF: Average REF: Page 165 OBJ: 3-3.4 Application
NAT: 12.3.5.a STA: GE7.0 TOP: 3-3 Proving Lines Parallel

34. ANS:
$x > 2$

$DA > DC$	$\overline{DC}$ is the shorter segment.
$2x + 4 > 8$	Substitute $2x + 4$ for DA and 8 for DC.
$2x > 4$	Subtract 4 from both sides.
$x > 2$	Divide both sides by 2 and simplify.

PTS: 1 DIF: Average REF: Page 172
OBJ: 3-4.1 Distance From a Point to a Line NAT: 12.3.5.a
STA: 7AF1.1 TOP: 3-4 Perpendicular Lines

35. ANS:
Swimming salmon form a transversal to the shore and the waves. The shore and the waves are parallel, and the swimming salmon are perpendicular to the shore. So by the Perpendicular Transversal Theorem, the salmon are perpendicular to the waves.
Swimming salmon form a transversal to the shore and the waves. The shore and the waves are parallel, and the swimming salmon are perpendicular to the shore. So by the Perpendicular Transversal Theorem, the salmon are perpendicular to the waves.

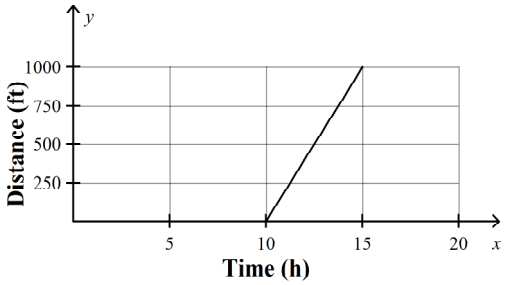
PTS: 1 DIF: Average REF: Page 174 OBJ: 3-4.3 Application
NAT: 12.3.5.a STA: GE1.0 TOP: 3-4 Perpendicular Lines

36. ANS:
$-\frac{2}{3}$
Substitute (6, –7) for (x_1, y_1) and (9, –9) for (x_2, y_2) in the slope formula.

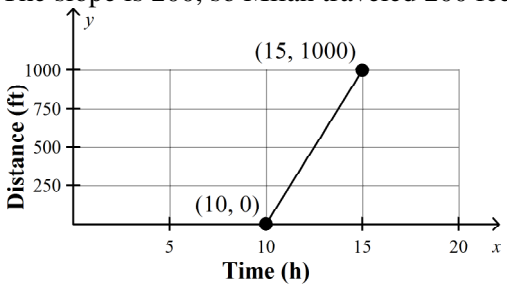
$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-9 + 7}{9 - 6} = \frac{-2}{3}$$

PTS: 1 DIF: Average REF: Page 182 OBJ: 3-5.1 Finding the Slope of a Line
NAT: 12.3.5.a STA: 7AF3.3 TOP: 3-5 Slopes of Lines

37. ANS:



The slope is 200, so Milan traveled 200 feet per hour.



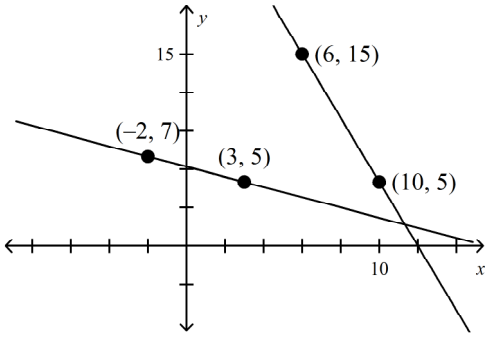
Convert 3:00 pm to 15:00. Use the points (10, 0) and (15, 1000) to make the graph and find the slope.

$m = \frac{1000 - 0}{15 - 10} = \frac{1000}{5} = 200$

The slope is 200, which means Milan is traveling at 200 feet per hour.

PTS: 1 DIF: Average REF: Page 183 OBJ: 3-5.2 Application
NAT: 12.3.5.a STA: 7AF3.3 TOP: 3-5 Slopes of Lines

38. ANS:
neither



slope of $\overleftrightarrow{AB} = \frac{3 - -2}{5 - 7} = \frac{5}{-2} = -\frac{5}{2}$

slope of $\overleftrightarrow{CD} = \frac{6 - 10}{15 - 5} = \frac{-4}{10} = -\frac{2}{5}$

The lines have different slopes, so they are not parallel.

The product of the slopes is $-\frac{5}{2} \cdot -\frac{2}{5} = 1$, not -1, so the slopes are not perpendicular.

The lines are coplanar, so they cannot be skew.

PTS: 1 DIF: Average REF: Page 184
OBJ: 3-5.3 Determining Whether Lines are Parallel, Perpendicular or Neither
NAT: 12.3.5.a STA: 1A8.0 TOP: 3-5 Slopes of Lines

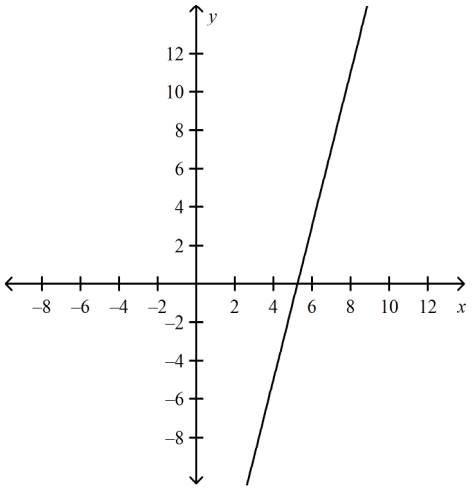
39. ANS:
$y - 7 = 2(x - 4)$

First write the point-slope formula.
$y - y_1 = m(x - x_1)$

Then substitute 2 for m, 4 for x_1, and 7 for y_1.
$y - 7 = 2(x - 4)$

PTS: 1 DIF: Average REF: Page 191 OBJ: 3-6.1 Writing Equations of Lines
NAT: 12.3.5.a STA: 1A7.0 TOP: 3-6 Lines in the Coordinate Plane

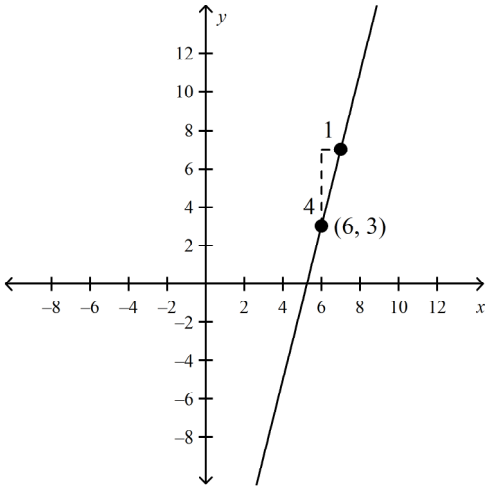
40. ANS:



The equation is given in point-slope form $y - y_1 = m(x - x_1)$.

The slope is $m = 4 = \frac{4}{1}$ and the coordinates of a point on the line are $(6, 3)$.

Plot the point $(6, 3)$ and then rise 4 and run 1 to locate another point. Draw the line connecting the two points.



PTS: 1 DIF: Average REF: Page 191 OBJ: 3-6.2 Graphing Lines
NAT: 12.3.5.a STA: 1A6.0 TOP: 3-6 Lines in the Coordinate Plane

41. ANS:
intersect
Solve the first equation for y to find the slope-intercept form. Compare the slopes and y-intercepts of both equations.

$12x + 3y = 3$ $3y = -12x + 3$ $y = -4x + 1$ The slope of the first equation is –4 and the y-intercept is 1.	$y = 4x + 1$ The slope of the second equation is 4 and the y-intercept is 1.

The lines have different slopes, so they intersect.

PTS: 1 DIF: Average REF: Page 192 OBJ: 3-6.3 Classifying Pairs of Lines
NAT: 12.3.5.a STA: 1A7.0 TOP: 3-6 Lines in the Coordinate Plane

42. ANS:
5 customers
Write an equation for each plan. Find the solution by solving the system of equations.

Jala's Yogurt Shop: $y = 6x + 20$	Ela's Salad Store: $y = 4x + 30$
$0 = 2x - 10$	Subtract the second equation from the first.
$x = 5$	Solve for x.

Both stores have the same amount of money after 5 customers.

PTS: 1 DIF: Average REF: Page 193 OBJ: 3-6.4 Problem-Solving Application
NAT: 12.3.5.a STA: 1A9.0 TOP: 3-6 Lines in the Coordinate Plane