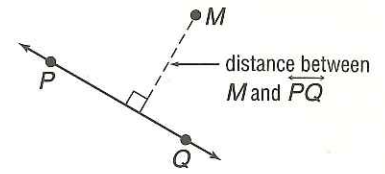


3-6 Study Guide and Intervention

Perpendiculars and Distance

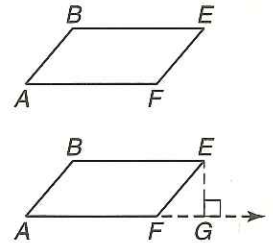
Distance From a Point to a Line When a point is not on a line, the distance from the point to the line is the length of the segment that contains the point and is perpendicular to the line.



Example Draw the segment that represents the distance from E to \overleftrightarrow{AF} .

Extend \overleftrightarrow{AF} . Draw $\overline{EG} \perp \overleftrightarrow{AF}$.

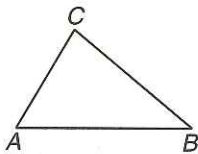
\overline{EG} represents the distance from E to \overleftrightarrow{AF} .



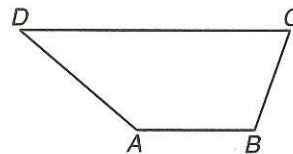
Exercises

Draw the segment that represents the distance indicated.

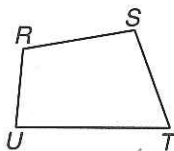
1. C to \overleftrightarrow{AB}



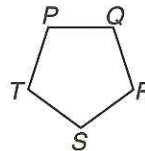
2. D to \overleftrightarrow{AB}



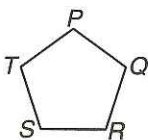
3. T to \overleftrightarrow{RS}



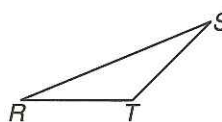
4. S to \overleftrightarrow{PQ}



5. S to \overleftrightarrow{QR}



6. S to \overleftrightarrow{RT}



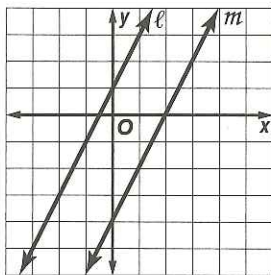
3-6 Study Guide and Intervention *(continued)*

Perpendiculars and Distance

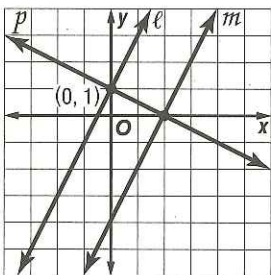
Distance Between Parallel Lines The distance between parallel lines is the length of a segment that has an endpoint on each line and is perpendicular to them. Parallel lines are everywhere **equidistant**, which means that all such perpendicular segments have the same length.

Example

Find the distance between the parallel lines ℓ and m whose equations are $y = 2x + 1$ and $y = 2x - 4$, respectively.



Draw a line p through $(0, 1)$ that is perpendicular to ℓ and m .



Line p has slope $-\frac{1}{2}$ and y -intercept 1. An equation of p is $y = -\frac{1}{2}x + 1$. The point of intersection for p and ℓ is $(0, 1)$.

To find the point of intersection of p and m , solve a system of equations.

$$\text{Line } m: y = 2x - 4$$

$$\text{Line } p: y = -\frac{1}{2}x + 1$$

Use substitution.

$$2x - 4 = -\frac{1}{2}x + 1$$

$$4x - 8 = -x + 2$$

$$5x = 10$$

$$x = 2$$

Substitute 2 for x to find the y -coordinate.

$$y = -\frac{1}{2}x + 1$$

$$= -\frac{1}{2}(2) + 1 = -1 + 1 = 0$$

The point of intersection of p and m is $(2, 0)$.

Use the Distance Formula to find the distance between $(0, 1)$ and $(2, 0)$.

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$= \sqrt{(2 - 0)^2 + (0 - 1)^2}$$

$$= \sqrt{5}$$

The distance between ℓ and m is $\sqrt{5}$ units.

Exercises

Find the distance between each pair of parallel lines.

1. $y = 8$
 $y = -3$

2. $y = x + 3$
 $y = x - 1$

3. $y = -2x$
 $y = -2x - 5$

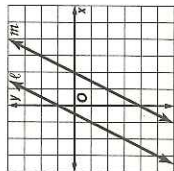
NAME _____ DATE _____ PERIOD _____

3-6 Study Guide and Intervention (continued)

Perpendiculars and Distance

Distance Between Parallel Lines The distance between parallel lines is the length of a segment that has an endpoint on each line and is perpendicular to them. Parallel lines are everywhere equidistant, which means that all such perpendicular segments have the same length.

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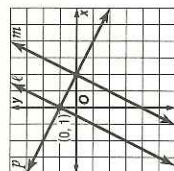
$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$= \sqrt{(2 - 0)^2 + (0 - 1)^2}$$

$$= \sqrt{5}$$

The distance between ℓ and m is $\sqrt{5}$ units.

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Line p has slope $-\frac{1}{2}$ and y -intercept 1. An equation of p is $y = -\frac{1}{2}x + 1$. The point of intersection for p and ℓ is $(0, 1)$.

Examples

Find the distance between each pair of parallel lines.

1. $y = 8$
 $y = -3$
11

2. $y = x + 3$
 $y = x - 1$
 $2\sqrt{2}$

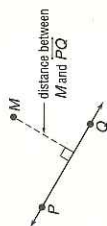
3. $y = -2x$
 $y = -2x - 5$
 $\sqrt{5}$

NAME _____ DATE _____ PERIOD _____

3-6 Study Guide and Intervention

Perpendiculars and Distance

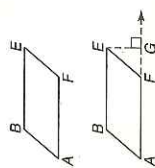
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Example Draw the segment that represents the distance from E to \overline{AF} .

Extend \overline{AF} . Draw $\overline{EG} \perp \overline{AF}$.

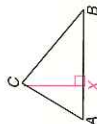
\overline{EG} represents the distance from E to \overline{AF} .



Examples

Draw the segment that represents the distance indicated.

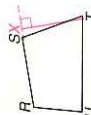
1. C to \overline{AB}



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}

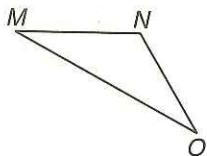


3-6 Practice

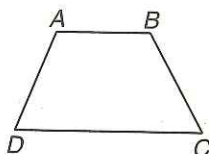
Perpendiculars and Distance

Draw the segment that represents the distance indicated.

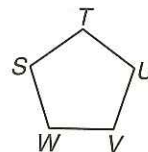
1. O to \overline{MN}



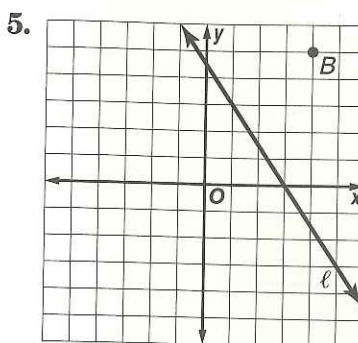
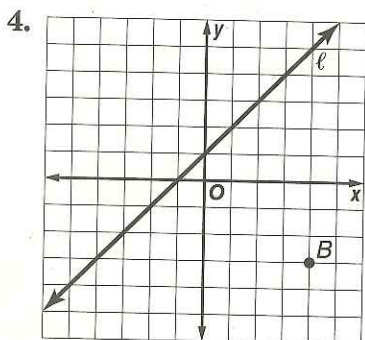
2. A to \overline{DC}



3. T to \overline{VU}



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



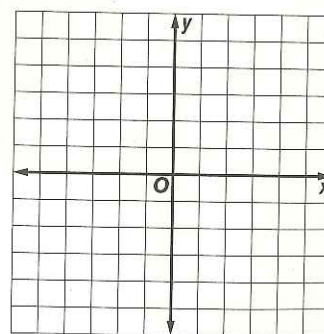
Find the distance between each pair of parallel lines.

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.



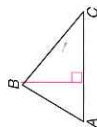
10. **CANOEING** Bronson and a friend are going to carry a canoe across a flat field to the bank of a straight canal. Describe the shortest path they can use.

3-6 Skills Practice

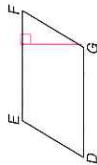
Perpendiculars and Distance

Draw the segment that represents the distance indicated.

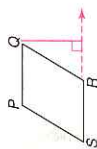
1. B to \overline{AC}



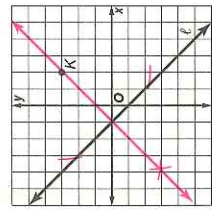
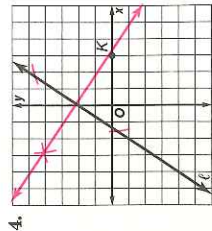
2. G to \overline{EF}



3. Q to \overline{SR}



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



Find the distance between each pair of parallel lines.

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

8

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

11

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

$3\sqrt{2}$

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

$\sqrt{10}$

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

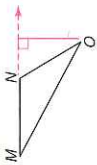
$2\sqrt{5}$

3-6 Practice (Average)

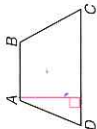
Perpendiculars and Distance

Draw the segment that represents the distance indicated.

1. O to \overline{MN}



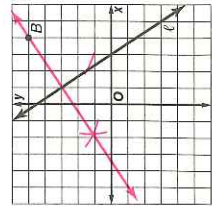
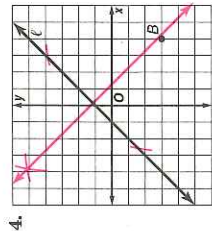
2. A to \overline{DC}



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

$2\sqrt{2}$

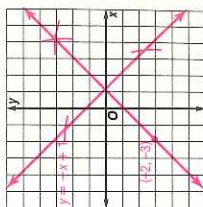
7. $y = 2x + 7$
 $y = 2x - 3$

$2\sqrt{5}$

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

$3\sqrt{10}$

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. $3\sqrt{2}$



10. **CANOING** 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.

Sample answer: The shortest path would be a perpendicular segment from where they are to the bank of the canal.