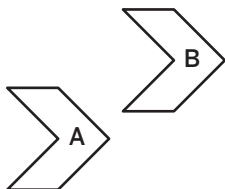


## Additional Practice

1.02

1. For each movement from Figure A to Figure B, decide whether it shows a translation or a rotation.

a

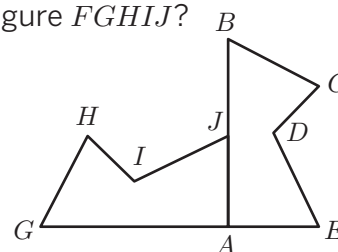


b



2. Which best describes the movement from Figure  $ABCDE$  to Figure  $FGHIJ$ ?

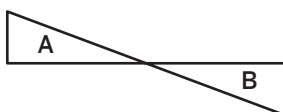
- A.  $90^\circ$  clockwise rotation about point  $A$ .
- B.  $90^\circ$  counterclockwise rotation about point  $A$ .
- C.  $180^\circ$  clockwise rotation about point  $A$ .
- D.  $270^\circ$  counterclockwise rotation about point  $A$ .



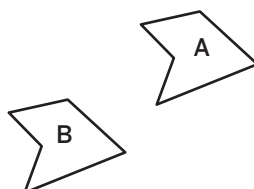
3. For each movement from Figure A to Figure B:

- Decide whether it shows a translation or rotation.

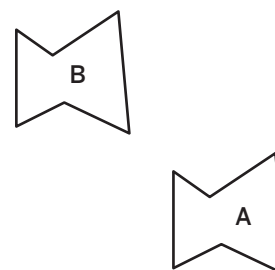
a



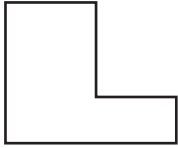
b



c

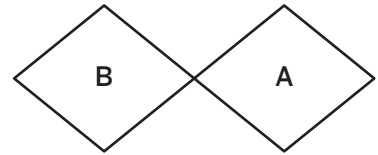


4. You will need a centimeter ruler. Translate the figure shown 4.5 cm right, and then rotate the newly translated figure  $90^\circ$  counterclockwise about point  $A$ .



●  
 $A$

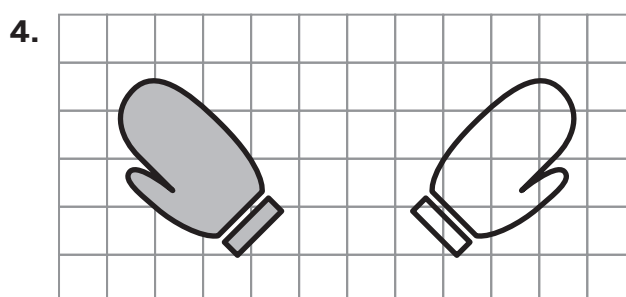
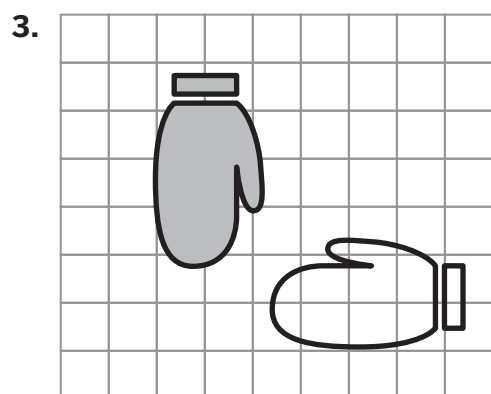
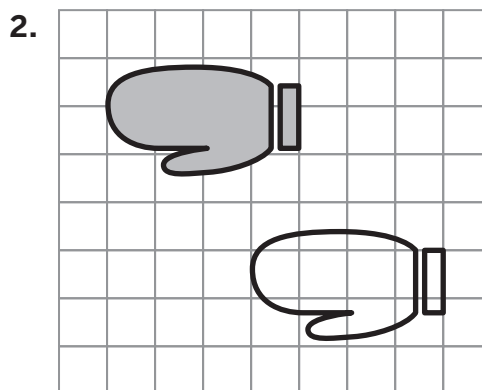
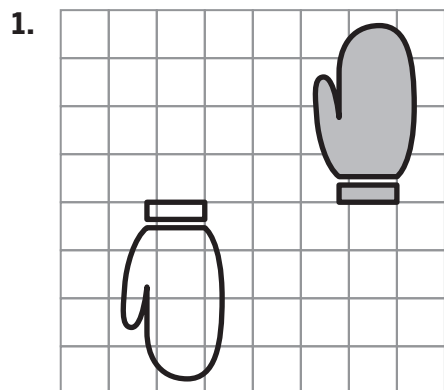
5. Refer to Figure A and Figure B. Is the movement from Figure A to Figure B a *translation*, a *rotation*, or *both*? Explain your thinking.



## Additional Practice

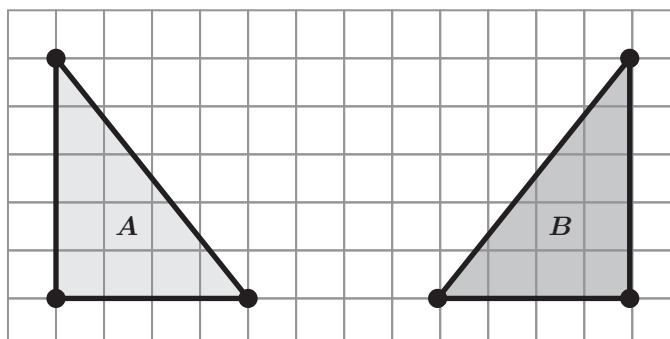
1.03

**Problems 1–4:** Describe a sequence of transformations that moves the shaded figure onto the unshaded figure.



5. Refer to the figures shown. Identify the transformation that has occurred from Figure A to Figure B.

- A. Translation 4 units to the left
- B. Translation 8 units to the right
- C. Reflection across a vertical line
- D. Reflection across a horizontal line



**6.** Select *all* the sequences of transformations that could return a figure to its original position.

- ☐ **A.** Rotate the figure around a point  $90^\circ$  clockwise and then rotate it another  $90^\circ$  clockwise
- ☐ **B.** Reflect the figure over one line and then reflect over a different line.
- ☐ **C.** Translate the figure 3 units down, then 5 units up, and then 2 units down.
- ☐ **D.** Reflect the figure over one line and then reflect over the same line.
- ☐ **E.** Rotate the figure  $90^\circ$  counterclockwise around a point and then  $270^\circ$  counterclockwise around the same point.
- ☐ **F.** Rotate a figure  $180^\circ$  counterclockwise, then reflect it over a vertical line.

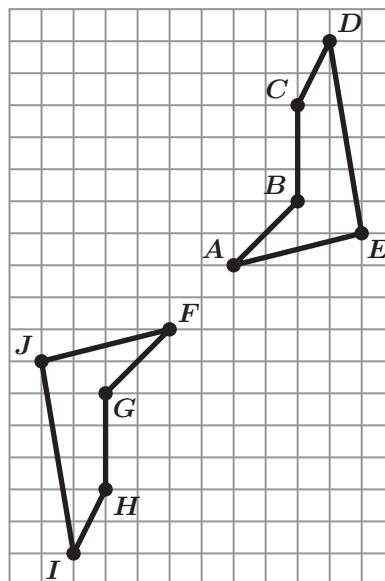
# Additional Practice

1.04

1. A sequence of transformations maps Polygon  $ABCDE$  onto Polygon  $FGHIJ$ . Select the correct sequence.

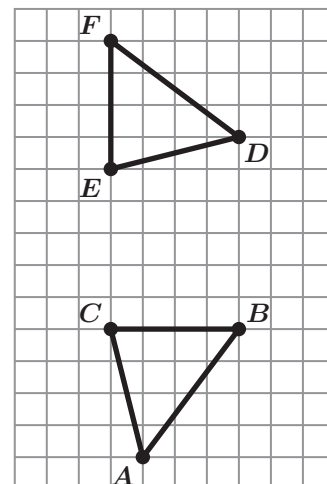
**Sequence A:** Reflect Polygon  $ABCDE$  over a vertical line, and then reflect the resulting image across a horizontal line.

**Sequence B:** Translate Polygon  $ABCDE$  down 9 units, and then reflect the resulting image across a vertical line.

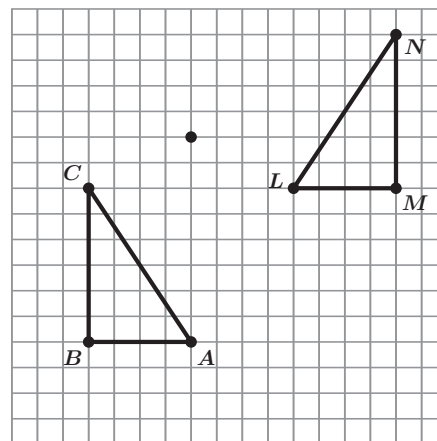


2. Select the series of transformations that maps Triangle  $ABC$  onto Triangle  $DFE$ .

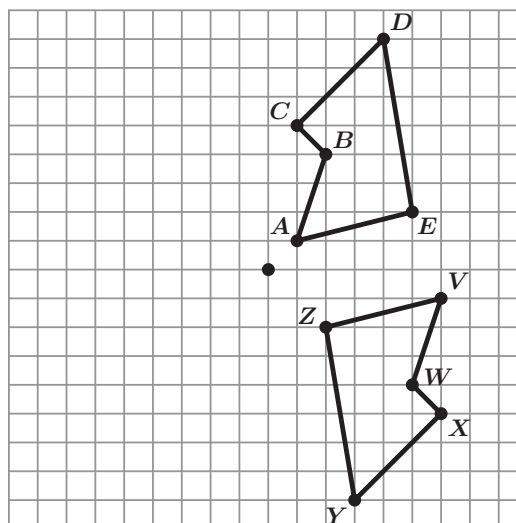
- A. Rotate Triangle  $ABC$   $90^\circ$  counterclockwise about point  $C$ , and then translate the resulting image up 5 units.
- B. Rotate Triangle  $ABC$   $90^\circ$  counterclockwise about point  $A$ , and then translate the resulting image up 5 units.
- C. Reflect Triangle  $ABC$  across line  $AB$ , and then translate the resulting image up 5 units and 1 unit left.
- D. Translate Triangle  $ABC$  up 9 units, and then rotate the resulting image  $90^\circ$  counterclockwise about point  $A$ .



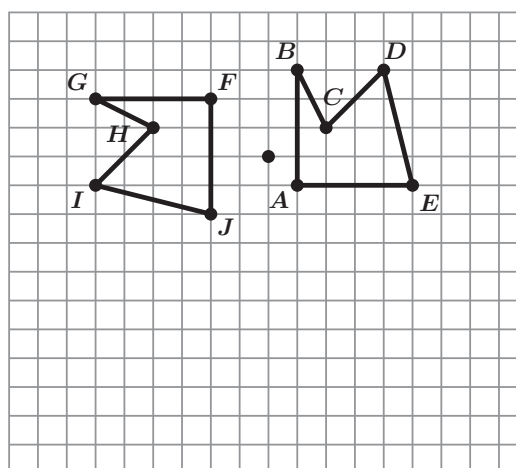
3. Describe a sequence of transformations that maps Triangle  $ABC$  onto Triangle  $LMN$ .



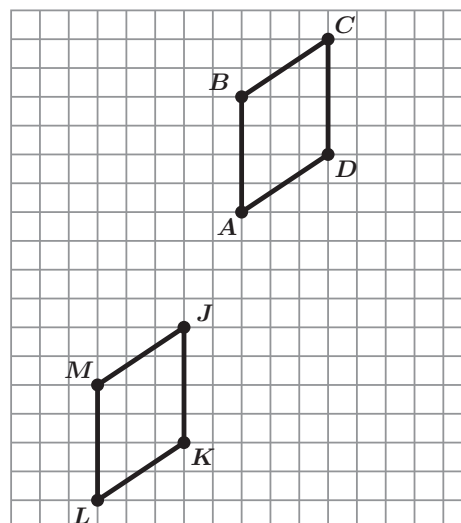
4. Describe a sequence of transformations that maps Polygon  $ABCDE$  onto Polygon  $VWXYZ$ .



5. Describe a sequence of transformations that maps Polygon  $ABCDE$  onto Polygon  $FGHIJ$ .



6. Kiran claims that there are at least two different transformations or sequences of transformations that map Polygon  $ABCD$  onto Polygon  $JKLM$ . Is he correct? Explain your thinking.

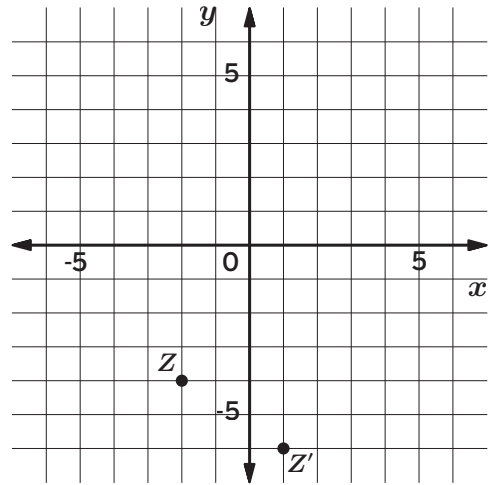


# Additional Practice

1.05

1. Point  $Z(-2, -4)$  is plotted on the coordinate plane. Point  $Z'$  is a translation of point  $Z$ . Which of the following describes the translation of point  $Z$ ?

- A. 2 units right, 3 units up
- B. 3 units right, 2 units down
- C. 3 units left, 2 units up
- D. 2 units left, 3 units down



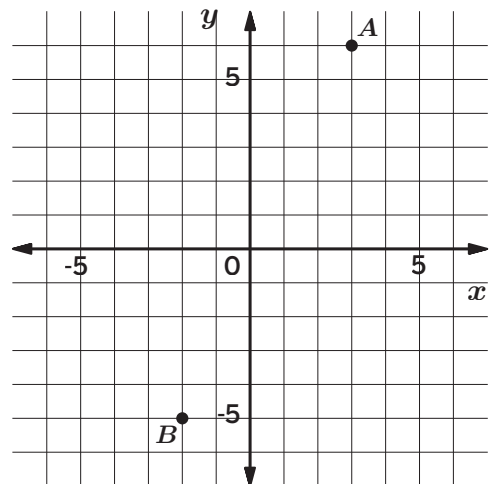
2. Points  $A(3, 6)$  and  $B(-2, -5)$  are plotted on the coordinate plane.

- a Which are the coordinates of point  $A$  after a reflection across the  $x$ -axis? Circle the correct choice.

$(3, -6)$   $(-3, 6)$

- b Which are the coordinates of point  $B$  after a reflection across the  $y$ -axis? Circle the correct choice.

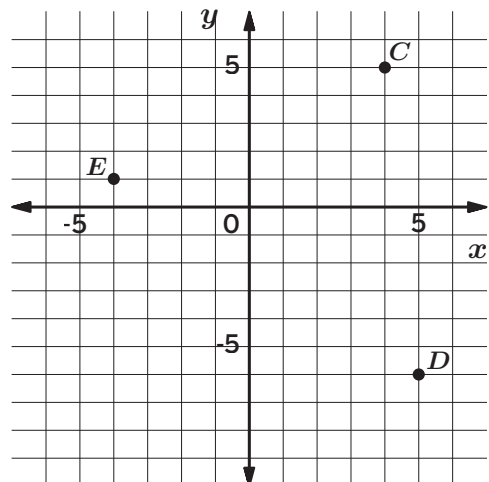
$(-2, 5)$   $(2, -5)$



3. Points  $C(4, 5)$ ,  $D(5, -6)$ , and  $E(-4, 1)$  are plotted on the coordinate plane.

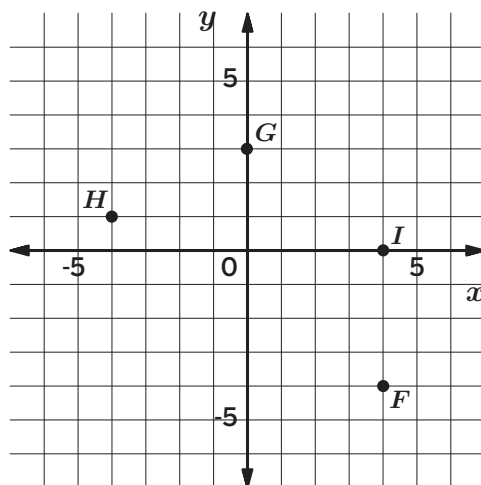
- a What are the coordinates of points  $C$ ,  $D$ , and  $E$  after each point is translated 2 units to the left and 3 units down?

- b Plot these points on the grid, and label them  $C'$ ,  $D'$ , and  $E'$ .



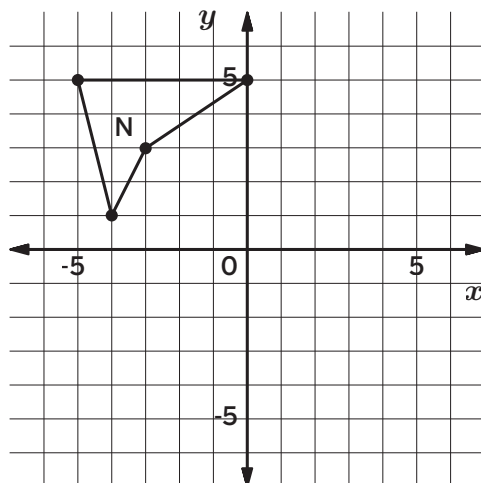
4. Points  $F(4, -4)$ ,  $G(0, 3)$ ,  $H(-4, 1)$ , and  $I(4, 0)$  are plotted on the coordinate plane.

- What are the coordinates of points  $F$  and  $G$  after a reflection across the  $x$ -axis?
- What are the coordinates of points  $H$  and  $I$  after a reflection across the  $y$ -axis?
- Plot these points on the grid, and label them  $F'$ ,  $G'$ ,  $H'$ , and  $I'$ .



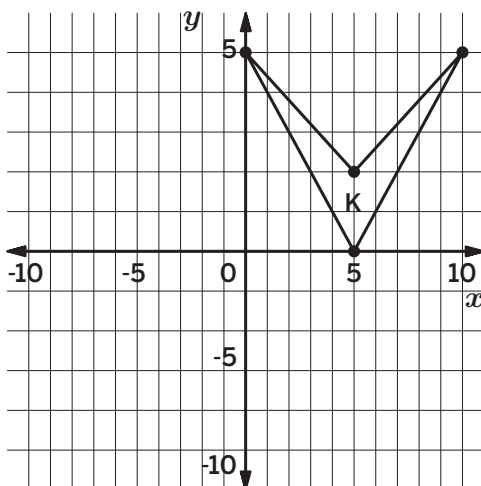
5. Polygon N is reflected across the  $y$ -axis. Predict the coordinates of the image by completing the table. Check your predictions by graphing the image.

Preimage	Image
$(0, 5)$	
$(-3, 3)$	
$(-4, 1)$	
$(-5, 5)$	



6. K is reflected across the  $x$ -axis and then reflected across the  $y$ -axis. Complete the table with the coordinates of the final image. Check your coordinates by graphing the image.

Preimage	Image
$(5, 0)$	
$(5, 2)$	
$(0, 5)$	
$(10, 5)$	





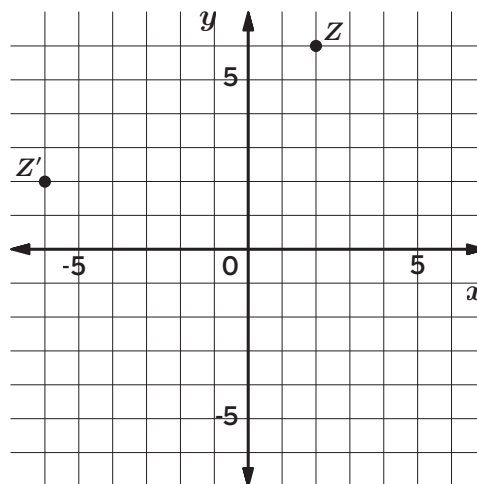
## Additional Practice

1.06

- Point  $Z(2, 6)$  is plotted on the coordinate plane. Point  $Z'$  is a rotation of point  $Z$  about the origin. Circle the degree and direction of the rotation.

**Degree:**  $90^\circ$  or  $180^\circ$

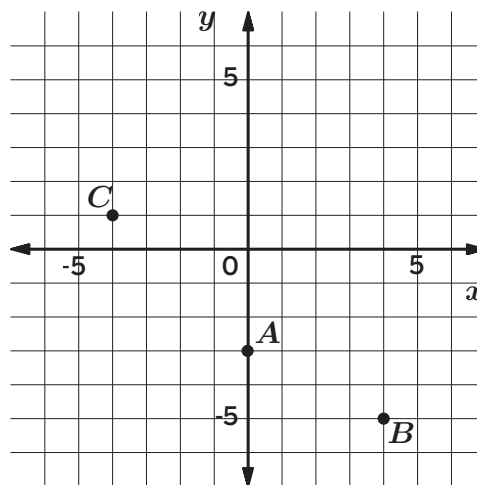
**Direction:** clockwise or counterclockwise



- Point  $N(0, 6)$  is rotated  $180^\circ$  counterclockwise about the origin, and the image is labeled  $N'$ . What are the coordinates of point  $N'$ ?

- Points  $A(0, -3)$ ,  $B(4, -5)$ , and  $C(-4, 1)$  are plotted on the coordinate plane.

What are the coordinates of  $A$ ,  $B$ , and  $C$  after a rotation  $270^\circ$  counterclockwise about the origin? Plot these points on the grid, and label them  $A'$ ,  $B'$ , and  $C'$ . Include the coordinates of the images in your labels.



- Point  $H(6, 4)$  is rotated  $90^\circ$  clockwise about the origin, and the image is labeled  $H'$ . Which of the following are the coordinates of point  $H'$ ?

A.  $(4, -6)$

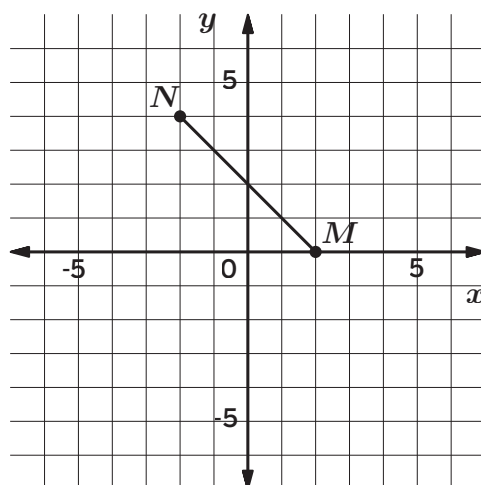
B.  $(-4, 6)$

C.  $(6, -4)$

D.  $(-6, -4)$

5. Rotate line segment  $MN$   $90^\circ$  counterclockwise about the origin and label the image of the line segment  $M'N'$ . Record the coordinates of the image in the table.

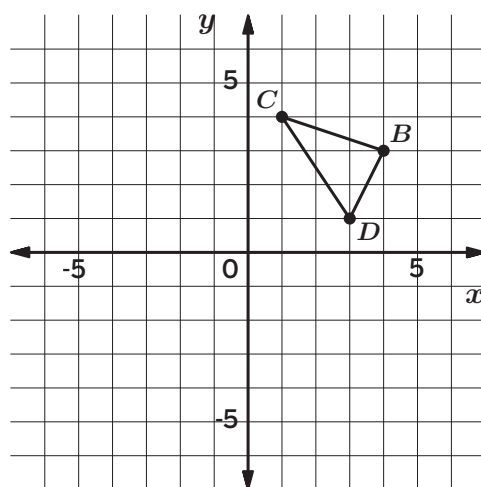
Preimage coordinates		Image coordinates	
$M$	$(2, 0)$	$M'$	
$N$	$(-2, 4)$	$N'$	



6. Triangle  $JKL$  has been rotated about the origin to create Triangle  $J'K'L'$ . The following table shows the coordinates of the vertices. Indicate the degree and direction of the rotation that maps Triangle  $JKL$  onto Triangle  $J'K'L'$ .

Preimage coordinates		Image coordinates	
$J$	$(-3, 6)$	$J'$	$(6, 3)$
$K$	$(-3, 2)$	$K'$	$(2, 3)$
$L$	$(2, 2)$	$L'$	$(2, -2)$

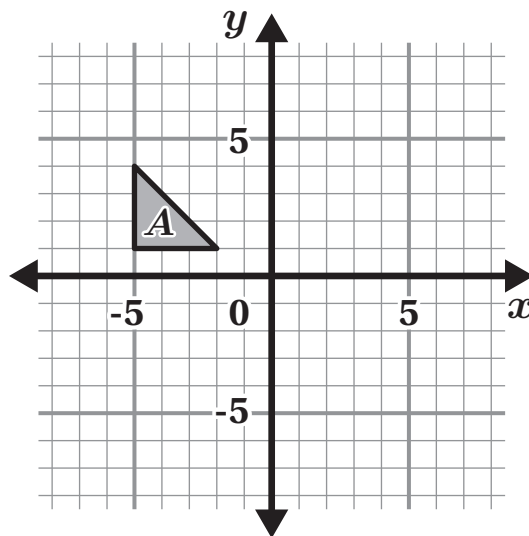
7. Elena wants to rotate Triangle  $BCD$   $180^\circ$  about the origin. She says that it does not matter if she rotates the triangle clockwise or counterclockwise. Is she correct? Explain your thinking.



## Additional Practice

1.08

**Problems 1–3:** This coordinate plane shows Figure A.



1. Translate Figure A 6 units to the right. Label the image B.
2. Reflect Figure B over the x-axis. Label the image C.
3. Are Figures A and C congruent? Explain your thinking.

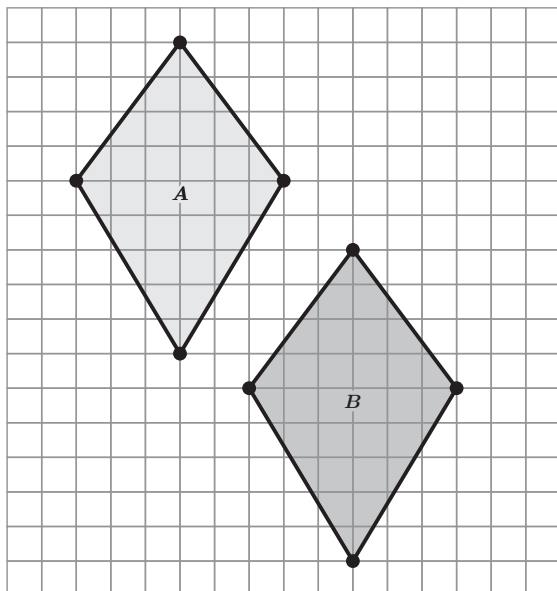
4. Trapezoid  $JKLM$  was graphed on a coordinate plane and then rotated  $270^\circ$  clockwise around the origin to form Trapezoid .

Select *all* statements that are always true.

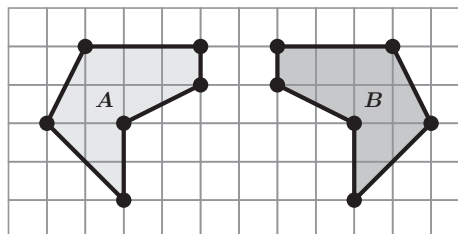
- ☐ A. Trapezoid  $J'K'L'M'$  is congruent to Trapezoid  $JKLM$ .
- ☐ B. The length of side  $J'K'$  is not the same as the length of side  $JK$ .
- ☐ C. The measure of Angle  $J'K'L'$  is the same as the measure of Angle  $JKL$ .
- ☐ D. The area of Trapezoid  $J'K'L'M'$  is equal to the area of Trapezoid  $JKLM$ .
- ☐ E. Trapezoid  $J'K'L'M'$  is facing the same direction as Trapezoid  $JKLM$ .

**Problems 5–8:** Determine whether Figure *A* is congruent to Figure *B*.  
Explain your thinking.

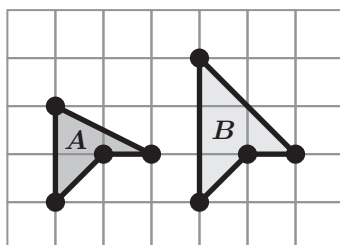
5.



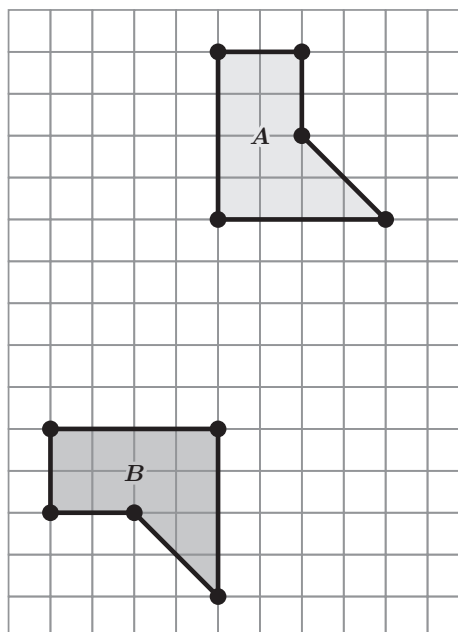
6.



7.



8.



## Additional Practice

1.09

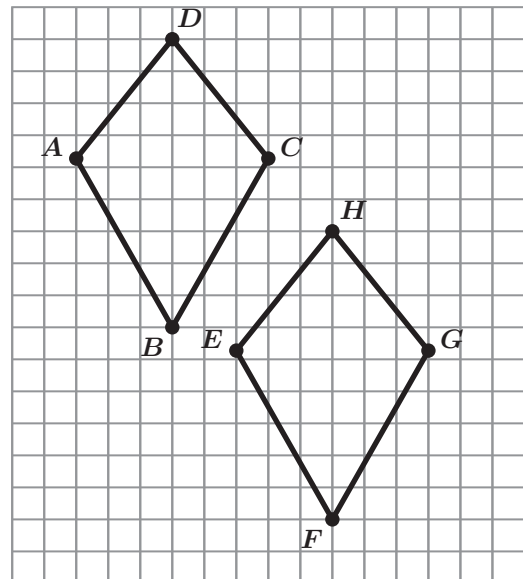
1. For each statement, choose the correct term or terms to complete the statement.

- a If there is a sequence of translations, rotations, or reflections that map one polygon onto the other, then the two polygons are [congruent, not congruent].
- b If two polygons have different side lengths, different angle measures, or different areas, then the polygons are [congruent, not congruent].

2. Which statement is better to explain why the polygons shown are congruent?

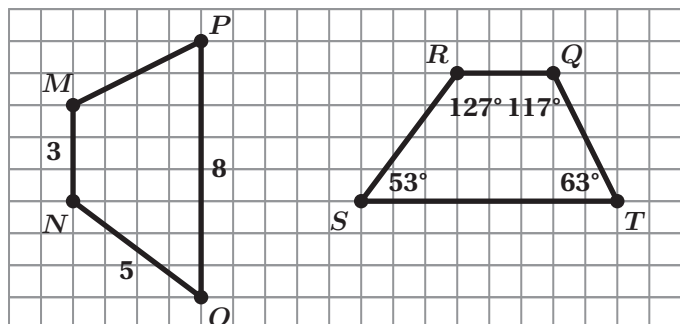
**Statement A:** Both figures have 4 sides and 4 angles.

**Statement B:** I can map one figure onto the other by translating Polygon  $ABCD$  right 5 units and down 6 units.



3. Refer to Trapezoids  $MNOP$  and  $QRST$ .

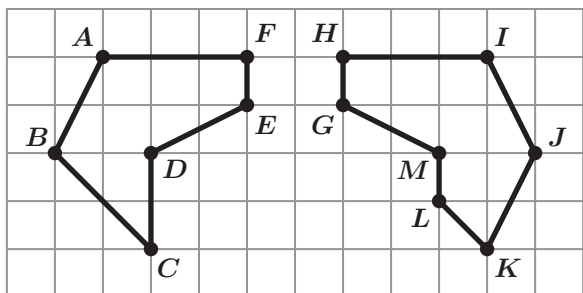
- a Show that the two trapezoids are congruent by describing a sequence of rigid transformations that can map one figure onto the other.



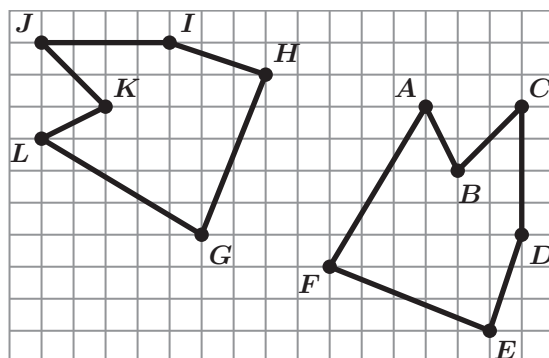
- b Label the angle measures of Trapezoid  $MNOP$  and the side lengths of Trapezoid  $QRST$ .

4. For each pair of figures, decide whether they are congruent. Explain your thinking.

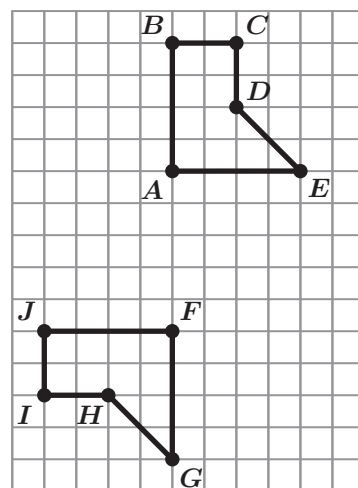
a



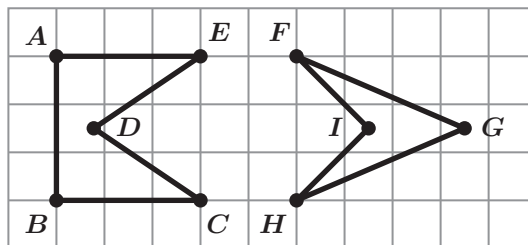
b



5. Describe a sequence of transformations that shows that Polygon  $ABCDE$  is congruent to Polygon  $FJIHG$ .



6. Is the pair of figures congruent?  
Explain your thinking.



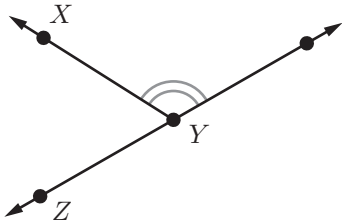
7. Rectangle A and Rectangle B have the same side lengths. Jada says that this is enough to prove that the figures are congruent. Do you agree? Explain your thinking.

# Additional Practice

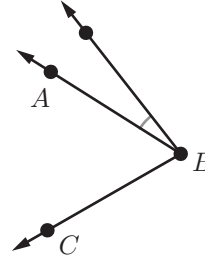
7.02

1. Consider each diagram shown. For each angle specified, determine whether its adjacent angle is *complementary* or *supplementary* to it.

a  $\angle XYZ$

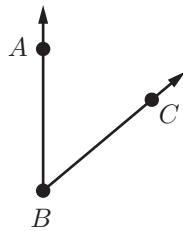


b  $\angle ABC$

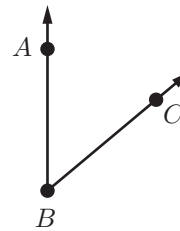


2. For each diagram, draw an angle that is:

a Complementary to  $\angle ABC$ .

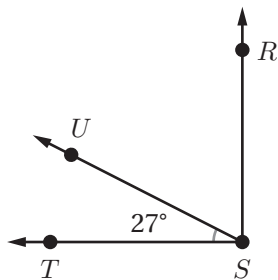


b Supplementary to  $\angle ABC$ .

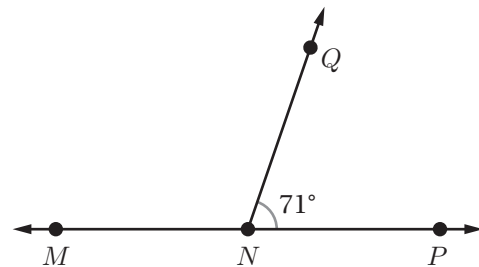


3. Determine the missing angle measure in each diagram.

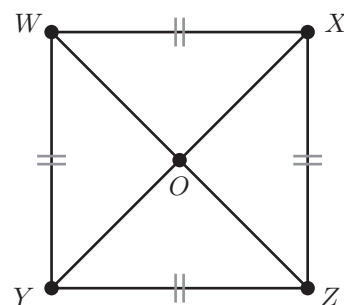
a Angle  $RST$  is a right angle. Determine the measure of  $\angle RSU$ .



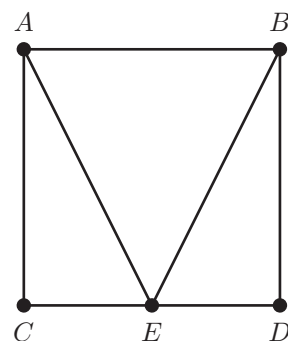
b Point  $N$  lies on line  $MP$ . Determine the measure of  $\angle MNQ$ .



4. Refer to Square  $WXZY$ . Name two angles whose measures have a sum of  $180^\circ$ .

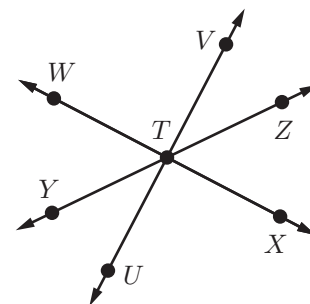


5. Refer to Square  $ABDC$ . Name three angles whose measures have a sum of  $180^\circ$ .



6. Segments  $WX$ ,  $YZ$ , and  $UV$  intersect at point  $T$ . Angle  $VTW$  is a right angle. Select *all* the pairs of supplementary angles.

- ☐ A.  $\angle VTZ$  and  $\angle ZTX$
- ☐ B.  $\angle WTV$  and  $\angle VTX$
- ☐ C.  $\angle WTY$  and  $\angle YTU$
- ☐ D.  $\angle YTU$  and  $\angle YTV$
- ☐ E.  $\angle ZTX$  and  $\angle VTZ$



7. Angle  $A$  is supplementary to angle  $B$ . Angle  $C$  is complementary to angle  $B$ . Do you have enough information to determine which angle has the smallest measure? Explain your thinking.



# Additional Practice

7.03

In Problems 1–6, the figures may not be drawn to scale.

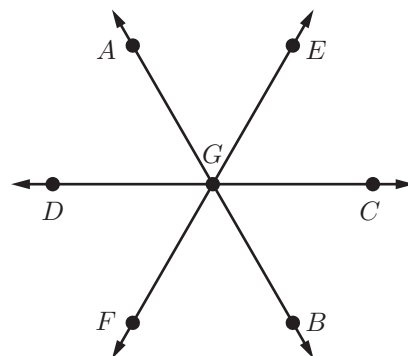
1. Determine whether the pairs of angles are vertical angles. State *yes* or *no*.

**a**  $\angle AGE$  and  $\angle FGB$

**b**  $\angle AGD$  and  $\angle AGE$

**c**  $\angle EGC$  and  $\angle CGB$

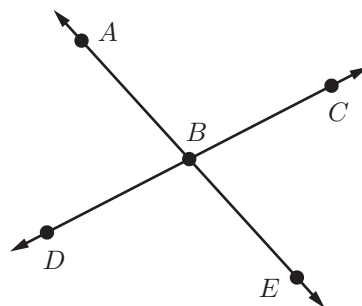
**d**  $\angle BGC$  and  $\angle AGD$



2. Lines  $AE$  and  $CD$  intersect at point  $B$  and  $m\angle ABC = 105^\circ$ . Determine the measures of angles  $ABD$  and  $DBE$ .

$m\angle ABD =$  .....

$m\angle DBE =$  .....



3. Select *all* the equations that represent a true relationship between the angles in the diagram shown.

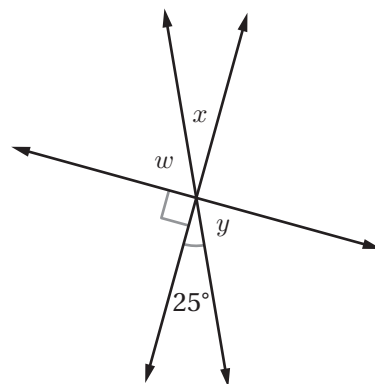
☐ A.  $x = 25$

☐ B.  $w = 90$

☐ C.  $y = 65$

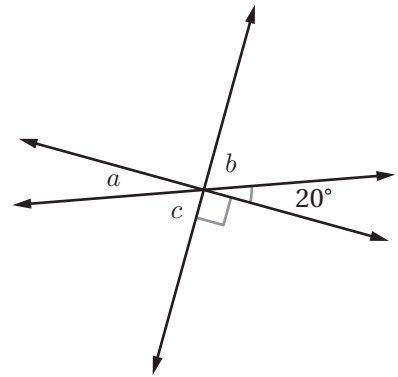
☐ D.  $90 + w + x = 180$

☐ E.  $w + x + y = 90$

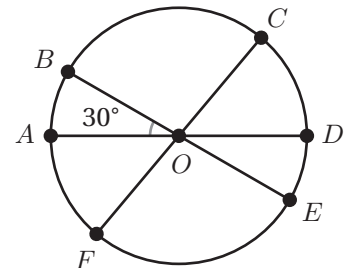


4. Determine whether the statements about the relationships between the angles in the figure are *true* or *false*.

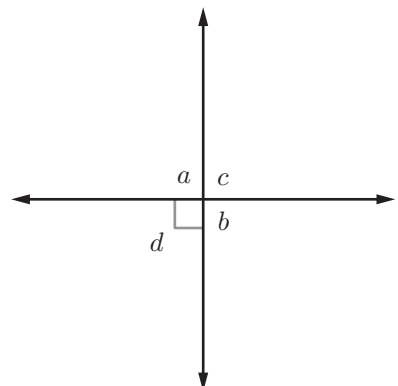
- a The value of  $a$  is  $20^\circ$ .
- b The value of  $a$  and the value of  $b$  are equal.
- c The sum of the values of  $a$ ,  $c$ , and  $90$  is  $180$ .
- d The sum of the values of  $a$  and  $c$  is  $90$ .
- e The sum of the values of  $a$ ,  $c$ , and  $20$  is  $180$ .
- f The sum of the values of  $b$  and  $c$  is  $90$ .



5. Line segments  $AD$ ,  $BE$ , and  $CF$  are all diameters of the circle. The measure of angle  $DOF = 130^\circ$ . Determine the measure of  $\angle BOC$ . Explain your thinking.



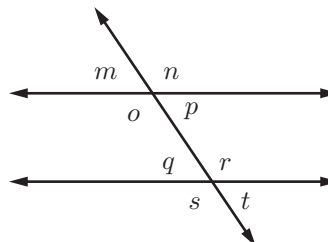
6. Mai says that angles  $a$  and  $b$  are vertical angles and complementary angles. Tyler says that angles  $c$  and  $d$  are vertical angles and supplementary angles. Who is correct? Explain your thinking.



## Additional Practice

1.10

1. List *all* the pairs of vertical angles in the figure shown.

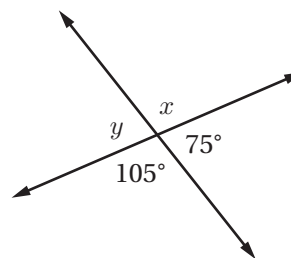


The figure may not be drawn to scale.

2. Use the figure to determine the missing values.

a  $x$

b  $y$



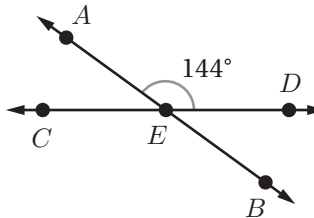
The figure may not be drawn to scale.

3. Use the figure to calculate the measure of each angle. Explain your thinking.

a  $m\angle AEC$

b  $m\angle DEB$

c  $m\angle CEB$



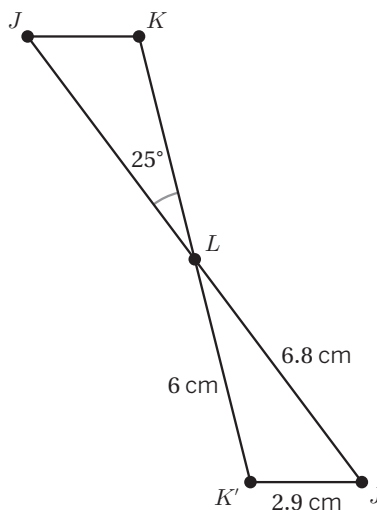
The figure may not be drawn to scale.

4. Triangle  $JKL$  is rotated  $180^\circ$  about point  $L$  to create Triangle  $J'K'L$ .

a What is the length of side  $JK$ ? Explain your thinking.

b Name a pair of vertical angles. What are their angle measures?

c Name two different angles that are also congruent.

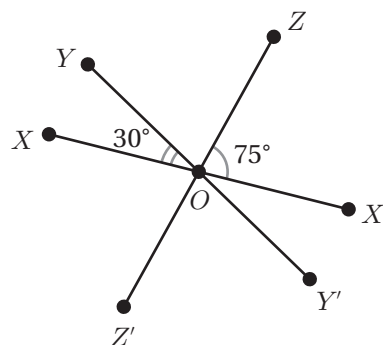


The figure may not be drawn to scale.

5. Points  $X$ ,  $Y$ , and  $Z$  are located at different distances from point  $O$ . The points  $X$ ,  $Y$ , and  $Z$  are each rotated  $180^\circ$  about point  $O$  resulting in points  $X'$ ,  $Y'$ , and  $Z'$ .

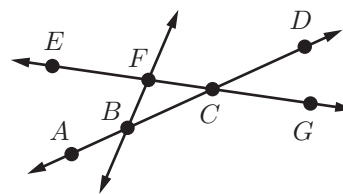
a Name a segment that has the same length as segment  $YO$ . Explain your thinking.

b List all the angles with a measure of  $75^\circ$ . Explain your thinking.



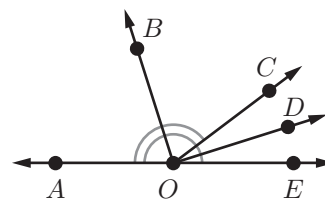
The figure may not be drawn to scale.

6. Suppose  $m\angle ECD$  is  $150^\circ$ . Shawn says that  $m\angle ACG$  is  $150^\circ$ . Is Shawn correct? Explain your thinking.



The figure may not be drawn to scale.

7. Points  $A$ ,  $O$ , and  $E$  lie on the same line.  
 $m\angle AOB = m\angle BOC$  and  $m\angle COD = m\angle DOE$ .  
 What is the measure of angle  $BOD$ ? Explain your thinking.



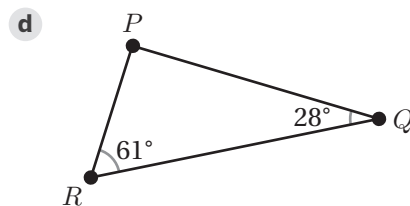
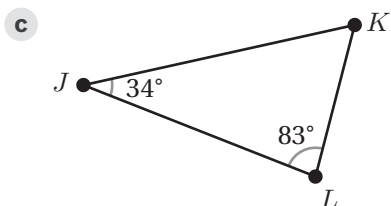
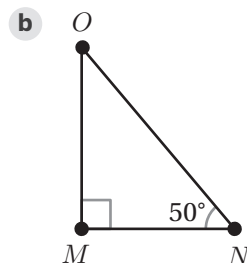
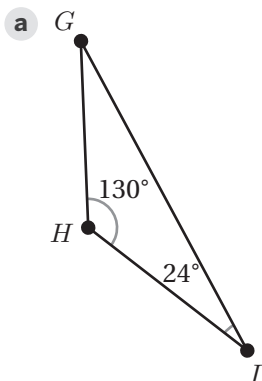
The figure may not be drawn to scale.

## Additional Practice

1.11

1. For each triangle, write a possible measure for the third angle.

**Note:** The figures may not be drawn to scale.



2. For each set of angles, determine whether a triangle with the given angle measures is possible. Write *yes* or *no*.

**a**  $45^\circ, 45^\circ, 45^\circ$

**b**  $90^\circ, 50^\circ, 40^\circ$

**c**  $90^\circ, 90^\circ, 20^\circ$

**d**  $100^\circ, 60^\circ, 30^\circ$

**e**  $110^\circ, 40^\circ, 30^\circ$

**3.** Select three of the following measures that could be angles in the same triangle.

**A.**  $20^\circ$

**B.**  $60^\circ$

**C.**  $35^\circ$

**D.**  $90^\circ$

**E.**  $100^\circ$

**F.**  $180^\circ$

Explain your thinking.

**4.** Clare states that a triangle can have three acute angles. Do you agree with her?

Explain your thinking.

**5.** Shawn says that it is possible to create a triangle with two right angles and one acute angle. Is Shawn correct? Explain your thinking.

**6.** Is there a relationship between the two acute angles in a right triangle? If so, what is it? Explain your thinking.

**7.** Write all of the possible combinations of three angle measures, from the following list, that can be the interior angle measures of a triangle. Use the number only once in your combination.

$120^\circ$

$20^\circ$

$100^\circ$

$40^\circ$

$60^\circ$

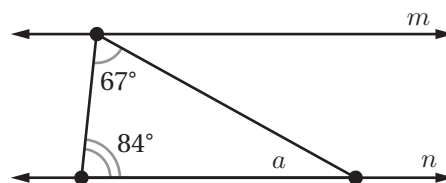
$70^\circ$

$10^\circ$

## Additional Practice

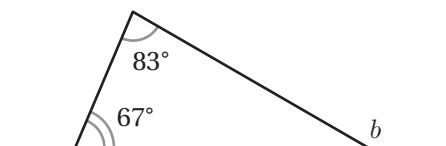
1.12

1. Line  $m$  is parallel to line  $n$ . Determine the value of  $a$ .



The figure may not be drawn to scale.

2. Determine the value of  $b$ .



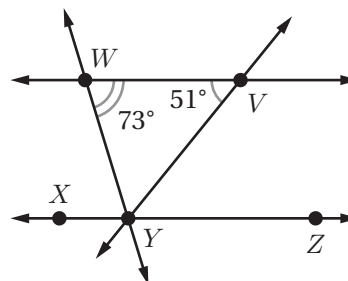
The figure may not be drawn to scale.

3. The diagram shows parallel lines  $WV$  and  $XZ$ .

a What is  $m\angle VYZ$ ?

b What is  $m\angle WYX$ ?

c What is  $m\angle WYV$ ?

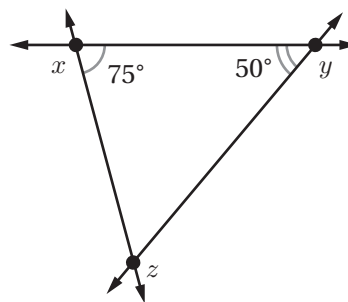


The figure may not be drawn to scale.

4. Three intersecting lines are shown.

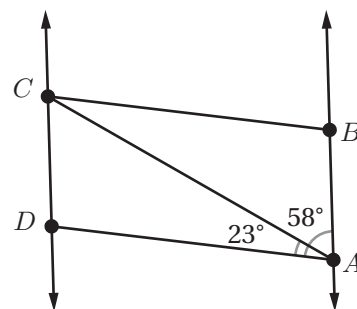
a Determine the three missing angle measures.

b What is the sum of these three angle measures?

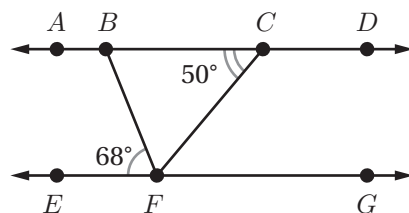


The figure may not be drawn to scale.

5. Line  $AB$  is parallel to line  $CD$ . Angle  $BAC$  measures  $58^\circ$  and Angle  $DAC$  measures  $23^\circ$ . What is the measure of  $\angle ADC$ ? Show or explain your thinking.



6. Line  $AD$  is parallel to line  $EG$ . Determine all five unknown angle measures. Show or explain your thinking.





## Additional Practice

7.05

1. Is it possible to form a triangle with the side lengths 4 cm, 3 cm, and 10 cm?  
Write *yes* or *no*.
  
2. A triangle has side lengths of 12 in. and 5 in. Which of the following side lengths is a possible length of the third side?
  - A. 13 in.
  - B. 2 in.
  - C. 30 in.
  - D. 32 in.
  
3. Diego was asked to determine all the possible values for the length of the third side of the triangle with side lengths of 6 in, 9 in., and an unknown third side length. His response is shown.

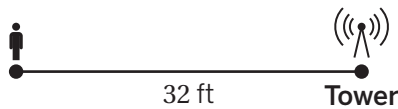
*Let  $x$  represent the length of the unknown side. The value of  $x$  can be any length that is greater than 3 in. because  $6 + x > 9$ . It also has to be less than 15 in. because  $6 + 9 > x$ .*

Is Diego correct? Explain your thinking.

4. Select *all* of the sets of three side lengths that will form a triangle.

- ☐ A. 7 in., 6 in., 11 in.
- ☐ B. 9 in., 5 in., 13 in.
- ☐ C. 8 in., 3 in., 12 in.
- ☐ D. 5 in., 5 in., 9 in.
- ☐ E. 5 in., 5 in., 10 in.

5. A cell phone is exactly 58 ft from the nearest cell phone tower. The phone's owner is currently standing 32 ft from the same cell phone tower. Han says the only distance the phone could be from the owner is 26 ft. Do you agree with Han? Explain your thinking.



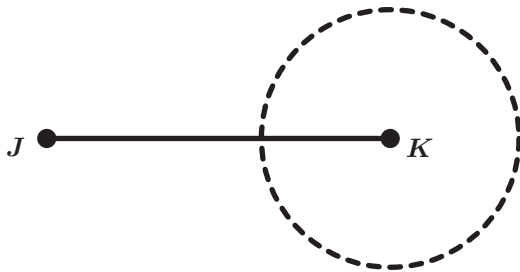
6. An isosceles triangle has one side with a length of 10 cm. If each side has a length that is a whole number, what are the possible lengths of the other two sides?

## Additional Practice

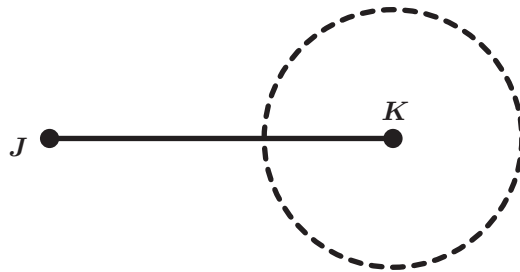
7.06

- Segment  $JK$  is 8 units long and the radius of the circle is 3 units. Draw two different triangles where one side is 8 units long and the other side is 3 units long.

Triangle 1



Triangle 2

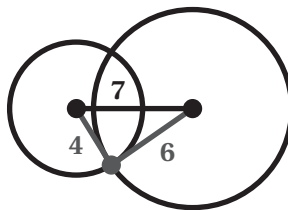


- Daniel drew two triangles with side lengths of 4, 6, and 7 units.

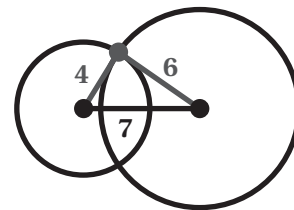
Are the triangles identical?

Explain your thinking.

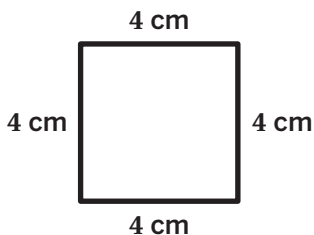
Triangle 1



Triangle 2



- Megan was asked to draw a figure with 4 equal sides. Megan drew the figure shown.



Is the only possible figure Megan could have drawn?

If Yes, explain why. If No, provide a sketch of another figure with 4 equal sides different from Megan's.

4. Is it possible to form a triangle with the side lengths 4 cm, 3 cm, and 10 cm?

Circle your choice.

Yes      No      Need more information

Explain your thinking.

5. Noah drew two Circles A and B with the same center. One circle has a radius of 5 units and another has a radius of 8 units. Noah measures the distance between the points of Circles A and B. What are the maximum and minimum distances he can get? Draw a picture and explain your reasoning.

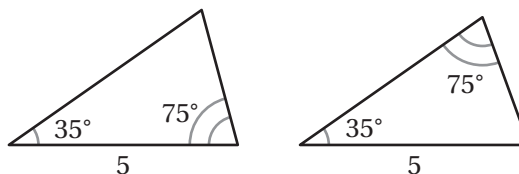
**Problems 6–7:** A box contains wood planks of several different lengths. There is one 2-foot plank, one 5-foot plank, one 6-foot plank, and one 8-foot plank.

6. What is the maximum number of different triangles that can be made using these planks as sides?
- A. 1
  - B. 2
  - C. 3
  - D. 4
7. Describe the lengths of the different triangles that can be made with the given planks.

## Additional Practice

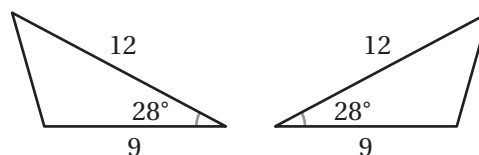
7.07

1. Are these triangles identical based solely on the measurements indicated? Write *yes* or *no*.



*The figures may not be drawn to scale.*

2. Are these triangles identical based solely on the measurements indicated? Write *yes* or *no*.



*The figures may not be drawn to scale.*

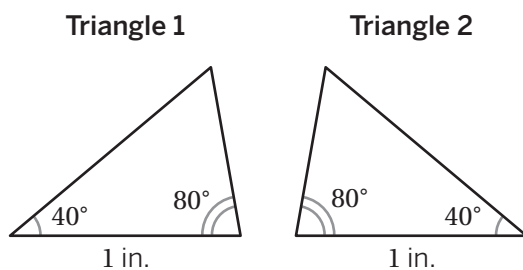
3. Two triangles each have two angle measures of  $60^\circ$  and one angle measure of  $20^\circ$ . Based on these measurements alone, can you guarantee these two triangles are identical? Explain your thinking.
4. Two triangles both have angles measuring  $90^\circ$  and  $65^\circ$  and both have a side of 15 units. Can you guarantee that the triangles are identical? If yes, explain your thinking. If no, provide an example.

5. Priya wants to create two triangles, each with side measures of 3 units and 4 units, and an angle measuring  $30^\circ$ . What other information is needed to guarantee that the triangles will be identical? Explain your thinking.

6. Which of the following measures of corresponding parts of two triangles could you use to determine whether two triangles are identical? Select *all* that apply.

- ☐ A. Two angle measures
- ☐ B. Two sides measures
- ☐ C. One angle measure and one side length measure
- ☐ D. Two angle measures and one side length measure
- ☐ E. The two side length measures and one angle measure between the side lengths

7. Triangles 1 and 2 are identical and share three of the same measurements. Is it possible to draw a third triangle using the same three measurements that is not identical to the other two? Show or explain your thinking.



## Additional Practice

7.08

**Problems 1–2:** A triangle has one 8-inch side, one 10-inch side and one  $40^\circ$  angle. Circle True or Need More Information for each statement about this triangle.

- |  |      |                       |
|--|------|-----------------------|
| 1. More than one unique triangle can be made using these measurements. | True | Need More Information |
| 2. The triangle contains only acute angles.                            | True | Need More Information |

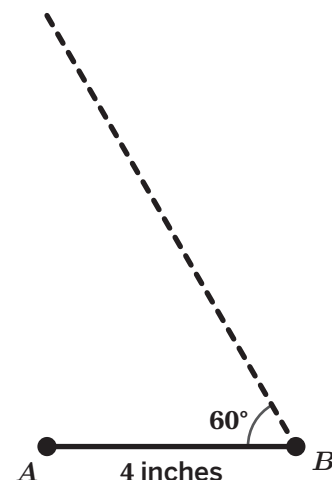
**Problems 3–5:** For each set of three measurements, decide whether you can create zero triangles, one triangle, or more than one non-identical triangle.

Circle your choice.

- |  |      |     |               |
|--|------|-----|---------------|
| 3. One 5-centimeter side, one 7-centimeter side, and one 10-cm side.                       | Zero | One | More than One |
| 4. One $80^\circ$ angle, one $60^\circ$ angle, and one $50^\circ$ angle.                   | Zero | One | More than One |
| 5. One $70^\circ$ angle, one 12-inch side, and one 6-inch side.                            | Zero | One | More than One |
| 6. A triangle has a $60^\circ$ angle, a $90^\circ$ angle, and a side that is 4 units long. |      |     |               |

The 4-inch side is in between the  $90^\circ$  and  $60^\circ$  angles.

Complete the diagram and label your diagram with the given measurements.



**Problems 7–9:**

- 7.** Write two side lengths and one angle measure so that more than one unique triangle can be created with these measurements.

- 8.** Then, sketch a diagram of two different triangles with these measurements. Label each diagram with the given measurements.

Triangle 1	Triangle 2

- 9.** Change one measurement about your triangle so that only one triangle is possible. Explain or show your thinking.

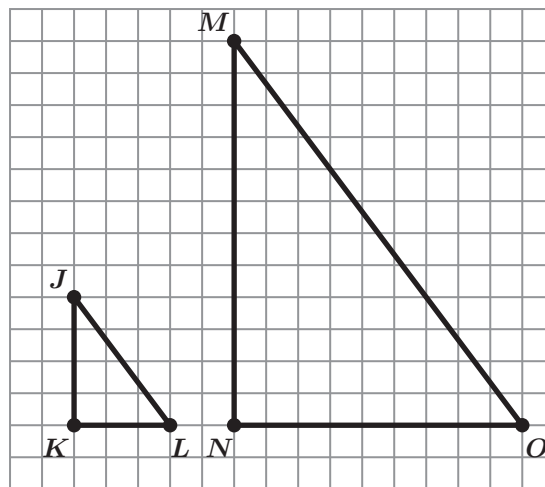


# Additional Practice

1.02

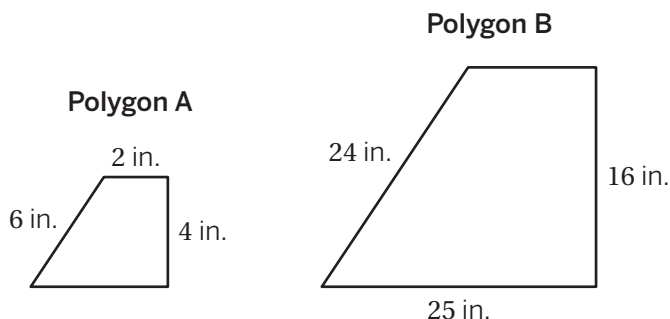
1. Triangle  $MNO$  is a scaled copy of Triangle  $JKL$ . What is the scale factor?

A. 2  
B. 3  
C. 4  
D. 5



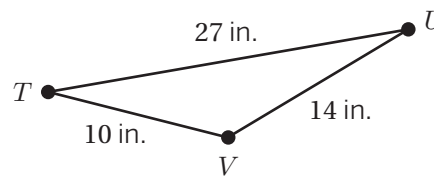
2. Polygon B is a scaled copy of Polygon A.

- a What is the length of the shortest side of Polygon B?
- b What is the length of the longest side of Polygon A?



3. Which values could represent the corresponding side lengths, in inches, of the scaled copy of Triangle  $TUV$  if the scale factor is  $\frac{1}{2}$ ? Select *all* three side lengths.

☐ A. 7                      ☐ B. 28  
☐ C. 13.5                ☐ D. 20  
☐ E. 5                      ☐ F. 54

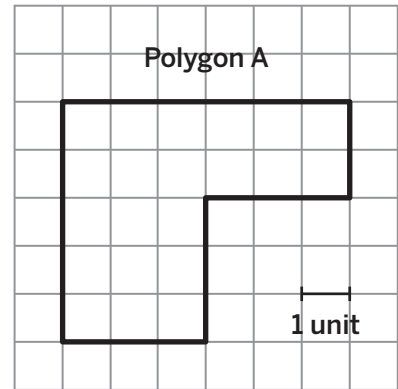


4. Polygon A has side lengths of 10, 18, 20, and 22 units. Polygon B is a scaled copy of Polygon A. Which of the following sets of values could *not* be the side lengths of Polygon B?

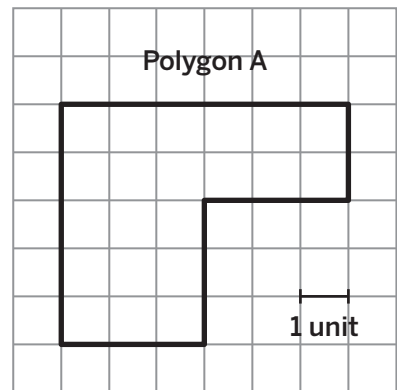
A. 5, 9, 10, 11                      B. 25, 45, 50, 55  
C. 20, 28, 30, 32                      D. 2, 3.6, 4, 4.4

5. Quadrilateral  $ZOID$  is a scaled copy of Quadrilateral  $TRAP$ . Select *all* the true statements.

- ☐ A. Angle  $DIO$  is smaller than angle  $PAR$ .
- ☐ B. The scale factor is greater than 1.
- ☐ C. Point  $T$  corresponds to point  $Z$ .
- ☐ D. Side  $PT$  is 2.25 times longer than side  $DZ$ .
- ☐ E. The measure of angle  $DZO$  is  $105^\circ$ .
- ☐ F. Side  $RA$  corresponds to side  $ZD$ .



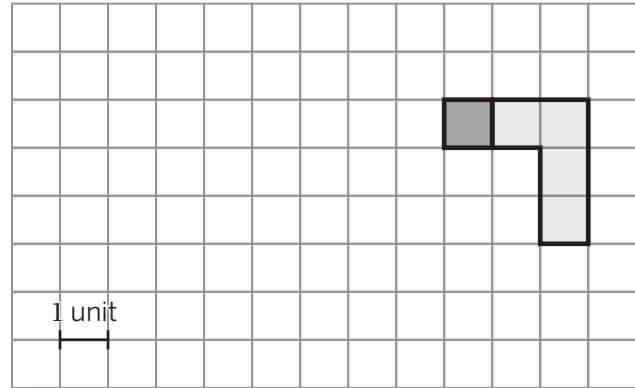
6. Polygon B is a scaled copy of Polygon A, shown here. Suppose the shortest side of Polygon B is 13.5 units.
- a What is the scale factor that takes Polygon A to Polygon B?
  - b What is the length of the longest side of Polygon B?



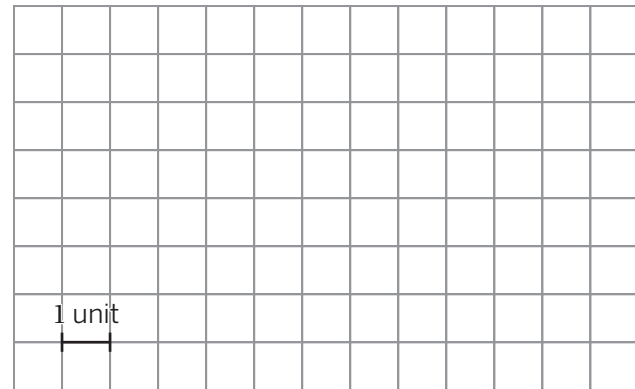
## Additional Practice

1.03

**Problems 1–2:** Here is a polygon.

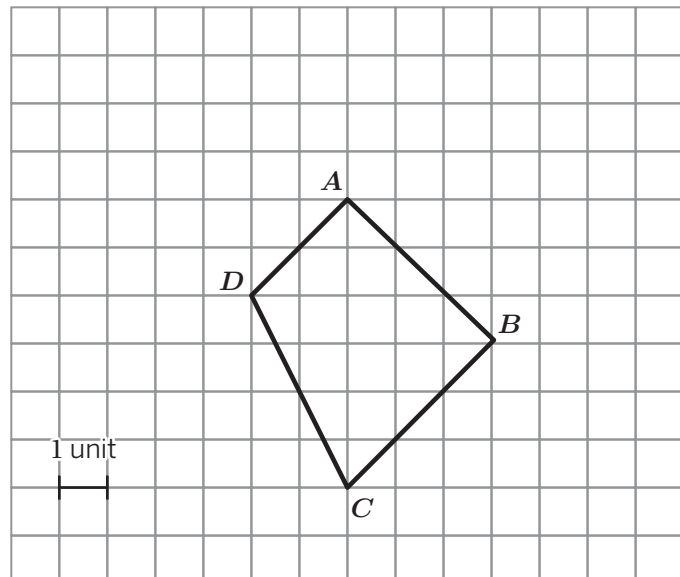


1. Draw a scaled copy of the polygon using a scale factor of 2.
2. What is the area and perimeter of your scaled copy?

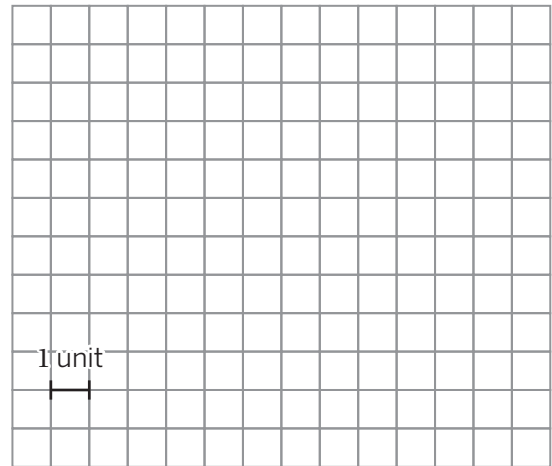


Here is figure  $ABCD$ .

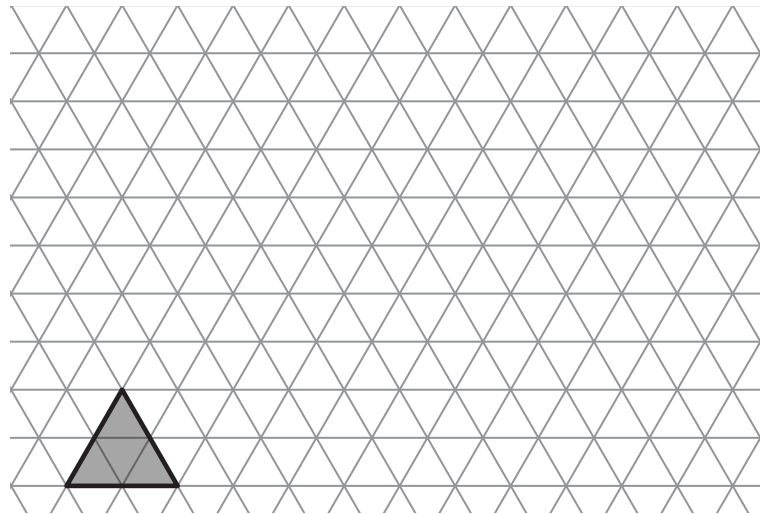
Use this figure for Problem 3.



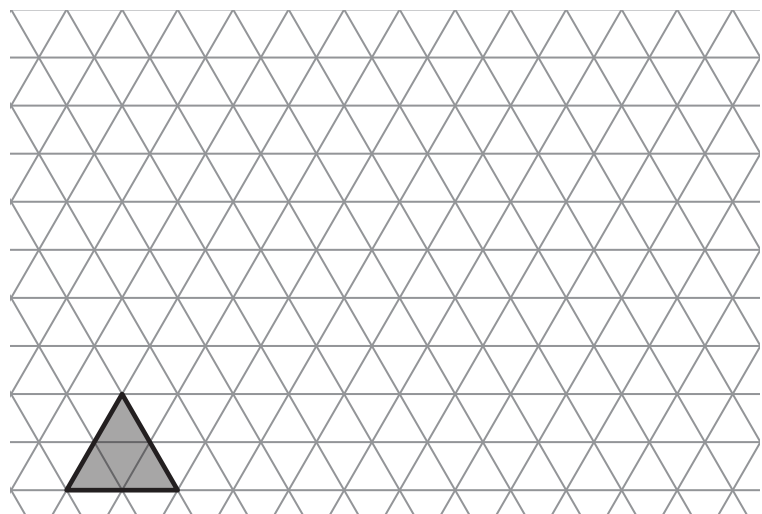
- 3.** Draw a scaled copy of figure  $ABCD$  using a scale factor of 1.5.



- Problems 4–5:** Here is an equilateral triangle.



- 4.** Draw a scaled copy of this equilateral triangle using a scale factor of 4.



- 5.** Equilateral triangles are always scaled copies. Are squares also scaled copies?

Yes      No      Maybe

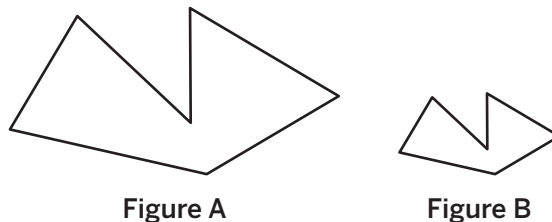
## Additional Practice

1.04

1. If a scaled copy is created by applying a scale factor of 10 to a polygon, what scale factor would take the scaled copy back to its original size? Explain your thinking.

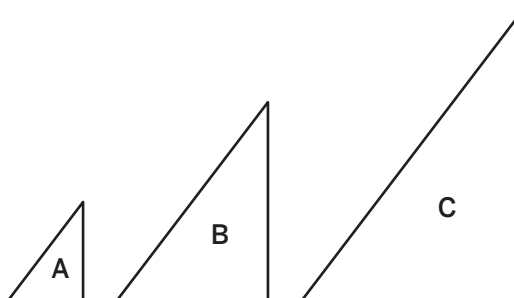
2. Figure B is a scaled copy of Figure A. Which of the following values could be the scale factor that maps Figure A onto Figure B?

- A. 1
- B.  $\frac{1}{2}$
- C. 2
- D.  $\frac{5}{2}$



3. Triangles A, B, and C are scaled copies of one another. For each pair, decide if the scale factor that takes one figure to another is *greater than 1* or *less than 1*. Explain your thinking.

- a From Triangle A to B
- b From Triangle B to C
- c From Triangle B to A
- d From Triangle C to A

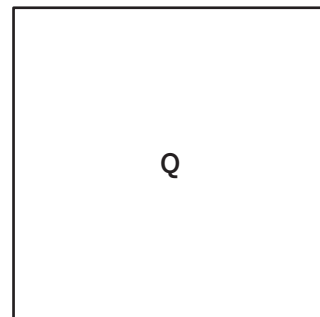


4. Squares S and Q are scaled copies of one another.

- a What scale factor maps Square S onto Square Q?
- b What scale factor maps Square Q onto Square S?



1.4 in.



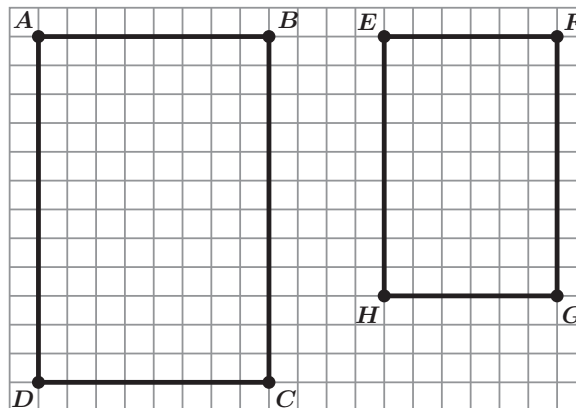
5.6 in.

5. Suppose Figure B is a scaled copy of Figure A. If each of the listed values represents a scale factor that map Figure A onto Figure B, determine the scale factor that will map Figure B back onto Figure A.

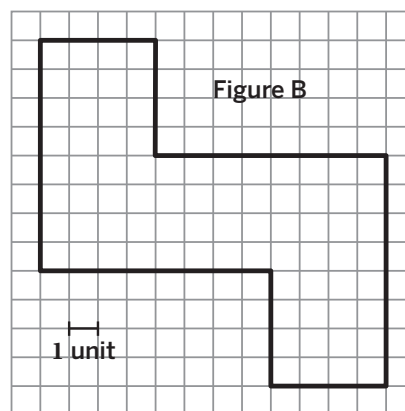
- a 4                      b  $\frac{1}{2}$   
c  $\frac{3}{5}$                       d 3.5

6. Polygon  $EFGH$  is a scaled copy of Polygon  $ABCD$ .

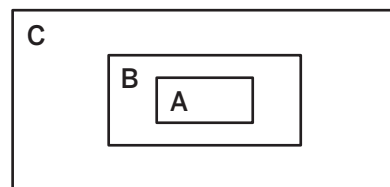
- a What scale factor will take Polygon  $EFGH$  back to its original size?  
b What scale factor will result in Polygon  $EFGH$  remaining the same size?



7. Figure B is a scaled copy of Figure A (not drawn). The scale factor that takes Figure A to Figure B is  $\frac{2}{3}$ . Determine the side lengths of Figure A. Explain your thinking.



8. Andre and Tyler are creating the design shown. They use a scale factor of 2 from Rectangle A to Rectangle B and from Rectangle B to Rectangle C. They create Rectangle A with dimensions 1 in. by  $\frac{1}{2}$  in.

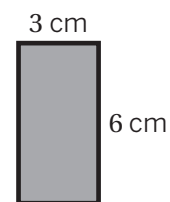


- a What dimensions should Tyler use to create Rectangle B? Explain your thinking.  
b Andre plans to create Rectangle C with dimensions 3 in. by  $1\frac{1}{2}$  in. Are Andre's dimensions correct? Explain your thinking.

## Additional Practice

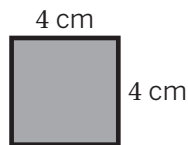
## 1.07

**Problems 1–4.** Here is part of a scale drawing of Nova’s kitchen. The scale is 9 centimeters to 21 feet.



1. What are the dimensions of Nova's actual kitchen?
2. What is the actual area of Nova's kitchen?
3. Nova wants to put a table in their kitchen that is 3.5 feet wide. How wide would the table be if it were drawn on the scale drawing?
4. Nova's living room is near their kitchen and measures 6 centimeters by 10 centimeters. Is Nova's living room twice as large as their kitchen? Explain your thinking.

**Problems 5–7.** Paulina is looking at a map of a square fountain in a park that has a scale of 2 centimeters to 800 feet. On the map, each side of the park is 4 centimeters long.



5. Paulina lives 2,000 feet from the fountain. How long would this distance be on the map?
  
  
  
  
  
  
  
  
  
  
6. If Paulina ran around the perimeter of the fountain once, what distance would she run?
  
  
  
  
  
  
  
  
  
  
7. Paulina wants to run a mile (5,280 feet). About how many times would she need to run around the fountain in order to reach her goal?



## Additional Practice

## 1.10

**Problems 1–4:** James and Piper buried a treasure together on their school’s field. The field is 400 feet wide. James made a map that is 8 inches wide to record its location.

1. Write two possible scales James could have used to make his drawing.
2. Piper made her own map using a scale of 1 inch to 20 feet. Whose map is larger: James's or Piper's? Explain your thinking.
3. On Piper's map, the treasure is 2 inches from the south edge of the field. How far is the treasure from the south edge on Piper's map?
4. On Piper's map, the area of the field is 16 square inches. Piper says that the actual area of the field is 320 square feet. Is Piper correct? Explain your thinking.

**5.** Select *all* the scales that are equivalent to 4 centimeters to 20 meters.

- ☐ **A.** 4 inches to 20 inches
- ☐ **B.** 1 centimeter to 5 meters
- ☐ **C.** 10 meters to 2 centimeters
- ☐ **D.** 5 millimeters to 3 meters
- ☐ **E.** 1 inch to 4 feet

Explain your thinking for the scale(s) you selected.

**6.** On a blueprint, the living room is 4.2 inches wide. The blueprint has a scale of 1 inch to 5 feet. How wide would the living room be on a blueprint that has a scale of 1 inch to 20 feet?

- A.** 1.2 inches
- B.** 2.1 inches
- C.** 3.2 inches
- D.** 31 inches

## Additional Practice

6.01

**Problems 1–4:** A local gym charges \$115 a month for a gym membership and 3 training sessions and \$145 a month for a gym membership with 4 training sessions.

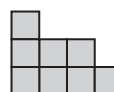
- How much does the gym charge for the monthly membership only?
- How much does the gym charge for each training session?
- Is the relationship between the number of training sessions and the total amount charged proportional? Explain your thinking.
- If the total monthly charge was \$265, how many training sessions were purchased? Explain your thinking.
- Here are scaled copies of a figure. The top three have a toothpick border and the bottom three have a tile border. Complete the table to show the number of toothpicks and tiles for different stages.

Stage	Border Toothpicks	Border Tiles
2		
3		
4		
5		
6		

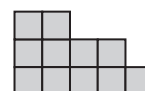
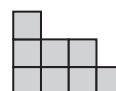
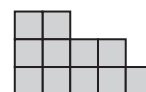
Stage 2






Stage 3



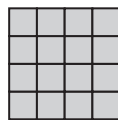
Stage 4



**Problems 6–10:** Use the pattern below to answer the following questions.

Stage 1	Stage 2	Stage 3
		
Border Tiles: .....	Border Tiles: .....	Border Tiles: .....

6. Determine the number of border tiles for each Stage.
7. Describe how you can determine the number of border tiles at any stage without drawing the figure.
8. Describe the pattern of the inner figure.
9. Sketch the figure for Stage 4 below and identify the number of border tiles it has.



Border Tiles: .....

10. Without sketching it, determine how many border tiles Stage 6 will have.  
Explain your thinking.

## Additional Practice

6.03

1. Han purchased 4 packs of tomato plants. He also purchased 5 pepper plants. He bought 17 plants in all. Which equation represents the scenario?

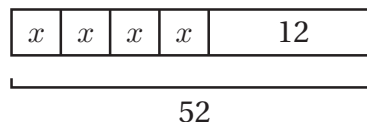
A.  $17 = 4x + 5$

B.  $17 = 4(x + 5)$

C.  $17 - 5 = 4x$

D.  $4x + 17 = 5$

2. Refer to the tape diagram shown. Clare had 4 packages of stickers. After her sister gave her 12 more stickers, she had a total of 52 stickers. In the tape diagram, what does  $x$  represent, the number of packages of stickers or the number of stickers in each package?



3. Read these real-world scenarios, and study the two equations shown.

**Scenario 1:** Lin's mother bought 4 kids-meals. She also bought a meal for herself that cost \$8. She spent a total of \$28 on lunch.

$$8x + 4 = 28$$

$$4x + 8 = 28$$

**Scenario 2:** A preschool teacher has 28 toy cars. She gives equal amounts of toy cars to 8 students. She has 4 toy cars left over.

- a Decide which equation represents each scenario. What does  $x$  represent in each equation?

**Scenario 1:**

**Scenario 2:**

- b Determine the solution to each equation. Show or explain your thinking.

**Scenario 1:**

**Scenario 2:**

- c What does each solution tell you about its scenario?

**Scenario 1:**

**Scenario 2:**

4. Diego and two friends each spent  $\$x$  on a round of mini-golf. They spent \$16 on a veggie pizza. The total cost of the mini-golf and the pizza was \$34.

- a Draw a tape diagram and write an equation that represents the scenario.
- b Solve the equation. Show your thinking. What is the cost of one round of mini-golf?

**Problems 5–9:** Priya wanted to run 54 miles. Each day that she goes out running, she runs 6 miles. She has already run 18 miles. Priya wants to know how many days she needs to run to meet her goal.

5. Identify what the variable,  $x$ , represents in this context.
6. Draw a tape diagram to represent this situation.
7. Using your tape diagram, write an equation to represent this situation.
8. What is the value of  $x$ ? Explain how you arrived at this solution.

## Additional Practice

6.04

1. Kiran gives away a total of 28 bouncy balls to his 4 cousins. He first gives an equal amount to each cousin, and then gives each cousin 2 more. Which equation represents this situation?

- A.  $6(x + 2) = 28$
- B.  $2(x + 4) = 28$
- C.  $4(x + 2) = 28$
- D.  $6(x + 4) = 28$

2. What is the solution to the equation  $64 = 8(x + 2)$ ?

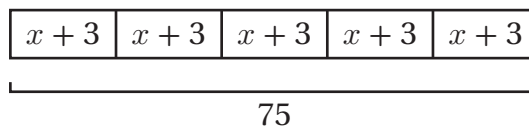
- A.  $x = 10$
- B.  $x = 8$
- C.  $x = 6$
- D.  $x = -10$

3. Solve each equation. Show your thinking.

a  $91 = 7(x + 6)$

b  $\frac{3}{4}(x + 1) = 12$

4. Refer to the tape diagram shown. Clare says that the tape diagram could match the following scenario:



A kindergarten teacher placed an equal amount of stickers at 5 tables. Then he placed 3 more stickers at each table. He placed 75 stickers in all.

Do you agree with Clare? Explain your thinking.

**5. Match each story with the equation that represents it.**

**Stories**

- a.** Mai packaged 48 cans of vegetable soup in 6 boxes for a canned food drive. She first placed an equal amount in each box and then added 4 cans to each box.
- b.** A group of 4 friends each purchased a ticket to drive go-karts. Each friend also spent \$6 on a meal. They spent \$48 in all.

**Equations**

.....  $6(x + 4) = 48$

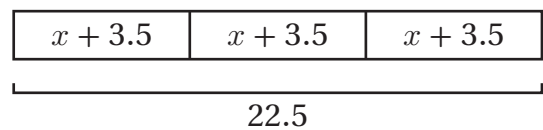
.....  $4(x + 6) = 48$

**6. Solve each equation. Show your thinking.**

**a**  $9 = 2.25(x + 1.5)$

**b**  $\frac{2}{3}\left(x + \frac{9}{6}\right) = \frac{6}{3}$

**7. Refer to the tape diagram shown.**



- a** Write a scenario that could be represented by the tape diagram.
- b** Write an equation that represents the diagram and the scenario.
- c** What does  $x$  represent?
- d** Solve the equation.
- e** Interpret the solution.



## Additional Practice

6.05

1. Determine what changes were made to the first hanger diagram that resulted in the second hanger diagram. Name the property (or properties) that tell you that if the first hanger is balanced, then the second hanger diagram remains balanced.

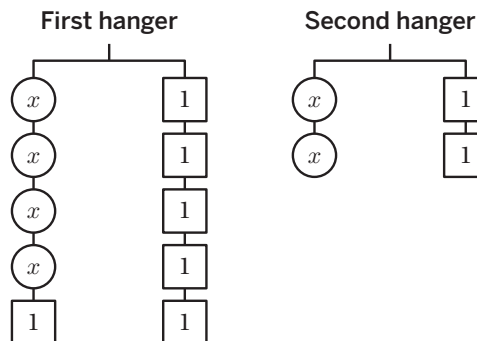
First hanger	Second hanger	What was done?	What property?

2. Each hanger diagram in the table from Problem 1 is balanced. Determine the weight of each lettered shape, and explain your thinking. You may draw on the diagrams to help with your thinking.

a  $z =$  \_\_\_\_\_ b  $x =$  \_\_\_\_\_ c  $2z =$  \_\_\_\_\_ d  $0.5x =$  \_\_\_\_\_

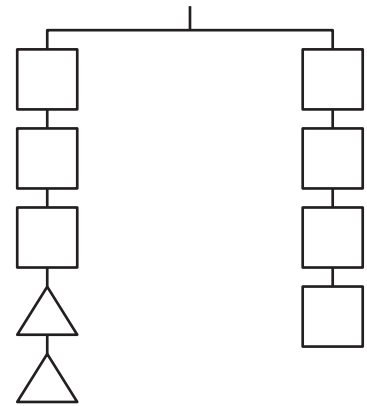
3. Refer to these hanger diagrams. What changes were made to the first hanger diagram that resulted in the second hanger diagram?

- A. One unit was added to each side. Then each side was divided by 2.
- B. One unit was removed from each side. Then each side was divided by 2.
- C. One unit was added to each side. Then each side was divided by 3.
- D. Each side was partitioned into 2 equal groups, and one half of each side was removed.

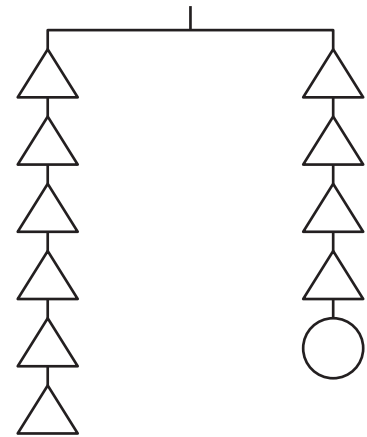


4. Refer to the balanced hanger diagram. Determine the weight of a triangle if each square weighs:

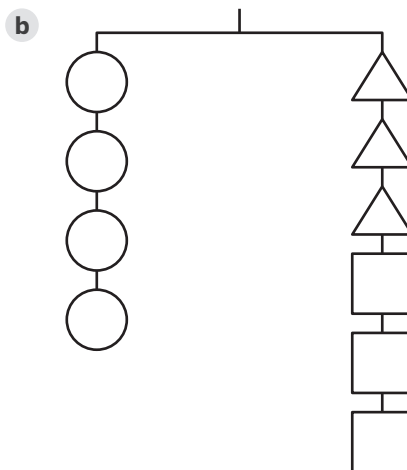
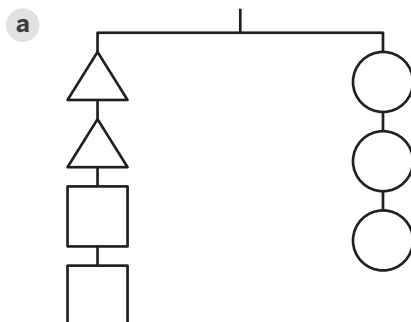
- a 2 lb
- b 3 lb
- c  $1\frac{1}{2}$  lb
- d  $\frac{1}{2}$  lb



5. Refer to the balanced hanger diagram. The weight of each triangle is 2.5 g. What is the weight of the circle? Explain your thinking.



6. Suppose the weight of each triangle is  $x$  lb, the weight of each circle is 2 lb, and the weight of each square is  $\frac{1}{4}$  lb. Write an equation to represent the hanger diagrams shown.

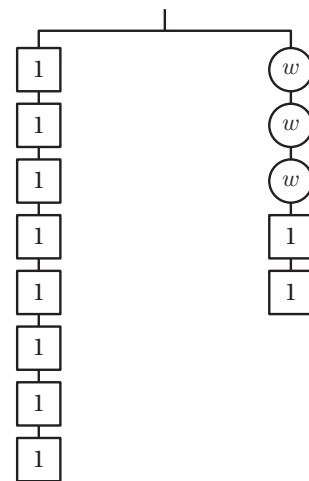


## Additional Practice

6.06

1. Refer to the hanger diagram. Which equation is represented by the hanger diagram?

- A.  $8 = 2w + 3$
- B.  $10 = 3w$
- C.  $8 = 3w + 2$
- D.  $6 = 3w$



2. Clare described a hanger diagram as having three unknowns and two weights balanced with five weights. Which hanger diagram represents this description?

Diagram A

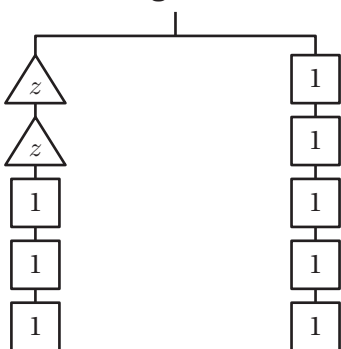
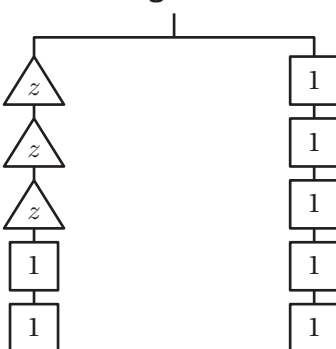
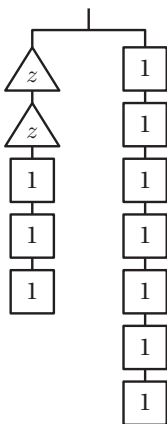


Diagram B

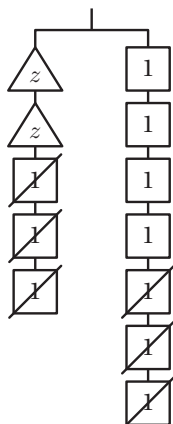


3. Andre used a hanger diagram to find the solution to the equation  $2z + 3 = 7$ . Write an equation to represent each step.

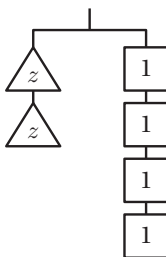
Step 1



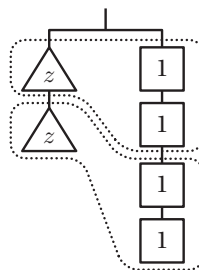
Step 2



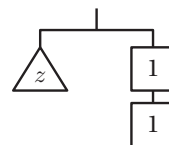
Step 3



Step 4



Step 5

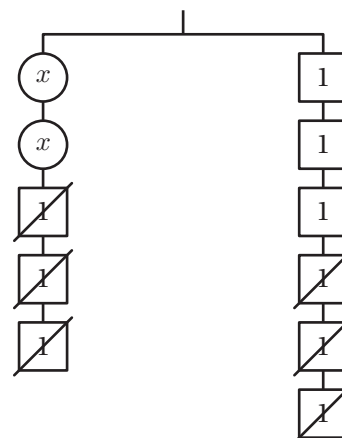


4. Bard started to solve the equation  $2x + 3 = 6$  using the hanger diagram shown. Complete Bard's response, including marking up the hanger diagram.

**Bard's thinking:**

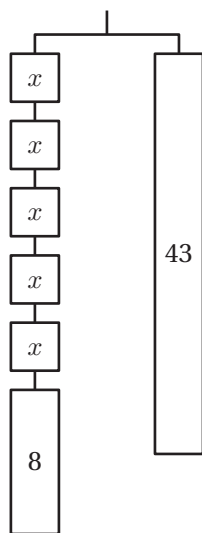
$$2x + 3 = 6$$

$$2x + 3 - 3 = 6 - 3$$

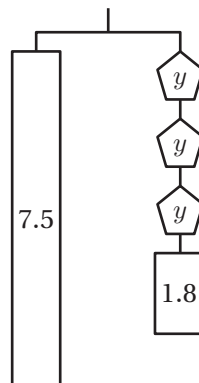


5. Solve each equation. Refer to the hanger to help with your thinking.

**a**  $5x + 8 = 43$



**b**  $7.5 = 3y + 1.8$



6. Solve each equation. Draw a hanger diagram, if needed.

**a**  $1.25y + 6.2 = 11.2$

**b**  $\frac{1}{2}x + \frac{3}{4} = 2\frac{3}{4}$

## Additional Practice

6.07

**Problems 1–3:** Solve each equation by filling in the blanks.

1.  $12x - 6 = 54$

$12x = \dots\dots\dots$

$x = \dots\dots\dots$

2.  $5(x + 3) = -25$

$x + 3 = \dots\dots\dots$

$x = \dots\dots\dots$

3.  $-75x + 150 = 0$

$-75x = \dots\dots\dots$

$x = \dots\dots\dots$

**Problems 4–7:** Solve each equation. Draw a hanger diagram to help with your thinking, if needed. Show your thinking.

4.  $-10(x - 3) = 50$

5.  $18 = \frac{2}{3}(w + 4)$

6.  $15 = -0.5(y + 6)$

7.  $-\frac{1}{3}(z - 12) = -2$

**Problems 8–9:** Matthew and Alice each solved the equation  $-\frac{1}{3}(x + 6) = 12$  using different methods. The first steps of their methods are shown below.

**8.** Continue to solve the equation following each student's first steps. Show your thinking.

Matthew's Method	Alice's Method
$-\frac{1}{3}(x + 6) = 12$ $-3 \cdot -\frac{1}{3}(x + 6) = 12 \cdot -3$	$-\frac{1}{3}(x + 6) = 12$ $-\frac{1}{3}x + -\frac{1}{3}(6) = 12$

**9.** What is different about each method? What is the same?

**10.** Which method do you prefer? Explain.

## Additional Practice

6.08

**Problems 1–3:** Write each expression in expanded form.

1.  $-3(-2)$

2.  $-9(1 - y)$

3.  $-14(-2y)$

**Problems 4–6:** Complete the missing information in the puzzle and complete the table.

4.

	$w$	$-8$
$2$		

Factored	Expanded
$2(w - 8)$	

5.

$6$	$12a$	$-24$

Factored	Expanded
	$12a - 24$

6.


Factored	Expanded
	$8y - 20$

**Problems 7–10:** Solve each equation. Show your thinking.

**7.**  $-3(x - 5) = 12$

**8.**  $-4(x + 2) = 32$

**9.**  $\frac{2}{3}(x + 3) = -18$

**10.**  $-\frac{1}{4}(x - 7) = -10$



## Additional Practice

6.09

1. Gina says that  $4x - 8$  and  $3x + 4$  are equivalent because they equal 40 when  $x$  is 12. Do you agree with Gina? Explain your thinking.

2. Write at least three different expressions that are equivalent to  $12w + 18$ .

3. Write at least three different expressions that are equivalent to  $-1/4(16m - 40)$ .

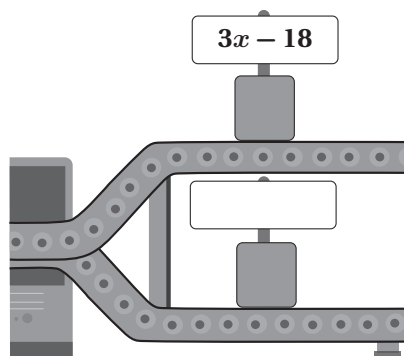
**Problems 4-7:** Write an equivalent expression in expanded form.

4.  $-3(-a + 4) = \dots\dots\dots$
5.  $-12\left(z - \frac{1}{2}\right) = \dots\dots\dots$

6.  $\frac{1}{4}(20y - 10) = \dots\dots\dots$
7.  $3(2x + 6y - 1) = \dots\dots\dots$

**Problems 8–9:** A never-equal machine is given.

8. Write an expression that will always be equal to  $3x - 18$  and an expression that will never be equal to  $3x - 18$ . Use  $x$  as the variable in each expression.



9. Explain how you know that your two expressions will never be equal.

## Additional Practice

6.10

1. Select *all* of the expressions that are equivalent to  $12x + 7 - 2x$ .

- ☐ A.  $17x$
- ☐ B.  $10x + 7$
- ☐ C.  $14x + 7$
- ☐ D.  $12x + 7 + (-2x)$
- ☐ E.  $12x - 2x + 7$

2. Fill in the blanks to make each equation true.

- a  $4x + \dots = 7x$
- b  $4x + \dots = x$
- c  $4x + \dots = -6x$
- d  $4x + \dots = 7x - 2$
- e  $4x - \dots = x$
- f  $4x - \dots = -6x$
- g  $4x + \dots = 8$
- h  $4x - (\dots) = 2x - 6$

**Problems 3–6:** Collect all the squares by choosing two or more expressions to combine using appropriate operations. Then, write an equivalent expression using the fewest number of terms.

All squares must be used.

$-3x$	$6 - x$	$3(x - 2)$
$2(x - 1)$	$5 + x$	$10x$
$9x + 4$	$4x$	$\frac{1}{2}x + 6$

	Original Expression	Equivalent Expression
3		
4		
5		
6		

## Additional Practice

6.11

1. Which is the solution to the equation  $3x + 7 = -11$ ?

- A. 9
- B. 6
- C. -6
- D. -9

2. Which is the solution to the equation  $\frac{2}{3}(x + 8) = -4$ ?

- A. 14
- B. 2
- C. -2
- D. -14

3. Solve each equation. Show your thinking.

**a**  $41 = 11 + 4z$

**b**  $3w + 3.1 = 9.7$

4. Solve each equation. Show your thinking.

**a**  $-\frac{5}{4}(x - 6) = \frac{10}{4}$

**b**  $8000 = 4000(x - 0.06)$

5. Select *all* expressions that represent a correct solution to the equation  $4(x + 6) = 22$ .

☐ A.  $22 - 4 - 6$

☐ D.  $\frac{1}{4}(22 - 6)$

☐ B.  $22 \div 4 - 6$

☐ E.  $(22 - 6) \div 4$

☐ C.  $\frac{1}{4}(22 - 24)$

☐ F.  $(22 - 24) \div 4$

6. Solve the equation  $-\frac{3}{4}(x - 8) = -6$  using two different methods. Show your thinking.

7. Diego solved the equation  $-\frac{3}{2}(x + 6) = \frac{21}{2}$ . His response is shown. Diego made a mistake. Identify his mistake, and then correct his response. Show your thinking.

$$\begin{aligned}
 -\frac{3}{2}(x + 6) \div \left(-\frac{3}{2}\right) &= \frac{21}{2} \div \left(-\frac{3}{2}\right) \\
 x + 6 &= -6\frac{3}{4} \\
 x + 6 &= -15\frac{3}{4} \\
 x + 6 - 6 &= -15\frac{3}{4} - 6 \\
 x &= -21\frac{3}{4}
 \end{aligned}$$

## Additional Practice

6.12

1. Elena had 100 fliers to pass out. She gave an equal amount of fliers to 5 volunteers and she passed out 10 fliers. Which equation represents this situation?

A.  $100 = 5(x + 10)$

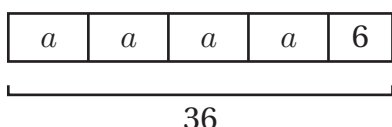
B.  $10(x + 5) = 100$

C.  $10x + 5 = 100$

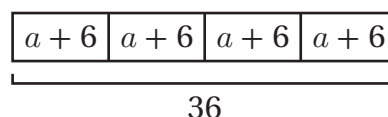
D.  $100 = 5x + 10$

2. Which tape diagram represents the equation  $4(a + 6) = 36$ ?

Tape diagram A



Tape diagram B



3. Match each scenario with the equation that it could represent. Some scenarios may be represented by the same equation.

**Equation**

**Scenario**

a.  $4(x + 2) = 18$

..... Jada has 4 dimes and 2 times as many quarters as Han. She has 18 dimes and quarters altogether. How many quarters does Han have?

b.  $2x + 4 = 18$

..... Lin's father spent \$18 and purchased each of his 4 children a \$2 yo-yo and a bottle of bubbles. How much does each bottle of bubbles cost?

c.  $4x + 2 = 18$

..... Diego made two fruit baskets using 18 pieces of fruit. He placed an equal number of pieces in each basket and then added 4 more pieces to each basket. How many pieces of fruit did Diego originally put in each basket?

d.  $2(x + 4) = 18$

..... Clare has 18 gel pens. She gives an equal amount of gel pens to 4 friends and keeps 2 for herself. How many gel pens did she give each friend?

..... A teacher had 18 copies of a class chapter book. She stacked an equal number of copies in 4 piles. Then she placed 2 more copies in each pile. How many copies of the book were first placed in each pile?

**For Problems 4–6:** write and solve an equation, including identifying what the variable in each equation represents. After solving each equation, describe what the solution represents in the scenario. Draw a tape diagram to help if needed.

4. Andre tutored 8 times this past month and earned the same amount each time he tutored. To thank him, the family gave him an extra \$6 at the end of the month. Andre earned \$110 from tutoring.

**a** Equation:

**b** Description:

5. Mai spent 5 more minutes reading than Clare. Lin read 3 times as many minutes as Mai. If Lin read for 30 minutes, how many minutes did Clare spend reading?

**a** Equation:

**b** Description:

6. Priya and Tyler both run for 1 hour every day. In that time, Priya runs 1.5 miles less than Tyler. If after 4 days Priya has run a total of 20 miles, how far does Tyler run in 1 day?

**a** Equation:

**b** Description:

7. Write a scenario that could be represented by each of the following equations.

**a**  $3(x - 7) = 21$

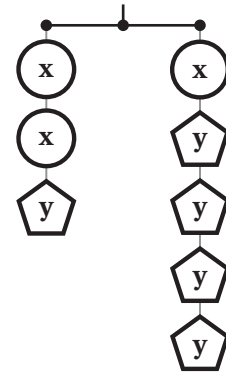
**b**  $2y - 20 = -5$



# Additional Practice

4.03

**Problems 1–2:** In this balanced hanger diagram, the weight of the circle is  $x$  and the weight of the pentagon is  $y$ .



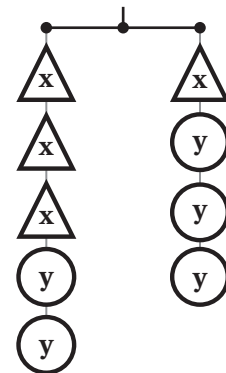
1. Label the figures with  $x$  or  $y$ . Then, write an equation using  $x$  or  $y$  to represent the hanger diagram.

2. If  $x = 9$ , what is the value of  $y$ ? Show or explain your thinking.

3. In this balanced hanger diagram, the weight of the triangle is  $x$  and the weight of the circle is  $y$ .

- a Label the figures with  $x$  or  $y$ .
- b Select *all* the equations that could represent a balanced hanger.

- ☐ A.  $3y + 2x = y + 3x$
- ☐ B.  $3x + 2y = x + 3y$
- ☐ C.  $2x + 2y = 3y$
- ☐ D.  $5xy = 4xy$
- ☐ E.  $2x = y$



4. Match each set of equations with a possible step that turns the first equation into the second equation.

Equation	Possible steps
a. $9x + 3 = 3x + 18$ $3x + 1 = x + 6$	..... Multiply each side by $-3$
b. $-3(5x - 7) = -21$ $5x - 7 = 7$	..... Divide each side by $-3$
c. $-\frac{4}{3}x = 5$ $4x = -15$	..... Divide each side by $3$
d. $7x + 5 = 3x - 6$ $4x + 5 = -6$	..... Subtract $3$ from each side
e. $10 - 5x = 8 + 4x$ $7 - 5x = 5 + 4x$	..... Subtract $3x$ from each side

**Problems 5–6:** Jada and Tyler were each trying to solve  $7x - 4 = 5x - 5$ . Describe the first step they each made to the equation.

5. The result of Jada's first step was  $7x = 5x - 1$ .

6. The result of Tyler's first step was  $7x + 1 = 5x$ .

## Additional Practice

4.04

1. Andre and Clare are each solving the equation  $-4(x - 5) = 10x - 8$ . Andre's solution is  $x = -2$ , and Clare's solution is  $x = -\frac{7}{9}$ . Their responses are shown.

**Andre's solution:**

$$-4(x - 5) = 10x - 8$$

$$4x - 20 = 10x - 8$$

$$-20 = 6x - 8$$

$$-12 = 6x$$

$$-2 = x$$

**Clare's solution:**

$$-4(x - 5) = 10x - 8$$

$$x - 5 = 10x + 2$$

$$-5 = 9x + 2$$

$$-7 = 9x$$

$$-\frac{7}{9} = x$$

Do you agree with either of their solutions? Show or explain your thinking.

2. Solve the equation  $-5(2x - 2) = 20x$  two different ways. Show your thinking.

3. Mia solved the equation  $\frac{1}{2}(6x - 8) = 5x + 12$ . Mia began with the original equation and her steps are shown. Complete the table by describing the steps Mai used to solve the equation.

Steps	Description
$\frac{1}{2}(6x - 8) = 5x + 12$	Original equation
$3x - 4 = 5x + 12$	
$-4 = 2x + 12$	
$-16 = 2x$	
$-8 = x$	

**Problems 4–5:** Determine whether  $x = 2$  is a solution for each equation. Show your thinking.

4.  $4(x - 5) = -12$

5.  $-3(x + 2) = 2x + 16$

6. Solve each equation below. Show your thinking. Check your solution.

$$2.4(x + 3) = 4.2x + 2(x - 4)$$

## Additional Practice

4.06

1. For each equation, determine whether it has *one solution*, *no solution*, or *infinitely many solutions* by placing a check mark in the appropriate box.

Equation	One solution	No solution	Infinitely many solutions
$x + 2 = x + 4$			
$2x + 4 = 2x + 1 + 3$			
$3(x - 1) = 2x + 1$			
$-(4x - 5) = -x + 5 - 3x$			

2. If an equation is never true for any value of  $x$ , which is true about the equation?

- A. It has no solution.
- B. It has one solution.
- C. It has infinitely many solutions.
- D. Zero is its only solution.

**Problems 3–4:** For each equation, decide whether it has *one solution*, *no solution*, or *infinitely many solutions*. Show or explain your thinking.

3.  $3x - 7x + 1 = -4x + 5$

4.  $4(x + 3) = -2(2x + 6)$

5. Elena said  $4x - 6 = 4(x - 6)$  has infinitely many solutions. Do you agree with Elena's answer? Explain your thinking.

6. Noah and Lin solved the equation  $-(3x + 2) - 1 = -2x - (x + 3)$ . Their responses are shown below.

**Noah's work:**

$$\begin{aligned} -(3x + 2) - 1 &= -2x - (x + 3) \\ -3x - 2 - 1 &= -2x - x - 3 \\ -3x - 3 &= -3x - 3 \\ -3 &= -3 \end{aligned}$$

**Lin's work:**

$$\begin{aligned} -(3x + 2) - 1 &= -2x - (x + 3) \\ -3x - 2 - 1 &= -2x - x - 3 \\ -3x - 3 &= -3x - 3 \\ -3x &= -3x \\ x &= x \end{aligned}$$

Noah says that one of them is incorrect because you cannot get different results for the same equation. Is Noah correct? Explain your thinking.

7. Write the other side of this equation so that it is true for all values of  $x$ .

$$-\frac{1}{2}(4x + 12) + 5x = \dots\dots\dots$$

8. Write the other side of this equation so that it is true for no values of  $x$ .

$$-\frac{1}{2}(4x + 12) + 5x = \dots\dots\dots$$

9. Write the other side of this equation so that it is true when  $x = 0$ .

$$-\frac{1}{2}(4x + 12) + 5x = \dots\dots\dots$$

## Additional Practice

4.07

1. Without solving them, identify whether each equation has a solution that is *positive*, *negative*, or *zero* by placing a check mark in the appropriate box.

Equation	Positive Solution	Negative Solution	Solution of zero
$12x = -36.24$			
$2x = 14.6$			
$6x - 10 = -10$			
$-\frac{2}{3}x = -64$			

**Problems 2–5:** Solve each equation. Show your thinking.

2.  $5x + 7x - 12 = 6(2x - 2)$

3.  $\frac{1}{2}(6y - 12) = 2(y - \frac{3}{2})$

4.  $4(6 - 2m) = 3(m + 1) + 10$

5.  $6b + 8 - 10b + 4 = -16 - 4b - 2$

6. Andre studied the equation  $3(3x - 6) = -9(x - 2)$ . He said, "I can tell right away there is no solution because, on the left side, you will have  $9x$ , and then, on the right side, you will have  $-9x$ . They will cancel each other out."

Do you agree with Andre's statement? Explain your thinking.

7. Jada wrote the equation  $8x + 2 = 8x + 4$ . She wants to change only one term so that the equation has exactly one solution.

a What is an example of a change that would result in exactly *one solution*?

b What is an example of a change that would result in an infinite number of *solutions*?



## Additional Practice

## 4.08

1. For what value of  $x$  do the expressions  $\frac{3}{4}x + 12$  and  $\frac{1}{4}x - 8$  have the same value? Show or explain your thinking.
2. Which story could the equation  $4x + 4 = 5x - 6$  represent?
  - A. Han and his brother get a weekly allowance of  $x$  dollars. At one point, Han had an allowance balance of  $-\$6.00$  and his brother had an allowance balance of  $\$4.00$ . After 5 weeks of allowance for Han and 4 weeks of allowance for his brother, they have the same allowance balance.
  - B. The Huskies and the Cardinals are playing a trivia game. Each correct question is worth  $x$  points. At one point in the game, the Huskies have  $-6$  points and the Cardinals have 4 points. After the Huskies answer 4 correct questions and the Cardinals answer 5 correct questions, they have the same number of points.
3. At Lin's fitness center, a membership costs  $\$40$  a month and there is a one-time registration fee of  $\$20$ . At Kiran's fitness center, a membership costs  $\$50$  a month and there is a one-time registration fee of  $\$10$ .

Which equation represents when the costs of the membership would be equal if  $m$  represents the number of months?

- A.  $40m + 10 = 50m + 20$
- B.  $40m = 50m + 10$
- C.  $40m + 20 = 50m$
- D.  $40m + 20 = 50m + 10$

**Problems 4–7:** Clare and Mai are running in the same direction on the same running trail.

4. Clare runs at a constant speed of 4 miles per hour. Write an expression that shows how many miles Clare has run after  $t$  hours.
5. Mai started running  $\frac{1}{4}$  of an hour after Clare. If Clare has been running for  $t$  hours, how long has Mai been running?
6. Mai runs at a constant speed of 6 miles per hour. Write an expression that shows how many miles Mai has run after Clare has been running for  $t$  hours.
7. Use your expressions to determine when Clare and Mai will meet each other on the running trail. Show or explain your thinking.
8. Shawn wants to take photography lessons. The instructor offers two options. Option 1 costs \$60 per lesson and comes with a camera. Option 2 costs \$40 per lesson but you have to purchase your own camera. Suppose Shawn buys the \$200 camera and chooses Option 2. After how many lessons,  $x$ , is Shawn's total cost the same as it would have been if Shawn had chosen Option 1? Show your thinking.

## Additional Practice

7.07

1. At a restaurant, a minimum of 2 people in each party need to be present in order to be seated at their table. Write an inequality that represents the possible number of people  $p$  that need to be present in order to be seated.
  
2. Clare is younger than Bard. Bard is 13 years old. Write an inequality that compares Clare's age in years  $c$  to Bard's age.
  
3. Diego started cooking dinner before 5:00 p.m. and finished cooking dinner at 6:00 p.m. Let  $d$  represent the number of hours Diego spent cooking dinner. Determine whether each statement is *definitely true*, *definitely not true*, or *possibly true*.

**a**  $d < 1$

**b**  $d > 1$

**c**  $d < 2$

**d**  $d > 2$

**e**  $d < 0.5$

**f**  $d > 0.5$

4. Noah started a run at 6:30 a.m. and finished sometime after 9:00 a.m. Let  $r$  represent the number of hours Noah spent running. Determine whether each statement is *definitely true*, *definitely not true*, or *possibly true*.

**a**  $r > 2$

**b**  $r > 2.5$

**c**  $r > 3$

**d**  $r < 3$

**e**  $r < 2.5$

**f**  $r < 2$

**5.** At the grocery store, all apples cost less than \$2.00 per pound.

- a** What is the most expensive price one pound of apples could cost?
- b** Write an inequality to represent the possible costs, in dollars, for any number of pounds of apples.

**6.** At the clothing store, all  $t$ -shirts cost more than \$9.99.

- a** What is the least expensive price a  $t$ -shirt could be?
- b** Write an inequality to represent the possible costs of  $t$ -shirts, in dollars.

**7.** Priya looks at a container of cherries and says, "I think there are more than 55 cherries in the container."

Jada looks at the same container of cherries and says, "I think there are less than 125 cherries in the container."

- a** Write an inequality to show Priya's statement, using  $c$  to represent the number of cherries.
- b** Write another inequality to show Jada's statement, also using  $c$  to represent the number of cherries.
- c** Can Priya and Jada both be correct? Explain your thinking and provide a possible number of cherries that supports your argument.

**8.** Priya and Jada are each analyzing a container of blueberries. Study their statements. Did Priya and Jada each represent their statements with correct inequalities? Explain your thinking.

**Priya**

I think there are less than 150 blueberries in the container. The inequality that represents this is  $b > 150$ , where  $b$  represents the number of blueberries.

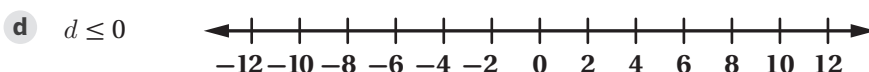
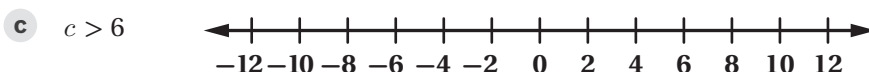
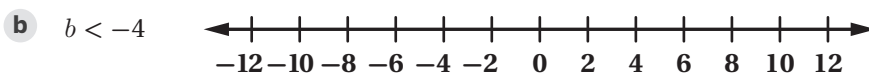
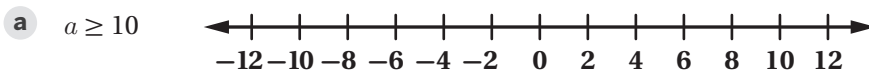
**Jada**

I think there are more than 65 blueberries in the container. The inequality that represents this is  $b < 65$ , where  $b$  represents the number of blueberries.

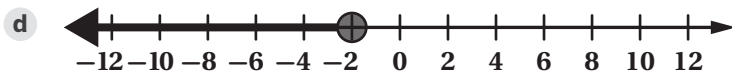
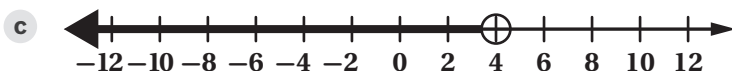
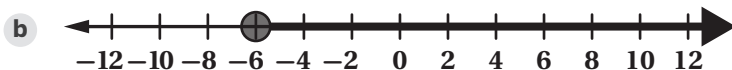
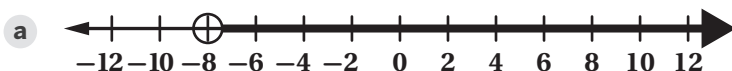
## Additional Practice

7.08

1. Graph each inequality statement on the number line.



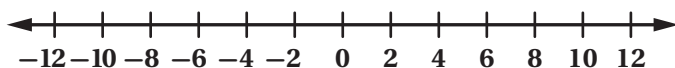
2. Use the variable  $x$  to write an inequality statement that represents each graph.



3. Consider the inequality  $m < 4$ .

a Which of these numbers are solutions to the inequality: 4,  $-3.1$ ,  $-1$ ,  $4.6$ ,  $1.5$ ,  $-8$ ,  $5$ ?  
List *all* that apply.

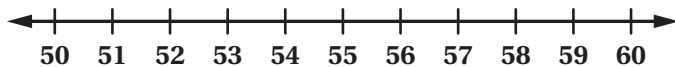
b Graph the inequality statement on the number line.



4. A sign at an amusement park reads, "You must be 54 in. or taller to ride."

a Using the variable  $h$ , write an inequality that represents the information on the sign.

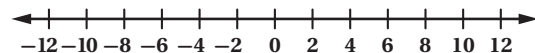
b Graph the inequality statement on the number line.



5. There are less than 12 people in line to ride the roller coaster.

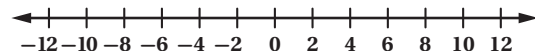
a Using the variable  $n$ , write an inequality that represents the number of people in line to ride the roller coaster.

b Graph the inequality statement on the number line.

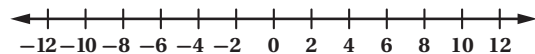


6. Represent each inequality scenario on the number line.

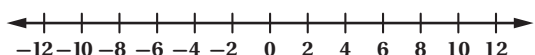
a The amusement park sells at least 10 flavors of ice cream.



b Andre spends less than \$6 at the arcade.



c It costs more than 4 tokens for the ride.



7. Andre counts more than 3 hot dog stands at the fair. He said, "To graph this scenario on a number line, I would draw a closed circle at 3 with an arrow pointing to the right." Did Andre correctly describe how to graph this scenario? Explain your thinking.

8. Priya and Jada each wrote a statement to describe a container of blueberries. Did Priya and Jada each correctly describe how to graph their inequality statements? Explain your thinking.

**Priya**

I think there are less than 150 blueberries in the container. To graph this inequality statement, I would draw an open circle at 150 with an arrow pointing to the right.

**Jada**

I think there are more than 65 blueberries in the container. To graph this inequality statement, I would draw a closed circle at 65 with an arrow pointing to the right.

## Additional Practice

6.13

1. For each scenario, circle the inequality that represents it.

- a** The temperature is above  $32^\circ$ .

$x > 32$        $x < 32$        $x \geq 32$        $x \leq 32$

- b** Kiran has no more \$20 to spend.

$x > 20$        $x < 20$        $x \geq 20$        $x \leq 20$

2. Consider the inequality  $c \leq 9$ . Circle *all* the solutions to the inequality.

7                  8                  9                  10

3. Express each statement as an inequality, and write two values which will make the inequality true.

- a**  $x$  is greater than 2.

- b**  $b$  is less than or equal 4.5.

- c** 5 is at least  $w$ .

- d**  $d$  is no less than 16.

- e**  $t$  is at most 8.

4. Write an inequality that represents each scenario.

- a** A student must have at least 5 hours of community service completed.

- b** Practice will be no more than 50 minutes.

- c** Children under the age of 3 are free.

- d** During hibernation, an arctic ground squirrel's body temperature never goes below  $-2.9^\circ\text{C}$ .

5. Consider the inequality  $-2x < 14$ .

- a List four values for  $x$  that would make this inequality true.
- b How are the solutions to the inequality  $-2x < 14$  different from the solutions to the inequality  $-2x \leq 14$ ?

6. Noah and Elena each wrote an inequality to represent the following situation.

Jada wants to take, at minimum, \$15 to the store.

**Noah's inequality:**  $x \geq 15$

**Elena's inequality:**  $15 \leq x$

Who is correct? Explain your thinking.

7. Refer to the following situations.

- a The Art Club spent \$249 on supplies last year. This is at most \$75 more than the Spanish club spent. Write an inequality that represents the amount of money that the Spanish Club spent.
- b In the first week of a canned food drive 480 cans were collected. In the last week of the canned food drive, at least twice that amount was collected. Write an inequality that represents the amount of cans that were collected in the last week of the canned food drive.

8. The number line shows a solution to an inequality. Write a real-world scenario that the inequality could represent.



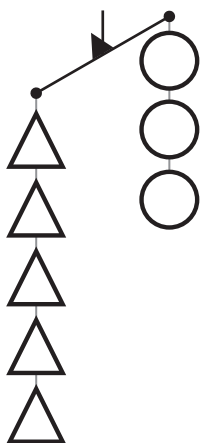


# Additional Practice

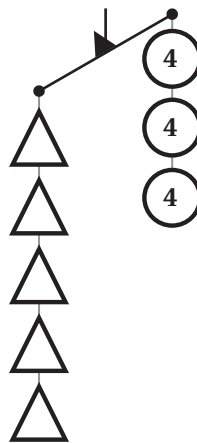
6.14

**Problems 1–2:** Here are two unbalanced hangers. Write an inequality to represent the relationship between the weights on each hanger. Use  $t$  to represent the weight of the triangle in grams. Use  $c$  to represent the weight of the circle in grams.

1.



2.



3. Select all values of  $x$  that make the inequality  $x - 7 \geq -3$  true.

☐ A. 3.9

☐ E. 5

☐ B. 0

☐ F.  $-1$

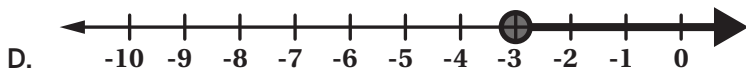
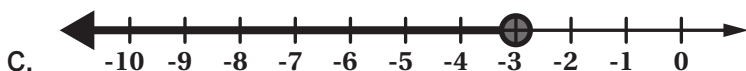
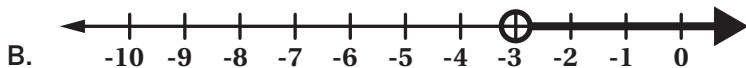
☐ C. 4

☐ G.  $-4$

☐ D. 4.1

☐ H. 8

4. Which number line shows the solution to  $-3x > 9$ ?





## Additional Practice

6.15

1. Priya has \$30 to spend at the school festival. Admission is \$4 and each ride ticket is \$2. Which inequality represents the greatest number of ride tickets she can buy?
  - A.  $2n + 4 < 30$
  - B.  $2n + 4 > 30$
  - C.  $2n + 4 \leq 30$
  - D.  $2n + 4 \geq 30$
  
2. It is currently 8 degrees outside, and the temperature will drop 2 degrees every hour. When the temperature falls below zero degrees, it can be represented by the inequality  $8 - 2h < 0$ , where  $h$  represents the number hours the temperature has been dropping. Does  $h < 4$  or  $h > 4$  represent the solution of the inequality?
  
3. Clare currently has a \$0 allowance balance. She has been borrowing \$5 each day from her father. Her allowance balance after  $d$  days is  $-5d$ .
  - a Explain what the equation  $-5d = -25$  represents.
  - b What value of  $d$  makes the equation true?
  - c Explain what the inequality  $-5d < -25$  represents.
  - d What values of  $d$  make the inequality true?
  
4. The 20 members of the photography club are trying to raise at least \$1,400 for new photography equipment. They have already raised \$540.
  - a Let  $m$  represent the amount of money each member must raise, on average, to meet their goal. Write an expression for the total amount of money going to be raised.
  - b Write an equation that represents the club raising all the money.
  - c Solve the equation. What does the solution mean in context of the scenario?
  - d Write an inequality representing the amount of money each member must raise, on average, to meet or exceed their goal.
  - e Write an inequality showing the possible average amount of money each club member needs to raise.

5. Andre's dog weighs 84 lb. The vet put Andre's dog on a diet for 6 months. The dog's weight after losing  $p$  pounds monthly is  $84 - 6p$ .

a Explain what the equation  $84 - 6p = 76$  represents.

b What value of  $p$  makes the equation true?

c Explain what the inequality  $84 - 6p \leq 76$  represents.

d What values of  $p$  make the inequality true?

6. Noah spent \$40 on supplies for making 25 birdhouses. Noah wants to make a profit of more than \$300.

a What inequality can you write to find the price  $p$  Noah should charge per birdhouse if he wants to meet his goal?

b What values of  $p$  make the inequality true?

7. Elena scored 95, 91, 90 on 3 tests. She wants her average test score for 5 tests to be at least 92.

a What inequality represents the average score she can get on her next two tests to meet her goal? Identify and define a variable.

b What values make the inequality true?

## Additional Practice

6.16

1. Select *all* values of  $x$  that make the inequality  $-x + 6 < 8$  true.

- |                                   |                                  |
|-----------------------------------|----------------------------------|
| <input type="checkbox"/> A. 1.9   | <input type="checkbox"/> E. -2   |
| <input type="checkbox"/> B. 2     | <input type="checkbox"/> F. -1.9 |
| <input type="checkbox"/> C. 2.01  | <input type="checkbox"/> G. 15   |
| <input type="checkbox"/> D. -2.01 | <input type="checkbox"/> H. -15  |

2. To ride on the Space *Mountain* rollercoaster at Disney World, guests must be at least 44 inches tall. Match each situation or number line graph with an inequality.

**Situation/Graph**

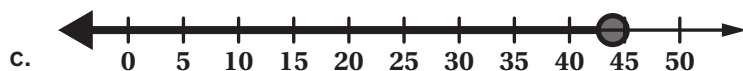
**Inequality**

- a. Kira is  $x$  inches tall and cannot ride the rollercoaster.

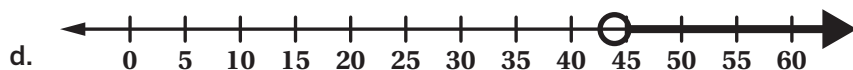
.....  $x > 4$

- b. Jake is  $x$  inches tall and can ride the rollercoaster.

.....  $x \leq 4$



.....  $x < 44$



.....  $x \geq 44$

**Problems 3–4:** Use the inequality  $60 - 2x \geq -10$ .

3. Select *all* values of  $x$  that make the inequality  $60 - 2x \geq -10$  true.

- |              |               |
|--------------|---------------|
| ..... A. 0   | ..... D. 35.1 |
| ..... B. 35  | ..... E. 34.9 |
| ..... C. -35 |               |

4. In order to solve the inequality  $60 - 2x \geq -10$ , Soorya solved the equation  $60 - 2x = -10$  and got  $x = 35$ . What is the solution to the inequality? Show or explain your thinking.

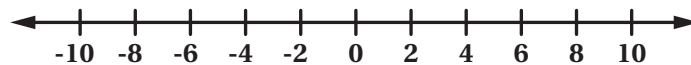
5. Jasmine is solving the inequality  $12x < -48$ . She solves the equation  $12x = -48$  to determine  $x = -4$ . What is the solution to the inequality?

- A.  $x < -4$
- B.  $x > -4$
- C.  $x \leq -4$
- D.  $x \geq -4$

**Problems 6–7:** Complete the table to determine the solutions to each inequality. Write the solutions as an inequality and graph them on the number line.

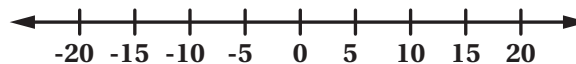
6.  $-5x \geq 30$

$x$	-9	-8	-7	-6	-5	-4	-3
$-5x$							

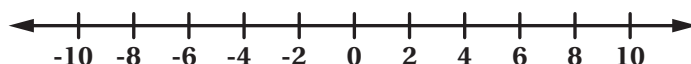


7.  $\frac{4}{5}x > -12$

$x$	-20	-15	-10	-5	0	5	10
$\frac{4}{5}x$							



8. Solve the inequality  $2x + 8 > 12$  and graph the solution on the number line. Show your thinking.



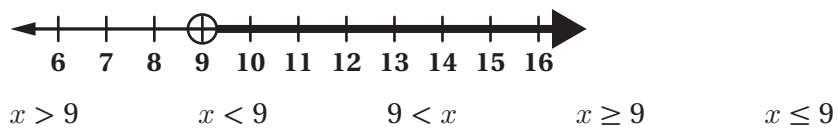
## Additional Practice

6.17

1. Here is an inequality: Which numbers are solutions to the inequality  $-2(x - 4) < 20$ ?

- ☐ A.  $-0.5$ 
☐ B.  $-8$ 
☐ C.  $-1$ 
☐ D.  $0$   
☐ E.  $-6$ 
☐ F.  $6$ 
☐ G.  $-5.9$ 
☐ H.  $-6.1$

2. Which inequalities does the following graph represent? Circle *all* that apply.



3. Bard is solving the inequality  $-80 - 5x \leq -20$ . Bard first solves the equation  $-80 - 5x = -20$  and obtain  $x = -12$ . What is the solution to the inequality?

- A.  $x < -12$ 
B.  $x > -12$   
C.  $x \geq -12$ 
D.  $x \leq -12$

4. Solve each inequality. Show your solution as a graph on the number line.

a  $7(x + 11) > -91$



b  $-8x - 4 \geq -6$



5. Priya solved both inequalities below, but she mixed up her solutions. Help her by deciding if the solution to each inequality is represented by  $x \leq 1\frac{1}{2}$  or  $x \geq 1\frac{1}{2}$ . Explain your thinking.

**a**  $-2x - 3 \geq -6$

**Solution:**

**Explanation:**

**b**  $-24 \geq -6(x + 2.5)$

**Solution:**

**Explanation:**

6. Solve the inequality  $-3.8 > -1.2b + 2.2$ .

- a** Solve the related equation and test values less than and greater than the solution.

- b** Graph the solution on the number line and write an inequality to represent the solution.



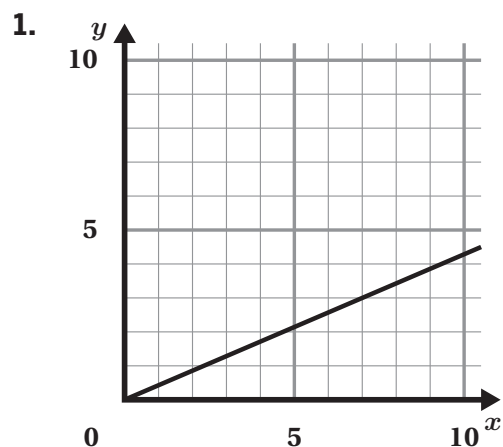
7. Compare and contrast solving an equation and solving an inequality.



## Additional Practice

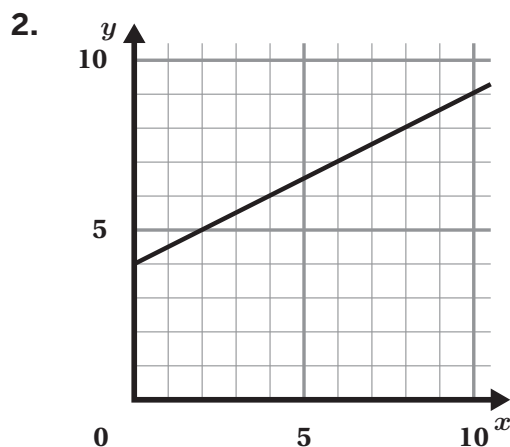
3.01

**Problems 1–4:** Determine whether each graph represents a proportional or non-proportional relationship (circle one). Then, determine the slope of each line.



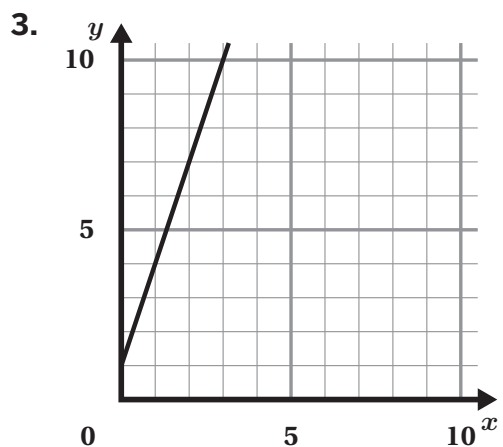
Proportional      Non-Proportional

Slope =



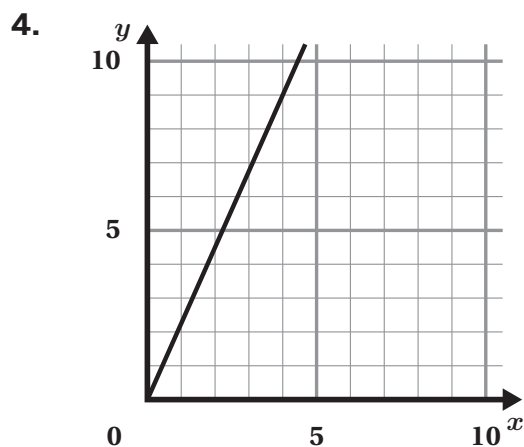
Proportional      Non-Proportional

Slope =



Proportional      Non-Proportional

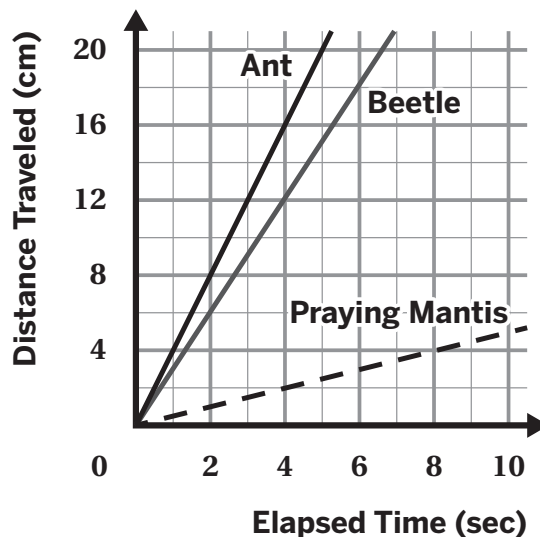
Slope =



Proportional      Non-Proportional

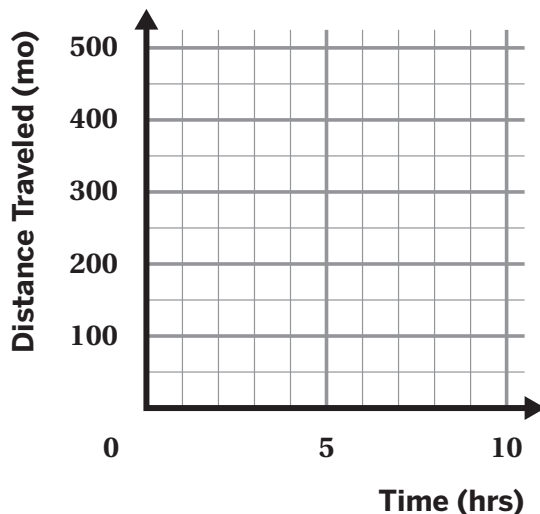
Slope =

5. An ant, a beetle, and a praying mantis compete in a 20-centimeter race. Write a story that represents the three lines on the graph.



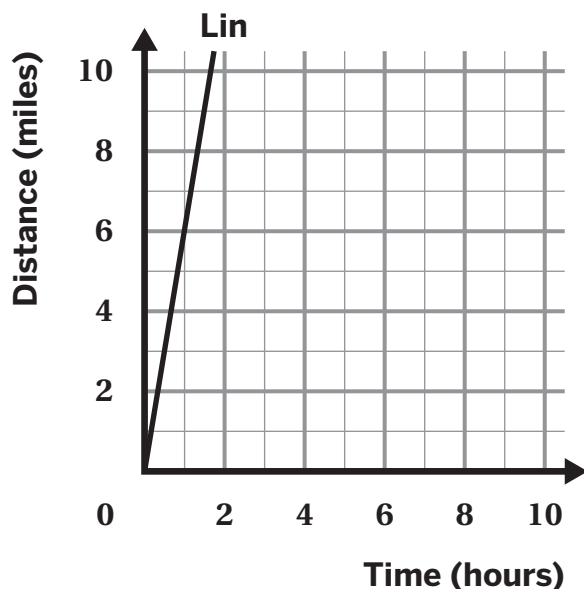
**Problems 6–8:** From rest, a bus travels at a constant rate. After 3 hours, the bus traveled 150 miles.

6. Graph the line showing the relationship between the car’s distance traveled and time.
7. What is the slope of the line?
8. What does the slope represent in context?



**Problems 9–10:** Lin bikes at a constant speed. The relationship between her distance and time is shown on the graph. Jada jogs at a constant speed that is half as fast as Lin.

9. Graph the relationship between Lin’s distance and time on the same coordinate plane.
10. Explain your reasoning.

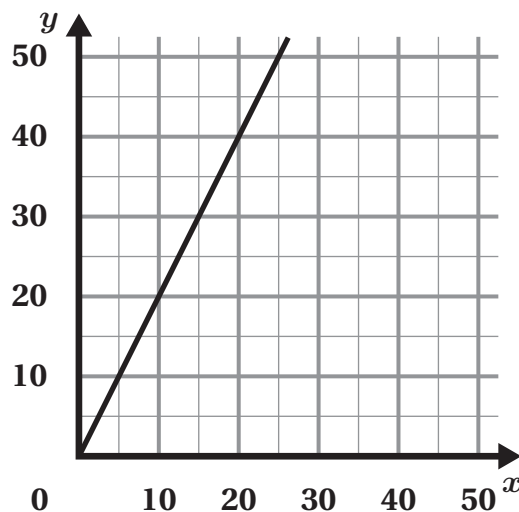


## Additional Practice

3.02

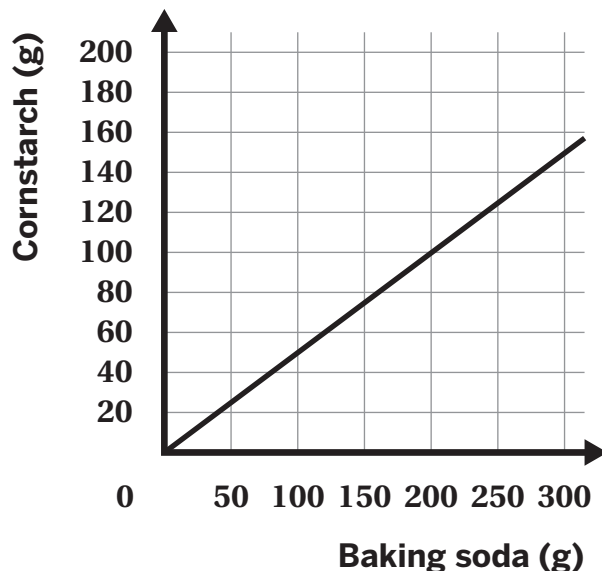
1. Write an equation for a graph of a proportional relationship that passes through the point (16, 12). Explain your thinking.

2. Write an equation of the line graphed.  
Use  $y = mx$  form where  $m$  represents the slope of the line.



**Problems 3–4:** The graph shown represents the proportional relationship between the number of grams of baking soda and the number of grams of cornstarch in a recipe to make your own bath fizzies.

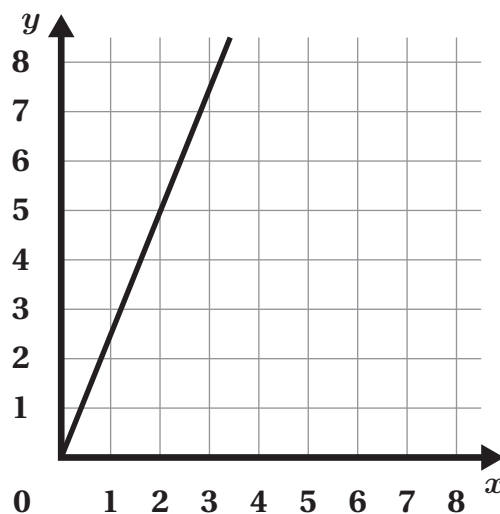
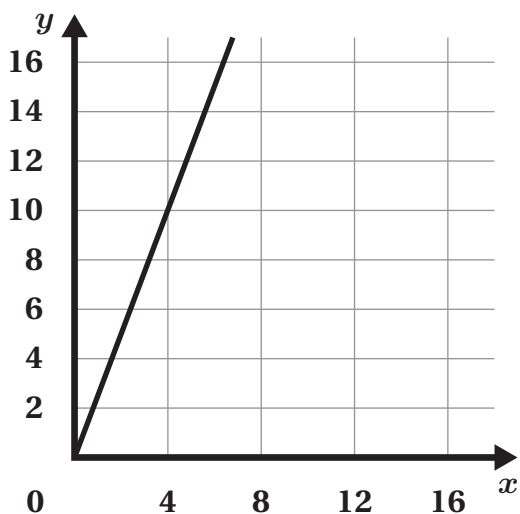
3. Write an equation that represents this relationship. Let  $x$  represent the number of grams of baking soda and  $y$  represent the number of grams of cornstarch.



4. Use your equation to complete the table.

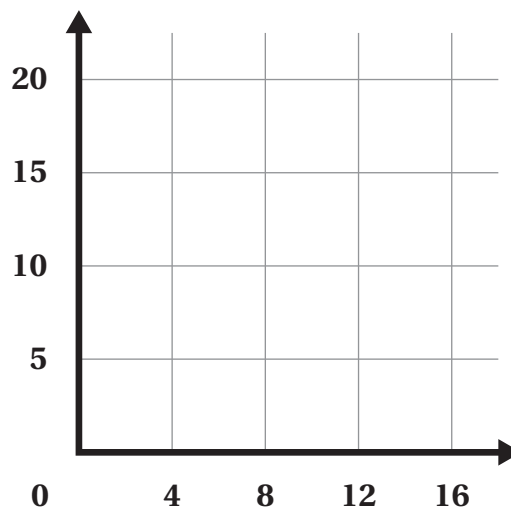
Baking Soda (g)	Cornstarch (g)
650	
	1,250
1	

**Problems 5–6:** A swimmer is swimming at a constant rate. The two graphs shown represent the same proportional relationship between the distance swam in feet,  $y$ , and the amount of time,  $x$ , that has passed in seconds.



5. Write an equation that represents the relationship between distance  $y$  and time  $x$ .

6. Draw a graph to show the same proportional relationship as Problem 5. Explain your reasoning.



## Additional Practice

3.03

1. In 200 grams of beef soup, there are 80 calories. Let  $x$  represent the amount of grams of beef soup and  $y$  represent the number of calories in the beef soup. Which equations represent the relationship between  $x$  and  $y$ ? Select *all* that apply.

☐ A.  $y = \frac{2}{5}x$

☐ C.  $x = \frac{2}{5}y$

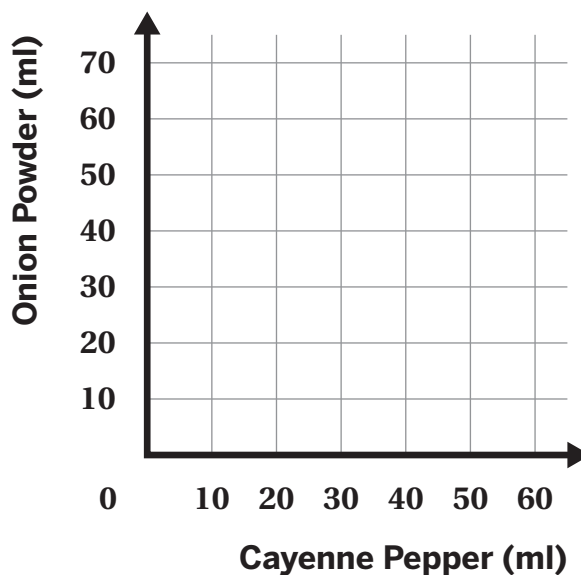
☐ B.  $y = \frac{5}{2}x$

☐ D.  $x = \frac{5}{2}y$

**Problems 2–4:** The table shows the ratios of paprika, onion powder, and cayenne pepper in a rub recipe.

Paprika (ml)	Onion Powder (ml)	Cayenne Pepper (ml)
60	24	16
90	36	24

2. Write an equation that represents the relationship between  $x$  milliliters of cayenne pepper and  $y$  milliliters of onion powder. Show or explain your thinking.



3. Graph the relationship on the coordinate plane.
4. How much onion powder is needed for 64 ml of cayenne pepper? Show or explain your thinking.

**Problems 5–7:** Han and Priya are at swim practice. While both were swimming at a constant rate, they noticed they each took a different number of strokes to swim the same distance. For every 3 strokes Priya takes, Han takes 5 strokes. Suppose  $x$  represents the number of strokes Priya takes and  $y$  represents the number of strokes Han takes.

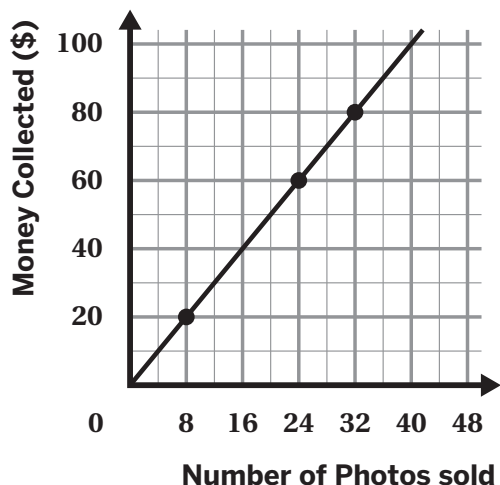
5. Complete the table.

Number of Priya's Strokes ( $x$ )	Number of Han's Strokes ( $y$ )
24	
36	
75	

6. Write an equation that reflects the relationship between  $x$  and  $y$ . Show or explain your thinking.
7. How many strokes has Han taken if Priya has taken 180 strokes? Show or explain your thinking.

8. At a middle school festival, they have a photo booth and are selling photos to raise money for the school. They collect \$40 for every 16 photos they sell.  
Which statement correctly identifies both the slope and the representation of slope for the situation?

- A. The slope is  $\frac{2}{5}$ , so the amount of money made for every photo is \$0.40.
- B. The slope is  $\frac{5}{2}$ , so the amount of money made for every photo is \$2.50.
- C. The slope is  $\frac{2}{5}$ , so to make \$1, they have to sell 0.40 photos.
- D. The slope is  $\frac{5}{2}$ , so to make \$1, they have to sell 2.5 photos.



## Additional Practice

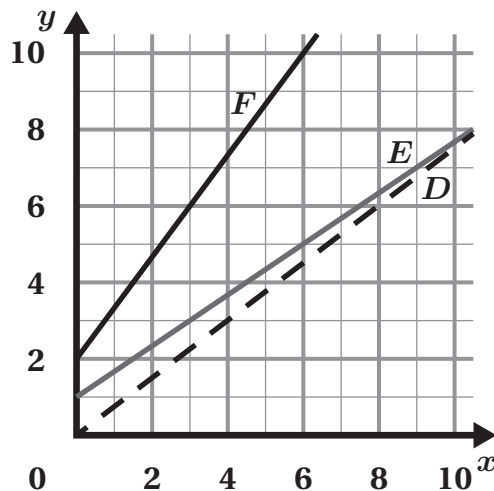
3.04

1. Match each equation with the graph of its line.

a.  $y = \frac{2}{3}x + 1$  \_\_\_\_\_

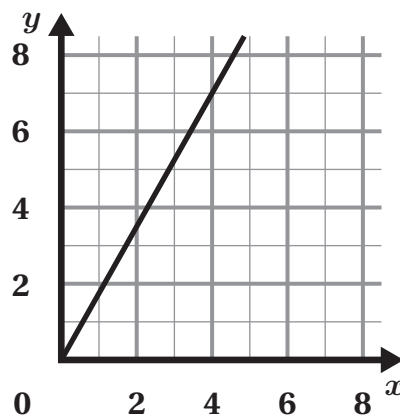
b.  $y = \frac{3}{4}x$  \_\_\_\_\_

c.  $y = \frac{4}{3}x + 2$  \_\_\_\_\_



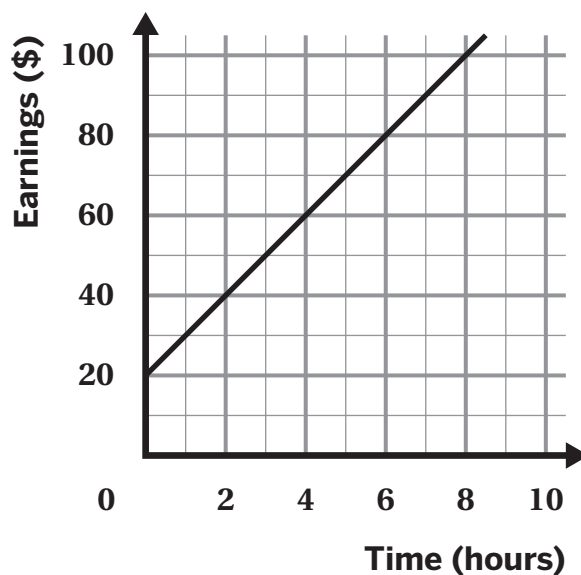
2. Select *all* statements that are true about the graph.

- ☐ A. The graph represents a linear relationship.
- ☐ B. The graph represents a proportional relationship.
- ☐ C. The constant of proportionality is  $\frac{3}{2}$ .
- ☐ D. The slope of the line is  $\frac{2}{3}$ .
- ☐ E. The slope of the line is  $\frac{2}{3}$ .



3. Jada charges a one-time supply fee plus an hourly rate to do yard work. The graph shows the money she earned, based on the number of hours worked for a recent all-day job.

Is the relationship a linear relationship?  
Is the relationship proportional? Explain your thinking.



**Problems 4–9:** Determine whether these linear relationships are proportional or non-proportional (Circle one).

4. From rest, Noah bikes at a constant speed of 12 miles per hour.

Proportional    Non-Proportional

5.

$x$	$y$
3	7
4	9
6	13

Proportional    Non-Proportional

6.  $y = 4x$

Proportional    Non-Proportional

7. At birth, a kitten weighs 3.5 ounces and doubles its weight in the first week.

Proportional    Non-Proportional

8.  $y = \frac{1}{2}x + 3$

Proportional    Non-Proportional

9.

$x$	$y$
2	5
4	10
8	20

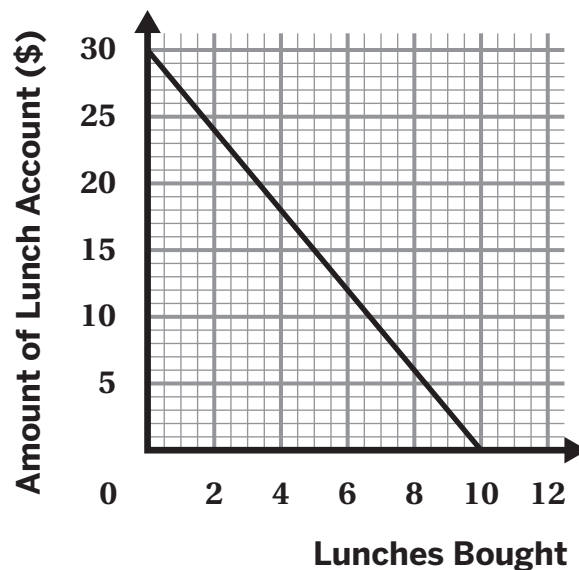
Proportional    Non-Proportional



# Additional Practice

3.05

**Problems 1–4:** Clara has an account to pay for her school lunches. Each time Clara buys lunch, \$3.00 is subtracted from the amount available in her account. This graph shows the amount of money available in her account,  $y$ , after buying  $x$  lunches.



- How much money was initially in Clara's account? Explain how you know.

- Complete the table.

Number of Lunches bought ( $x$ )	0	1	2	...	8
Amount of Money in Account	30	27		...	

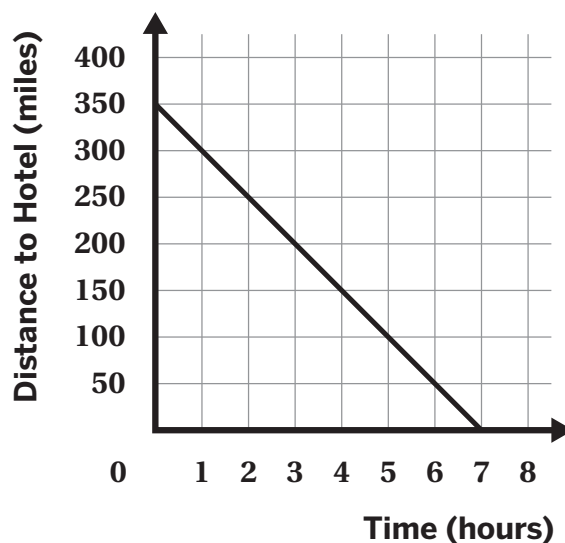
- Write an equation that represents the amount of money remaining in Clara's account,  $y$ , after buying  $x$  lunches.
- After how many lunches will Clara's account run out of money? Show or explain your thinking.

**Problems 5–7:** Mai's family is planning a trip and staying at a hotel. Mai estimates their average speed and graphed her expected progress on the trip. The graph shows the remaining distance  $d$  in miles to the hotel after driving  $h$  hours.

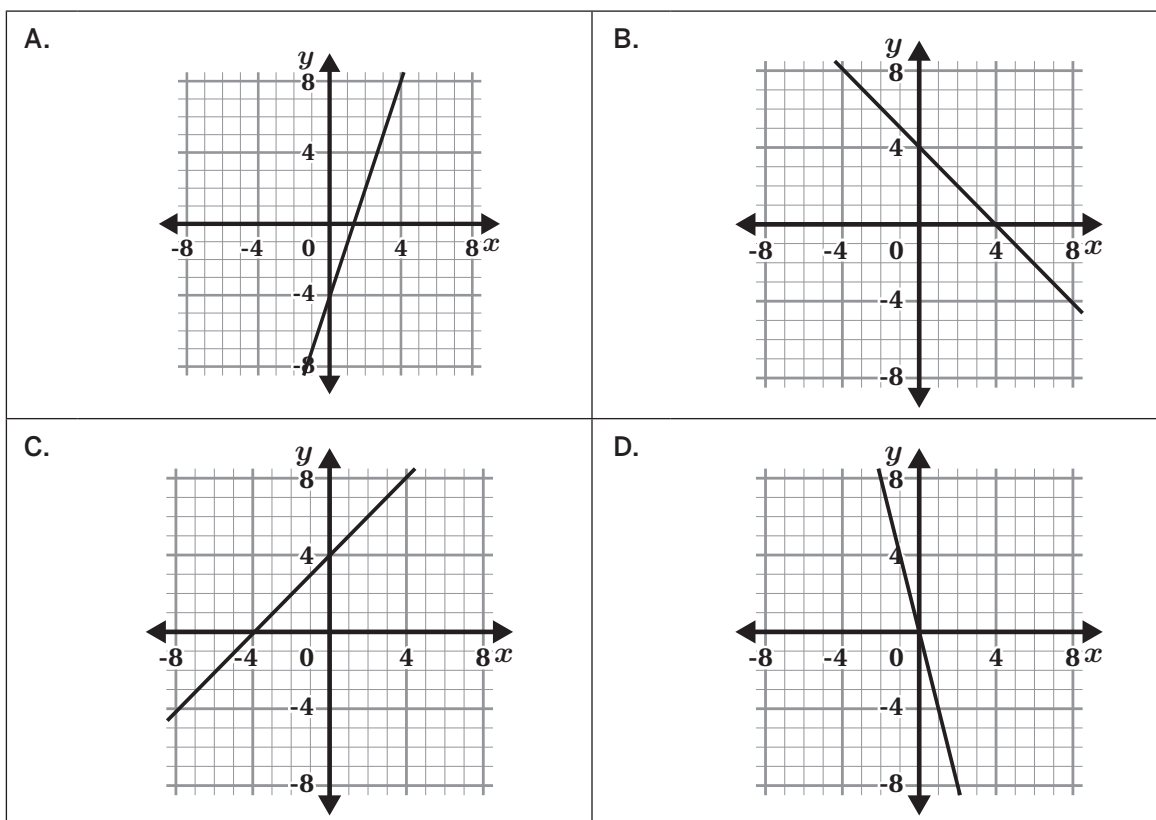
5. How far does Mai's family live from the hotel?  
Explain how you know.

6. Write an equation that describes the relationship between  $d$  and  $h$ . Show or explain your thinking.

7. Approximately how long will it take Mai's family to arrive at the hotel? Explain or show your thinking.



8. Which graph has a horizontal intercept of  $(-4, 0)$ ?



## Additional Practice

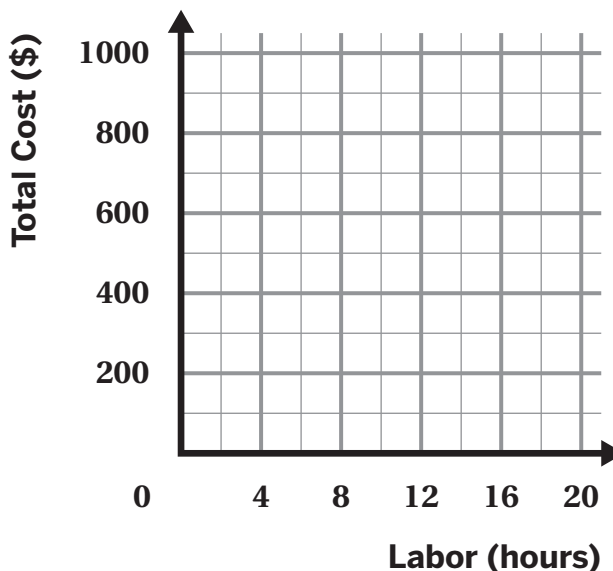
3.07

**Problems 1–4:** For any service call, an electrician charges \$60, plus \$40 for each hour of labor.

- How much would the electrician charge for a service call that needs 4 hours of labor? 20 hours of labor? Write your answers in the table.

Labor (hours)	Total cost (\$)
4	
20	

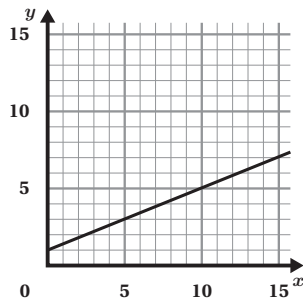
- Draw a line representing the relationship between the number of hours of labor for a service call and the total cost of the electrician's visit.



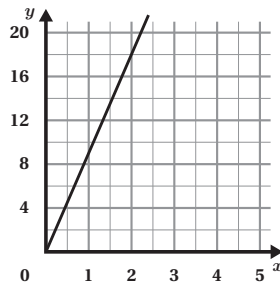
- Plot and label two points on the graph from Problem 1.
- What is the slope of the line? What does it represent?
- A flower shop allows you to purchase additional flowers,  $x$ , to add to the total cost of your arrangement,  $y$ . The line representing the relationship between  $x$  and  $y$  has a slope of 2.75 and a  $y$ -intercept of 25.25. Explain what the slope and  $y$ -intercept represent in this situation.

**Problems 6–9:** For each real-world situation, choose the graph that best represents it.

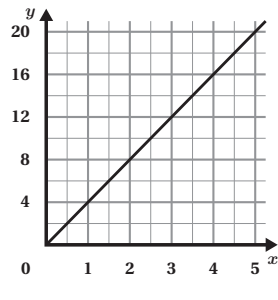
**Graph A**



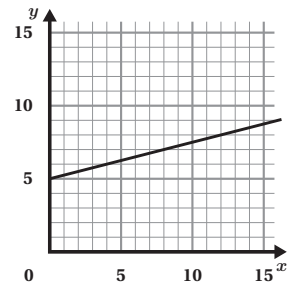
**Graph B**



**Graph C**



**Graph D**



6.  $y$  represents the total amount earned and  $x$  represents the number of hours worked. The slope of the line representing the relationship between  $x$  and  $y$  is 9.
7.  $y$  represents the cost of a scoop of ice cream and  $x$  represents the cost of each topping. The slope of the line representing the relationship between  $y$  and  $y$  is 4.
8.  $y$  represents the perimeter of a square and  $x$  represents its side length. The slope of the line representing the relationship between  $x$  and  $y$  is 0.25.
9.  $y$  represents the cost of a mailing a 1-ounce package and  $x$  represents the cost added for each additional ounce. The slope of the line representing the relationship between  $x$  and  $y$  is 0.40.

## Additional Practice

3.08

1. Select all the equations whose graphs have the same  $y$ -intercept.

☐ A.  $y = \frac{1}{2}x + 4$

☐ D.  $y = -2x + \frac{1}{2}$

☐ B.  $y = \frac{1}{3}x - 2$

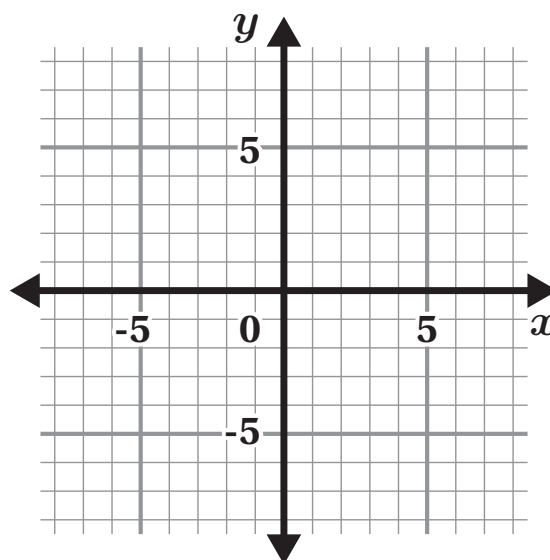
☐ E.  $y = \frac{1}{2}x - 2$

☐ C.  $y = 4x - 2$

**Problems 2–3:** Here is a coordinate plane.

2. Graph the equations  $y = -\frac{2}{3}x$  and  $y = -\frac{2}{3}x + 4$ .

3. How are the graphs alike? How are they different?



**Problems 4–5:** A streaming music service service changes \$6 per month of service to existing customers. For new customers, there is an additional one-time sign-up fee of \$10.

4. Write a linear equation representing the relationship between  $x$ , the number of months of service, and  $y$ , the total amount paid in dollars by a customer.

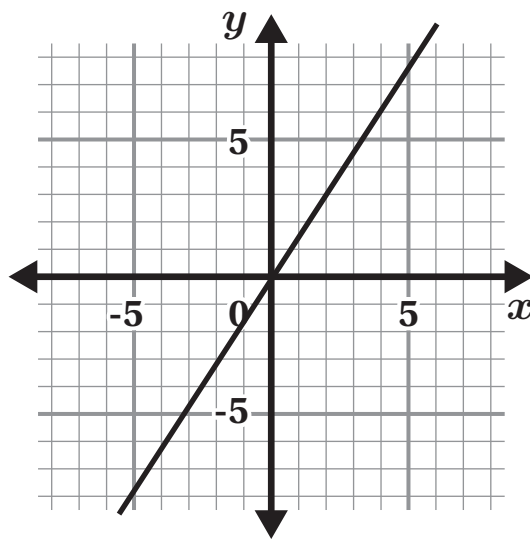
Existing customer: \_\_\_\_\_

New customer: \_\_\_\_\_

5. When the two equations are graphed on the coordinate plane, how are the graphs similar? How are they different?

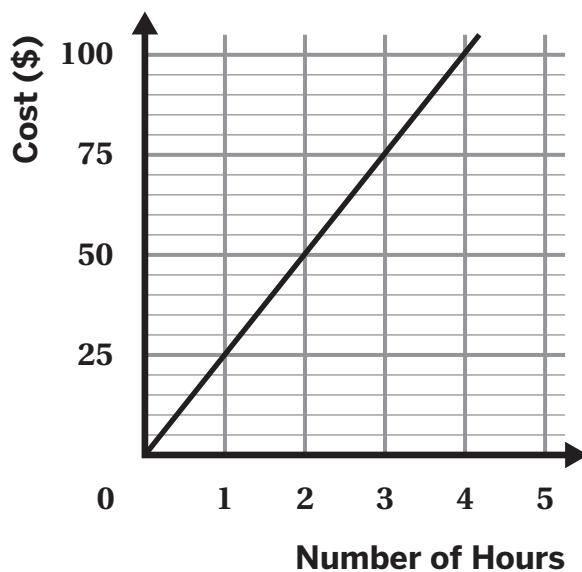
6. Here is the graph of line  $n$ . Which equation represents a line that is a translation of line  $n$ ?

- ☐ A.  $y = \frac{3}{2}x - 4$
- ☐ B.  $y = 4x - \frac{2}{3}$
- ☐ C.  $y = \frac{2}{3}x + 1$
- ☐ D.  $y = -\frac{2}{3}x - 6$



**Problems 7–8:** A driving range charges \$25 per hour for renting a space to hit golf balls. Here is a graph that represents the cost,  $y$ , of renting a space for  $x$  hours.

7. Write an equation that represents the cost,  $y$ , of bowling  $x$  games without renting any shoes.
8. Daniel went to the driving range and also rented a bucket of balls for \$15. On the same coordinate plane, graph the relationship that represents the amount of money,  $y$ , that Daniel would spend after spending  $x$  hours at the driving range.

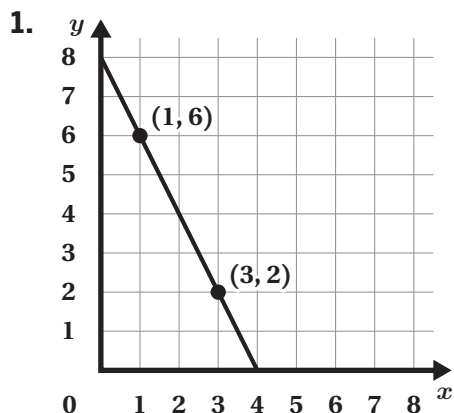


9. Write an equation for the relationship you graphed in Problem 8.

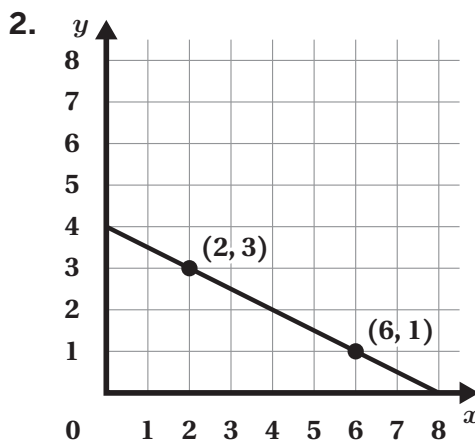
## Additional Practice

3.09

**Problems 1–2:** Determine the slope of each line. Show your thinking.



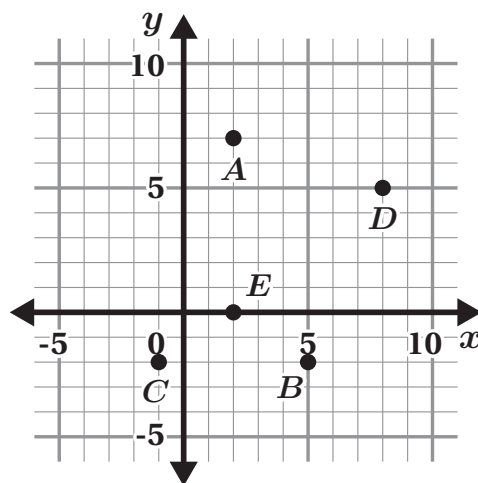
Slope = \_\_\_\_\_



Slope = \_\_\_\_\_

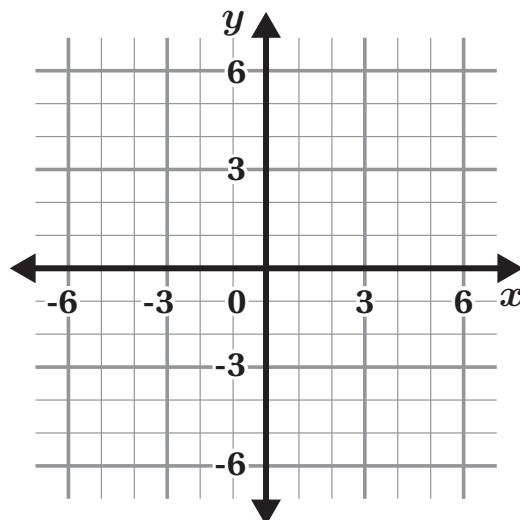
3. Draw a line with a slope of  $-\frac{2}{3}$  that passes through point B.

What other point lies on that line?



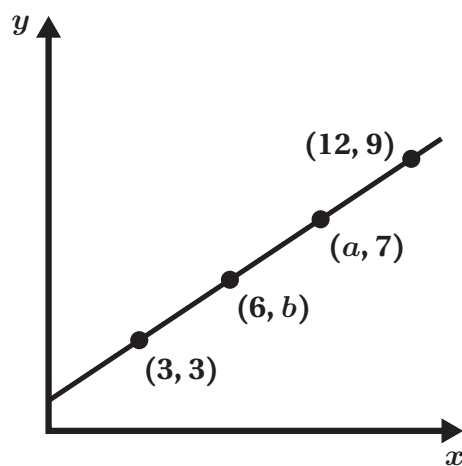
**Problems 4–5:** Here is a blank graph.

4. Draw a line with a slope of  $-3$  and a positive  $y$ -intercept.
5. Explain how you know the slope of your line is  $-3$ .



**Problems 6–8:** All the points in this graph are on the same line.

6. What is the slope of the line?  
Explain your thinking.



7. What are the values for  $a$  and  $b$ ?

8. What is the  $x$ -value when  $y = 0$ ?  
Show or explain your thinking.



## Additional Practice

3.10

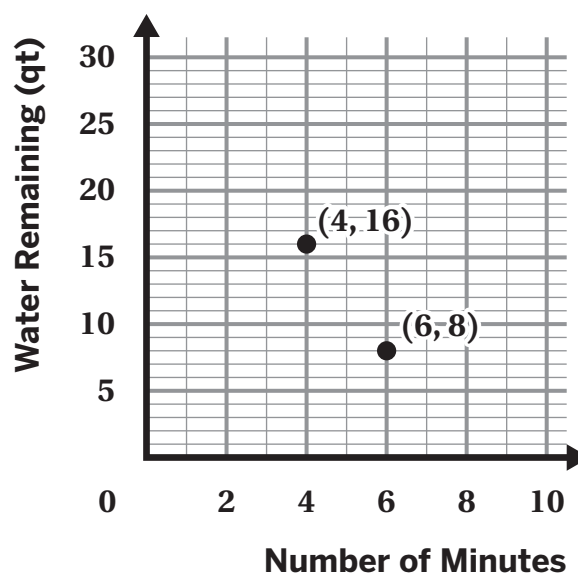
- Diego is finding the slope of the line that passes through the points (10, 8) and (14, 10). His work is shown. Review his work. Find and fix any errors.

**Diego's work:**

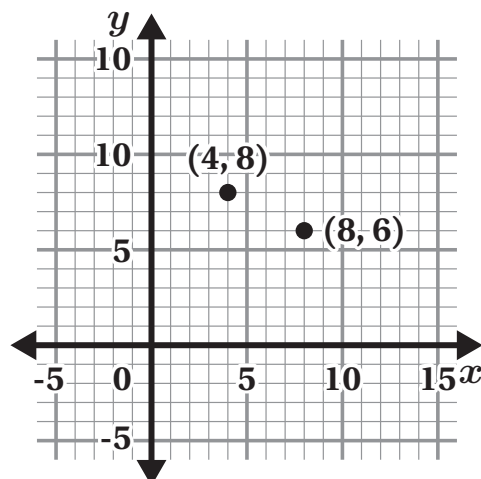
$$\text{Slope} = \frac{10 - 8}{10 - 14} = \frac{2}{-4} = -\frac{1}{2}$$

- A cooler of water is draining. After 4 minutes, there are 16 quarts remaining. After 6 minutes, there are 8 quarts remaining.

Write an equation for the amount of water remaining,  $y$ , in the cooler after  $x$  minutes.



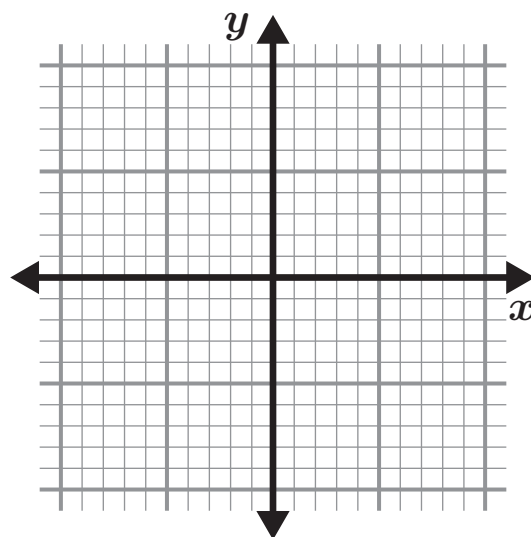
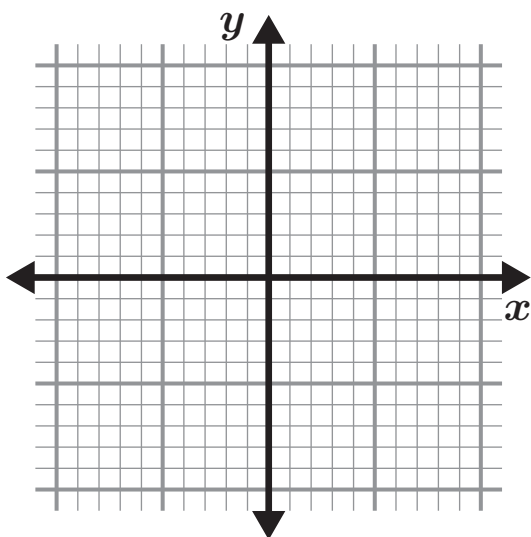
- Here is a graph showing the points (4, 8) and (8, 6). What is the  $y$ -intercept of the line that passes through these points?



**Problems 4–5:** Write the equation of the line that passes through each pair of points. Show your work, and use the coordinate plane if it helps with your thinking.

**4.** (3, 6) and (4, 10)

**5.** (−5, 4) and (−1, 2)



**6.** Which equation represents the line that passes through points (−8, 12) and (4, 6)?

A.  $y = \frac{1}{2}x + 8$

B.  $y = \frac{1}{2}x - 2$

C.  $y = -\frac{1}{2}x + 8$

D.  $y = -\frac{1}{2}x - 2$