

## Graphing Linear Equations

We use a Cartesian Co-ordinate System

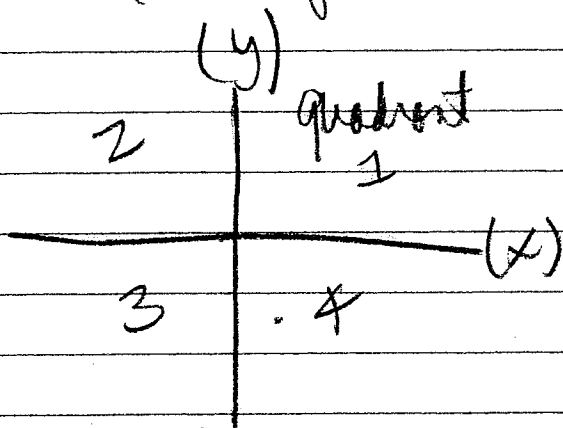
"x" is the independent variable and is always on the horizontal axis.

"y" is the dependent variable and is always on the vertical axis.

In a linear equation, a constant change in 1 quantity produces a constant change in the related quantity.

Ordered pairs are always shown as  $(x, y)$  where

\* (x is first)



f

### 5.3 Relations as Ordered Pairs

MATHPOWER™ Eight, pp. 156–158

A set of ordered pairs is known as a **relation**. A relation can also be expressed as an equation, as a table of values, or in words.

Use each of the following equations.

- Complete the table of values.
- Describe the relation in words.
- Write the ordered pairs.

1.  $x + y = 4$

a) 

$x$	$y$
3	
1	
-2	
-5	
-7	

b) \_\_\_\_\_

c) \_\_\_\_\_

2.  $x - y = 3$

a) 

$x$	$y$
4	
0	
-1	
-3	
-6	

b) \_\_\_\_\_

c) \_\_\_\_\_

3.  $y = x + 5$

a) 

$x$	$y$
3	
1	
-2	
-5	
-7	

b) \_\_\_\_\_

c) \_\_\_\_\_

4.  $y = 3x - 1$

a) 

$x$	$y$
3	
2	
0	
-2	
-3	

b) \_\_\_\_\_

c) \_\_\_\_\_

5. For the equation  $x + y = 7$ , find the missing value in each ordered pair.

- a)  $(3, \square)$     b)  $(7, \square)$     c)  $(\square, 1)$   
 d)  $(\square, 0)$     e)  $(-2, \square)$     f)  $(-4, \square)$

6. For the equation  $y = x - 5$ , find the missing value in each ordered pair.

- a)  $(2, \square)$     b)  $(6, \square)$     c)  $(\square, 1)$   
 d)  $(0, \square)$     e)  $(-3, \square)$     f)  $(\square, 3)$

7. List 5 ordered pairs of a relation for which the  $y$ -value is always 3 less than the  $x$ -value.

\_\_\_\_\_

\_\_\_\_\_

8. List 5 ordered pairs of a relation for which the  $x$ -value is always 4 times the  $y$ -value.

\_\_\_\_\_

\_\_\_\_\_

9. a) Make up a table of values where there is a relationship between the values of  $x$  and  $y$ .

$x$	$y$

b) Write an equation for the relation.

\_\_\_\_\_

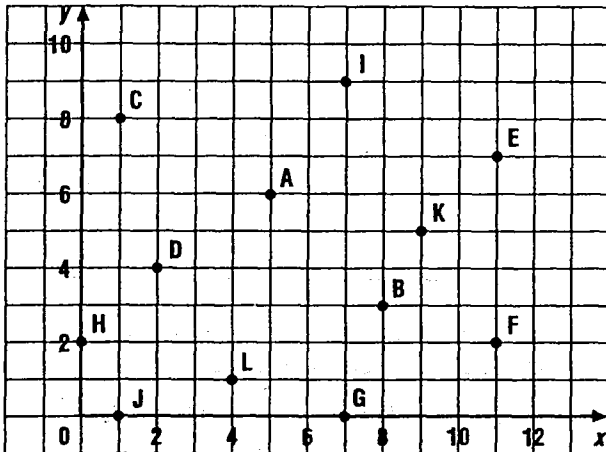
## 5.4 Graphing Ordered Pairs

MATHPOWER™ *Eight*, p. 159

When ordered pairs are plotted on a grid, the horizontal number line is called the  $x$ -axis. The vertical number line is called the  $y$ -axis. The two lines meet at the origin.

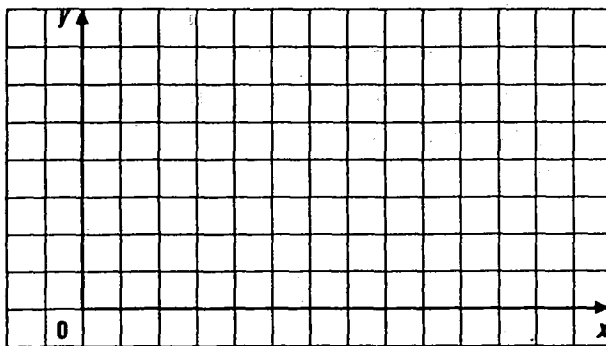
The first number of an ordered pair is the  $x$ -coordinate. The second number is the  $y$ -coordinate.

1. State the coordinates of each point.



- A \_\_\_\_\_ B \_\_\_\_\_ C \_\_\_\_\_  
 D \_\_\_\_\_ E \_\_\_\_\_ F \_\_\_\_\_  
 G \_\_\_\_\_ H \_\_\_\_\_ I \_\_\_\_\_  
 J \_\_\_\_\_ K \_\_\_\_\_ L \_\_\_\_\_

2. a) Plot the points A(2, 2), B(4, 6), C(9, 6), and D(7, 2) on the grid, and join the points in the order given. Join the last point to the first point.



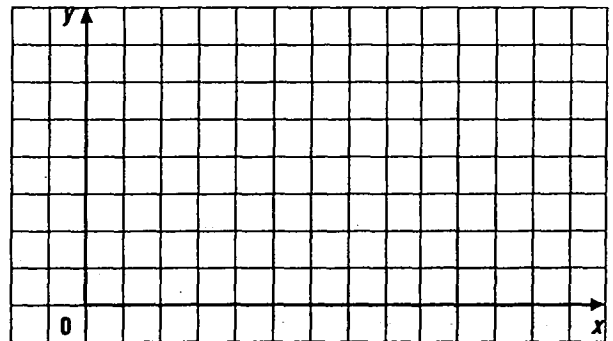
b) Identify the figure and calculate its area, in square units.

\_\_\_\_\_

\_\_\_\_\_

3. The points W(1, 3), X(1, 8), and Y(6, 8) are 3 vertices of a square.

a) Plot the points on the grid.



b) Find the coordinates of Z so that WXYZ is a square.

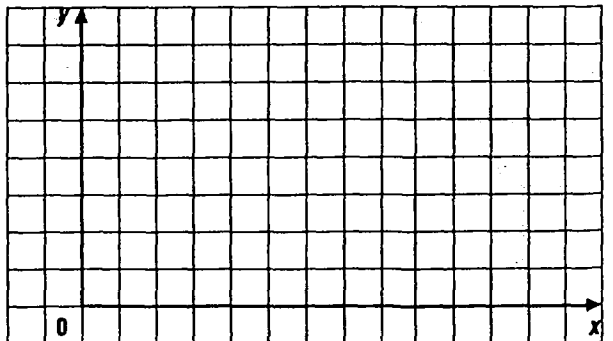
\_\_\_\_\_

c) Calculate the perimeter and the area of the square.

\_\_\_\_\_

\_\_\_\_\_

4. a) Plot the points A(6, 5), B(8, 1), and C(11, 1) on the grid, and join the points in order. Join the last point to the first point.



b) Classify the triangle formed.

\_\_\_\_\_

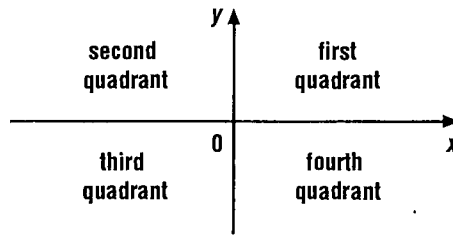
c) Calculate its area, in square units.

\_\_\_\_\_

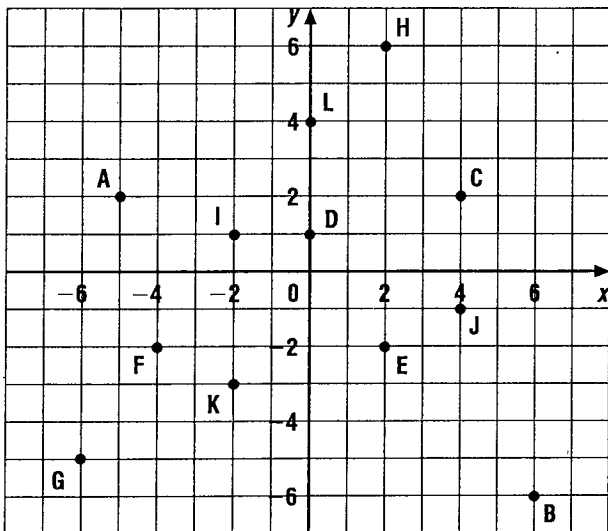
## 5.5 Graphing on the Coordinate Plane

MATHPOWER™ *Eight*, pp. 160–161

The  $x$ - and  $y$ -axes divide the coordinate plane into 4 quadrants.



1. a) State the coordinates of each point.



- |         |         |         |
|---------|---------|---------|
| A _____ | B _____ | C _____ |
| D _____ | E _____ | F _____ |
| G _____ | H _____ | I _____ |
| J _____ | K _____ | L _____ |

b) Plot each of the following points on the grid in part a).

M(5, -2), N(0, -4), P(-7, 6), Q(-3, -5),  
R(5, 7), S(-2, 4), T(3, 4), U(-7, -2)

c) Name 3 points on the  $y$ -axis.

\_\_\_\_\_

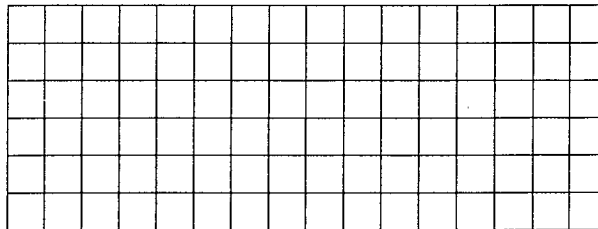
d) Name 3 points in the third quadrant.

\_\_\_\_\_

e) Name 3 points in the fourth quadrant.

\_\_\_\_\_

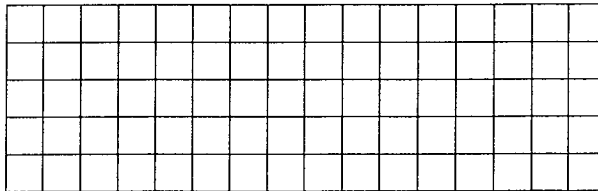
2. a) Plot the points A(2, 3), B(2, -2), C(-1, -2), and D(-1, 3) on the grid.



b) Identify the figure and find its area, in square units.

\_\_\_\_\_

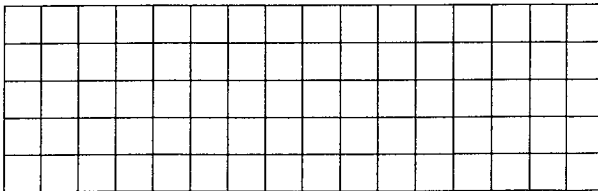
3. a) Plot the points P(-3, -1), Q(-2, 3), R(3, 3), and S(5, -1) on the grid.



b) Identify the figure and find its area, in square units.

\_\_\_\_\_

4. a)  $\triangle XYZ$  has vertices X(-3, 4), Y(4, 4), and Z(4, 0). Plot  $\triangle XYZ$  on the grid.



b) Find the lengths of the sides, in units.

\_\_\_\_\_

c) Calculate the perimeter, in units, and the area, in square units, of the triangle.

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## 5.6 Graphing Relations

MATHPOWER™ *Eight*, pp. 162–163

1. Express each relation in words and draw its graph on the grid.

a)

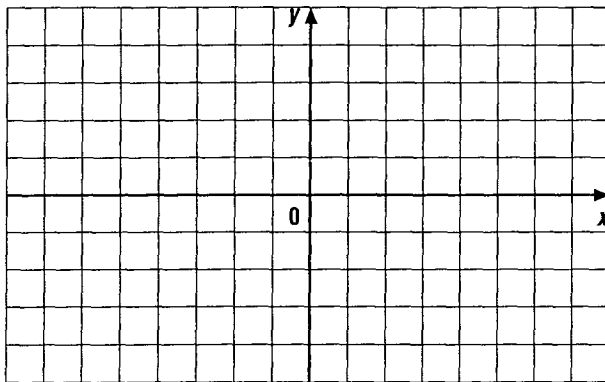
$x$	$y$
-1	9
0	8
1	7
3	5
6	2

b)

$x$	$y$
0	-2
2	0
4	2
8	6
-4	-6

a) \_\_\_\_\_

b) \_\_\_\_\_



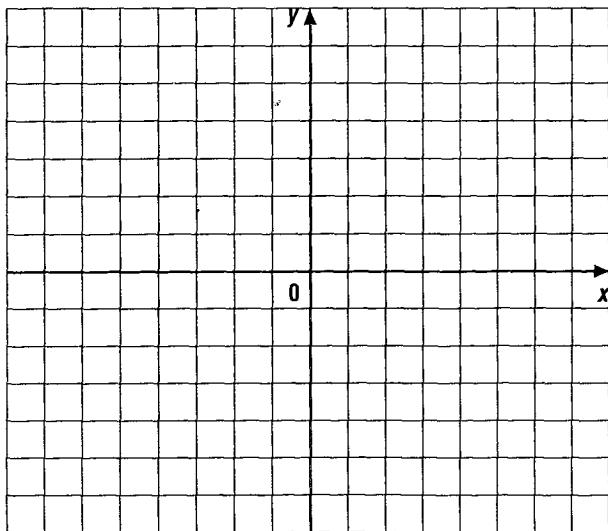
2. Find 5 ordered pairs that satisfy each relation. Draw each graph on the grid.

a)  $x - y = 4$

b)  $x + y = 5$

c)  $y = 3x + 1$

d)  $y = x - 1$

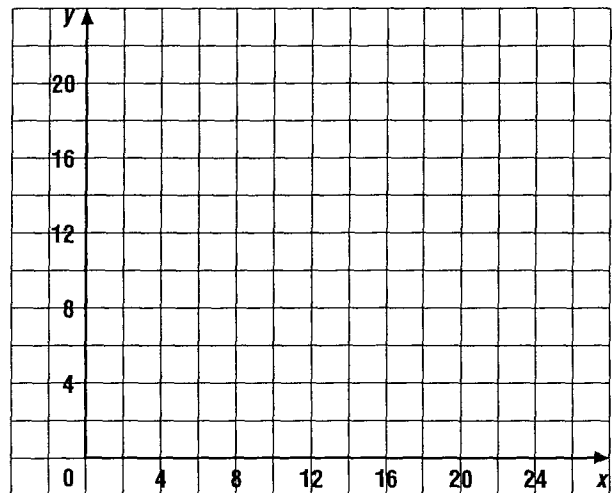


3. The area of a rectangle is  $24 \text{ cm}^2$ .

a) Complete the table for possible values of the length and width.

Width, $w$	Length, $l$	Ordered Pair, $(w, l)$
1		
2		
3		
4		
6		
8		
12		
24		

b) Graph the relation. Write the coordinates of each point on the grid.



c) What is the perimeter of each possible rectangle?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

d) What are the dimensions of the rectangle that has the largest perimeter?

\_\_\_\_\_

# Test One CHAPTER 5: Patterns and Relations

MATHPOWER™ Eight, pp. 145–169

Use each of the following equations.

- a) Complete the table of values.
- b) Describe the relation in words.
- c) Write the ordered pairs.

1.  $x + y = 7$

a)	x	y	b) _____
	3		
	2		_____
	1		_____
	0		_____
	-1		
c) _____			

2.  $x - y = 4$

a)	x	y	b) _____
	6		
	5		_____
	4		_____
	3		_____
	2		
c) _____			

3. The formula for the area of a trapezoid is  $A = \frac{1}{2}(a + b)h$ , where  $a$  and  $b$  are the parallel sides, and  $h$  is the height. Write the formula to calculate the height when the area and the sides  $a$  and  $b$  are known.

\_\_\_\_\_

Write 5 ordered pairs for each relation.

- 4.  $x + y = 6$  \_\_\_\_\_
- \_\_\_\_\_
- 5.  $x - y = 2$  \_\_\_\_\_
- \_\_\_\_\_
- 6.  $y = 8 - x$  \_\_\_\_\_
- \_\_\_\_\_
- 7.  $y = 3x - 2$  \_\_\_\_\_
- \_\_\_\_\_

8. For the equation  $y = x - 2$ , find the missing value in each ordered pair.

- a)  $(2, \square)$       b)  $(3, \square)$       c)  $(\square, 2)$
- d)  $(\square, 0)$       e)  $(-3, \square)$       f)  $(\square, -4)$

Write an equation for each relation.

9. 

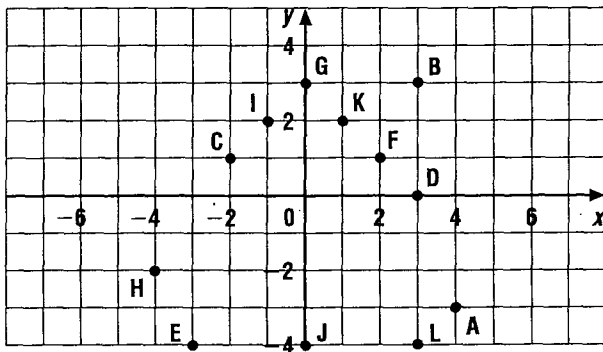
x	y
3	1
2	0
0	-2
-1	-3

10. 

x	y
-4	-1
-2	1
0	3
2	5

Name the points on the grid with the following coordinates.

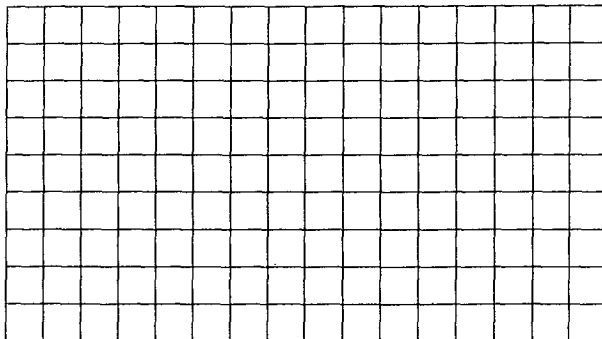
- 11.  $(3, 0)$  \_\_\_\_\_
- 12.  $(2, 1)$  \_\_\_\_\_
- 13.  $(-3, -4)$  \_\_\_\_\_
- 14.  $(4, -3)$  \_\_\_\_\_
- 15.  $(3, -4)$  \_\_\_\_\_
- 16.  $(-1, 2)$  \_\_\_\_\_
- 17.  $(1, 2)$  \_\_\_\_\_
- 18.  $(-4, -2)$  \_\_\_\_\_
- 19.  $(0, -4)$  \_\_\_\_\_
- 20.  $(-2, 1)$  \_\_\_\_\_



Draw a graph of each of the following relations.

21.  $x - y = 5$

22.  $y = 2x - 3$



## Test Two CHAPTER 5: Patterns and Relations

MATHPOWER™ Eight, pp. 145–169

Use each of the following equations.

- a) Complete the table of values.  
 b) Describe the relation in words.  
 c) Write the ordered pairs.

1.  $x - y = 2$

a)	<table style="border-collapse: collapse;"> <tr><td style="padding: 2px 10px;"><math>x</math></td><td style="padding: 2px 10px;"><math>y</math></td></tr> <tr><td style="padding: 2px 10px;">2</td><td style="border-left: 1px solid black;"></td></tr> <tr><td style="padding: 2px 10px;">1</td><td style="border-left: 1px solid black;"></td></tr> <tr><td style="padding: 2px 10px;">0</td><td style="border-left: 1px solid black;"></td></tr> <tr><td style="padding: 2px 10px;">-1</td><td style="border-left: 1px solid black;"></td></tr> <tr><td style="padding: 2px 10px;">-2</td><td style="border-left: 1px solid black;"></td></tr> </table>	$x$	$y$	2		1		0		-1		-2		b) _____ _____ _____
$x$	$y$													
2														
1														
0														
-1														
-2														

c) \_\_\_\_\_  
 \_\_\_\_\_

2.  $y = 2x + 3$

a)	<table style="border-collapse: collapse;"> <tr><td style="padding: 2px 10px;"><math>x</math></td><td style="padding: 2px 10px;"><math>y</math></td></tr> <tr><td style="padding: 2px 10px;">-3</td><td style="border-left: 1px solid black;"></td></tr> <tr><td style="padding: 2px 10px;">-2</td><td style="border-left: 1px solid black;"></td></tr> <tr><td style="padding: 2px 10px;">-1</td><td style="border-left: 1px solid black;"></td></tr> <tr><td style="padding: 2px 10px;">0</td><td style="border-left: 1px solid black;"></td></tr> <tr><td style="padding: 2px 10px;">1</td><td style="border-left: 1px solid black;"></td></tr> </table>	$x$	$y$	-3		-2		-1		0		1		b) _____ _____ _____
$x$	$y$													
-3														
-2														
-1														
0														
1														

c) \_\_\_\_\_  
 \_\_\_\_\_

3. The formula for the perimeter of a rectangle is  $P = 2(l + w)$ , where  $l$  is the length and  $w$  is the width. Write the formula to calculate the length when the perimeter and the width are known.
- \_\_\_\_\_

Write 5 ordered pairs for each relation.

4.  $3x + y = 2$  \_\_\_\_\_  
 \_\_\_\_\_

5.  $x - 2y = 1$  \_\_\_\_\_  
 \_\_\_\_\_

6.  $y = 7x + 1$  \_\_\_\_\_  
 \_\_\_\_\_

7.  $y = 4x - 2$  \_\_\_\_\_  
 \_\_\_\_\_

8. For the equation  $y = x - 6$ , find the missing value in each ordered pair.

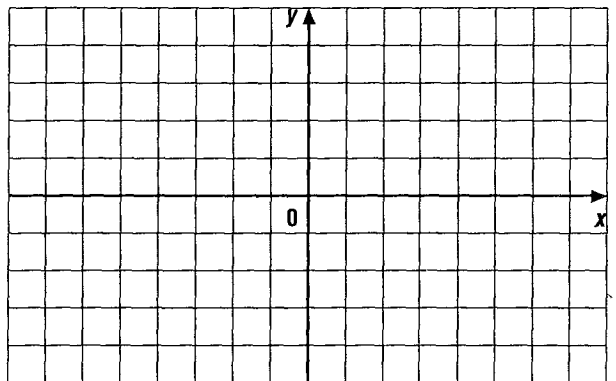
- a)  $(3, \square)$     b)  $(2, \square)$     c)  $(\square, 6)$   
 d)  $(\square, 0)$     e)  $(-4, \square)$     f)  $(\square, -3)$

Write an equation for each relation.

9.  $(5, 2), (-2, -5), (1, -2), (-4, -7), (0, -3)$   
 \_\_\_\_\_

10.  $(-2, 4), (1, 1), (3, -1), (5, -3), (-3, 5)$   
 \_\_\_\_\_

11. a) Plot the points  $A(-4, -4)$ ,  $B(-4, 5)$ ,  $C(3, 5)$ , and  $D(3, -4)$  on a grid. Join the points in order. Join the last point to the first point.



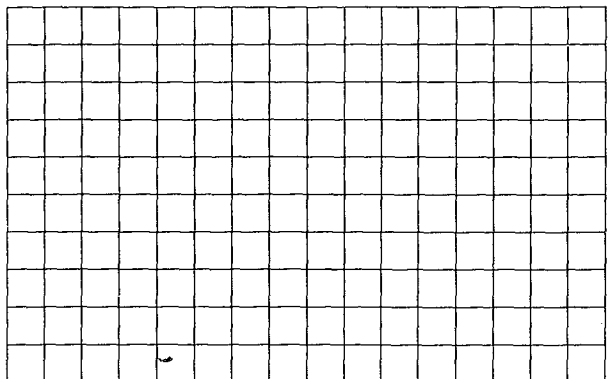
- b) Identify the figure formed.  
 \_\_\_\_\_

- c) Find its area, in square units.  
 \_\_\_\_\_

Draw a graph of each of the following relations.

12.  $x + y = 6$

13.  $y = 5 - 3x$



# Extension CHAPTER 5: Patterns and Relations

MATHPOWER™ *Eight*, pp. 145–169

Complete the table, given  $y < x$ .

	$x$	$y$	$x + 2y$	$2x^2 - y$	$12 + y^2$	$5x - 3y$
1.	3	-2				
2.	-1		-9			
3.				8		10
4.			2		16	
5.		-5		37		
6.					21	24

7. The sum of each row, column, and diagonal in the magic square is 9. Determine the value of each expression and complete the magic square using numerical values.

$6x$	$-7 - x$	$x + 4$
_____	_____	_____
$x - 5$	$x^2 - 1$	$4x + 1$
_____	_____	_____
$x - 2$	$9x - 3$	$-3x$
_____	_____	_____

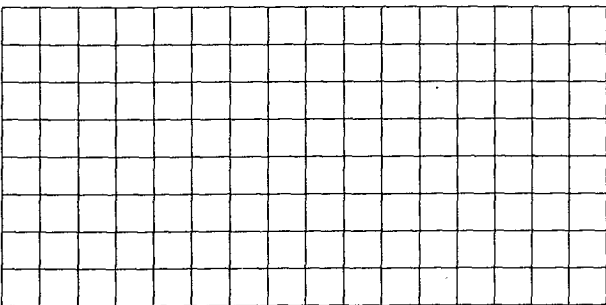
8. Find 5 ordered pairs that satisfy each relation. Graph each relation on the grid.

a)  $x^2 = y - 2$

b)  $y = 2x + 2$

\_\_\_\_\_

\_\_\_\_\_



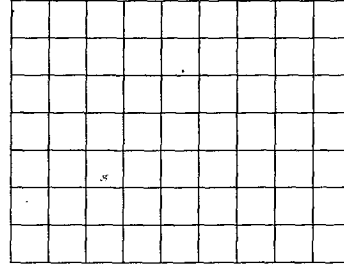
c) Write 2 sets of coordinates where the graphs intersect.

\_\_\_\_\_

9. Write an equation for each relation. Graph the relation on the grid.

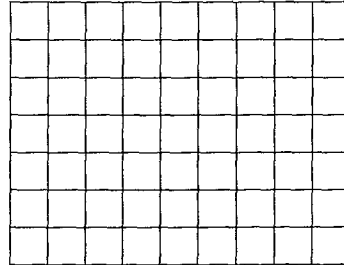
a)

$x$	$y$
2	3
-4	-9
-1	-3
6	11
-2	-5

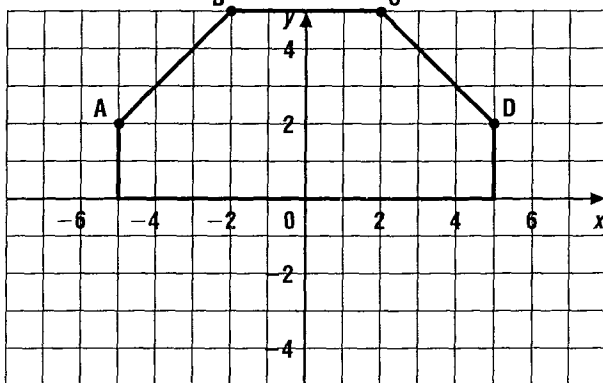


b)

$x$	$y$
3	5
-2	0
-4	12
1	-3
2	0



10.



a) State the coordinates of the vertices of the figure ABCD.

A \_\_\_\_\_ B \_\_\_\_\_

C \_\_\_\_\_ D \_\_\_\_\_

b) Write the coordinates of the points EFGH that complete an octagon that has the  $x$ -axis as a line of symmetry. Plot the points on the grid.

E \_\_\_\_\_ F \_\_\_\_\_

G \_\_\_\_\_ H \_\_\_\_\_

c) Find the area of the octagon in square units.

\_\_\_\_\_



# 9.1 Making a Table of Values

## GOAL

Create a table of values for a given linear relation.

1. Complete the table of values for each equation.

a)

$n$	1	2	3	4	5	6
$2n + 4$				12		

b)

$n$	1	2	3	4	5	6
$\frac{n}{2} - 1$						

2. A rectangle is three times wider than it is long.

- Write an equation that you can use to determine the length when you know the width.
- Write an equation that you can use to determine the perimeter when you know the width.
- Complete the table of values for the perimeters of rectangles with the given widths.

Width of rectangle (cm)	9	12	15	18	21	24
Perimeter of rectangle (cm)						

- d) Determine the perimeter of a rectangle with a width of 45 cm. Explain your steps.

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## At-Home Help

You can represent a linear situation using an equation and a table of values.

For example, lunch for up to 24 people costs \$2 for each person, plus \$4.

- Write an equation to represent this situation. Let  $n$  represent the number of people and  $c$  represent the total cost. The equation is  $c = 2n + 4$ .
- Complete the table of values. Substitute values for  $n$  into the equation to determine the values for  $c$ . The value of  $n$  cannot be greater than 24.

Number of people, $n$	Cost of lunch, $c$ (\$)
4	12
8	20
12	28
16	36
20	44
24	52

# 9.2

## Graphing Linear Relations

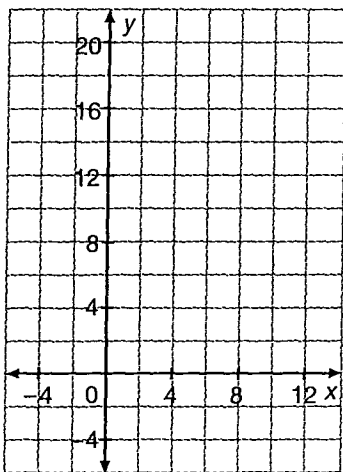
### GOAL

Construct a graph from the equation of a given linear relation.

1. a) Complete the table of values.

$y = 4 + 3x$	
$x$	$y$
-2	
0	
2	
4	
6	

- b) Graph the points from your table on a Cartesian coordinate system.



### At-Home | Help

You can make a **graph** of a linear equation using a table of values.

For example, the table of values for  $c = 2n + 4$  is shown.

$n$	$c$
4	12
8	20
12	28
16	36
24	52

- Plot  $n$  on the horizontal axis and  $c$  on the vertical axis.
- The  $n$ -axis will go from 0 to at least 24. The  $c$ -axis will go from 0 to at least 52.

