4.3 Skill Builder

Solving Equations

Solving an equation means finding a value of the variable that makes the equation true. To solve the equation $3x - 2 = 7$, find the value of x so that the left and the right side of the equation are balanced.

$3x - 2 = 7$ Add 2 to both sides to isolate x.

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

$3x = 9$ Divide each side by 3.

$\frac{3x}{3} = \frac{9}{3}$

$x = 3$

To verify the equation, substitute $x = 3$ in the original equation.

Left side: $3(3) - 2$ Right side = 7

$= 9 - 2$

$= 7$

Since the left side equals the right side, the solution is correct.

Check

1. Solve each equation.

a) $2x + 3 = 11$

$2x + 3 - \_\_\_\_ = 11 - \_\_\_\_$

Check your solution.

b) $3 - 2x = -9$

4.3 Another Form of the Equation for a Linear Relation

FOCUS **Recognize the equations of horizontal, vertical, and oblique lines, and graph them.**

Example 1 Graphing and Describing Vertical Lines

For the equation $x = 4$:

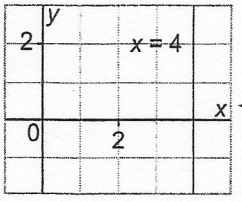
a) Draw the graph.

b) Describe the graph.

Solution

$x = 4$

a) For any value of y, x is always 4.



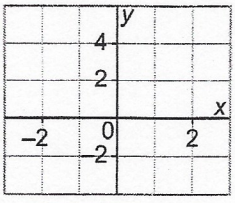
The vertical line intersects the x-axis at 4.

b) The graph is a vertical line.
Every point on the graph has x-coordinate 4.

When the equation is $x =$ a constant, the graph is a **vertical line.**

Check

1. For the equation $x = 1$:
Draw the graph.
Then describe the graph.



The graph is a _____ line.
Every point on the graph has _____-coordinate _____.

Example 2 Graphing and Describing Horizontal Lines

For the equation $y + 1 = 0$:

a) Draw the graph.

b) Describe the graph.

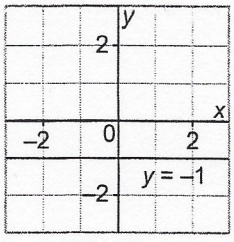
Solution

$y + 1 = 0$ Solve for y. Subtract 1 from each side.

$y + 1 - 1 = 0 - 1$

$y = -1$

a)



The horizontal line intersects the y-axis at –1.

b) The graph is a horizontal line.
Every point on the graph has y-coordinate -1.

When the equation is $y =$ a constant, the graph is a **horizontal line.**

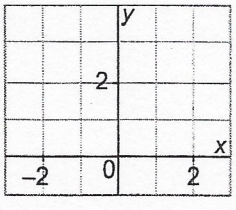
Check

1. For the equation $y = 3$:

a) Draw the graph.

b) Describe the graph.

a)



b) The graph is a _____.
Every point on the graph has _____-coordinate _____.

Example 3 Graphing an Equation

For the equation $y + 2x = 4$:

a) Make a table of values for $x = -2$, 0, and 2.

b) Graph the equation.

Solution

a) $y + 2x = 4$

Substitute each value of x, then solve for y.

Substitute: $x = -2$

$y + 2(-2) = 4$

$y - 4 = 4$

$y - 4 + 4 = 4 + 4$

$y = 8$

Substitute: $x = 0$

$y + 2(0) = 4$

$y + 0 = 4$

$y = 4$

Substitute: $x = 2$

$y + 2(2) = 4$

$y + 4 = 4$

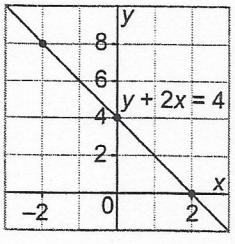
$y + 4 - 4 = 4 - 4$

$y = 0$

x	y
−2	8
0	4
2	0

b) Plot the points on a grid, and join the points.

The graph is an **oblique** line.



Oblique means slanted.

Check

1. Do not graph the equations.

Does each equation describe a horizontal line, a vertical line, or an oblique line?

a) $y = 4$ _____

b) $y = 3x - 2$ _____

c) $x = -1$ _____

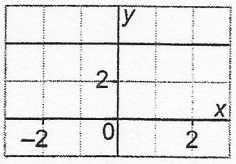
d) $2x + y = -6$ _____

Practice

1. Which equation describes each graph?

i) $y = 4$ **ii)** $x = 2$ **iii)** $y = 2$ **iv)** $x = 4$

a)



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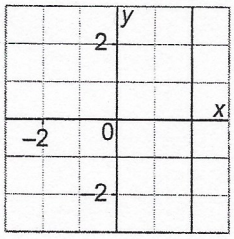
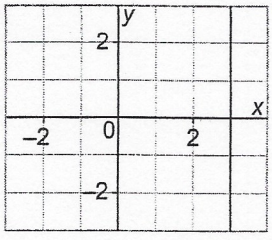
b)



_____

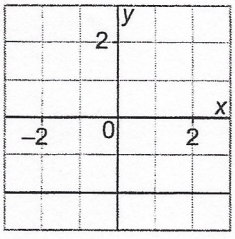
2. Write an equation to describe each line.

a)



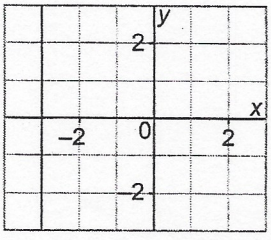
$x =$ _____

b)



$y =$ _____

c)



_____

3. a) Is each line vertical or horizontal?

i) $x = -1$

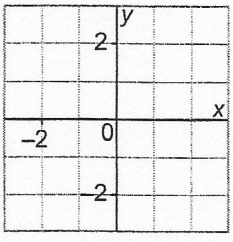
_____

ii) $y = -4$

_____

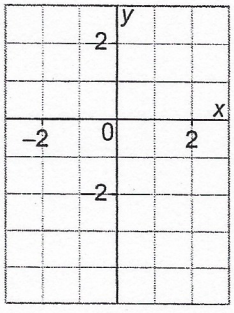
b) Graph each line. Describe the graph.

i)



Every point on the graph has x-coordinate _____.

ii)



Every point on the graph has _____-coordinate _____.

4. a) Does each equation describe a vertical line, a horizontal line, or an oblique line?

i) $x + 3 = -1$ _____

ii) $1 + y = 0$ _____

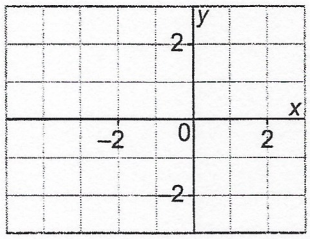
iii) $x + 2y = 8$ _____

b) Graph the first 2 equations in part a.

i) $x + 3 = -1$

_____

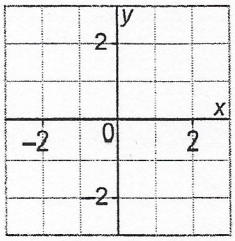
_____



ii) $1 + y = 0$

_____

_____



c) For the equation $x + 2y = 8$:

Complete the table of values for $x = -2$, 0, and 2.

Graph the equation.

Substitute: $x = -2$

____ $+ 2y = 8$

_____

_____

_____

_____

Substitute: $x = 0$

____ $+ 2y = 8$

_____

_____

_____

_____

Substitute: $x = 2$

____ $+ 2y = 8$

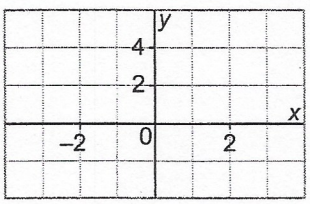
_____

_____

_____

_____

x	y
−2	__
0	__
2	__



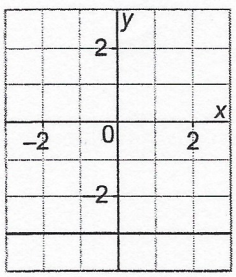
5. a) Explain why this equation describes the graph below.

$y + 3 = 0$

_____

_____

This is a _____ line, with _____-coordinate _____, which matches the graph.



CHECKPOINT

Can you ...

- Use equations to describe and solve problems involving patterns?
- Graph a linear relation?
- Recognize the equations of horizontal, vertical, and oblique lines, and graph them?

4.1 **1.** This pattern of squares continues. Draw the next 2 figures in the pattern.

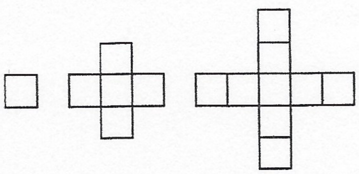


Figure 1 Figure 2 Figure 3 ____ Figure 4 ____ Figure 5

a) Complete the table of values below.

	Figure Number, *n*	Number of Squares, *s*	
	1	1	
+1	2	5	+4
+1	3	___	+4
+1	4	___	+4
+1	5	___	+4

b) What patterns do you see?

The figure number increases by _____ each time.
The number of squares increases by _____ each time.

c) Describe how the number of squares relates to the figure number.

The number of squares is _____ times the figure number, less _____.

d) Write an equation for this pattern.
$s =$ _____n − _____

2. The pattern in the table of values continues. Complete the table.

Number of Red Buttons, r	Number of Blue Buttons, b
2	10
3	13
4	16
5	19
____	____
____	____

a) What patterns do you see? The number of red buttons increases by _____ each time.
The number of blue buttons increases by _____ each time.

b) Write an equation that relates the number of blue buttons to the number of red buttons.
$b =$ _____$r +$ _____

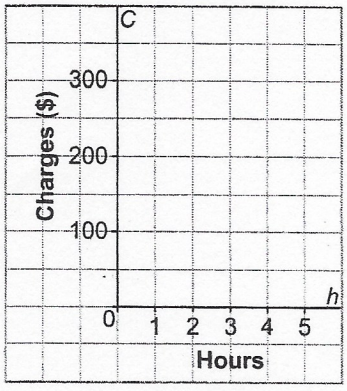
4.2 **3.** A home service provider charges for the service according to the table of values.

Home Service Charges

Hours, h	Charges, C ($)
0	60
1	150
2	240
3	330

a) Graph the data.

Home Service Charges



b) Is this an example of a linear relation? Why?

_____

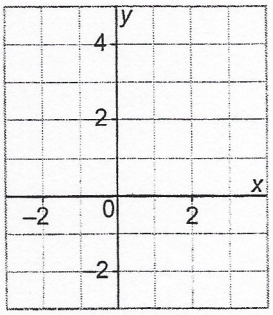
c) Describe the patterns in the table.
As h increases by _____, C increases by _____.

d) How is the pattern shown in the graph?
On the graph, to get from one point to the next, move 1 unit right, and _____ up.

e) Write an equation for this pattern.
$C =$ _____$h +$ _____

4. a) This table of values represents a linear relation.
Graph the data.

x	y
−2	−2
−1	0
0	2
1	4



b) How do the patterns in the graph relate to the patterns in the table?
In the table, as x increases by _____, y increases by _____.
On the graph, to get from one point to the next,
move 1 unit right and _____ up.

c) Write an equation for this pattern.
$y =$ _____$x +$ _____

4.3 **5.** Does each equation describe a horizontal line, a vertical line, or an oblique line?

a) $x + 4 = 0$

_____

b) $y = -6$

_____

c) $x + y = 2$

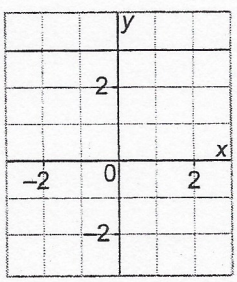
_____

d) $2y = 4$

_____

6. Write an equation to describe each line.

a)



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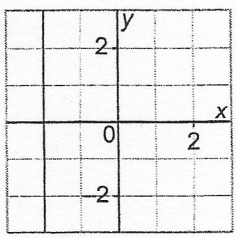
b)



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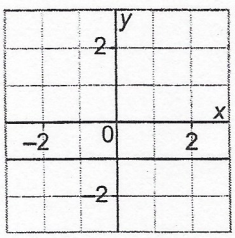
c)



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