Warm Up

9/12

Solve for x:

$5 - 7(x - 3) = 4 - 2x$

Distribute

$5 - 7x + 21 = 4 - 2x$

combine like terms

$26 - 7x = 4 - 2x$

$+7x \quad +7x$

$26 = 4 + 5x$

$-4 \quad -4$

$\frac{22}{5} = \frac{5x}{5}$

$\frac{22}{5} = x$

Homework Questions?

What Do You Call Someone Who Can't Turn Pancakes?

Cross out the letter pair next to each correct solution. For each letter pair you DON'T cross out, write the upper case letter in the box containing the lower case letter.

a	b	c	d	e	f	g	h	i	j	k	l	m

1 $9y + 4 = 2y + 25$

2 $5n - 2 = n + 18$

3 $11 + 8q = 3q - 19$

4 $-3 - 10x = 25 + 4x$

5 $15a = 6a - 90$

6 $24 - 5d = d$

7 Xavier is thinking of a number. Nine more than four times the number is the same as fifteen less than twice the number. What is Xavier's number?

8 $2 + 11b = 8b + 15$

9 $7m + 32 = 12 - m$

10 $16 - 5y = 1 - 4y$

11 $2x - 8x + 1 = 9 - 10x$

12 $-3t - 8 + 7t = 34 + 9t - 2$

13 $2a + 3a + 4a = 5a - 18$

14 Yvonne is thinking of a number. Fifty, decreased by three times the number, is the same as seven times the number, increased by 80. What is Yvonne's number?

15 $5(x + 4) = 7x - 26$

16 $20 - 9w = 4(15 - w)$

17 $2(11 + 3n) = 12n$

18 $10 - 4(p + 7) = 2(1 - p)$

19 $11x = 8x - 3(5 - 2x)$

20 $9 - 6(4u - 1) = u + 15$

21 Zabato is thinking of a number. Three times the sum of the number and ten is the same as eight times the number. What is Zabato's number?

means equals

e • N	4	c • N	15
a • P	−6	k • O	−6
f • I	−1	e • H	$-2\frac{1}{2}$
d • R	−12	m • T	−3
l • F	3	g • P	$-3\frac{3}{4}$
b • A	7	a • R	−8
i • E	−10	l • S	$4\frac{1}{3}$
g • S	5	h • D	2
j • L	−9	d • F	11
k • U	−2	i • L	$-4\frac{1}{2}$

e • T	−8
l • V	6
h • S	−10
l • P	18
m • E	$3\frac{2}{3}$
e • L	−9
c • N	0
i • G	23
a • P	5
i • F	$6\frac{1}{3}$

$3(n+10) = 8n$

$3n + 30 = 8n$

$-3n \quad -3n$

$\frac{30}{5} = \frac{5n}{5}$

$6 = n$

Why Do Cowboys Have So Much Trouble With Math?

Solve each equation or problem and find your solution in the answer column. Write the letter of the answer in each box that contains the exercise number. If the answer has a ●, shade in the box instead of writing a letter in it.

(1) $8x + 15 = 3x - 20$

(2) $9n - 2 = 7n + 50$

(3) $18 - 5y = y + 4$

(4) $-7a - 10 = 20 - 3a$

(5) $11d = 81 - 16d$

(6) $-22 - x = 5 + 6x + 9$

(7) $10b - 25 - 3b = 4b - 1$

(8) $33 + 15w = 3w - w + 4w$

(9) The Sun Spa charges annual dues of $125 plus $10 per hour to use the facilities. The Moon Spa charges annual dues of $230 plus $7 per hour to use the facilities. For what number of hours would the two spas charge the same total amount?

(10) $9(m - 2) = m + 40$

(11) $3(2p + 7) = 15(p - 4)$

(12) $5x + 2(11 - 4x) = 82 + x$

(13) $16 - 5(3t - 4) = 8(-2t + 11)$

(14) $7(7c + 1) - 4c = 13(3c - 2)$

(15) $12(5 + 2y) = 4y - (6 - 9y)$

(16) $3q - 16q = 7 + 2(-8q - 3)$

(17) $14 - 3(5t - 12) = 1 - (20t + 1)$

(18) Simon says: "Five times my age 4 years ago is the same as 3 times my age in 2 years." How old is Simon now?

Answers 1-9

- (A) 8
- (I) $-7\frac{1}{2}$
- (K) 38
- ● $-5\frac{1}{7}$
- (O) -7
- (P) $-3\frac{2}{3}$
- (T) 3
- (E) $2\frac{1}{3}$
- (D) 35
- (C) $-4\frac{1}{4}$
- (S) 26
- (J) 5

Answers 10-18

- (M) 18
- (L) $-5\frac{1}{2}$
- (N) 13
- (G) 9
- (R) -10
- (B) $-7\frac{3}{4}$
- ● 52
- (W) $7\frac{1}{4}$
- (F) 12
- (H) $\frac{1}{3}$
- (Y) -15
- (U) -6

5	16	3	12	6	7	14	10	7	12	2	13	17	1	15	18	9	6	5	16	4	18	11	2	13	15	8

2.2 Up and Down the Staircase

Exploring Slope

Linear functions are often used as models for patterns in data plots. In *Moving Straight Ahead*, you learned several facts about equations representing linear functions.

$y = mx + b$

- Any linear function can be expressed by an equation in the form $y = mx + b$.
- The value of the coefficient m tells the rate at which the values of y increase (or decrease) as the values of x increase by 1. Since m tells you the change in y for every one-unit change in x, it can also be called the *unit rate*. A unit rate is a rate in which the second number is 1, or 1 of a quantity.
- The value of m also tells the steepness and direction (upward or downward) of the graph of the function.
- The value of b tells the point at which the graph of the function crosses the y-axis. That point has coordinates $(0, b)$ and is called the **y-intercept.**

In any problem that calls for a linear model, the goal is to find the values of m and b for an equation with a graph that fits the data pattern well. To measure the steepness of a linear equation graph, it helps to imagine a staircase that lies underneath the line.

Linear equation basics:

Slope Intercept Form:

$y = mx + b$

y-intercept

slope

y-intercept:

the value of y when $x = 0$

$y = mx + b$

$y = m(0) + b$

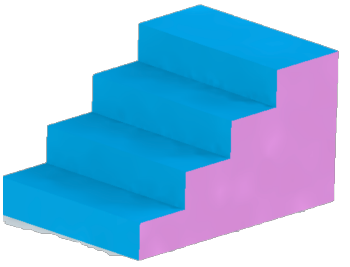
$y = b$

What is slope?

Measure of steepness

As a group, build a 4 step staircase with the blocks at your table.

The steps only need to be one block wide.



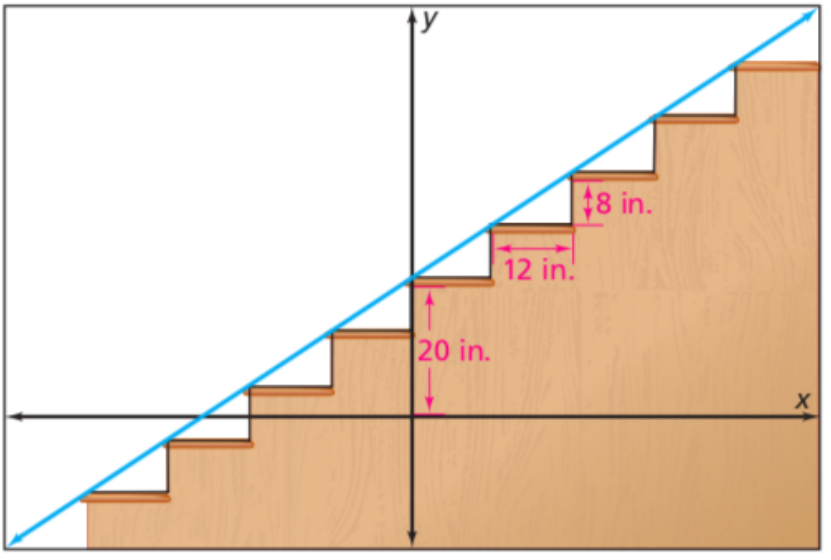
Can you build a 4 step staircase that is not as steep? What did you change?

stretched "the x" made it longer

Can you build a 4 step staircase that is steeper than your first one? What did you change?

make steps higher ↑y

make staircase not a long ↓x

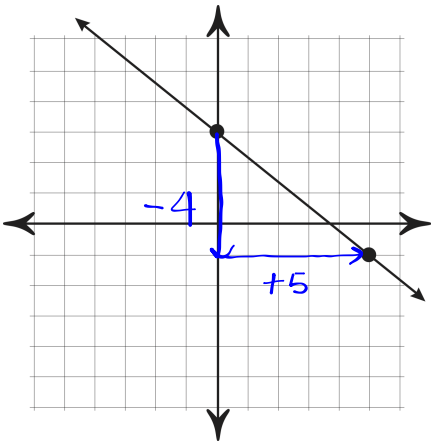


The steepness of the line is the ratio of rise to run. This ratio is the **slope** of the line.

$$\text{slope} = \frac{\text{vertical change}}{\text{horizontal change}} = \frac{\text{rise}}{\text{run}} = \frac{\text{change in } y}{\text{change in } x}$$

$$\text{slope} = \frac{\text{change in } y}{\text{change in } x} = \frac{\Delta y}{\Delta x}$$

Slope Calculation: From a graph, a table, or 2 points.



$\text{slope} = \frac{\Delta y}{\Delta x} = \frac{-4}{5}$

$\text{Slope} = \frac{-4}{5}$

x	y
3	7
5	15
7	23

+2, +8; +2, +8

$\text{Slope} = \frac{\Delta y}{\Delta x} = \frac{8}{2} = 4$

(2, 7) and (5, 37)

$m = \frac{y_2 - y_1}{x_2 - x_1}$ forget this!

x	y
2	7
5	37

+3, +30

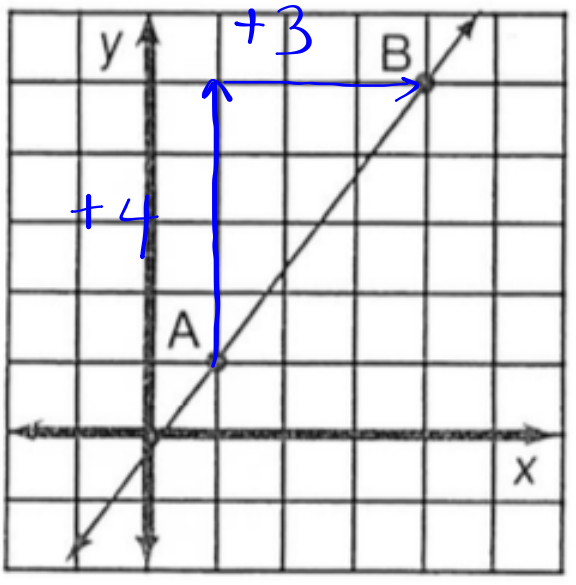
We can "stack" the coordinate pairs and find the changes like we would in a table.

$\frac{\Delta y}{\Delta x} = \frac{30}{3} = 10$

Practice

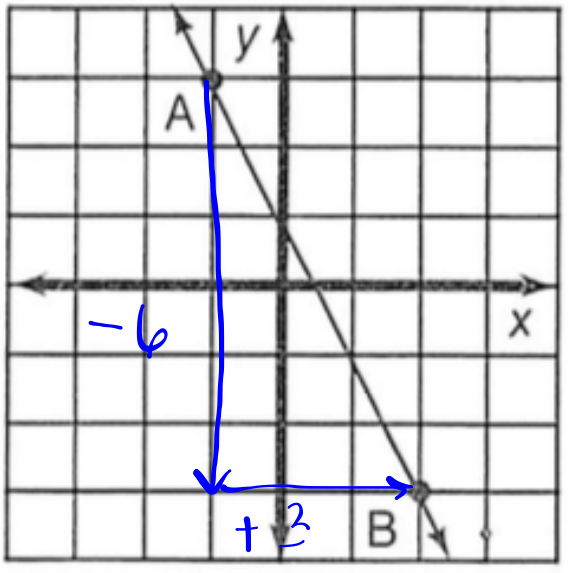
Start with the left hand point and travel vertically, then horizontally to the second point.

1



$\frac{\Delta y}{\Delta x} = \frac{4}{3}$

2



slope: $\frac{\Delta y}{\Delta x} = \frac{-6}{3} = -2$

Practice

x, y x, y

⑦ (2, 1); (5, 3)

$\frac{\Delta y}{\Delta x} = \frac{2}{3}$

$+3 < \begin{matrix} 2, 1 \\ 5, 3 \end{matrix} > +2$

⑧ (8, 3); (2, 5)

$\frac{\Delta y}{\Delta x} = \frac{2}{-6} = -\frac{1}{3}$

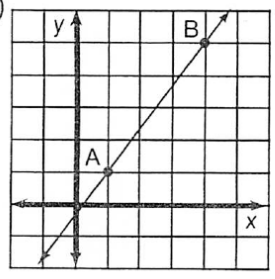
$-6 < \begin{matrix} 8, 3 \\ 2, 5 \end{matrix} > +2$

What Do You Call a Duck That Steals?

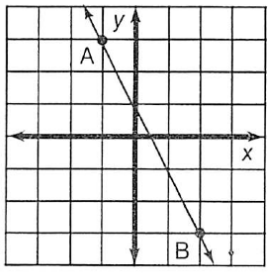
For the first six exercises, find the slope of the line $\overleftrightarrow{AB}$. For the remaining exercises, find the slope of the line that passes through the two given points. Cross out each box in the rectangle below that contains a correct answer. When you finish, print the letters from the remaining boxes in the spaces at the bottom of the page.

slope $= \frac{\Delta y}{\Delta x}$

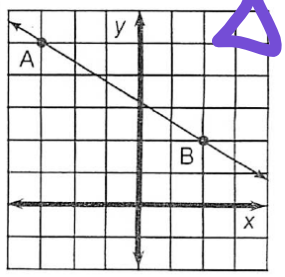
(1)



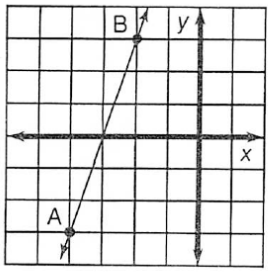
(2)



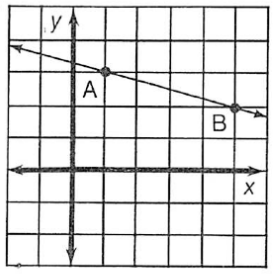
(3)



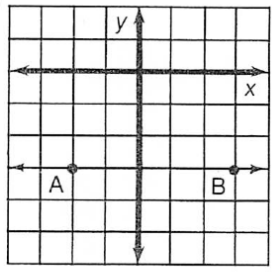
(4)



(5)



(6)



(7) (2, 1); (5, 3)

(8) (8, 3); (2, 5)

(9) (1, −4); (6, −2)

(10) (−3, 1); (−7, 4)

(11) (9, 2); (3, −1)

(12) (−5, 8); (−4, 2)

(13) (0, −1); (4, −7)

(14) (1, −1); (−2, −6)

(15) (−4, −8); (−2, 0)

(16) (−3, −3); (0, 0)

(17) (2, 5); (9, 1)

(18) (0, 0); (−2, 7)

DU 0	AB −6	CK $-\frac{3}{5}$	ST $-\frac{4}{7}$	AR 9	IG $\frac{1}{2}$	AT $-\frac{7}{2}$	OB $-\frac{7}{6}$	IG $\frac{4}{3}$	ET $\frac{2}{3}$	BE $-\frac{5}{4}$	ST $\frac{5}{3}$
CA $\frac{2}{5}$	RD $\frac{1}{6}$	RI $-\frac{1}{4}$	CH −2	UC −8	RI $-\frac{3}{2}$	ME 1	AQ $-\frac{1}{3}$	UA $-\frac{3}{4}$	KY $\frac{8}{5}$	ET 4	CK 3

OBJECTIVE 5–h: To find the slope of a line given two points on the line (not using the graph).

Homework

Finish classwork