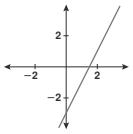
SECTION 12A

Ready to Go On? Quiz

12-1 Graphing Linear Equations

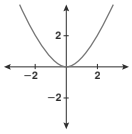
Graph each equation and tell whether it is linear.

1. $y = -3 + 2x$



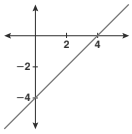
linear

2. $y = \frac{1}{2}x^2$



not linear

3. $x = y + 4$



linear

4. A bookstore buys back school books according to the formula $y = \frac{1}{2}x - 5$, where x is the price you originally paid for a book and y is the amount the store will now pay you for it. What is the buy-back price for each of the books listed in the table?

Original Price	Buy-Back Price
$40	$15
$50	$20
$70	$30
$100	$45

12-2 Slope of a Line

Find the slope of the line that passes through each pair of points.

5. (0, 1) and (4, 3)

$\frac{1}{2}$

6. (−2, 6) and (1, 3)

−1

7. (1, −9) and (3, 1)

5

8. (4, 0) and (1, −6)

2

9. (5, 1) and (−4, 4)

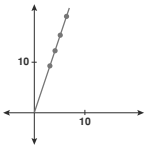
$-\frac{1}{3}$

10. (−4, −1) and (2, −1)

0

11. The table shows Sam's progress during an all-day hike. Graph the data, find the slope of the line, and explain what the slope shows.

Time	Distance
3 h	9 km
4 h	12 km
5 h	15 km
7 h	21 km



slope = 3; The slope shows that Sam walks at a constant rate of 3 km/h.

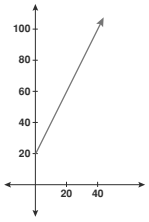
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SECTION 12A

Ready to Go On? Quiz continued

12-3 Using Slopes and Intercepts

12. An amusement park charges $20 to get in plus $2 for each ride. The equation $y = 2x + 20$ represents the total amount paid if a person goes on x rides. Identify the slope and the y-intercept and then use them to graph the equation.



slope = 2; y-intercept = 20

Write the equation of the line that passes through each pair of points. Use the slope-intercept form.

13. (−2, −2) and (4, 1)

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

14. (1, −5) and (−2, 4)

$y = -3x - 2$

15. (0, 1) and (−3, 10)

$y = -3x + 1$

16. (−5, −3) and (5, −3)

$y = -3$

17. (−8, −2) and (4, 1)

$y = \frac{1}{4}x$

18. (3, 0) and (1, 1)

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

12-4 Point-Slope Form

Use the point-slope form of each equation to identify a point the line passes through and the slope of the line.

19. $y - 1 = 2(x - 2)$

slope = 2

point = (2, 1)

20. $y = -x + 6$

slope = −1

point = (6, 0)

21. $y + 3 = 4x + 2$

slope = 4

point = $(-\frac{1}{2}, -3)$

Write the point-slope form of the equation with the given slope that passes through the indicated point.

22. slope 2, passing through (1, −1)

$y + 1 = 2(x - 1)$

23. slope $-\frac{1}{3}$, passing through (−1, −2)

$y + 2 = -\frac{1}{3}(x + 1)$

24. slope −4, passing through (5, 0)

$y = -4(x - 5)$

25. slope $\frac{2}{3}$, passing through (−6, 3)

$y - 3 = \frac{2}{3}(x + 6)$

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SECTION 12A

Ready to Go On? Enrichment

Clown Face

For each of the following, graph the given point and draw a line with the indicated slope through the point.

1. point: (60, 110)
slope: 0

2. point: (105, 82)
slope: −2

3. point: (25, 25)
slope: −1

4. point: (82, 15)
slope: $\frac{1}{2}$

5. point: (10, 60)
slope: undefined

6. point: (38, 105)
slope: $\frac{1}{2}$

7. point: (105, 38)
slope: 2

8. point: (38, 15)
slope: $-\frac{1}{2}$

9. point: (82, 105)
slope: $-\frac{1}{2}$

10. point: (25, 95)
slope: 1

11. point: (110, 60)
slope: undefined

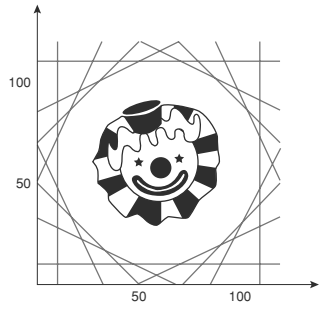
12. point: (15, 82)
slope: 2

13. point: (95, 95)
slope: −1

14. point: (60, 10)
slope: 0

15. point: (15, 38)
slope: −2

16. point: (95, 25)
slope: 1



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LESSON 12-5

Ready to Go On? Skills Intervention

Direct Variation

If two variables are related proportionally by a constant ratio, k, then they have a **direct variation.** The ratio is called the **constant of proportionality.**

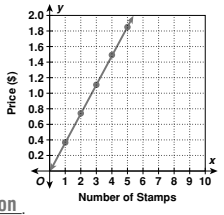
$y = kx$ or $k = \frac{y}{x}$

Vocabulary
direct variation
constant of proportionality

Determining Whether a Data Set Varies Directly
Determine whether the data set shows direct variation.

A.

Stamps	1	2	3	4	5
Price $	0.37	0.74	1.11	1.48	1.85



Make a graph of the data.

Does the line appear to be a straight line? yes

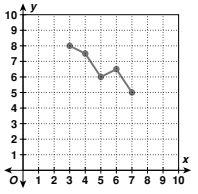
Compare the ratios. $\frac{0.37}{1} = \frac{0.74}{2} = \frac{1.11}{3} = \frac{1.48}{4} = \frac{1.85}{5}$

Reduce each ratio: 0.37, 0.37, 0.37, 0.37, 0.37

Since the ratios are all the same this is a direct variation.

B.

x	3	4	5	6	7
y	8	7.5	6	6.5	5



Make a graph of the data.

Does the line appear to be a straight line? no

Compare the ratios. $\frac{8}{3} = \frac{7.5}{4} = \frac{6}{5} = \frac{6.5}{6} = \frac{5}{7}$

Reduce each ratio: 2.7, 1.9, 1.2, 1.1, 0.7

Since the ratios are not all the same this is not a direct variation.

Finding Equations of Direct Variation
Find the equation of direct variation, given that y varies directly with x. y is 32 when x is 8.

$y = kx$ Write the direct variation equation.

32 $= k \cdot$ 8 Substitute for x and y.

4 $= k$ Substitute 4 back into the original equation.

$y =$ 4 x

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LESSON 12-7

Ready to Go On? Problem Solving Intervention

Lines of Best Fit

You can use lines of best fit to make projections based on past trends.

The table shows the attendance for women's NCAA basketball games for each year from 1982 to 1993. If the trend had continued, what would the attendance have been in 2000? Use a scatter plot to find out.

Year (1982 is 0)	Attendance (thousands)
1982	50
1983	60
1984	75
1985	100
1986	85
1987	100
1988	120
1989	150
1990	180
1991	150
1992	185
1993	220

Understand the Problem

1. If 1982 represents year 0, what ordered pair will be the first point?

(0, 50) or (0, 50,000)

Make a Plan

2. If you had an equation for a line that fit the data, how would you use it to solve the problem?

Solve the equation for the year 2000.

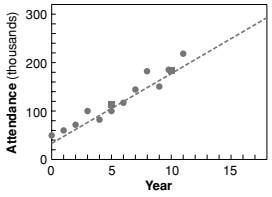
Solve

3. Make the scatter plot. Use 0 for 1982.

4. Find x_m and y_m, the mean of the *x*-coordinates and the mean of the *y*-coordinates.

$x_m = \frac{66}{12} = 5.5$; $y_m = \frac{1475}{12} \approx 123$

5. Draw a line of best fit through (x_m, y_m). Choose another point on the line and use it to find the slope and the equation of the line.



Sample, using (10,190) as other point: $m = 14.9$

$y - (190) = 14.9(x - (10))$, $y = 14.9x + 41$

6. Use the equation from Exercise 5 to estimate the attendance in 2000.

$y = 14.9(18) + 41$, $y = 309.2$; Attendance in 2000 $\approx$ 309,200

Check

7. Extend the line to $x = 18$ to check your solution. (The attendance in 2000 was actually 320,000. Did the trend continue as you projected?)

Graph should match. (309,200 is almost 320,000.)

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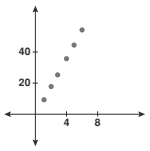
SECTION 12B

Ready to Go On? Quiz

12-5 Direct Variation

1. The table shows how many miles Julia has traveled after riding so many hours on her bicycle. Make a graph of the data and tell whether the data sets have a direct variation.

Hours	Miles
0	0
1	9
2	18
3	27
4	36
5	45
6	54



yes

Find each equation of direct variation, given that y varies directly with x.

2. The variable *y* is 9 when *x* is 3.

$y = 3x$

3. The variable *y* is 2 when *x* is 8.

$y = \frac{1}{4}x$

4. The variable *y* is 4.5 when *x* is 4.5.

$y = x$

5. The variable *y* is 5 when *x* is 0.5

$y = 10x$

6. The variable *y* is $\frac{7}{2}$ when *x* is $\frac{7}{2}$.

$y = x$

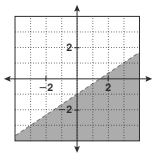
7. The variable *y* is 2 when *x* is 6.

$y = \frac{1}{3}x$

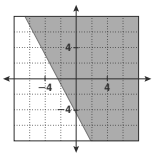
12-6 Graphing Inequalities in Two Variables

Graph each inequality.

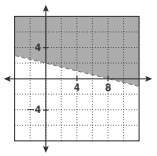
8. $y < \frac{2}{3}x - 1$



9. $y \geq -2x - 5$

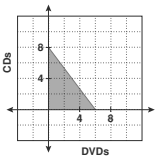


10. $y > -\frac{1}{4}x + 2$



11. Buster's Movies and Music sells movie DVDs (*d*) for $16 and music CDs (*c*) for $12, tax included. Jeremy has $96. Write and graph an inequality showing the different ways Jeremy might spend all or part of his money. Could he buy 5 CDs and 2 DVDs?

$16d + 12c \leq 96$; yes



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SECTION 12B

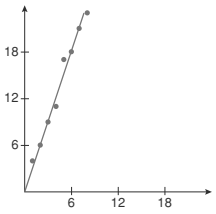
Ready to Go On? Quiz continued

12-7 Lines of Best Fit

Plot the data and find a line of best fit.

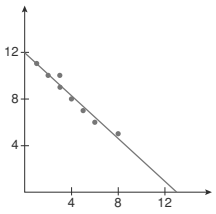
12.

x	*y*
1	4
4	11
5	17
8	23
7	21
3	9
2	6
6	18



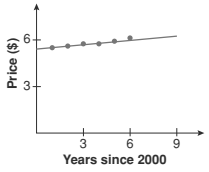
13.

x	*y*
3	9
8	5
4	8
3	10
2	10
1	11
5	7
6	6



14. Find the line of best fit for the price of a ticket to a baseball game.

Year	Price
2001	$5.50
2002	$5.60
2003	$5.75
2004	$5.75
2005	$5.95
2006	$6.15



15. Use the equation of this line to predict the ticket price in 2010 to the nearest 5 cents.

$6.60

16. Is this prediction reasonable? Explain.

Yes, it is consistent with the trend.

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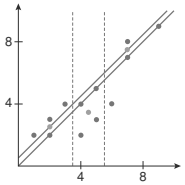
SECTION 12B

Ready to Go On? Enrichment

Line of Best Fit

This page provides a simple illustration of one way mathematicians find the line of best fit. It can be used with any number of points and is more precise than our intuitive way.

1. Graph the following 12 points: (1, 2); (2, 2); (2, 3); (3, 4); (4, 2); (4, 4); (5, 3); (5, 5); (6, 4); (7, 7); (7, 8); (9, 9).



2. Draw two dashed *vertical* lines that separate these 12 points into 3 groups of 4 points each.

3. In each group, find the median of the *x*-coordinates and the median of the *y*-coordinates. Graph the median point using these two medians as the coordinates.

4. Draw a line through the first and last median points.

5. Now draw a line parallel to this line but $\frac{1}{3}$ of the distance to the second median point.

The second line you have just drawn is the line of best fit. Notice that there are precise rules for finding it. These rules define the *median-median method* of determining the line of best fit.

The other method you have been using is more intuitive because you have to guess the slope. However, there is no guessing with the median-median method; which is why mathematicians prefer it.

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