

Name \_\_\_\_\_ Date \_\_\_\_\_ Class \_\_\_\_\_

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## Section 1-1 Linear Equations and Inequalities

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**Goal:** To solve linear equation and linear inequalities**Equality Properties:**

1. If  $x = y$  and  $a$  is any real number, then  $x \pm a = y \pm a$ .
2. If  $x = y$  and  $a$  is any nonzero real number, then  $ax = ay$  and  $\frac{x}{a} = \frac{y}{a}$ .

**Inequality Properties:**

1. If  $x > y$  and  $a$  is any real number, then  $x \pm a > y \pm a$ .
2. If  $x > y$  and  $a$  is any positive real number, then  $ax > ay$  and  $\frac{x}{a} > \frac{y}{a}$ .
3. If  $x > y$  and  $a$  is any negative real number, then  $ax < ay$  and  $\frac{x}{a} < \frac{y}{a}$ .

**Interval Notation:**

A bracket, ] or [, is used if the endpoint is included.  
A parentheses, ) or (, is used if the endpoint is not included.  
Infinity, either positive or negative, always uses a parentheses.

In Problems 1–3, solve for the variable:

1.  $7x + 8 = 2x + 28$

2.  $7y + 3(6y - 11) = 167$

3.  $\frac{m}{6} + 8 = \frac{m}{3} + 10$

In problems 4–6, solve for the variable and place the final answer in interval notation.

4.  $9x + 4 > 22$

5.  $-5 < -2x + 1 < 13$

6.  $\frac{u}{3} + \frac{3}{4} < \frac{u}{2} - \frac{5}{4}$

7. *Break-even Analysis.* A publisher for a promising new novel figures fixed costs (overhead, advances, promotion, copyediting, typesetting, and so on) at \$87,000 and variable costs (printing, paper, binding, shipping) at \$4.50 for each book produced. If the book is sold to distributors for \$28 each, how many must be produced and sold for the publisher to break even?



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## Section 1-2 Graphs and Lines

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**Goal:** To find the equations of lines,  $x$ -intercepts, and  $y$ -intercepts

Slope of a Line:  $m = \frac{y_2 - y_1}{x_2 - x_1}$ , where  $P_1 : (x_1, y_1)$  and  $P_2 : (x_2, y_2)$

Slope-Intercept Form of a Line:  $y = mx + b$ , where  $m$  is the slope and  $(0, b)$  is the  $y$ -intercept.

Equation of a line in standard form:  $Ax + By = C$ , where  $A$  and  $B$  are not both zero.

Horizontal Line:  $y = b$ , slope is zero.      Vertical Line:  $x = a$ , slope is undefined.

$y$ -intercept:  $(0, b)$

$x$ -intercept:  $(a, 0)$

In Problems 1–12 write the equation of the line in slope-intercept form with the given characteristics:

1. Slope is 8 and  $y$ -intercept is  $(0, 3)$ .

2. Slope is  $-5$  and  $y$ -intercept is  $(0, -6)$ .

3. Slope is  $\frac{3}{7}$  and passes through the point  $(-14, 2)$ .

4. Slope is  $\frac{-4}{5}$  and passes through the point  $(2, -3)$ .

5. Passes through the points  $(4, 8)$  and  $(8, 4)$ .

6. Passes through the points  $(-1, 4)$  and  $(2, -2)$ .

7. Passes through the points  $(0, 6)$  and  $(5, 0)$ .
8. Passes through the points  $(0, -6)$  and  $(1, 0)$ .
9. A horizontal line that passes through the point  $(-2, 8)$ .
10. A horizontal line that passes through the point  $(2, -5)$ .
11. A vertical line that passes through the point  $(-2, 7)$ .
12. A vertical line that passes through the point  $(2, -8)$ .

In Problems 13–17, find the  $x$ -intercept and the  $y$ -intercept.

13.  $y = -3x + 3$

14.  $y = -2x - 2$

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

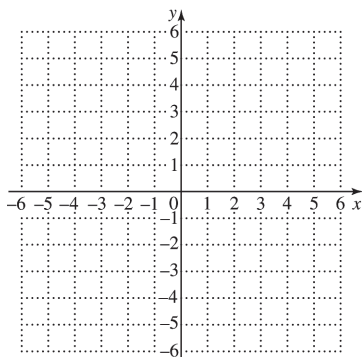
16.  $y = \frac{4}{3}x - 4$

17.  $x - 3y = -3$

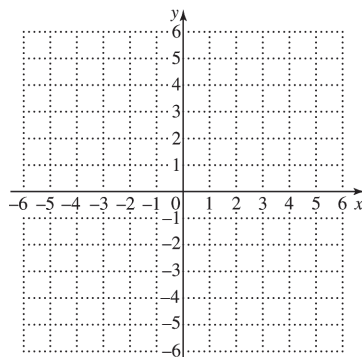


18. Graph each line in Problems 13–17.

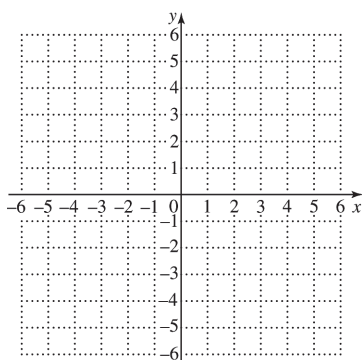
Grid for 13



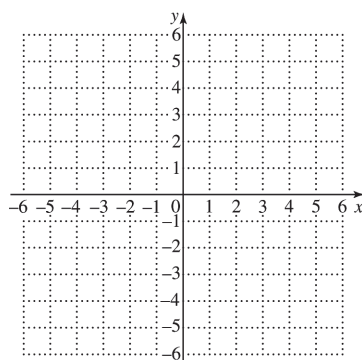
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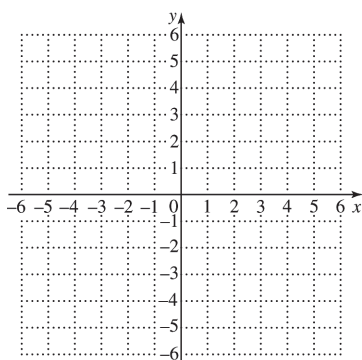
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Grid for 16



Grid for 17



19. A piece of equipment used in a landfill has an original value of \$200,000. After two years of use, the piece of equipment is valued at \$150,000.
- a) If the depreciation of the equipment is assumed to be linear, find an equation to relate the value ( $V$ ) of the equipment over time ( $t$ ).
  - b) What would the value of the piece of equipment be after 6 years?
  - c) In how many years would the value of the piece of equipment be \$0?

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## Section 1-3 Linear Regression

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**Goal:** To interpret slopes and find linear regression equations**Solving Real-World Problems**

1. Construct a mathematical model.
2. Solve the mathematical model.
3. Interpret the solution.

**Linear Regression on a Graphing Calculator**

1. Enter the data in columns  $L_1$  and  $L_2$ .
2. In the “STAT” mode, find the “LinReg” function.
3. Read the display to find the values of the slope and the  $y$ - intercept.

In Problems 1–3, use the given information to answer the questions.

1. *Depreciation.* A new car worth \$45,000 is depreciating in value by \$5000 per year.
  - a) Find the linear model for the current value of the car,  $v$ , and the number of years,  $y$ , after it was purchased.
  - b) Interpret the slope of the model.
  - c) If the car is 3 years old, what does the model predict for its value?
  - d) After how many years will the car be worth nothing?

2. *Health Club Membership.* A health club offers membership for a fee of \$59 plus a monthly fee of \$15 per month.
- a) Find the linear model for the membership fee,  $f$ , and the number of months,  $m$ , since you have been a member.
  - b) Interpret the slope of the model.
  - c) If you have been a member for 24 months, what does the model predict for the fee you have paid so far?
  - d) After how many months will you have paid the health club \$329?

3. *Stress.* The table below shows the relationship between a stress test score and the diastolic blood pressure for 8 patients. A linear regression model for this data is

$$y = 0.56x + 41.71,$$

where  $x$  represents the stress test score and  $y$  represents the blood pressure.

<b>Stress Test Score, <math>x</math></b>	55	62	58	78	92	88	75	80
<b>Blood Pressure, <math>y</math></b>	70	85	72	85	96	90	82	85

- a) Interpret the slope of the model.
- b) Use the model to predict the blood pressure for a person with a stress test score of 75
- c) Use the model to estimate the stress test score for if the diastolic blood pressure was 90.

