Practice Test - Chapter 4

1. Graph $y = 2x - 3$.

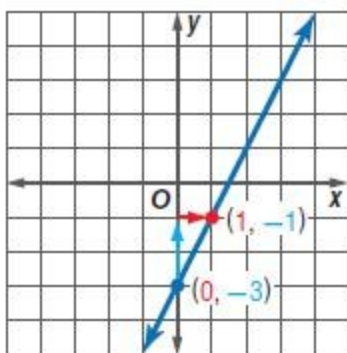   *SOLUTION:*

    The slope-intercept form of a line is $y = mx + b$, where m is the slope, and b is the y-intercept.

    $$y = mx + b$$
    $$y = 2x - 3$$

    Plot the y-intercept $(0, -3)$. The slope is $\dfrac{\text{rise}}{\text{run}} = \dfrac{2}{1}$.

    From $(0, -3)$, move up 2 units and right 1 unit. Plot the point. Draw a line through the two points.

2. **MULTIPLE CHOICE** A popular pizza parlor charges \$15 for a large cheese pizza plus \$1.50 for each additional topping. Write an equation in slope-intercept form for the total cost C of a pizza with t toppings.

    A $C = 15t + 1.50$
    B $C = 16.50t$
    C $C = 15 + 1.50t$
    D $C = 1.50t - 15$

    SOLUTION:

    The cost of the additional products is the rate or the slope, so you can eliminate choices A and B. The price of the large pizza is a constant at \$15. Choice D, subtracts 15 from each order, so you can eliminate this choice. The equation is $C = 15 + 1.50t$, so the correct choice is C.

Write an equation of a line in slope-intercept form that passes through the given point and has the given slope.

3. $(-4, 2)$; slope -3

    SOLUTION:

    Find the y-intercept.

    $$y = mx + b$$
    $$2 = -3(-4) + b$$
    $$2 = 12 + b$$
    $$-10 = b$$

    Write the equation in slope-intercept form.

    $$y = mx + b$$
    $$y = -3x - 10$$

4. $(3, -5)$; slope $\dfrac{2}{3}$

    SOLUTION:

    Find the y-intercept.

    $$y = mx + b$$
    $$-5 = \frac{2}{3}(3) + b$$
    $$-5 = 2 + b$$
    $$-7 = b$$

    Write the equation in slope-intercept form.

    $$y = mx + b$$
    $$y = \frac{2}{3}x - 7$$

Write an equation of the line in slope-intercept form that passes through the given points.

5. (1, 4), (3, 10)

SOLUTION:

Find the slope of the line containing the given points.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$
$$= \frac{10 - 4}{3 - 1}$$
$$= \frac{6}{2}$$
$$= 3$$

Use the slope and either of the two points to find the *y*-intercept.

$$y = mx + b$$
$$10 = 3(3) + b$$
$$10 = 9 + b$$
$$10 - 9 = 9 - 9 + b$$
$$1 = b$$

Write the equation in slope-intercept form.

$$y = mx + b$$
$$y = 3x + 1$$

6. (2, 5), (−2, 8)

SOLUTION:

Find the slope of the line containing the given points.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$
$$= \frac{8 - 5}{-2 - 2}$$
$$= \frac{3}{-4}$$
$$= -\frac{3}{4}$$

Use the slope and either of the two points to find the *y*-intercept.

$$y = mx + b$$
$$8 = -\frac{3}{4}(-2) + b$$
$$8 = \frac{3}{2} + b$$
$$8 - \frac{3}{2} = \frac{3}{2} - \frac{3}{2} + b$$
$$\frac{13}{2} = b$$

Write the equation in slope-intercept form.

$$y = mx + b$$
$$y = -\frac{3}{4}x + \frac{13}{2}$$

7. $(0, 4), (-3, 0)$

   SOLUTION:

   Find the slope of the line containing the given points.

   $$m = \frac{y_2 - y_1}{x_2 - x_1}$$
   $$= \frac{0 - 4}{-3 - 0}$$
   $$= \frac{-4}{-3}$$
   $$= \frac{4}{3}$$

   Use the slope and either of the two points to find the *y*-intercept.

   $$y = mx + b$$
   $$4 = \frac{4}{3}(0) + b$$
   $$4 = 0 + b$$
   $$4 = b$$

   Write the equation in slope-intercept form.

   $$y = mx + b$$
   $$y = \frac{4}{3}x + 4$$

8. $(7, -1), (9, -4)$

   SOLUTION:

   Find the slope of the line containing the given points.

   $$m = \frac{y_2 - y_1}{x_2 - x_1}$$
   $$= \frac{-4 - (-1)}{9 - 7}$$
   $$= \frac{-3}{2}$$
   $$= -\frac{3}{2}$$

   Use the slope and either of the two points to find the *y*-intercept.

   $$y = mx + b$$
   $$-1 = -\frac{3}{2}(7) + b$$
   $$-1 = -\frac{21}{2} + b$$
   $$-1 + \frac{21}{2} = -\frac{21}{2} + \frac{21}{2} + b$$
   $$\frac{19}{2} = b$$

   Write the equation in slope-intercept form.

   $$y = mx + b$$
   $$y = -\frac{3}{2}x + \frac{19}{2}$$

9. **PAINTING** The data in the table show the size of a room in square feet and the time it takes to paint the room in minutes.

Room Size	100	150	200	400	500
Painting Time	160	220	270	500	680

a. Use the points (100, 160) and (500, 680) to write an equation in slope-intercept form.

b. Predict the amount of time required to paint a room measuring 750 square feet.

SOLUTION:

a. Find the slope of the line containing the given points.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$
$$= \frac{680 - 160}{500 - 100}$$
$$= \frac{520}{400}$$
$$= 1.3$$

Use the slope and either of the two points to find the y-intercept.

$$y = mx + b$$
$$160 = 1.3(100) + b$$
$$160 = 130 + b$$
$$160 - 130 = 130 - 130 + b$$
$$30 = b$$

Write the equation in slope-intercept form.

$$y = mx + b$$
$$y = 1.3x + 30$$

b. Substitute 750 for x into the equation from part **a**.

$$y = 1.3x + 30$$
$$y = 1.3(750) + 30$$
$$y = 975 + 30$$
$$y = 1005$$

So it will take 1005 minutes to paint a room that measures 750 square feet.
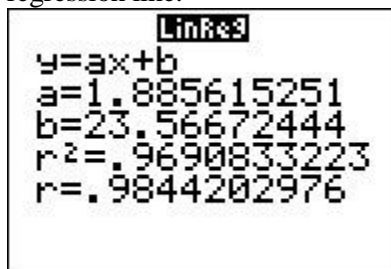
10. **SALARY** The table shows the relationship between years of experience and teacher salary.

Years Experience	1	5	10	15	20
Salary (thousands of dollars)	28	31	42	49	64

a. Write an equation for the best-fit line.

b. Find the correlation coefficient and explain what it tells us about the relationship between experience and teacher salary.

SOLUTION:

a. Use a calculator to find the equation of the regression line.

```
        LinReg
y=ax+b
a=1.885615251
b=23.56672444
r²=.9690833223
r=.9844202976
```

$$y = 1.89x + 23.57$$

b. Use a calculator to find the correlation coefficient. It is 0.98. This means that there is a strong positive correlation between years of experience and salary.

Write an equation in slope-intercept form for the line that passes through the given point and is parallel to the graph of each equation.

11. $(2, -3), y = 4x - 9$

SOLUTION:

The slope of the line with equation $y = 4x - 11$ is 4. The line parallel to $y = 4x - 11$ has the same slope, 4.

Find the y-intercept.

$$y = mx + b$$
$$-3 = 4(2) + b$$
$$-3 = 8 + b$$
$$-11 = b$$

Write the equation in slope-intercept form.

$$y = mx + b$$
$$y = 4x - 11$$

12. $(-5, 1), y = -3x + 2$

SOLUTION:

The slope of the line with equation $y = -3x + 2$ is -3. The line parallel to $y = -3x + 2$ has the same slope, -3.

Find the y-intercept.

$$y = mx + b$$
$$1 = -3(-5) + b$$
$$1 = 15 + b$$
$$-14 = b$$

Write the equation in slope-intercept form.

$$y = mx + b$$
$$y = -3x - 14$$

Write an equation in slope-intercept form for the line that passes through the given point and is perpendicular to the graph of the equation.

13. $(1, 4), y = -2x + 5$

SOLUTION:

The slope of the line with equation $y = -2x + 5$ is -2. The slope of the perpendicular line is the opposite reciprocal of -2, or $\dfrac{1}{2}$.

Find the y-intercept.
$$y = mx + b$$
$$4 = \frac{1}{2}(1) + b$$
$$4 = \frac{1}{2} + b$$
$$\frac{7}{2} = b$$

Write the equation in slope-intercept form.
$$y = mx + b$$
$$y = \frac{1}{2}x + \frac{7}{2}$$

14. $(-3, 6), y = \dfrac{1}{4}x + 2$

SOLUTION:

The slope of the line with equation $y = \dfrac{1}{4}x + 2$ is $\dfrac{1}{4}$. The slope of the perpendicular line is the opposite reciprocal of $\dfrac{1}{4}$, or -4.

Find the y-intercept.
$$y = mx + b$$
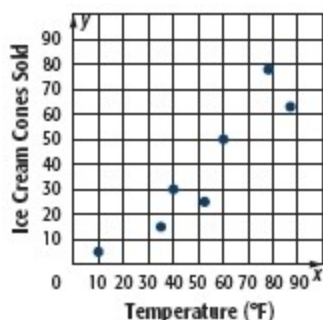$$6 = -4(-3) + b$$
$$6 = 12 + b$$
$$-6 = b$$

Write the equation in slope-intercept form.
$$y = mx + b$$
$$y = -4x - 6$$

15. **MULTIPLE CHOICE** The graph shows the relationship between outside temperature and daily ice cream cone sales. What type of correlation is shown?

F positive correlation
G negative correlation
H no correlation
J not enough information

SOLUTION:

As the temperature gets larger, the number of ice cream cones sold also gets larger. This shows that there is a positive correlation, so the correct choice is F.

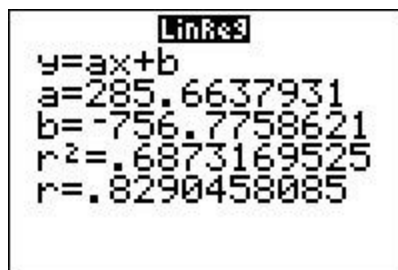16. **ADOPTION** The table shows the number of children from Ethiopia adopted by U.S. citizens.

Years Since 2000	5	7	9	10	11
Number of Children	442	1254	2275	2511	1732

a. Write the slope-intercept form of the equation for the line of fit.

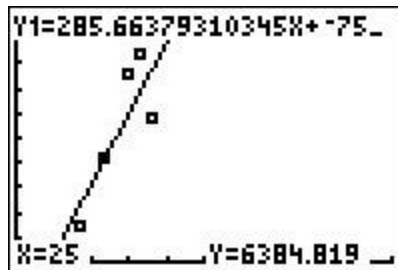**b.** Predict the number of children from Ethiopia who will be adopted in 2025.

SOLUTION:

a. Use a calculator to find the equation of the regression line.

```
        LinReg
y=ax+b
a=285.6637931
b=-756.7758621
r²=.6873169525
r=.8290458085
```

$y = 285.7x - 756.8$

b.

```
Y1=285.66379310345X+-75_



       □
      □
        □
    ■
  □
X=25              Y=6386.819
```

There will be about about 6386 children adopted from Ethiopia in 2025.

Find the inverse of each function.

17. $f(x) = -5x - 30$

SOLUTION:

$$f(x) = -5x - 30 \quad \text{Original equation}$$
$$y = -5x - 30 \quad \text{Replace } f(x) \text{ with } y.$$
$$x = -5y - 30 \quad \text{Interchange } x \text{ and } y.$$
$$x + 30 = -5y \quad \text{Add 30 to each side.}$$
$$-\tfrac{1}{5}x - 6 = y \quad \text{Divide each side by } -5.$$
$$-\tfrac{1}{5}x - 6 = f^{-1}(x) \quad \text{Replace } y \text{ with } f^{-1}(x).$$

Write the final equation in slope-intercept form. So, $f^{-1}(x) = -\tfrac{1}{5}x - 6.$

18. $f(x) = 4x + 10$

SOLUTION:

$$f(x) = 4x + 10 \quad \text{Original equation}$$
$$y = 4x + 10 \quad \text{Replace } f(x) \text{ with } y.$$
$$x = 4y + 10 \quad \text{Interchange } x \text{ and } y.$$
$$x - 10 = 4y \quad \text{Subtract 10 from each side.}$$
$$\tfrac{1}{4}x - \tfrac{5}{2} = y \quad \text{Divide each side by 4.}$$
$$\tfrac{1}{4}x - \tfrac{5}{2} = f^{-1}(x) \quad \text{Replace } y \text{ with } f^{-1}(x).$$

Write the final equation in slope-intercept form. So, $f^{-1}(x) = \tfrac{1}{4}x - \tfrac{5}{2}.$

19. $f(x) = \tfrac{1}{6}x - 2$

SOLUTION:

$$f(x) = \tfrac{1}{6}x - 2 \quad \text{Original equation}$$
$$y = \tfrac{1}{6}x - 2 \quad \text{Replace } f(x) \text{ with } y.$$
$$x = \tfrac{1}{6}y - 2 \quad \text{Interchange } x \text{ and } y.$$
$$x + 2 = \tfrac{1}{6}y \quad \text{Add 2 to each side.}$$
$$6x + 12 = y \quad \text{Multiply each side by 6.}$$
$$6x + 12 = f^{-1}(x) \quad \text{Replace } y \text{ with } f^{-1}(x).$$

Write the final equation in slope-intercept form. So, $f^{-1}(x) = 6x + 12.$

20. $f(x) = \frac{3}{4}x + 12$

    SOLUTION:

$$f(x) = \frac{3}{4}x + 12 \quad \text{Original equation}$$

$$y = \frac{3}{4}x + 12 \quad \text{Replace } f(x) \text{ with } y.$$

$$x = \frac{3}{4}y + 12 \quad \text{Interchange } x \text{ and } y.$$

$$x - 12 = \frac{3}{4}y \quad \text{Subtract 12 from each side.}$$

$$\frac{4}{3}x - 16 = y \quad \text{Multiply each side by } \frac{4}{3}.$$

$$\frac{4}{3}x - 16 = f^{-1}(x) \quad \text{Replace } y \text{ with } f^{-1}(x).$$

Write the final equation in slope-intercept form. So,

$$f^{-1}(x) = \frac{4}{3}x - 16 .$$