Benchmark Test 3

Writing Linear Equations

1. Write an equation in slope-intercept form of the line with a slope of $-3$ and a $y$-intercept of $2$.

2. Which of the following is an equation of the line with a slope of $-2$ and a $y$-intercept of $-3$?
   A. $y = -2x + 3$
   B. $y = 2x - 3$
   C. $y = -2x - 3$
   D. $y = 2x + 3$

3. Which of the following is an equation in slope-intercept form of the line shown?
   
   ![Graph Image](image)
   
   A. $y = x - \frac{4}{3}$
   B. $y = x - \frac{2}{3}$
   C. $y = -\frac{4}{3}x + 1$
   D. $y = -\frac{2}{3}x + 1$

4. Write an equation in slope-intercept form of the line that passes through the point $(-1, 4)$ and has a slope of $-2$.

5. Which of the following is an equation of the line that passes through $(-3, 4)$ and $(1, 0)$?
   A. $y = -x + 1$
   B. $x + y = 4$
   C. $y = x + 7$
   D. $x - y = 1$

6. Write an equation in point-slope form of the line that passes through the points $(5, -9)$ and $(-6, 4)$.

7. Write an equation in standard form of the line that passes through $(7, -8)$ and has a slope of $-3$.

8. a. What is the slope of the line in terms of $p$ and $q$?
   b. Write the equation of the line in standard form.
Benchmark Test 3

Parallel and Perpendicular Lines

9. Determine which lines, if any, are parallel or perpendicular.
   Line a: $2x + 4y = 5$  Line b: $x = 2(y - 5)$  Line c: $5x - 10y = 3$
   A. Lines a and b are perpendicular.
   B. Lines a and c are parallel.
   C. Lines b and c are parallel.
   D. Lines a and c are perpendicular.

10. Write an equation of the line that passes through $(1, -3)$ and is parallel to the line $3x - 4y = 5$.

11. Which of the following is an equation of the line that passes through $(5, -1)$ and is parallel to the line $4x - 7y = 3$?
   A. $y = \frac{-7}{4}x + \frac{31}{4}$
   B. $y = \frac{4}{7}x - \frac{27}{7}$
   C. $y = \frac{-4}{7}x + \frac{13}{7}$
   D. $y = \frac{7}{4}x - \frac{30}{4}$

12. Write an equation of the line that passes through $(4, 0)$ and is perpendicular to the line $2x - 5y = 10$.

13. Which of the following is an equation of the line that passes through $(-1, 2)$ and is perpendicular to the line $x - 2y = 5$?
   A. $y = -\frac{1}{2}x + \frac{3}{2}$
   B. $y = \frac{1}{2}x + \frac{5}{2}$
   C. $y = -2x$
   D. $y = 2x + 4$

Linear Models

For Exercises 14–17, describe the correlation of the data graphed in the scatter plot.

14.

15.
18. Which of the following equations best models the data in the table?

<table>
<thead>
<tr>
<th>x</th>
<th>1</th>
<th>2</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>3</td>
<td>5</td>
<td>8</td>
<td>10</td>
<td>11</td>
<td>16</td>
<td>19</td>
</tr>
</tbody>
</table>

A. \( y = \frac{1}{2}x + 2 \)  
B. \( y = 2x + \frac{1}{2} \)  
C. \( y = x \)  
D. \( y = x + 1 \)


| Year \( t \)  
(in years since 1930) | 0 | 20 | 40 | 60 |
|------------------------|---|----|----|----|
| Average Length \( m \) 
(in minutes over 100)   | 31| 38 | 54 | 72 |

a. Make a scatter plot of the data.

b. Draw and write an equation of a line of fit.

c. Predict the approximate average length \( (100 + m) \) of the critic’s top ten movies in the year 2010. Explain how you made your prediction.

<table>
<thead>
<tr>
<th>Year t (in years since 1980)</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population p</td>
<td>1050</td>
<td>998</td>
<td>935</td>
<td>864</td>
</tr>
</tbody>
</table>

a. Make a scatter plot of the data.

b. Draw and write an equation of a line of fit.

c. Approximate the population in the year 1992. Explain how you made your prediction.

Graphing Inequalities

21. Graph the inequality \( x \geq 0 \).

22. Graph the inequality \( x < -2 \).
Benchmark Test 3 continued

23. A school basketball team sells cups for $4 each and T-shirts for $12 each to raise money for their travel expenses. They need to raise a minimum of $360.
   a. Write and graph an inequality to model the number of T-shirts $y$ in terms of the number of cups $x$ that the team needs to sell.

   \[ y \geq -\frac{1}{3}x + 30 \]

   b. If the team sells 18 T-shirts and 20 cups, will they raise enough money? Use your graph to explain your answer.
   c. What is the $y$-intercept of the graph? What does it represent?

   For Exercises 24 and 25, choose an inequality represented by the graph.

24. \[ -5 \quad -4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \]
   A. $x \leq 2.5$  
   B. $x \leq -2.5$  
   C. $x \geq 2.5$  
   D. $x \geq -2.5$

25. \[ -5 \quad -4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \]
   A. $x \geq -1$  
   B. $x > -1$  
   C. $x < -1$  
   D. $x \leq -1$

For Exercises 26 and 27, translate the verbal phrase into an inequality. Then graph the inequality.

26. All real numbers that are less than or equal to 4 and greater than $-3$.

27. All real numbers that are greater than or equal to 1 or less than 0.
Benchmark Test 3 continued

For Exercises 28–31, graph the inequality on the grid.

28. \( y \geq 3x - 2 \)

29. \( x < -4 \)

30. \( x + 3y < 0 \)

31. \( x - y \leq -1 \)

Answers

28. See graph.

29. See graph.

30. See graph.

31. See graph.

32. \( x > -7 \)

33. \( a \leq -3/2 \)

34. \( x \geq -8 \)

35. \( p \geq -6 \)

36. \( t \leq -19 \)

37. \( \emptyset \)

38. \( q \geq 5/2 \)

39. \( 2 \geq b \geq -5 \)

40. \( 3 \leq x \leq 6 \)

41. \( -4/3 \leq c \leq 3 \)

42. \( c \leq -11/2 \) or \( c \geq -6 \)

43. \( n \leq -8 \) or \( n \geq 2 \)

44. \( c \leq -3 \)

Solving Inequalities

For Exercises 32–43, solve the inequality, if possible.

32. \( x + 12 > 5 \)

33. \( a - \frac{3}{2} \leq \frac{b}{8} + \frac{3}{2} \)

34. \( -4x < 12 \)

35. \( \frac{p}{3} \leq 2 - 3 \)

36. \( 9 < -(f + 10) \)

37. \( -3(3 + 2c) < 6 - 3c \)

38. \( 3(a + 1) + 5a > 4(3 + 2a) \)

39. \( 5q - 2(3 - q) \geq 4 + 3q \)

40. \( 8 > 4b \geq -20 \)

41. \( 11 < 5x - 4 < 26 \)

42. \( 2(c + 4) > -3 \) or \( 4 - \frac{1}{2}c \geq 7 \)

43. \( -7(n + 2) \geq 42 \) or \( 4n - 1 > 15 \)

44. At 9.00 A.M., you begin a hike on a six-mile trail at a park. Let \( t \) represent the hours past 9 A.M. If your walking speed is 2 miles per hour, then which inequality describes the possible values of \( t \)?

A. \( 9 < t \leq 12 \)

B. \( |t| \leq 12 \)

C. \( 0 \leq t \leq 3 \)

D. \( t > 0 \) or \( t < 3 \)
Benchmark Test 3 continued

45. A teacher stacks 25 exams in order by score, with the highest score at the top. The first 5 exams in the stack earn an A. The first 10 exams, except those in the first 5, earn a B.
   a. Kelly earns a B. Write a compound inequality to describe the position \( p \) of Kelly’s exam in the stack.
   b. Jason’s exam is 14th in the stack. Does Jason earn an A, B, or neither? Explain.

Absolute Value Equations and Inequalities
For Exercises 46–53, solve the absolute value equation or inequality, if possible.

46. \(|x| = 13\)
47. \(|b + 3| = 5\)
48. \(|2m - 4| = 11\)
49. \(|5 - 4y| + 6 = 4\)
50. \(-3|x + 3| + 4 = -5\)
51. \(3|4m + 1| - 3 = -4\)
52. \(3|x| < 6\)
53. \(9|g - 1| \geq 27\)
54. Graph the solution of \(|p + 1| > 2\).

55. Which of the following is the solution of \(|x + 58| < 100|)?
   A. \(x < -158 \) or \(x > 42\)
   B. \(-158 < x < 42\)
   C. \(-42 < x < 158\)
   D. \(x < -42 \) or \(x > 158\)

56. Which of the following is the graph of the solution to \(|v - 2| < 1|)?
   A. 
   B. 
   C. 
   D. 

Answers
45a. \(5 < p \leq 10\)
45b. Neither
46. \(x = \pm 13\)
47. \(b = -8, 2\)
48. \(m = -\frac{15}{2}, \frac{15}{2}\)
49. No Solution
50. No Solution
51. No Solution
52. \(-2 < z < 2\)
53. \(g \geq 4 \) or \(g \leq -2\)
54. See graph.
55. B
56. B
Benchmark Test 4

Solving Linear Systems by Graphing

1. The graph represents a system of linear equations. What is the solution of the linear system?

   A. (0, 0)  B. (0, 1)  C. (5, -2)  D. (5/2, 5/2)

2. Mari and James are friends. The difference between 9 times James’ age and 4 times Mari’s age is 72. Twelve years ago, James was half as old as Mari was.
   a. Write a linear system to describe the relationship between Mari’s age and James’ age.
   b. Graph the system on the grid.

   c. Five years from now, how old will Mari and James be?

3. Solve the linear system by graphing.

   \[ x - y = -2 \]
   \[ y = x + 2 \]

   \[ 5x + 3y = -18 \]

   \[ 3y = 18 - 5x \]

   \[ y = -6 - 3x \]

   \[ (-3, 1) \]

   \[ 5x + 6 + 3x = -18 \]

   \[ 8x = -24 \]

   \[ x = -3 \]