Introductory Algebra Final Exam Review

Note: This review represents the topics covered by the final exam. It is in no way intended to represent the quantity of any particular type of problem on the final exam. The answers are provided at the end of this packet.
Note: Problem numbers 1 – 28, 51 – 56, 64, 65, and 68 – 112 serve as a review of the concepts covered on the midterm.

Terminology: Be able to recognize, identify and use these terms.

absolute value	equation	factor	multiple	LCD
reciprocal	solution	inequality	interval notation	x-intercept
y-intercept	origin	quadrant	ordered pair	slope
slope-intercept form	parallel lines	perpendicular lines	linear system	system of linear inequalities

For #1–20, simplify the expression. You could use a calculator, but it's best to have an understanding of order of operations (and fraction operations) without a calculator.

1. $|3-15| \cdot (-4) \div (-16)$

2. $\dfrac{(-7)(-3)-4 \cdot 3}{3[7 \div (3-10)]}$

3. $12 - [7-(3-6)] + (2-3)^3$

4. $\dfrac{2}{5} + \dfrac{3}{4} - \dfrac{1}{2}$

5. $-\dfrac{3}{4} - \left(-\dfrac{5}{4}\right)$

6. $\left(\dfrac{4}{15}\right) \cdot \left(-\dfrac{5}{6}\right) \cdot \left(-\dfrac{3}{16}\right)$

7. $-\dfrac{5}{6} + \dfrac{3}{5} - \dfrac{-7}{10}$

8. $\dfrac{5}{2} \div \dfrac{10}{3}$

9. $\dfrac{9}{4} - 3 - \dfrac{2}{3}$

10. $\dfrac{-4}{-3} \cdot \dfrac{-11}{12} + \dfrac{-1}{9}$

11. $\dfrac{-4}{-3} \cdot \left(\dfrac{-11}{12} + \dfrac{-1}{9}\right)$

12. $-\dfrac{6}{15} \div \left(\dfrac{-8}{5} \cdot \dfrac{9}{-16}\right)$

13. $\dfrac{-7}{9} - \dfrac{-7}{12}$

14. $-\dfrac{12}{20} \div \left(\dfrac{-3}{5} \cdot \dfrac{10}{9}\right)$

15. $(3-5+12)^2 \div 5^2 + (-3)^2$

16. $\dfrac{(3-5+12)^2}{5^2 + (-3)^2}$

17. $4^2 - 3[5-(-2+7)5]$

18. $\dfrac{4}{6} \div \left(\dfrac{9}{2} - \dfrac{3}{4}\right) + (-3)$

19. $\dfrac{6-3(2-4)^3-(-8)}{4-\left(17-8\{6+(-2)^3\}^2\right)}$

20. $\left|\dfrac{2}{5} - \dfrac{3}{4}\right| - \left(4 + \left(-\dfrac{4}{5}\right)\right)^2$

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21. A pipe 24 feet long is cut into three pieces. The first piece is twice as long as the second piece and the third piece is 6 feet longer than the second piece. What are the lengths of all 3 pieces?

22. One number is 4 times a second number and their sum is 120. Find the numbers.

23. A major-league pitcher throws a ball upward with an initial rate of 130 feet per second. The height h (in feet) of the ball after t seconds is given by the formula $h = 130t - 16t^2$. Determine the height of the ball after 4 seconds.

24. In a physics class of 36 students, 5 more students received B's than A's and twice as many students received C's as A's. Seven people received a grade below C. How many students received A's, B's and C's?

25. Food for hummingbirds must contain four times as much water as sugar. How much sugar and water are needed to make 20 cups of food?

26. A broker invests twice the amount of money in a low-risk mutual fund as in a high-risk mutual fund. The low-risk fund showed a return of 4%, and the high-risk fund showed a loss of 10%. If the net loss on the investments was $600, how much money did the broker invest?

27. Two teachers are team-teaching for the first time together at Null Elementary School. They are planning on shopping together to purchase decorations for their new room. They are told that they will teach in one large room with a perimeter of 228 ft and the length is 6 ft greater than twice its width. What are the dimensions of their classroom?

28. A plumbing company charges $35 for the service call plus $25 for each hour of work. The owner of an apartment complex budgeted $200 to repair its oven. How many hours of service can the owner afford so that she does not exceed her budget?

For #29-32, determine the slope of the line that passes through the given points.
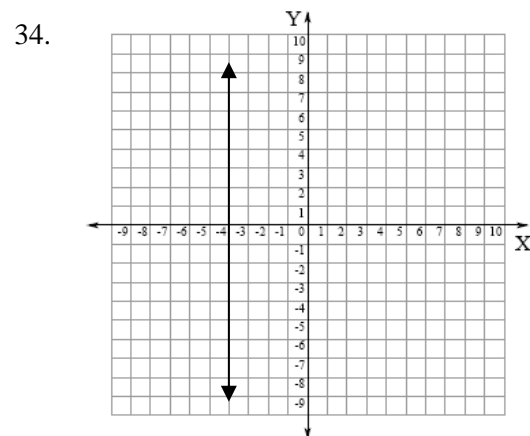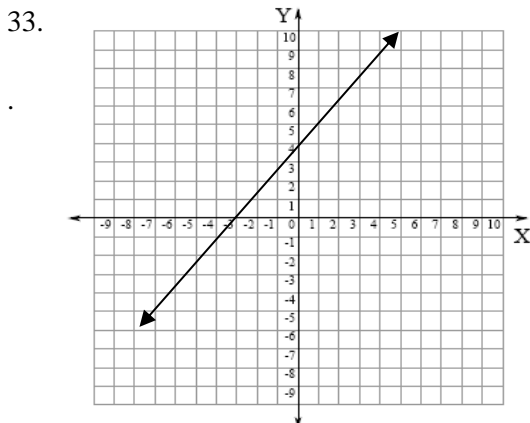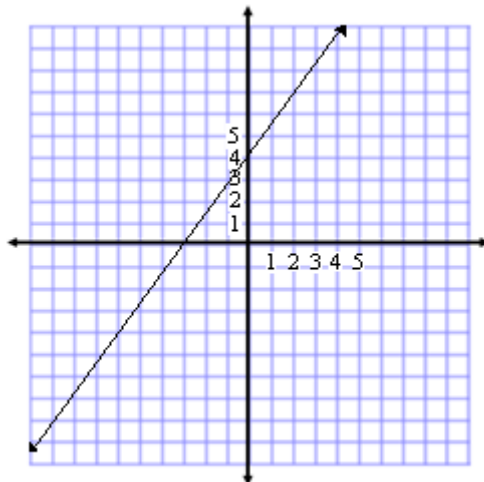
29. $(-2,3)$ and $(-1,-5)$

30. $(2,-5)$ and $(-1,-5)$

31. $(-1,-10)$ and $(5,6)$

32. $(-2,3)$ and $(-2,-5)$

For #33-34, determine the slope of the line.

33.

34.

For #35-38, use the given graph to answer the questions that follow.

35. Approximate the value of x when $y = 3$.

36. Write the y-intercept as an ordered pair.

37. Write the x-intercept as an ordered pair.

38. Write the equation of the line in slope-intercept form.

For #39-42, graph the line and determine the slope and intercepts.

39. $\dfrac{3}{4}x - y = 3$

40. $2x + 5y = -10$

41. $-\dfrac{3}{4}x + 5 = -1$

42. $-3 - \dfrac{1}{2}y = -2$

For #43-50, find the equation of the line, and write in slope-intercept form, if possible.

43. Find the equation of the line that passes through the points $(4,3)$ and $(4,-1)$.

44. Find the equation of the line with slope $\dfrac{1}{2}$ that passes through $(0, 3)$.

45. Find the equation of the line with slope $\dfrac{1}{2}$ that passes through $(4, 3)$.

46. Find the equation of the line that passes through $(1,3)$ and $(-2,1)$.

47. Find the equation of the line with slope 0 that passes through $(4, 3)$.

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48. Find the equation of the line that is perpendicular to $y = 3x - 5$ and passes through $\left(0, \dfrac{4}{5}\right)$.

49. Find the equation of the line parallel to $4x + 2y = 2$ that passes through $(-3, 4)$.

50. Find the equation of the line perpendicular to $x = -3$ and passes through $(-3, 7)$.

For #51-56, graph the solution on the number line, and write the solution in interval notation.

51. $2x - 6 > 0$

52. $-\dfrac{1}{2}x \geq 6$

53. $\dfrac{2}{3}x \leq -10$

54. $5(x - 2) \leq x + 1$

55. $24 \leq 8x + 8$ *or* $2x - 5 < 7$

56. $24 \leq 8x + 8$ *and* $2x - 5 < 7$

For #57-59, solve the following systems of equations, state whether the system is consistent/inconsistent and independent/dependent.

57. $\begin{cases} -12x - 8y = -8 \\ 6x + 4y = 4 \end{cases}$

58. $\begin{cases} 2y + 3x = 2 \\ 4x + 6y = -\dfrac{7}{3} \end{cases}$

59. $\begin{cases} 3x - 4y = 8 \\ -6x + 8y = 8 \end{cases}$

For #60-63, graph the following systems of inequalities.

60. $\begin{cases} x + 2y \leq 2 \\ x + y \geq 0 \end{cases}$

61. $\begin{cases} x \leq 4 \\ y > -3 \end{cases}$

62. $\begin{cases} x + y \leq 4 \\ x - y < 4 \end{cases}$

63. $\begin{cases} x + y > 3 \\ 5x - y > -27 \end{cases}$

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64. Jack has saved a total of $2.15 in nickels and dimes in his piggy bank. He has 10 more nickels than dimes. How many of each denomination does he have in his piggy bank?

65. The perimeter of a desk is 28 feet. If the width is 2 feet less than the length, find the dimensions of the desk.

66. *Del Monte Bloom Energy Drink* contains 50% fruit juice while *Rockstar Juice*, an energy/ juice hybrid, contains 70% fruit juice. How much of the *Del Monte Bloom Energy Drink* should be mixed with the *Rockstar Juice* drink to make 12 ounces of a 65% fruit juice blend?

67. Corey has just moved into his first apartment and is trying to decide between two different calling plans so that he can use his phone. The *Unlimited Plus Plan* has a $32.99 monthly fee with unlimited free long-distance calls. The *One Rate®* *10¢ Nationwide Direct Plan* has a monthly fee of only $2.99, but there is also a 10¢ charge for each call made. How many calls would someone with the *One Rate® 10¢ Nationwide Direct Plan* have to make for the monthly cost to be the same as the *Unlimited Plus Plan*?

68. Evaluate: $|3-15| \cdot -20 \div (-4)$

69. Replace ? with the correct symbol: $> < =$ $-|-5| \ ? \ |-5|$

70. Anita recently received a 7.8% pay cut. Her hourly wage is now $21.21. Find her hourly wage before the pay cut.

71. Linda and Dave leave simultaneously from the same starting point biking in opposite directions. Linda bikes at 7 miles per hour and Dave bikes at 10 miles per hour. How long will it be until they are 27 miles apart from each other?

72. Two trains leave a train station at the same time. One travels north at 9 miles per hour. The other train travels south at 11 miles per hour. In how many hours will the two trains be 132 miles apart?

73. If a plane can cover 906 miles in $1\frac{2}{3}$ hours, how long will a 2016 mile trip take?

74. A plane can travel 1980 miles in 9 hours with a tailwind. On the return trip, the trip takes 11 hours. Find the speed of the plane in still air.

75. A ski lift runs at a rate of 22 ft/sec. At that rate, how many minutes would it take to cover a mile? (hint: 1 mile = 5280 feet)

76. The perimeter of an equilateral triangle is 17 inches longer than the length of one side. Find the length of one side.

77. Solve: $\frac{5}{4}a + 3 = 13$

78. Solve: $-3(5 - 3k) = 6k + 6$

79. A Wendy's Mandarin Chicken salad contains 10 grams less fat than a Taco Bell Zesty Chicken Border Bowl. If there are 60 grams of fat in the two salads, find the number of grams of fat in the Taco Bell Zesty Chicken Border Bowl, by solving the equation $x + (x-10) = 60$, where x represents the number of grams of fat in a Taco Bell Border Bowl, and $x - 10$ represents the number of grams of fat in a Wendy's Mandarin Chicken Salad.

80. Solve: $0.3(z - 10) - 0.5z = -6$

81. Solve: $\dfrac{3}{4}x = \dfrac{1}{2}x - 5$

82. Solve: $5n - 3 > 4n$

83. Solve: $3x + 4 > \dfrac{1}{3}(x - 2)$

84. A total of $20,000 is to be divided between Roberto and Juan, with Roberto to receive $2000 less than Juan. How much will each receive?

85. Solve: $-\dfrac{2}{3}m = \dfrac{8}{27}$

86. Solve: $2(x + 7) = -2x - 2 + 16$

87. Solve: $\dfrac{5}{4}x + 2 < \dfrac{5}{6}x - \dfrac{7}{6}$

88. Solve: $6x - 10 < 7x + 2$

89. Sherry purchased a new backpack for her daughter. The backpack was on sale for 20% off the regular price. If Sherry paid $28.80 for the backpack without sales tax, what was the original price?

90. Solve: $4x + 3 < 2x - 10$

91. Solve for T: $\dfrac{AB}{RT} = \dfrac{C}{D}$

92. Solve for C: $AB - \dfrac{RT}{C} = V$

93. Solve for m: $\dfrac{1}{3}t + \dfrac{1}{5}t + m = t$

94. Solve for A: $\dfrac{AB}{RT} = \dfrac{C}{D}$

95. Solve for r: $D = rt$

For #96-99, simplify, and write the answer without using negative exponents.

96. $x^{-6}\, y^7$

98. $-(c^3)^4$

97. $\dfrac{(a^{-6})(a^{-3})}{(a^4)(a^9)}$

99. $-\left(\dfrac{p^{-3}q^2}{4r^5}\right)^{-5}$

For #100-101, simplify, and write the answer in scientific notation.

100. $(7 \times 10^8)(6 \times 10^{12})$ 101. $(4.5 \times 10^{-3}) \div (5 \times 10^{-8})$

102. The number of *E. coli* bacteria in a colony doubles every 20 minutes. After 4 hours, a colony that starts with n bacteria grows to $(2^3)^4 \cdot n$ bacteria. Simplify this expression.

Solve and graph the following absolute value inequalities. Then write the solution using interval notation.
103. $3|2x + 1| \leq 9$ 104. $|-3x + 1| - 5 < 3$

105. $|-3x + 2| > 7$

Solve the absolute value equations. Write the solution using set notation.
106. $|2x - 1| + 2 = 3$ 107. $|5x + 3| = 0$

108. $|2x + 5| + 7 = 3$

Solve and graph the inequalities. Then write the solution using interval notation.
109. $-15 \leq 5(x-7) < 20$ 110. $10 - s \geq 4$ or $-1 < 2s + 3$

111. $-16 < -4(9 - x) \leq 24$ 112. $1 \geq -\frac{1}{2}(4x + 1) \geq 25$

For #113-117, factor the following expressions.
113. $12y^2 + 8y$ 114. $9x^2 + 12x - 6$

115. $6a^4b - 36a^2b^2 + 12ab^3$ 116. $20a^2 - 5ab + 8ac - 2bc$

117. $4p^2 - p^2r - q^3r + 4q^3$

For #118-120, add/subtract as directed.

118. Subtract $(3n^4 - 2n^2 - 6)$ from $(2n^2 - 3n + 1)$

119. Add: $5x^3 + 2x^2 - 1$ and $3 - 7x + x^2 - 4x^3$

120. $(4x^3 - 3x^2) + (x^2 + 2x - 10) - (x^3 - 15)$

For #121-126, multiply:
121. $(x + y)(4x - 7y)$ 122. $(t - 10)(t + 10)$

123. $(x - 2y^2)(4 + 4x - x^3)$ 124. $(2n - 5)^2$

125. $(4p + 7q)^2$ 126. $(\frac{1}{4}x - 12y)(\frac{1}{2}x - 4y)$

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For #127-130, divide:

127. $\dfrac{3x^2-9xy-72y^2}{9y^2}$

128. $(x^2 + x - 12) \div (x + 4)$

129. $\dfrac{-5n^2-3n-17+2n^3}{2-n}$

130. $\dfrac{n^3+2}{n^2-2n+3}$

131. Given $f(x)$ and $g(x)$, find $\dfrac{f(x)}{g(x)}$.

    $f(x) = a^2 - 3a - 28$ and $g(x) = a + 4$

132. Given: $g(x) = -2x + 4$ Find the following:
   a) g(-3)
   b) g(a)
   c) g(a +4)

133. State the domain and range of the following relation.
   $\{(4, -1), (1, -1), (0, 0), (4, 2)\}$

134. Determine whether the following relations are functions.
   a.) $\{(4, 1), (-3, 1), (-1, 1), (7, 1)\}$
   b.) $\{(1,2), (3, 4), (5, 6), (7, 8)\}$
   c.) $\{(-5, 4), (-2, 0), (0, 2), (3, 7), (0, 8)\}$
   d.) $\{(2, 3), (2, -4), (2,2), (2, -1)\}$

135. A car that is purchased new for $22,500 depreciates in value by $1875 per year.
   a.) Use function notation to show the value $V(t)$ of the car (in dollars) t years after it is purchased.

   b.) What is the meaning of $V(6)$? Find this value.

   c.) Graph the function in part (a).
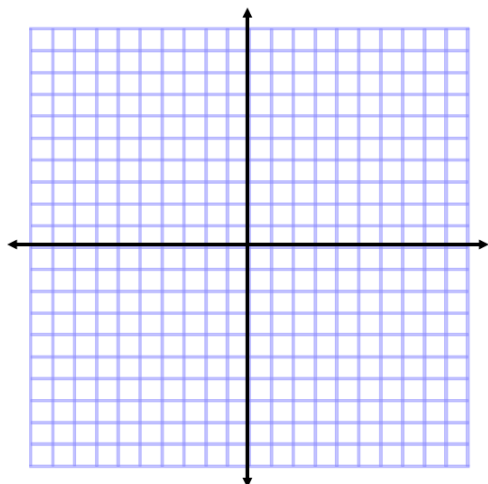
ANSWERS

1. 3

2. −3

3. 1

4. $\dfrac{13}{20}$

5. $\dfrac{1}{2}$

6. $\dfrac{1}{24}$

7. $\dfrac{7}{15}$

8. $\dfrac{3}{4}$

9. $-\dfrac{17}{12}$

10. $-\dfrac{4}{3}$

11. $-\dfrac{37}{27}$

12. $-\dfrac{4}{9}$

13. $-\dfrac{7}{36}$

14. $\dfrac{9}{10}$

15. 13

16. $\dfrac{50}{17}$

17. 76

18. $-\dfrac{127}{45}$

19. 2

20. $-9\dfrac{89}{100}$

21. $4\dfrac{1}{2}$ ft, 9 ft, $10\dfrac{1}{2}$ ft

22. 24; 96

23. 264 ft

24. A: 6; B: 11; C: 12

25. 4 cups sugar; 16 cups water

26. $90,000

27. 36 ft by 78 ft

28. 6.6 hours

29. −8

30. 0

31. $\dfrac{8}{3}$

32. undefined

33 . $\dfrac{5}{4}$

34. undefined

35. $-\dfrac{3}{4}$

36. $(0,4)$

37. $(-3,0)$

38. $y = \dfrac{4}{3}x + 4$

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39. $m = \dfrac{3}{4}$; $(4,0)$; $(0,-3)$
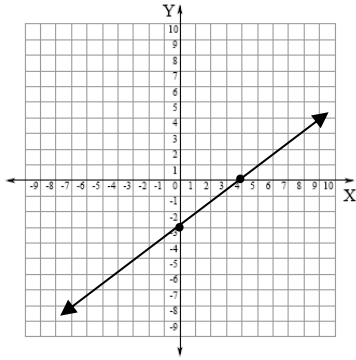
40. $m = -\dfrac{2}{5}$; $(-5,0)$; $(0,-2)$
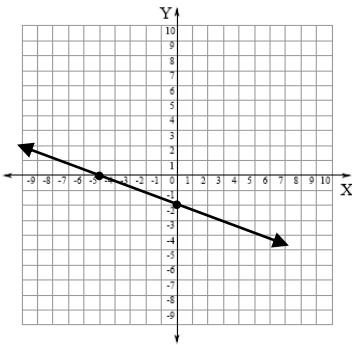
41. *m* is undefined; $(8,0)$; *no y-intercept*
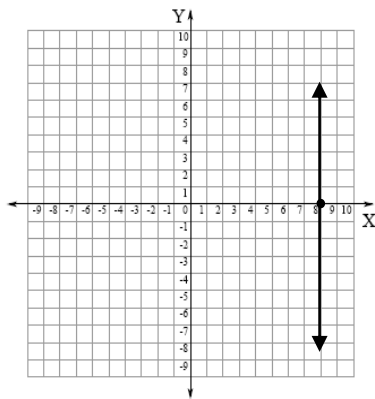
42. $m=0$; $(0,-2)$; *no x-intercept*
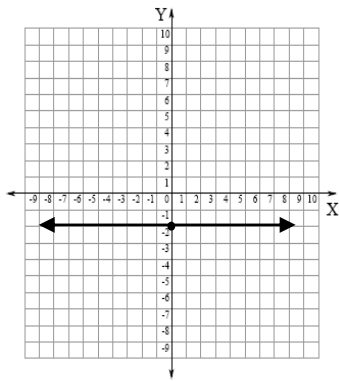
43. $x=4$

44. $y=\dfrac{1}{2}x+3$

45. $y=\dfrac{1}{2}x+1$

46. $y=\dfrac{2}{3}x+\dfrac{7}{3}$

47. $y=3$
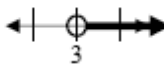
48. $y=-\dfrac{1}{3}x+\dfrac{4}{5}$

49. $y=-2x-2$

50. $y=7$

51.   ; $(3,\infty)$

52.   ; $(-\infty,-12]$

53.   ; $(-\infty,-15]$

54.   ; $\left(-\infty,\dfrac{11}{4}\right]$

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55. ; $(-\infty, \infty)$

56. $[2, 6)$
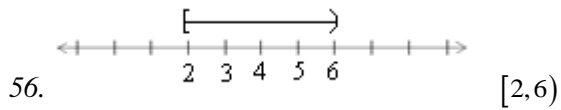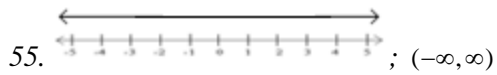
57. *infinitely many solutions, consistent, dependent*

58. $\left(\dfrac{5}{3}, -\dfrac{3}{2}\right)$, *consistent, independent*

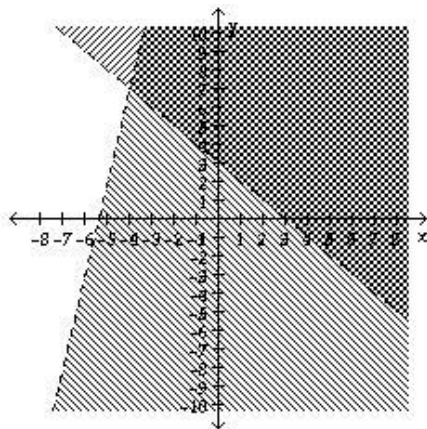59. *no solution, inconsistent, independent*

60. *intersection* $(-2, 2)$
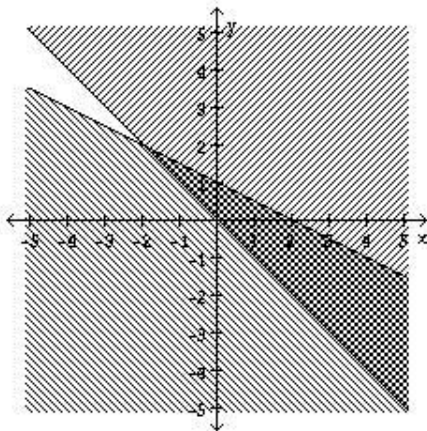
61. *intersection* $(4, -3)$
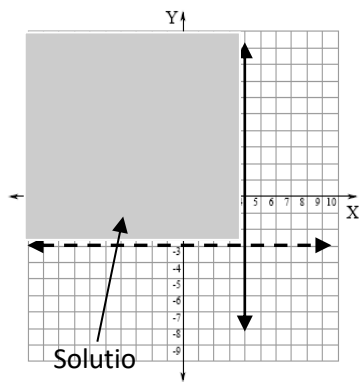
62. intersection $(4,0)$
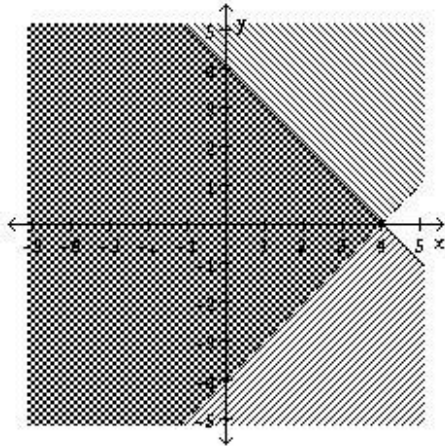
63. intersection $(-4,7)$

64. 11 dimes, 21 nickels

65. 8 ft by 6 ft

66. 3 oz Del Monte; 9 oz Rockstar

67. 300 calls

68. 60

69. <

70. $23

71. 1.6 hours

72. 6.6 hours

73. 3.7 hours

74. 200 mph

75. 4 min.

76. $8\frac{1}{2}$

77. $a = 8$

78. $k = 7$

79. 35 grams of fat

80. $z = 15$

81. $x = -20$

82. $n > 3, (3, \infty)$

83. $x > -\dfrac{7}{4}, \left(-\dfrac{7}{4}, \infty\right)$

84. Juan $11,000, Roberto $9000

85. $m = \dfrac{-4}{9}$

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86. $x = 0$

87. $x < -\dfrac{38}{5}$

88. $-12 < x$

89. $x = \$36.00$

90. $x < -\dfrac{13}{2}$, $\left(-\infty, -\dfrac{13}{2}\right)$

91. $\dfrac{ABD}{RC} = T$

92. $\dfrac{RT}{(V - AB)} = C$

93. $m = \dfrac{7}{15}t$

94. $A = \dfrac{CRT}{DB}$

95. $\dfrac{D}{t} = r$

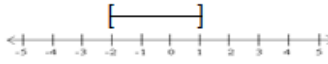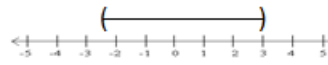96. $\dfrac{y^7}{x^6}$

97. $\dfrac{1}{a^{22}}$

98. $-c^{12}$

99. $-\dfrac{1024\,p^{15}r^{25}}{q^{10}}$
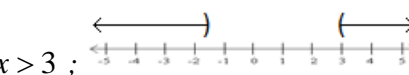
100. 4.2×10^{21}

101. 9×10^{4}

102. $4096n$

103. $-2 \le x \le 1$;   ; $[-2, 1]$

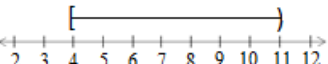104. $-\dfrac{7}{3} < x < 3$;   ; $\left(-\dfrac{7}{3}, 3\right)$
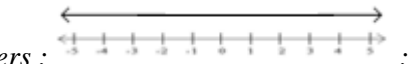
105. $x < -\dfrac{5}{3}$ or $x > 3$;   ; $\left(-\infty, -\dfrac{5}{3}\right) \cup (3, \infty)$
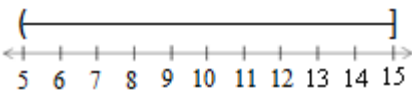
106. $\{0, 1\}$

107. $\left\{-\dfrac{3}{5}\right\}$

108. no solution

109. $4 \le x < 11$;   ; $[4, 11)$

110. all real numbers ;   ; $(-\infty, \infty)$

111. $5 < x \le 15$; ; $(5,15]$

112. *no solution* ; ; $\varnothing$

113. $4y(3y+2)$

114. $3(3x^2 + 4x - 2)$

115. $6ab(a^3 - 6ab + 2b^2)$

116. $(4a - b)(5a + 2c)$

117. $(4 - r)(p^2 + q^3)$

118. $-3n^4 + 4n^2 - 3n + 7$

119. $x^3 + 3x^2 - 7x + 2$

120. $3x^3 - 2x^2 + 2x + 5$

121. $4x^2 - 3xy - 7y^2$

122. $t^2 - 100$

123. $-x^4 + 2x^3 y^2 + 4x^2 + 4x - 8xy^2 - 8y^2$

124. $4n^2 - 20n + 25$

125. $16p^2 + 56pq + 49q^2$

126. $\dfrac{1}{8}x^2 - 7xy + 48y^2$

127. $\dfrac{x^2}{3y^2} - \dfrac{x}{y} - 8$

128. $x - 3$

129. $-2n^2 + n + 5 - \dfrac{27}{2-n}$

130. $n + 2 + \dfrac{n-4}{n^2 - 2n + 3}$

131. $a - 7$

132. (a.) 10

    (b.) $-2a + 4$

    (c.) $-2a - 4$

133. *domain* $\{0,1,4\}$; *range* $\{-1,0,2\}$

134. (a.) *yes*

    (b.) *yes*

    (c.) *no*

    (d.) *no*

135.   *(a.)* $V(t) = -1875t + 22500$

(b.) the value of the car 6 years after purchase ; $11,250

(c.)