



Summer Skills Packet

For students entering Geometry Honors

This packet is **NOT** OPTIONAL

All topics will be reviewed the first day.

A test, on all concepts, will be given the **second day** of class.

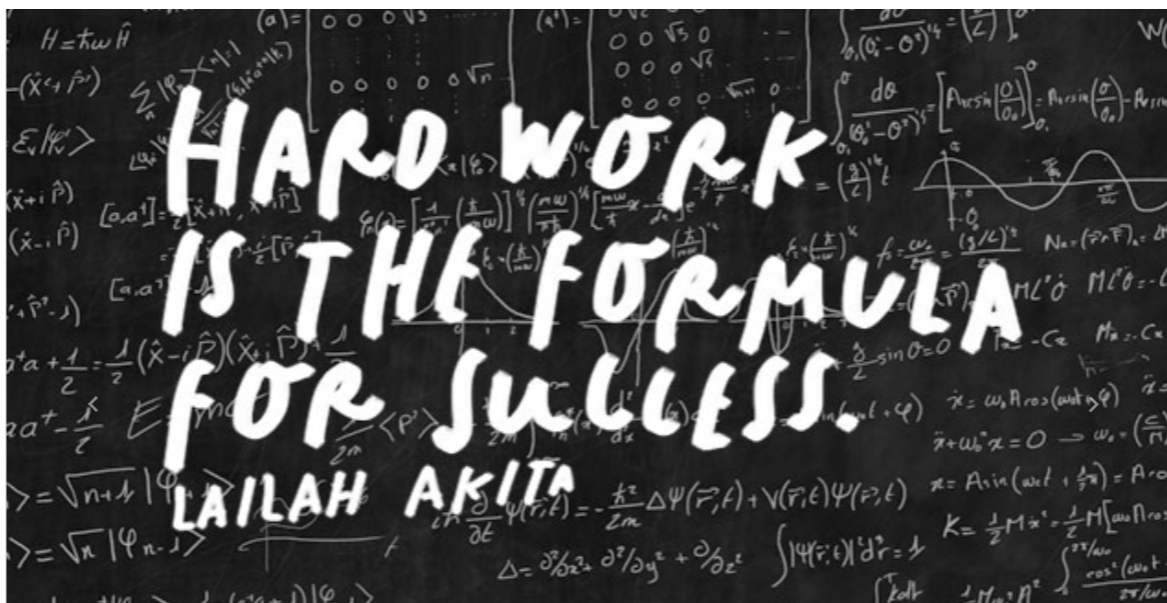
For students that need additional support, check out Khan Academy.

Answers are included in the back of the packet.

Have a great summer and we look forward to seeing you in September!!

Topics Covered in Algebra I that you need to know for Geometry

- | | |
|--------------------------------|------------------------------|
| ⇒ Solving Linear Equations | ⇒ Distance Formula |
| ⇒ Solving Systems of Equations | ⇒ Midpoint Formula |
| ⇒ Factoring | ⇒ Pythagorean Theorem |
| ⇒ Solving Quadratic Equations | ⇒ Graphing Lines |
| ⇒ Simplifying Radicals | ⇒ Writing Equations of Lines |



SOLVING EQUATIONS

Solving Linear Equations: SHOW ALL WORK and NO DECIMAL ANSWERS!

1. $x + 3 = 23$

2. $19 = y - 15$

3. $24 = 3a$

4. $44 = -4w$

5. $\frac{1}{3}k = -2$

6. $30 = -\frac{4}{3}w$

7. $5x + 3 = 23$

8. $8 - 5w = -37$

9. $\frac{x}{2} + 4 = 3$

10. $4x - 9 = 7x + 12$

11. $5x - 22 - 7x + 2 = 40$

12. $2x = x + 3$

13. $4(180 - x) = 90 - x$

14. $2(180 - x) + 45 = 3x$

15. $2(90 - x) + 180 - x = 45$

16. $\frac{4}{3}x + 2(3 - x) = 5$	17. $2x - 3(x + 4) = -1$	18. $\frac{2x - 5}{7} = 4$
19. $8(y - 2) + 6 = 2(y + 1)$	20. $\frac{1}{2}z - \frac{3}{4} = z - \frac{5}{8}$	21. $-3x + 4 = \frac{1}{3}x - \frac{8}{3}$

Solving Proportions: SHOW ALL WORK and NO DECIMAL ANSWERS!

Remember to solve proportions using cross multiplication. Here is an **EXAMPLE** if you are stuck:

$$\frac{2 + x}{5} = \frac{3x - 1}{9}$$

$$9(2 + x) = 5(3x - 1)$$

$$18 + 9x = 15x - 5$$

$$18 = 6x - 5$$

$$23 = 6x$$

$$x = \frac{23}{6} \text{ OR } 3\frac{5}{6}$$

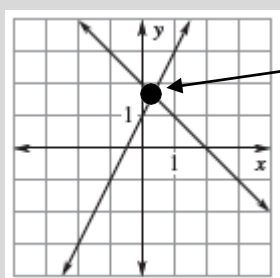
22. $\frac{5}{k} = \frac{7}{16}$	23. $\frac{a}{6} = \frac{-5}{2}$	24. $\frac{2k}{3} = \frac{k + 1}{2}$	25. $\frac{j + 3}{-5} = \frac{j - 2}{3}$
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SOLVING SYSTEMS OF EQUATIONS

A system of equations is two equations with two variables, usually x and y . You can't solve each equation individually, but with 2 equations you can use either substitution or elimination to solve. The solution of the system is the **ORDERED PAIR** that works in both equations. If you remember that each equation represents a line, you are just trying to find the ordered pair where the two lines intersect.

POSSIBILITIES:

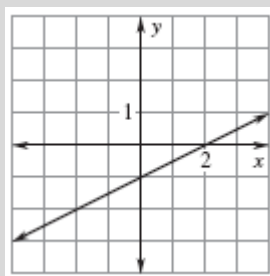
One Solution



Solution

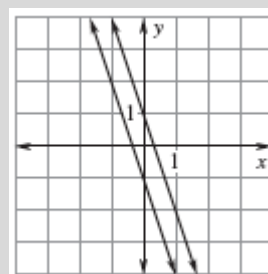
The lines intersect and the solution is the ordered pair where the two lines meet.

Infinite # of Solutions



The lines are exactly the same so lie right on top of each other. The solution is all real numbers or you can just write the equation of the line as the solution because every point on the line works.

No Solution



The lines don't intersect because they are parallel so no solution exists. Your answer would be no solution or \emptyset .

Solve using the **SUBSTITUTION** method. Solutions must be written as an ordered pair, no solution \emptyset , or the equation of the line!

Here is an **EXAMPLE** if you are stuck:

$$y = x - 1$$

$$2x - y = 1$$

Since y is the same as $x-1$, we can replace y with $x-1$ in the second equation!

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

$$2x - x + 1 = 1$$

$$x = 0$$

Now that you know x , you can just plug x into either equation to find the value of y .

$$y = (0) - 1$$

$$y = -1$$

SOLUTION: (0, -1)

26. $y = x + 8$
 $2y + x = 1$

27. $x = \frac{1}{2}y$
 $4x - 2y = 12$

28. $y = -2x + 5$
 $3x - 2y = 4$

29. $x + 4y = 5$
 $5x - 7y = -2$

Solve using the **ELIMINATION** method. **Solutions must be written as an ordered pair, no solution \emptyset , or the equation of the line!**

Here are two **EXAMPLES** if you are stuck:

Try to eliminate one of the variables by adding or subtracting the equations. Sometimes the equations are all set for you like EXAMPLE A, but then there are those like EXAMPLE B when you will need to force one of the variables to eliminate by multiplying each equation by a number.

A.

$$\begin{array}{r} x + y = 5 \\ + x - y = 1 \\ \hline 2x = 6 \\ x = 3 \end{array}$$

Now that you know x, you can just plug x into either equation to find the value of y.

$$\begin{array}{r} (3) + y = 5 \\ y = 2 \end{array}$$

SOLUTION: (3, 2)

B.

$$\begin{array}{r} 2x + 4y = -18 \\ 3x - y = 1 \end{array} \quad \longrightarrow \quad \begin{array}{r} 2x + 4y = -18 \\ 4(3x - y = 1) \end{array}$$

$$\begin{array}{r} 2x + 4y = -18 \\ + 12x - 4y = 4 \\ \hline 14x = -14 \\ x = -1 \end{array}$$

Now that you know x, you can just plug x into either equation to find the value of y.

$$\begin{array}{r} 2(-1) + 4y = -18 \\ -2 + 4y = -18 \\ 4y = -16 \\ y = -4 \end{array}$$

SOLUTION: (-1, -4)

30. $2x + y = 1$
 $3x - y = 14$

31. $x - 2y = 6$
 $x - 3y = 4$

32. $5x + 3y = -9$
 $2x - 5y = -16$

33. $x + 2y = 8$
 $2x - 3y = -19$

NOW CHOOSE THE METHOD YOU WANT TO USE TO SOLVE THE SYSTEM!

34. $8y = x - 1$
 $2x = 10y + 5$

35. $8x - 5y = 14$
 $10x - 2y = 9$

*****MULTIPLYING BINOMIALS—FOIL*****

FOIL- Multiply the FIRST terms, then the OUTER terms, then INNER, and finish with the LAST terms of each grouping. Combine all like terms for your final answer.

Here is an **EXAMPLE** if you are stuck:

$$\begin{aligned} &(x + 2)(x - 3) \\ &x^2 - 3x + 2x - 6 \\ &x^2 - 1x - 6 \end{aligned}$$

36. $(x + 2)(x - 2)$

37. $(x - 1)^2$

38. $(4x + 5y)(2x - 7y)$

FACTORING

FACTORING- For factoring, you break up a polynomial into factors or parts, which is the opposite of multiplying like FOIL. There are many types of factoring so let's separate them into types.

GCF-Greatest Common Factor

Pulling out (dividing by) a GCF is the opposite of distributing. Take out the GCF and then write what is left in parentheses. Here is an **EXAMPLE** if you are stuck:

$$3x^2 - 12x = 3x(x - 4)$$

39. $6a^2 + a$

40. $2a + 8a^2$

41. $2x^3 + 8x^2 + 6x$

DOS-Difference of Perfect Squares

Here is an **EXAMPLE** if you are stuck:

$$x^2 - 36 = (x + 6)(x - 6)$$

42. $x^2 - 16$

43. $4x^2 - 25$

44. $16x^2 - 225$

Trinomials

When you factor a trinomial, make sure you find numbers that multiply to the last term and add to the middle term. Watch your signs! FOIL your answer to check! Here are two **EXAMPLES** if you are stuck:

No number in front of the squared term:

$$c^2 + 8c + 12 = (c + 6)(c + 2)$$

Number in front of the squared term:

$$3x^2 + 4x - 7 = (3x + 7)(x - 1)$$

45. $x^2 - 10x + 21$

46. $c^2 + c - 42$

47. $a^2 - 6a + 8$

48. $x^2 + 18x + 81$

49. $9x^2 - 12x + 4$

50. $25x^2 + 80x + 64$

51. $2x^2 + 5x + 2$

52. $5a^2 - 11a + 2$

53. $15k^2 - k - 2$

SOLVING QUADRATICS

Solving Quadratic Equations by Factoring

STEPS for solving a quadratic equation, $ax^2 + bx + c = 0$, by factoring:

1. Get the equation equal to zero
2. Factor
3. Set each factor or part equal to zero
4. Solve each equation algebraically to get the two solutions.

The factoring is mixed in the practice problems below. Here is an **EXAMPLE** if you are stuck:

$$x^2 + 2x - 15 = 0$$

$$(x + 5)(x - 3) = 0$$

$$x + 5 = 0$$

$$x - 3 = 0$$

$$x = -5$$

$$x = 3$$

These 3 examples are already factored for you—just solve!

54. $(x - 3)(x + 2) = 0$

55. $(2x + 5)(3x - 1) = 0$

56. $7x(3x - 2) = 0$

Factor and Solve! You should have 2 answers for each.

57. $2x^2 + 6x = 0$

58. $x^2 - 9 = 0$

59. $x^2 - x - 12 = 0$

60. $2x^2 + 3x - 2 = 0$

61. $x^2 + 2x - 15 = 0$

62. $x^2 + 6x + 9 = 0$

63. $4x^2 - 9 = 0$

64. $x^2 + 14x = -49$

65. $x^2 + 5x = 150$

66. $x^2 - 19x = 0$

67. $25x^2 = 1$

68. $3m^2 - 14m - 5 = 0$

Solving Quadratic Equations using the Quadratic Formula

STEPS for solving a quadratic equation, $ax^2 + bx + c = 0$, using the quadratic formula:

1. Get the equation equal to zero
2. Determine a, b, and c
3. Plug a, b, and c into the formula
4. Solve algebraically to get the two solutions.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

The factoring is mixed in the practice problems below. Here is an **EXAMPLE** if you are stuck:

$$2x^2 - 5x - 12 = 0$$

$$a = 2 \quad b = -5 \quad c = -12$$

1. After making sure that one side is equal to 0, identify a, b, and c.
Be sure to include the signs on a, b, and c.

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - (4)(2)(-12)}}{2(2)}$$

2. Fill in the blanks of the formula with the values of a, b, c.

$$x = \frac{5 \pm \sqrt{25 + 96}}{4}$$

$$x = \frac{5 \pm \sqrt{121}}{4}$$

$$x = \frac{5 \pm 11}{4}$$

3. Start under the root and follow the order of operations to simplify.

$$x = \frac{5+11}{4} \text{ and } x = \frac{5-11}{4}$$

4. Once the root is simplified, split the problem into two.

$$x = \frac{16}{4} \text{ and } x = \frac{-6}{4}$$

5. If possible, simplify. If not, leave your answer in simplest form.

$$x = 4 \text{ and } x = -1.5$$

Solve using the quadratic formula. Round all answers to the nearest hundredth.

69. $2x^2 - 5x - 2 = 0$

70. $x^2 + 4x = -2$

*****SIMPLIFYING RADICALS—NO CALCULATORS THAT DO THE WORK FOR YOU!*****



Simplify radical expressions:

Break down a radical expression by finding the LARGEST perfect square that divides out of the number under the square root. You might want to review perfect squares:

List the largest perfect squares up to and including 225:

Here is an **EXAMPLE** if you are stuck:

$$\begin{aligned}\sqrt{50} \\ \sqrt{25} \cdot \sqrt{2} \\ \textcircled{5\sqrt{2}}\end{aligned}$$

Simplify the following radical expressions. NO DECIMAL ANSWERS!

71. $\sqrt{12}$	72. $\sqrt{20}$	73. $\sqrt{72}$	74. $\sqrt{200}$
75. $5\sqrt{90}$	76. $2\sqrt{12}$	77. $\sqrt{8} \cdot \sqrt{6}$	78. $\sqrt{5} \cdot \sqrt{15}$

79. $2\sqrt{14} \cdot \sqrt{21}$	80. $\sqrt{5} \cdot 3\sqrt{5}$	81. $(\sqrt{3})^2$	82. $(2\sqrt{3})^2$
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Dividing radical expressions:

You may not leave a radical expression in the denominator of a fraction. If you have a radical in the denominator, you will need to RATIONALIZE THE DENOMINATOR.

Here is an **EXAMPLE** if you are stuck:

$$\frac{1}{\sqrt{3}}$$

$$\frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{3}$$

Simplify the following radical expressions. NO DECIMAL ANSWERS!

83. $\frac{1}{\sqrt{2}}$	84. $\frac{1}{\sqrt{7}}$	85. $\frac{3}{\sqrt{5}}$	86. $\frac{4}{\sqrt{3}}$
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Distance Formula:

Use the distance formula when you want to find the length of a line segment or the distance between 2 ordered pairs.

$$D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Find the distance between each set of ordered pairs. Simplify any radical expressions. NO DECIMAL ANSWERS!

87. (9, 7) and (1, 1)	88. (0, 6) and (-3, -2)	89. (5, 2) and (8, -2)
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Midpoint Formula:

Use the midpoint formula when you want to find the midpoint of a line segment with the specified endpoints. Write your answer as an ordered pair.

$$\text{Midpoint} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Find the midpoint between each set of ordered pairs.

90. (2, 4) and (6, 8)

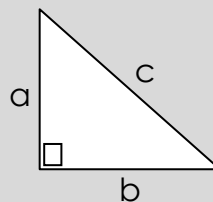
91. (0, 6) and (-3, -2)

92. (-2, 6) and (8, 6)

Pythagorean Theorem:

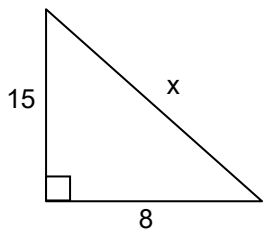
Use the Pythagorean Theorem to find a missing side of a right triangle.

$$a^2 + b^2 = c^2$$

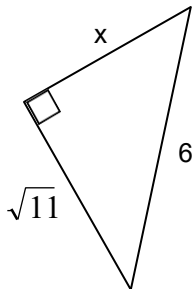


Find the value of x. Simplify all radical expressions. NO DECIMAL ANSWERS!

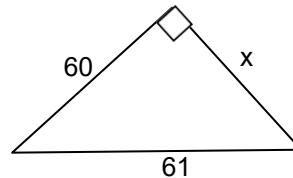
93.



94.



95.



LINEAR EQUATIONS

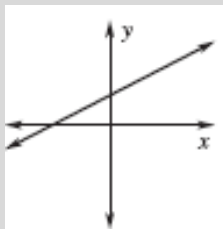
Slope:

Slope is the measure of the steepness of a line. To find the slope between two ordered pairs, use the following formula:

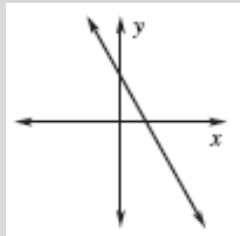
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

There are four types of slope shown below:

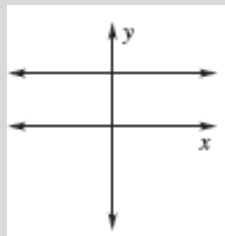
Positive Slope



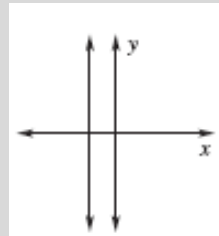
Negative Slope



Zero Slope



Undefined Slope



Find the slope between each set of ordered pairs.

96. (2, 4) and (6, 8)

97. (0, 6) and (7, -2)

98. (-2, 6) and (8, 6)

Graphing Linear Equations:

For the following linear equations, determine the slope and y-intercept. Then graph the lines on each coordinate plane. See the example below to help if you have forgotten slope-intercept form from Algebra I:

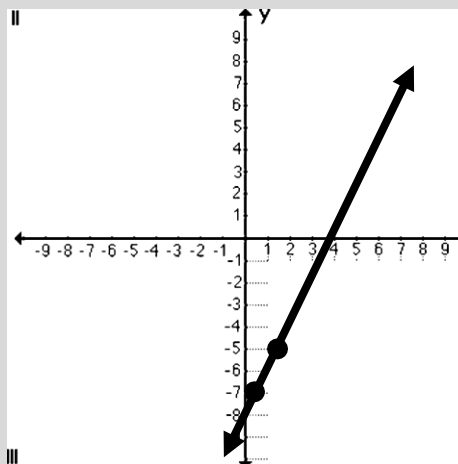
Slope-Intercept Form : $y = mx + b$

Equation in SIF : $y = 2x - 7$

$$m = \frac{2}{1} \quad y\text{-intercept} = (0, -7)$$

$$m = \frac{2}{1} = \begin{matrix} \text{up } 2 \\ \text{right } 1 \end{matrix}$$

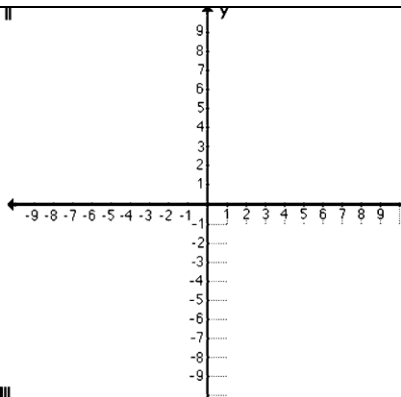
- 1) Plot the y-intercept.
- 2) Use the slope to plot another point on the line.
- 3) Connect the points and draw the line. Put arrows on both ends.



99. $y = x + 3$

$m =$ _____

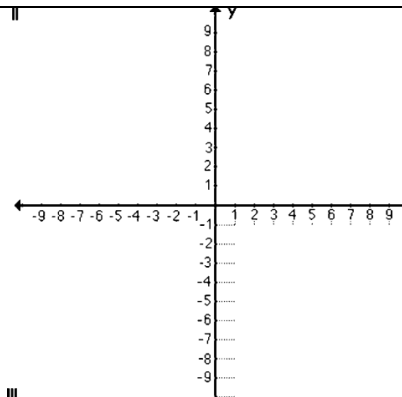
y-intercept = _____



100. $y = -2x - 5$

$m =$ _____

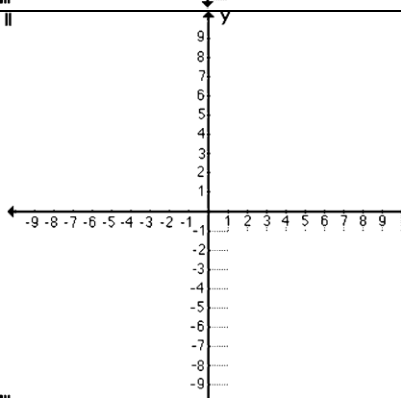
y-intercept = _____



101. $y = -\frac{1}{2}x + 8$

$m =$ _____

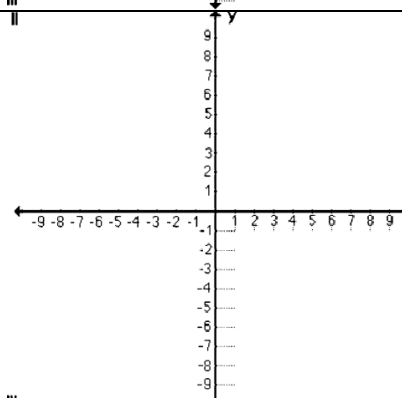
y-intercept = _____



102. $y = \frac{2}{3}x - 6$

$m =$ _____

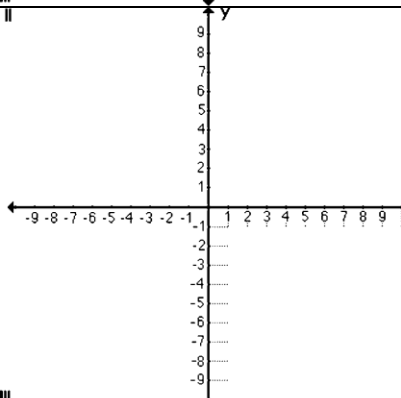
y-intercept = _____



103. $y = -x + 4$

$m =$ _____

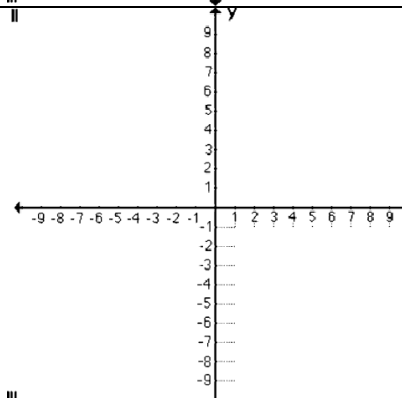
y-intercept = _____



104. $y = \frac{5}{2}x$

$m =$ _____

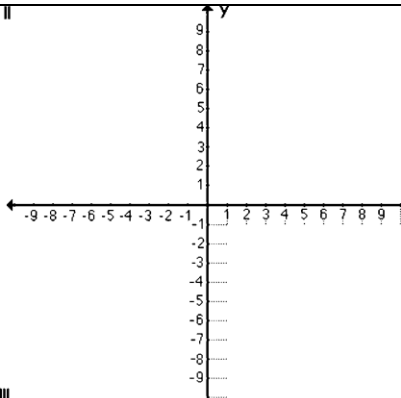
y-intercept = _____



**105. $x = -6$

$m =$ _____

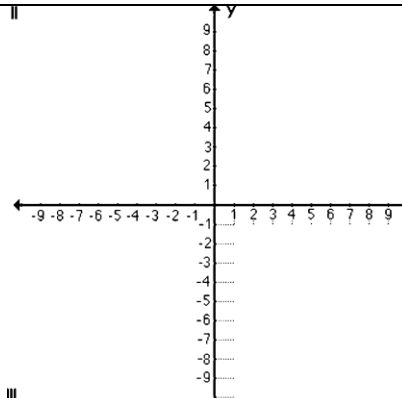
y-intercept = _____



**106. $y = 3$

$m =$ _____

y-intercept = _____



Writing Equations of Lines in Slope-Intercept Form:

When you write the equation of a line in slope-intercept form, you need both the slope and the y-intercept (where the line touches the y-axis). Sometimes you have this information and sometimes you need to do a little work to find them. Remember that slope-intercept form looks like: $y = mx + b$

There are a couple methods you can use to write an equation in slope intercept form. Use whichever one you like best because both will give you the same equation. Look at the following examples to choose your favorite method:

EXAMPLE:

Write the equation of the line that goes through the points $(-1, -2)$ and $(1, 4)$.

Use only slope-intercept form

1) Find the slope of the line.

$$\begin{aligned}m &= \frac{4 - (-2)}{1 - (-1)} \\m &= \frac{6}{2} \\m &= 3\end{aligned}$$

2) Find the y-intercept by plugging the slope and one of the ordered pairs into slope-intercept form.

$$\begin{aligned}m &= 3 \quad (1, 4) \\(4) &= (3)(1) + b \\4 &= 3 + b \\b &= 1\end{aligned}$$

3) Plug the slope and the y-intercept into slope-intercept form and you are done! 😊

$$y = 3x + 1$$

Use point-slope form to put the equation into slope-intercept form

1) Find the slope of the line.

$$\begin{aligned}m &= \frac{4 - (-2)}{1 - (-1)} \\m &= \frac{6}{2} \\m &= 3\end{aligned}$$

2) Find the equation of the line in slope-intercept form by plugging in the slope and one of the ordered pairs into point-slope form.

$$\begin{aligned}m &= 3 \quad (1, 4) \\y - y_1 &= m(x - x_1) \\y - (4) &= (3)(x - (1)) \\y - 4 &= 3(x - 1) \\y - 4 &= 3x - 3 \\+ 4 &\quad + 4\end{aligned}$$

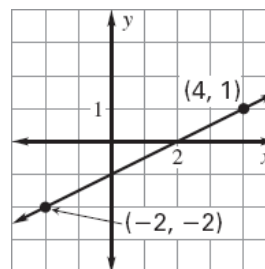
$$y = 3x + 1$$

Write the equation of each line described in slope-intercept form.

107. $m = -\frac{2}{3}, b = 4$

108. $m = 4$ and given point $(5, 3)$

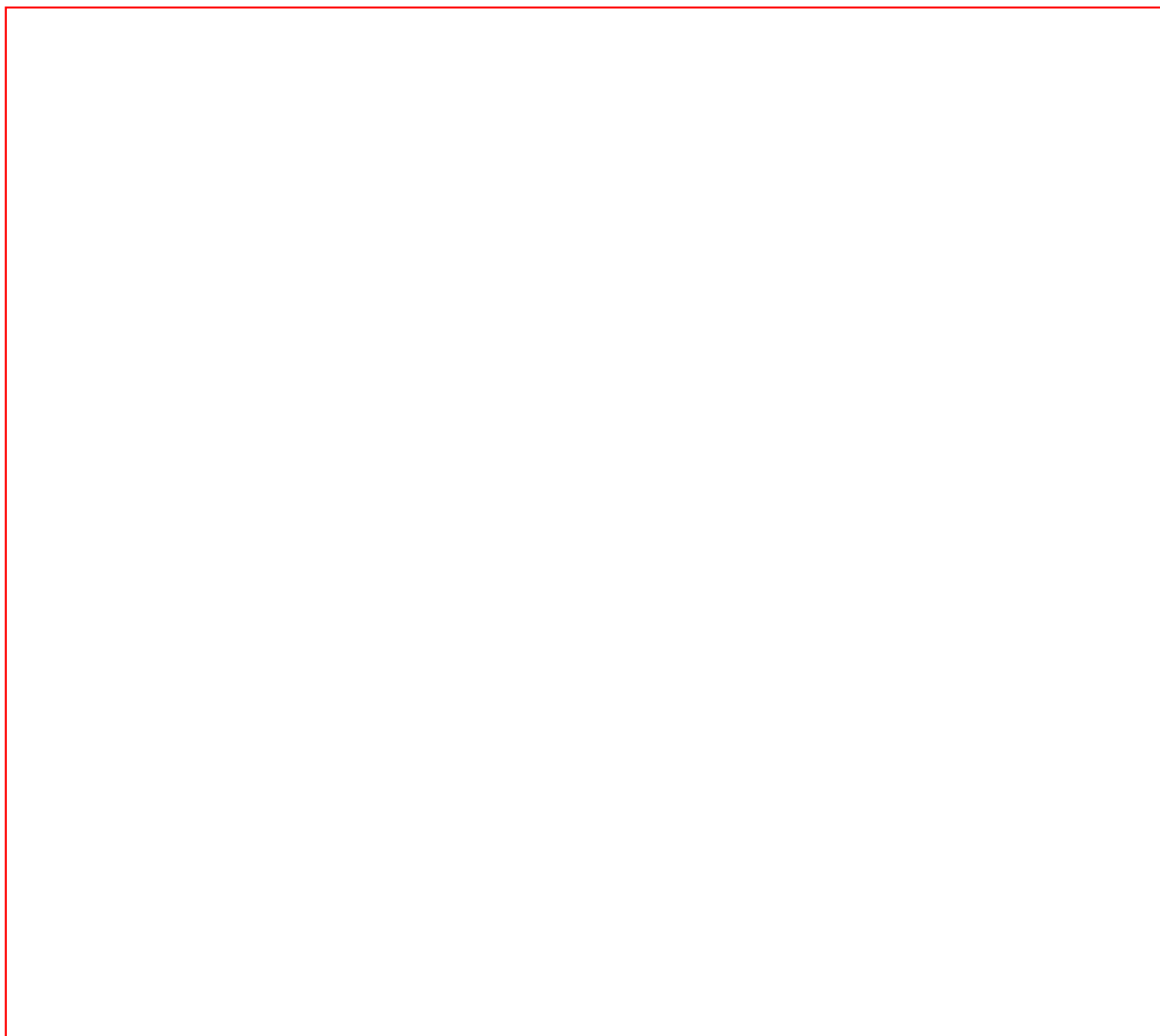
109.



110. $(2, 3)$ and $(2, 7)$

111. $(-1, 0)$ and $(-3, -1)$

112. $(2, -5)$ and $(-2, 3)$



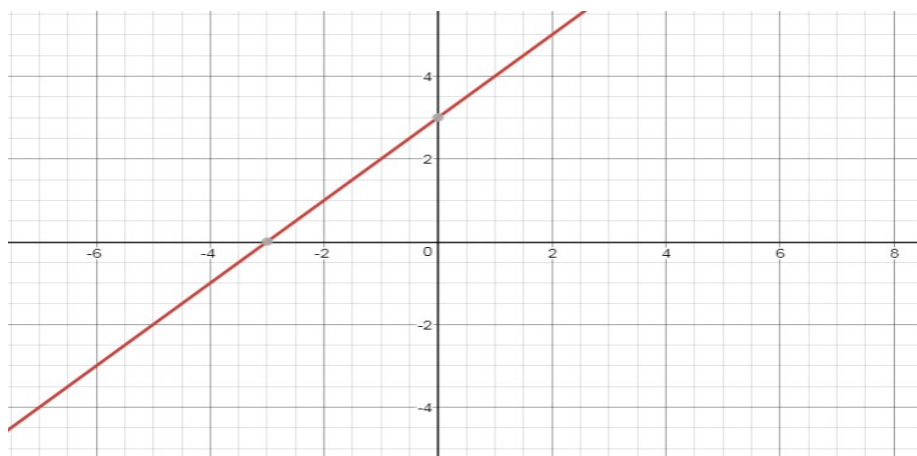
Answers to Summer Geometry Work Packet

1. $x = 20$	2. $y = 34$	3. $a = 8$
4. $w = -11$	5. $k = -6$	6. $w = -\frac{45}{2}$
7. $x = 4$	8. $w = 9$	9. $x = -2$
10. $x = -7$	11. $x = -31$	12. $x = 3$
13. $x = 210$	14. $x = 81$	15. $x = 105$
16. $x = \frac{3}{2}$	17. $x = -11$	18. $x = \frac{33}{2}$
19. $y = 2$	20. $z = -\frac{1}{4}$	21. $x = 2$
22. $k = \frac{80}{7}$	23. $a = -15$	24. $k = 3$
25. $j = \frac{1}{8}$	26. $(-5, 3)$	27. No solution, \emptyset
28. $(2, 1)$	29. $(1, 1)$	30. $(3, -5)$
31. $(2, 10)$	32. $(-3, 2)$	33. $(-2, 5)$
34. $\left(5, \frac{1}{2}\right)$	35. $\left(\frac{1}{2}, -2\right)$	36. $x^2 - 4$
37. $x^2 - 2x + 1$	38. $8x^2 - 18xy - 35y^2$	39. $a(6a + 1)$
40. $2a(1 + 4a)$	41. $2x(x + 1)(x + 3)$	42. $(x + 4)(x - 4)$
43. $(2x + 5)(2x - 5)$	44. $(4x + 15)(4x - 15)$	45. $(x - 3)(x - 7)$
46. $(c + 7)(c - 6)$	47. $(a - 2)(a - 4)$	48. $(x + 9)(x + 9)$
49. $(3x - 2)(3x - 2)$	50. $(5x + 8)(5x + 8)$	51. $(2x + 1)(x + 2)$
52. $(5a - 1)(a - 2)$	53. $(5k - 2)(3k + 1)$	54. $x = 3, x = -2$
55. $x = -\frac{5}{2}, x = \frac{1}{3}$	56. $x = 0, x = \frac{2}{3}$	57. $x = 0, x = -3$
58. $x = \pm 3$	59. $x = 4, x = -3$	60. $x = \frac{1}{2}, x = -2$
61. $x = -5, x = 3$	62. $x = -3$ (Double Root)	63. $x = \pm \frac{3}{2}$
64. $x = -7$ (Double Root)	65. $x = -15, x = 10$	66. $x = 0, x = 19$
67. $x = \pm \frac{1}{5}$	68. $m = -\frac{1}{3}, m = 5$	69. $x \approx 2.85, x \approx -0.35$
70. $x \approx -0.59, x \approx -3.41$	71. $2\sqrt{5}$	72. $2\sqrt{5}$
73. $6\sqrt{2}$	74. $10\sqrt{2}$	75. $15\sqrt{10}$
76. $4\sqrt{3}$	77. $4\sqrt{3}$	78. $5\sqrt{3}$
79. $14\sqrt{6}$	80. 15	81. 3

82. 12	83. $\frac{\sqrt{2}}{2}$	84. $\frac{\sqrt{7}}{7}$
85. $\frac{3\sqrt{5}}{5}$	86. $\frac{4\sqrt{5}}{3}$	87. 10
88. $\sqrt{73}$	89. 5	90. (4,6)
91. $\left(-\frac{3}{2}, 2\right)$	92. (3,6)	93. $x=17$
94. $x=5$	95. $x=11$	96. $m=1$
97. $m=-\frac{8}{7}$	98. $m=0$	

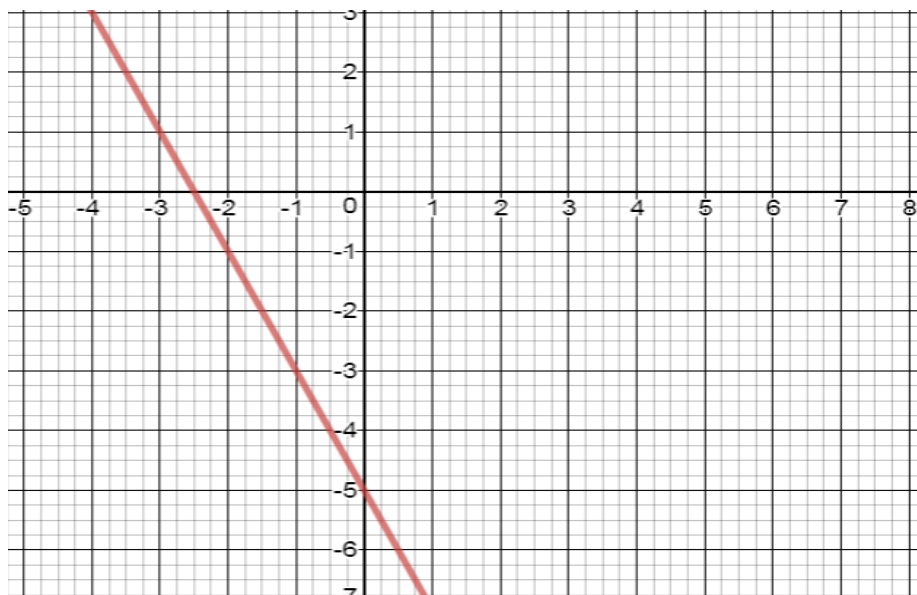
99. $m = 1$

y-intercept = 3

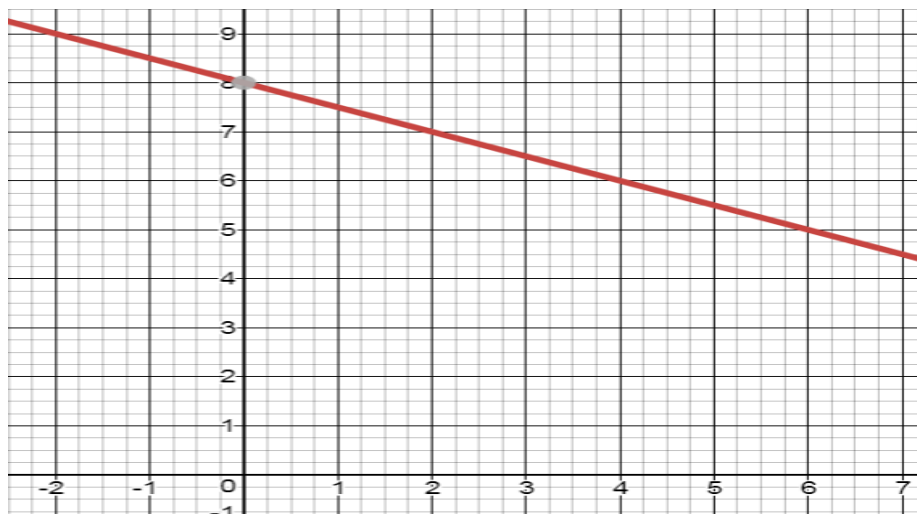


100. $m = -2$

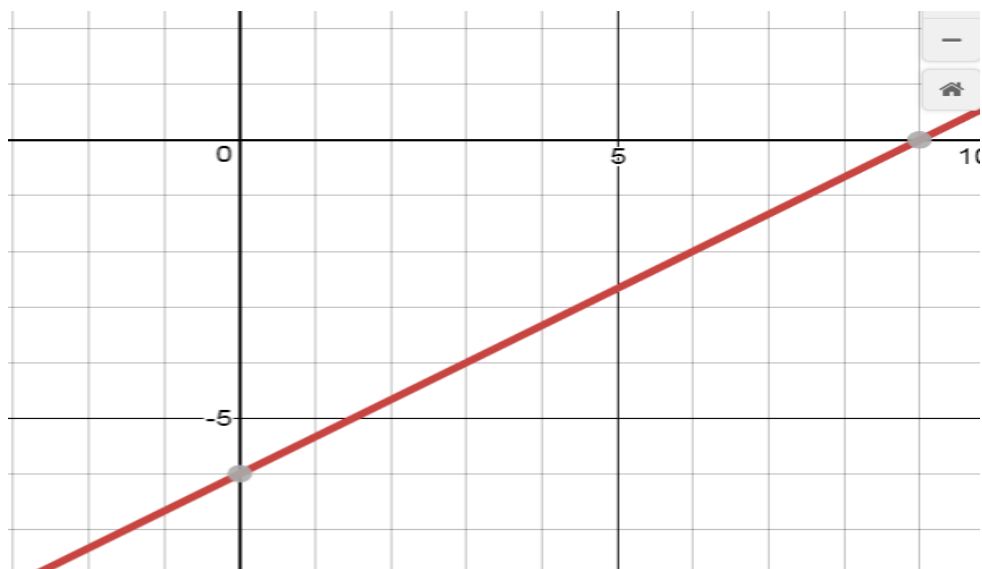
y-intercept = -5



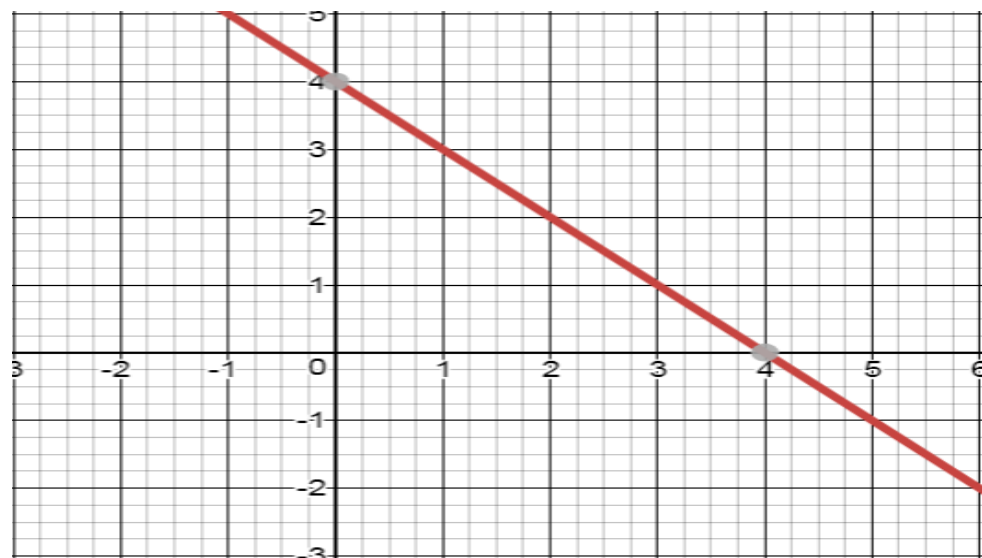
101. $m = -\frac{1}{2}$
y-intercept = 8



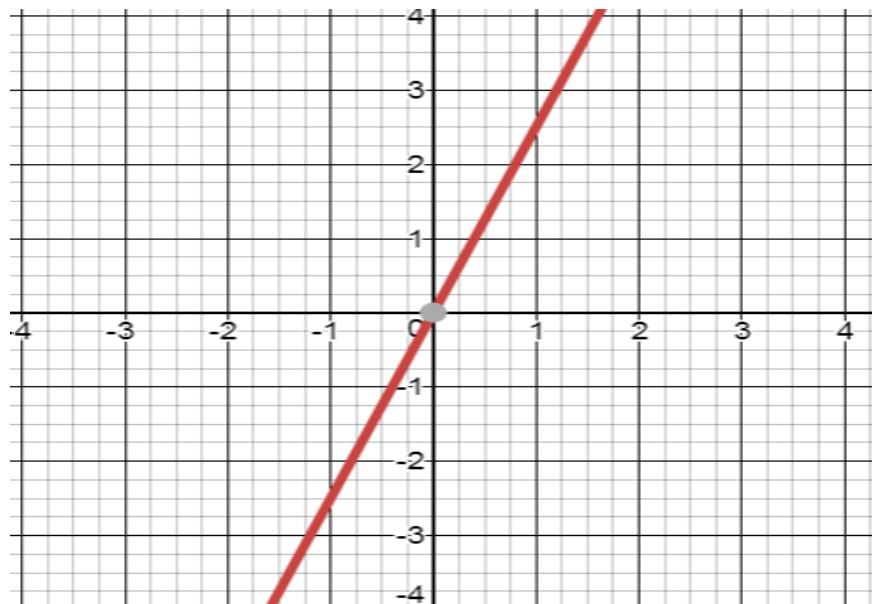
102. $m = \frac{2}{3}$
y-intercept = -6



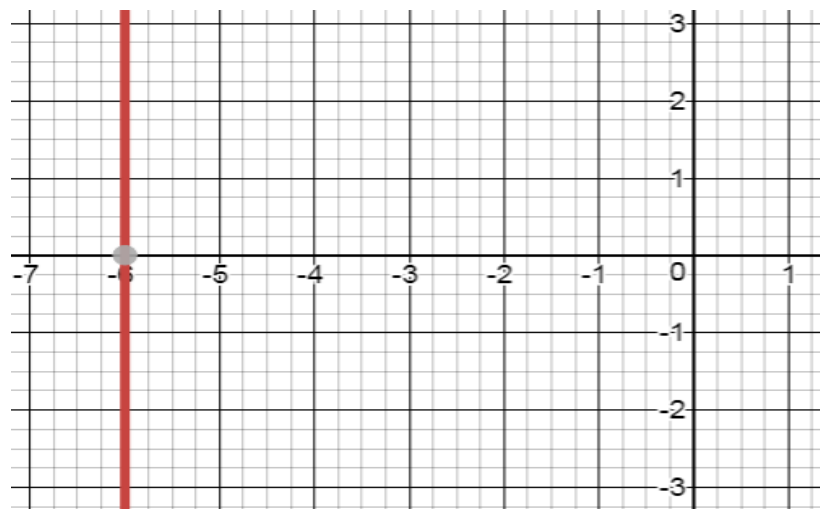
103. $m = -1$
y-intercept = 4



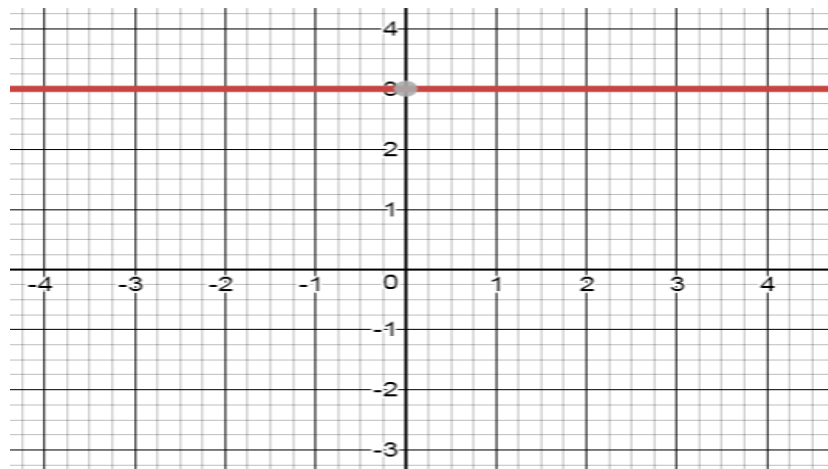
104. $m = \frac{5}{2}$
y-intercept = 0



105. $m = \text{undefined}$
y-intercept = None



106. $m = 0$
y-intercept = 3



107. $y = -\frac{2}{3}x + 4$	108. $y = 4x - 17$	109. $y = \frac{1}{2}x + 1$
110. $x = 2$	111. $y = \frac{1}{2}x + \frac{1}{2}$	112. $y = -2x - 1$