Key

A. Translations –

Need more review? Check out this video or this video!

Fill in the chart with the math symbol or operation that represents each term:

sum	+	**difference**	−	**product**	•
of	•	**twice**	2x	**quotient**	÷
more than	+	**times**	•	**square**	x^2
less than	−	**divided**	÷	**square root**	$\sqrt{x}$
is		**equals**	=	**is less than**	<
is less than or equal to	≤	**is greater than**	>	**is greater than or equal to**	≥

Exercises: Translate the following expressions into math symbols.

1. The quotient of a number and twelve.
   ÷ x 12
   $\frac{x}{12}$

2. Six less than five times a number.
   6 − 5 • x
   $5x - 6$

3. The product of twenty-five and a number equals one hundred.
   • 25 x = 100
   $25x = 100$

4. A number squared is sixteen.
   $x^2 = 16$
   $x^2 = 16$

5. The square root of thirty-six is less than or equal to a number.
   $\sqrt{\ }$ 36 ≤ x
   $\sqrt{36} \leq x$

6. One half of the sum of twenty and a number is greater than or equal to forty.
   $\frac{1}{2}$ + 20 x ≥ 40
   $\frac{1}{2}(20 + x) \geq 40$

B. Operations with Real Numbers

Visit these links to review the sign rules for addition/subtraction and for multiplication/division.

Review sign rules for operations with positive and negative values:

Positive + Positive = positive

Negative + Negative = negative

Positive + Negative = Hmmmmm?

Positive • Positive = positive

Negative • Negative = positive

Positive • Negative = negative

Describe why the sum of a positive and negative value can be either positive or negative: think about a numberline or "zero pairs." Which ever is more, pos. or neg., will overpower the other

Review rules for operations with fractions:

- Adding and subtracting fractions: Find the common denominator; add or subtract the numerator only.
- Multiplying fractions: Multiply numerators, multiply denominators. Simplify by dividing common factors.
- Dividing fractions: Multiply the dividend (first value) by the reciprocal (flip) of the divisor (second value). Simplify if possible.

Need more review? Check out this video!

Exercises: Simplify.

7. $-4+18$

14

8. $-5-5$

-10

9. $7-3-11$

-21

10. $-3+7-4+6$

6

11. $-\frac{1}{3}+\frac{1}{2}$

$-\frac{2}{6}+\frac{3}{6}=\frac{1}{6}$

12. $3-\frac{1}{7}$

$\frac{3}{1}-\frac{1}{7}$

$\frac{21}{7}-\frac{1}{7}=\frac{20}{7}$

13. $\frac{13}{16}+\frac{5}{8}$

$\frac{13}{16}+\frac{10}{16}=\frac{23}{16}$

14. $7(-6)$

-42

15. $-2\bullet(-9)$

18

16. $-30(7)$

-210

17. $-2\bullet4\bullet(-3)$

24

18. $\frac{1}{1}\cdot\frac{-1}{2}$

$\frac{1}{2}$

19. $121\div(-11)$

-11

20. $-56/8$

-7

21. $\frac{-108}{-12}$

9

22. $14\div\frac{7}{8}$

$\frac{14}{1}\cdot\frac{8}{7}=\frac{16}{1}=16$

Exercises: Simplify using your knowledge of exponents, radicals, and absolute value.

23. 5^2

25

5·5

24. 3^4

3·3·3·3

81

25. $\sqrt{49}$

7

26. $\sqrt[3]{8}=2$

x·x·x=8

2·2·2=8

27. $|-23|$

23

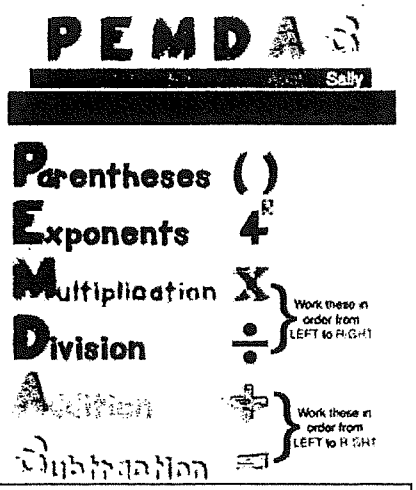
C. Order of Operations

Follow the Order of Operations (PEMDAS) when simplifying expressions:

1. Simplify all grouping symbols: parenthesis, brackets, braces, fraction bars, absolute value and radical signs.
2. Simplify all exponents and radicals.
3. Do multiplication and division in order from left to right.
4. Do addition and subtraction in order from left to right.

Need more review? Check out this video!

Exercises: Simplify.



28. $24 \div 4 \bullet 2$

$6 \cdot 2$

12

29. $\dfrac{3|2-4|}{2(4+3)}$

$\dfrac{3|-2|}{2(7)}$

$\dfrac{3(2)}{14} = \dfrac{6}{14} = \dfrac{3}{7}$

30. $5+6(4-1)\div\dfrac{1}{3}$

$5+6(3)\div\dfrac{1}{3}$

$5+18\cdot\dfrac{3}{1}$

$5+54$

59

31. $\dfrac{9(2+1)^2}{9}+\dfrac{5(4+2)}{5-4}$

$\dfrac{9(3)^2}{9}+\dfrac{5(6)}{1}$

$\dfrac{9(9)}{9}+\dfrac{30}{1}$

$9+30$

39

32. $2\sqrt{25}+10\div 2(6)-|-4|$

$2(5)+5(6)-(4)$

$10+30-4$

36

Challenge:

Insert the fewest number of grouping symbols to make the following equation true:

$24\div(3+9)\times(5-2)=6$

$24\div 12\cdot 3$

$2\cdot 3$

$6=6$ ✓

D. Evaluating Expressions

Replace each variable with its given value and simplify. Use parenthesis when substituting the value to preserve negative signs.

Need more review? Check out this video!

Exercises: Evaluate each of the following expressions for the given values of the variables:

$a=5$ $b=-2$ $c=0$

$d=-4$ $e=1$ $f=3$

33. $3a+4e$

$3(5)+4(1)$

$15+4$

19

34. $2(d-2)$

$2(-4-2)$

$2(-6)$

-12

35. b^2-2df

$(-2)^2-2(-4)(3)$

$4-(-24)$

28

36. $|a-f|+|f-a|$

$|5-3|+|3-5|$

$|2|+|-2|$

$2+2$

4

37. $\frac{2b-4d^2}{3}$

$\frac{2(-2)-4(-4)^2}{3}$

$\frac{-4-4(16)}{3}$

$-4-\frac{64}{3}=\frac{-68}{3}$

38. $5a+6d-\frac{bf}{6}$

$5(5)+6(-4)-\frac{(-2)(3)}{6}$

$25+(-24)-\frac{(-6)}{6}$

$1+1$

2

E. Distributive Property and Combining Like Terms

Use the Distributive Property when an expression with the addition or subtraction of terms is a factor.

Examples:

$8(x^2+y-3) \rightarrow 8x^2+8y-24$

$-4(3a-7b) \rightarrow -12a+28b$

Non-example:

$2(5x)(3) \rightarrow 30x$

The two is not distributed since there is only multiplication and no addition or subtraction.

Combining Like Terms: Like terms have exactly the same variables raised to the same power. Combine by adding or subtracting the coefficients.

Need more review? Check out this video!

Exercises: Simplify.

39. $3x-2-4x$

$-1x-2$

40. $2a-7b+8+4a-3b-10c+1$

$6a-10b-10c-7$

41. $14x^2-6x+8-6x^2+x-11$

$8x^2-5x-3$

42. $-2(3x-4y+5z)$

$-6x+8y+(-10z)$

43. $(3x^2+5x-9)(6)$

$18x^2+30x-54$

44. $\frac{1}{2}(14+10a)$

$7+5a$

45. $3x+6(2x+4)$

$3x+12x+24$

$15x+24$

46. $7(3-2x)+8(-3)(4x-9)$

$21-14x+8-12x+27$

$56-26x$

F. Solving Equations

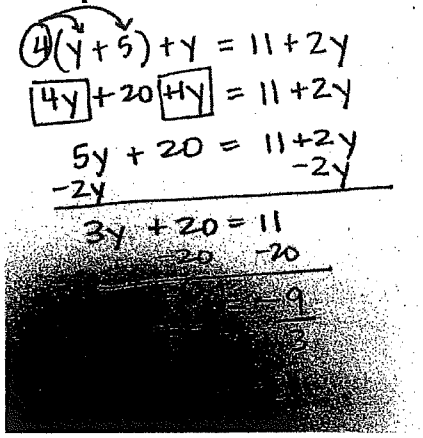
Solve for the variable by isolating it on one side of the equation.

Steps:

1. **Distribute.**
2. **Combine like terms on each side.**
3. **Move all the variables to one side by adding or subtracting.**
4. **Get rid of addition/subtraction.**
5. **Get rid of multiplication/division.**
6. **Check your answer by plugging in the solution.**

Need more review? Check out this video or this video!

Example:



Exercises: Solve:

47. $x-12=-14$

$+12 \quad +12$

$x = -2$

48. $-2y=-20$

$\frac{-2y}{-2} = \frac{-20}{-2}$

$y = 10$

49. $-15=-a-7$

$+7 \quad +7$

$-8 = -a$

$a = 8$

50. $\frac{3}{2}x-18=-42$

$+18 \quad +18$

$\frac{3}{2}x = -24$

$\frac{2}{3} \cdot \frac{3}{2}x = -24 \cdot \frac{2}{3}$

$x = -16$

51. $3w-6+5w=-2$

$8w-6=-2$

$+6 \quad +6$

$\frac{8w}{8} = \frac{4}{8}$

$w = \frac{1}{2}$

52. $21=3(2-a)$

$21 = 6-3a$

$-6 \quad -6$

$\frac{15}{-3} = \frac{-3a}{-3}$

$-5 = a$

53. $8x+3(2-3x)=28$

$8x+6-9x=28$

$-1x+6=28$

$-6 \quad -6$

$\frac{-1x}{-1} = \frac{22}{-1}$

$x = -22$

54. $5x-2(x+1)=10$

$5x-2x-2=10$

$3x-2=10$

$+2 \quad +2$

$\frac{3x}{3} = \frac{12}{3}$

$x = 4$

55. $\frac{1}{4}(8-10x)+\frac{1}{2}x=5$

$2-\frac{10}{4}x+\frac{1}{2}x=5$

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

$2-\frac{4}{2}x=5$

$-2 \quad -2$

$-\frac{4}{2}x = \frac{3}{1}$

$x = -\frac{6}{4}$

$= -\frac{3}{2}$

56. $3-5x=-8x-9$

$+8x \quad +8x$

$3+3x=-9$

$-3 \quad -3$

$\frac{3x}{3} = \frac{-12}{3}$

$x = -4$

57. $3(x-2)=5(x+8)$

$3x-6=5x+40$

$-3x \quad -3x$

$-6 = 2x+40$

$-40 \quad -40$

$\frac{-46}{2} = \frac{2x}{2}$

$-23 = x$

58. $-2(d+3)=1-d$

$-2d+(-6)=1-d$

$+2d \quad +2d$

$-6 = 1+1d$

$-1 \quad -1$

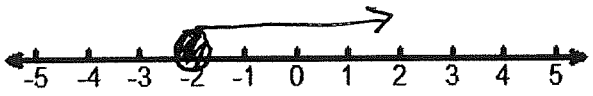
$-7 = 1d$

G. Solving Inequalities

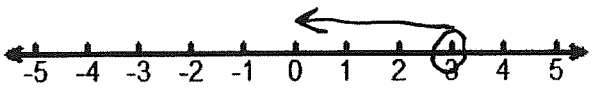
Graph the inequalities on a number line. Remember to use the open circle for < and > and the closed circle for ≤ and ≥. Draw the arrow in the direction that represents the solution.
Need more review? Check out this video!

Exercises: Graph each inequality on a number line.

59. $x \geq -2$



60. $x < 3$



Solve. Remember solving an inequality is just like solving an equation! (See previous section for review if needed!) The only extra step is when you multiply or divide each side of an inequality by a negative number, you must **FLIP** the inequality symbol to maintain a true statement.
Need more review? Check out this video!

Exercises: Solve each inequality. You do not need to graph the solution on a number line.

61. $x+7<10$

$-7 \quad -7$

$x < 3$

62. $-4y \leq 10$

$\frac{-4y}{-4} \leq \frac{10}{-4}$

$y \geq -\frac{10}{4}$

$y \geq -\frac{5}{2}$

63. $\frac{d}{2} \geq -6$

$\left(\frac{2}{1}\right)\frac{d}{2} \geq -6\left(\frac{2}{1}\right)$

$d \geq -12$

64. $-10 \leq -\frac{2}{5}c$

$\left(\frac{-5}{2}\right)-10 \leq -\frac{2}{5}c\left(\frac{-5}{2}\right)$

$25 \geq c$

65. $-2-3x \geq 2$

$+2 \quad +2$

$\frac{-3x}{-3} \geq \frac{4}{-3}$

$x \leq -\frac{4}{3}$

66. $-1 < 26-3x$

$-26 \quad -26$

$\frac{-27}{-3} < \frac{-3x}{-3}$

$9 > x$

67. $2m+3m \geq 85$

$\frac{5m}{5} \geq \frac{85}{5}$

$m \geq 17$

68. $x+10 \leq 3x-8$

$-x \quad -x$

$\frac{10}{2} \leq \frac{2x-8}{2}$

$+8 \quad +8$

$\frac{18}{2} \leq \frac{2x}{2}$

$9 \leq x$

69. $5(2h-3)-6(h-6) > 5$

$10h-15-6h+36 > 5$

$4h+21 > 5$

$-21 \quad -21$

$\frac{4h}{4} > \frac{16}{4}$

$h > 4$

70. $-2(7-x) < -14-5x$

$-14+2x \quad -14-5x$

$+5x \quad +5x$

$\frac{-14+7x}{+14} < \frac{-14}{+14}$

$\frac{7x}{7} < \frac{0}{7}$

$x < 0$

71. $7\left(\frac{2x-3}{5}\right) < 7\left(\frac{5}{1}\right)$

$2x-3 < 35$

$+3 \quad +3$

$\frac{2x}{2} < \frac{38}{2}$

$x < 19$

72. $2 < 8y-(6y-10)$

$2 < 8y-6y+10$

$2 < 2y+10$

$-10 \quad -10$

$\frac{-8}{2} < \frac{2y}{2}$

$-4 < y$

H. Solve for Y/Put in Slope-Intercept Form

Rewrite the equation so that y is a function of x.
This means solve for y or isolate the y to look like $y=mx+b$!!

Need more review? Check out this video!

Exercises: Solve each equation for y.

73. $2x+y=5$ $-2x \quad -2x$ $y=-2x+5$	74. $9-y=1.5x$ $-9 \quad -9$ $\frac{-y}{-1}=\frac{1.5x-9}{-1}$ $y=-1.5x+9$	75. $2x=-3y+10$ $-10 \quad -10$ $\frac{2x-10}{-3}=\frac{-3y}{-3}$ $-\frac{2}{3}x+\frac{10}{3}=y$

I. Identifying Functions, Domain, and Range

A relation is a function if and only if each input x has exactly one output y.
Domain = the x-values/input of the function.
Range = the y-values/output of the function.
Need more review? Check out this video or this video!

Exercises: Are the following relations functions? Why or why not? For those that are, identify the domain and range in set-builder notation.

76. $\{(2,5),(4,6),(6,5),(8,6)\}$

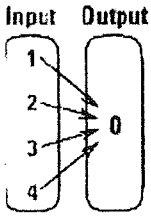
Yes! Each x has only one y!

77.

Input	Output
4	3
13	7
9	4
4	0

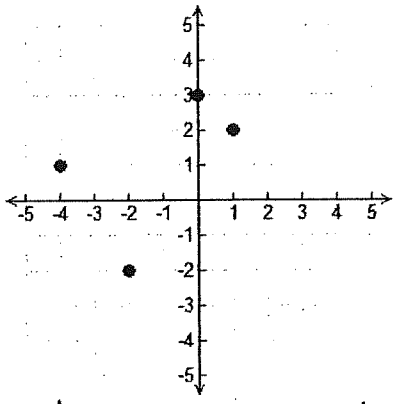
No! 4 has 3 & 0
X !!

78.



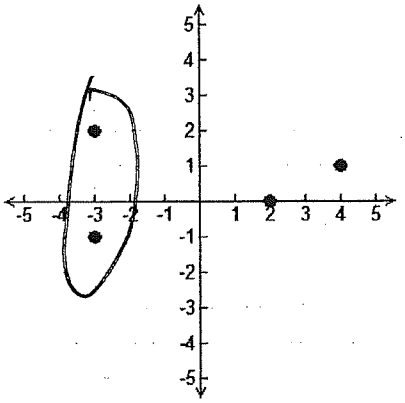
Yes!
No repeats in x (domain)

79.



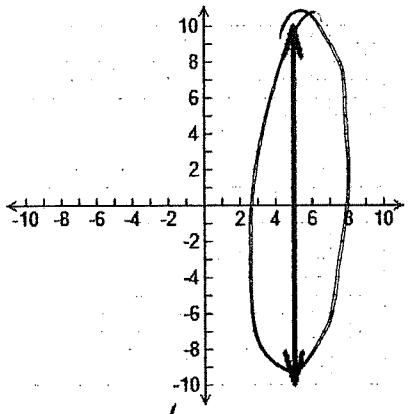
Yes: vertical line test ✓

80.



No!
-3 has 2 y values

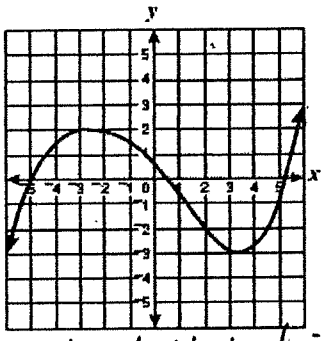
81.



No!
5 has infinite y

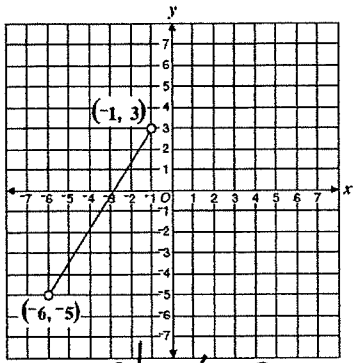
Are the following relations functions? Why or why not? You do not need to identify domain and range.

82.



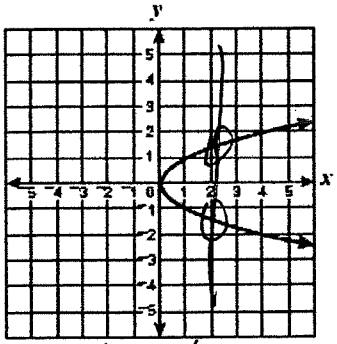
Yes! Vert. line test

83.



Yes! VLT

84.



No! 2 has 2 y values

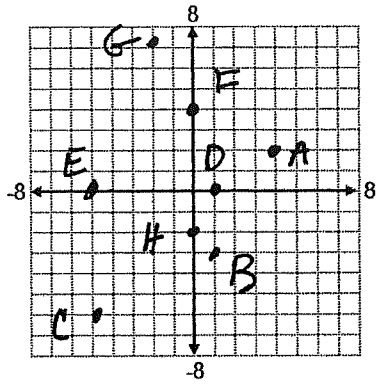
J. Graphing on the Coordinate Plane

The first value in an (x, y) ordered pair represents the distance horizontally from zero. If the x-value is positive, start at the origin (0, 0) and count to the right. If the x-value is negative, count to the left.

The second value in an (x, y) ordered pair represents the distance vertically from zero. If the y-value is positive, start at the origin (0, 0) and count up from zero. If the y-value is negative, count down.

Need more review? Check out this video or this video!

Exercises: If you do not have graph paper at home, you can print some from online, or you can do your best to draw clear graphs with a straight-edge or ruler.



85. Plot and label each of the (x, y) ordered pairs on the coordinate plane.

A (4, 2) B (1, -3) C (-5, -6) D (1, 0)

E (-5, 0) F (0, 4) G (-2, 7) H (0, -2)

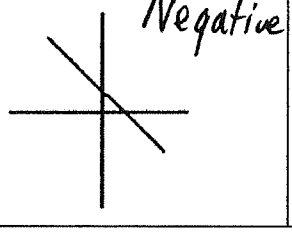
K. Slope

Slope describes how steep or flat a line is. It is the rate of change of the line. Slope is often represented by the variable *m*, such as in the slope-intercept form of a line $y = mx + b$. We can use the slope formula to find the slope between two given points: $m = \frac{y_2 - y_1}{x_2 - x_1}$.

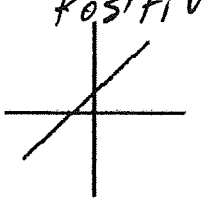
Need more review? Check out this video or this video!

Exercises: Identify the type of slope shown in each graph.

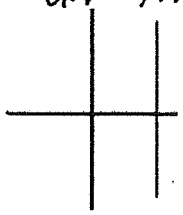
86. Negative



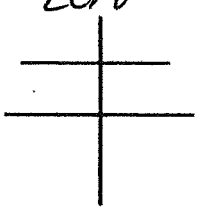
87. Positive



88. undefined

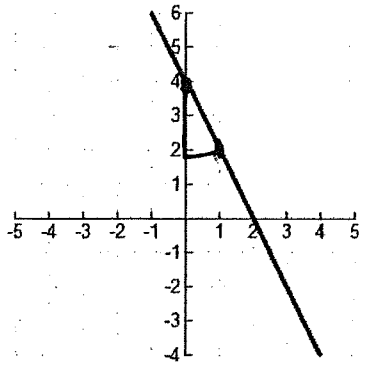


89. Zero



Find the slope of the given line or between the given points.

90.



$\frac{-2}{1} = -2$

$M = -2$

91. $y = -\frac{2}{3}x - 1$

$M = -\frac{2}{3}$

92. (2,1) (5,3)

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

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

$M = \frac{2}{3}$

93. (2,−9) (4,−3)

$\frac{-9-(-3)}{2-4} = \frac{-6}{-2} = 3$

$M = 3$

94.

X	Y
9	-3
4	-6
-6	-12

$\frac{-3-(-6)}{9-4} = \frac{3}{5}$

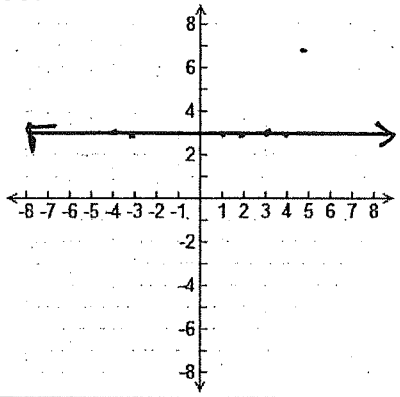
$M = \frac{3}{5}$

L. Graphing Linear Functions

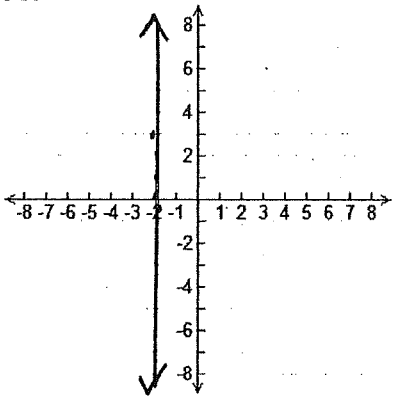
Exercises: Graph each line. If you do not have graph paper at home, you can print some from online, or you can do your best to draw clear graphs with a straight-edge or ruler.

Need more review? Check out this video!

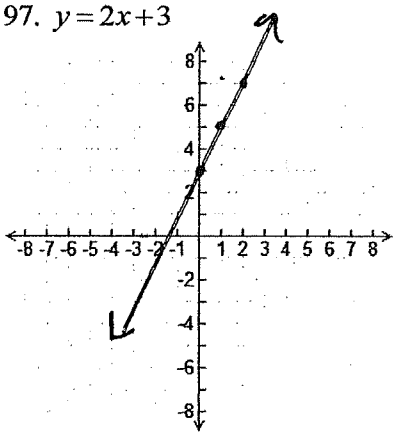
95. $y=3$



96. $x=-2$

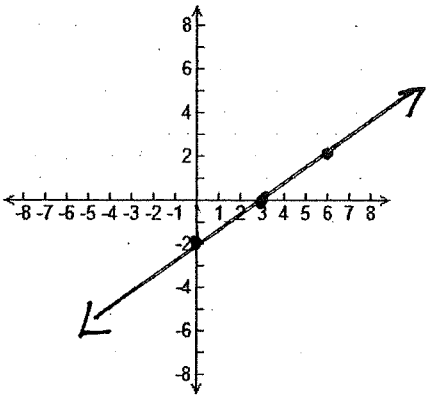


97. $y=2x+3$

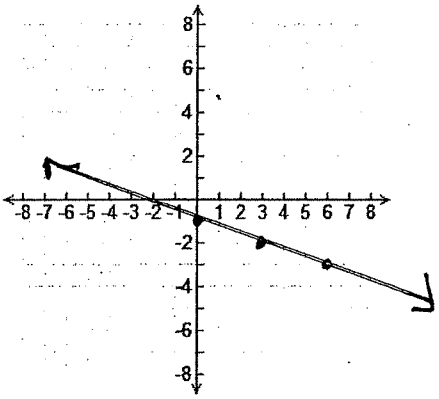


X	Y
-2	-1
-1	1
0	3
1	5
2	7

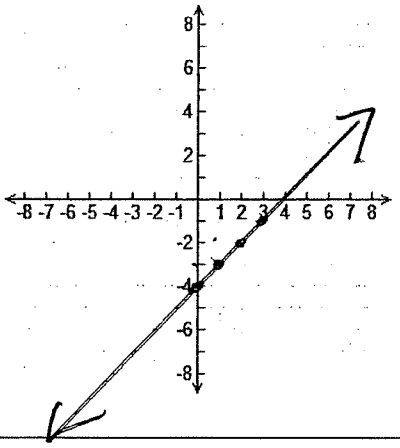
98. Graph the line that has a slope of $\frac{2}{3}$ and a y-intercept of -2.



99. $y=-\frac{1}{3}x-1$



100. $2x-2y=8$



$2x-2y=8$

$-2x \quad -2x$

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

$y=x-4$