KIDSLEARN MATH · PRACTICE ASSIGNMENT

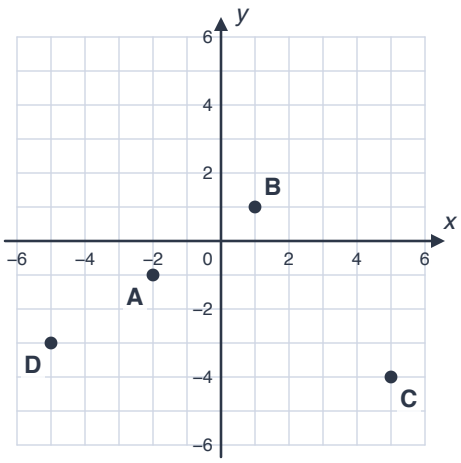
Linear Functions

Name: Date: Score: / 50

A line $y = mx + b$ has slope $m = \dfrac{\text{rise}}{\text{run}} = \dfrac{y_2 - y_1}{x_2 - x_1}$ and y-intercept b. Give answers that are not whole numbers as fractions in lowest terms. Answers are at the end.

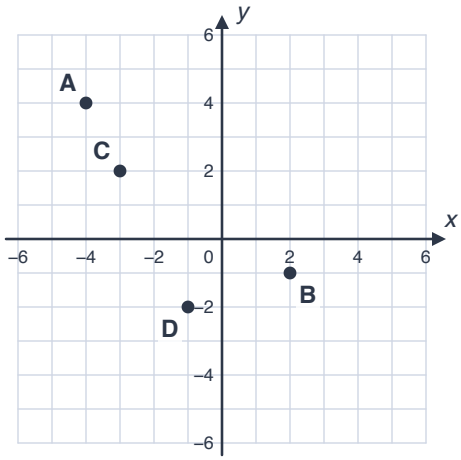
Part A — Warm-up

1. Which point is at $(5, -4)$?



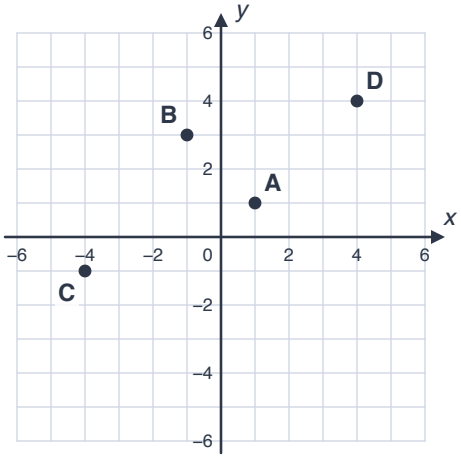
(A) A (B) B (C) C (D) D

2. What are the coordinates of point B?



(A) $(-2, -1)$ (B) $(-1, 2)$ (C) $(2, -1)$ (D) $(2, 1)$

3. Which point is at $(1, 1)$?



(A) A (B) B (C) C (D) D

4. In which quadrant is the point $(9, 2)$?

(A) Quadrant I (B) Quadrant II
(C) Quadrant III (D) Quadrant IV

5. In which quadrant is the point $(-12, -2)$?

(A) Quadrant I (B) Quadrant II

(C) Quadrant III (D) Quadrant IV

6. The point $(-10, 7)$ moves 5 units left and 9 units up. In which quadrant does it end up?

(A) Quadrant I (B) Quadrant II

(C) Quadrant III (D) Quadrant IV

7. For $y = -2x + 6$, find y when $x = 3$.

8. A line has equation $y = -x + 7$. The point $(2, y)$ is on the line. Find y.

9. A line has equation $y = 4x - 4$. The point $(-3, y)$ is on the line. Find y.

10. What is the y-intercept of $y = -\frac{1}{3}x$?

11. What is the slope of $y = -2x - 3$?

12. What is the slope of $y = -\frac{3}{2}x + 5$?

13. What kind of slope does the line through $(0, -2)$ and $(0, 2)$ have?

(A) Positive (B) Negative (C) Zero

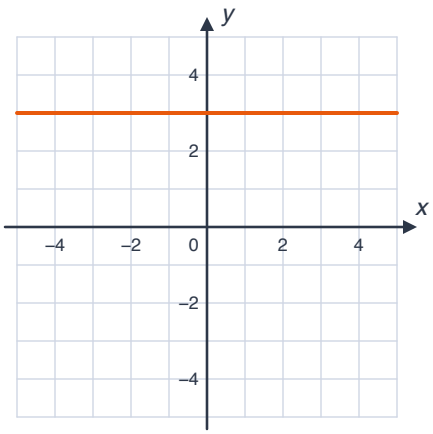
(D) Undefined

14. What kind of slope does the line through $(-3, 5)$ and $(-1, 4)$ have?

(A) Positive (B) Negative (C) Zero

(D) Undefined

15. What kind of slope does this line have?



(A) Positive (B) Negative (C) Zero

(D) Undefined

Part B — Core practice

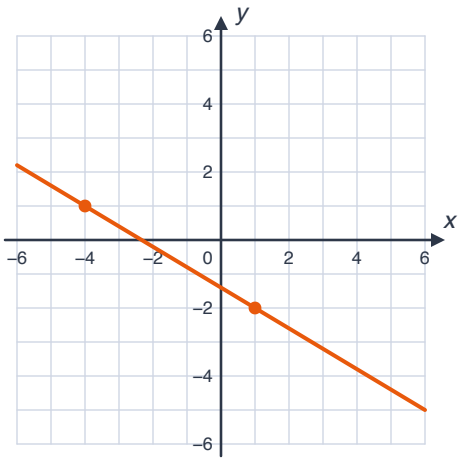
16. Find the slope of the line through $(4, -1)$ and $(-1, 6)$.

17. Find the slope of the line through $(-6, -1)$ and $(-5, 2)$.

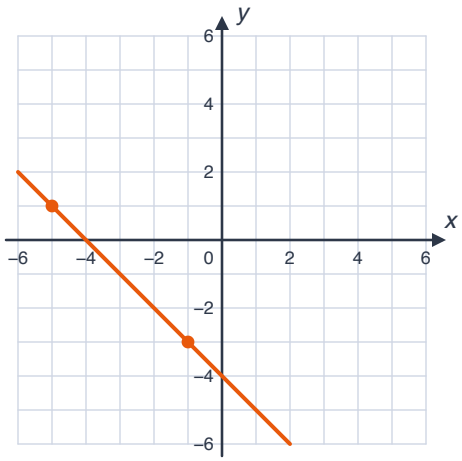
18. Find the slope of the line through $(3, 3)$ and $(2, 1)$.

19. Find the slope of the line through $(2, -5)$ and $(-1, -5)$.

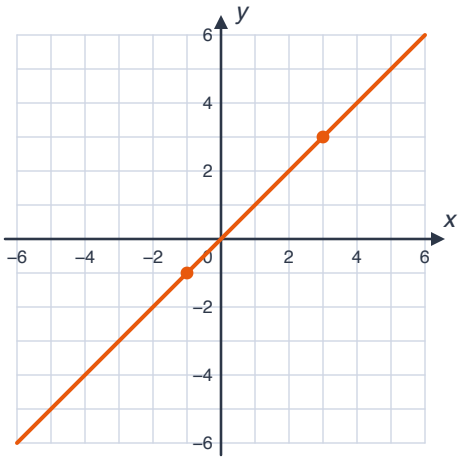
20. Find the slope of the line. The two marked points are on grid corners.



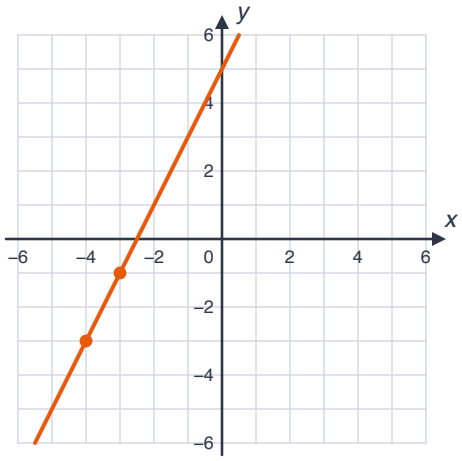
21. Find the slope of the line. The two marked points are on grid corners.



22. Find the slope of the line. The two marked points are on grid corners.



23. Find the slope of the line. The two marked points are on grid corners.



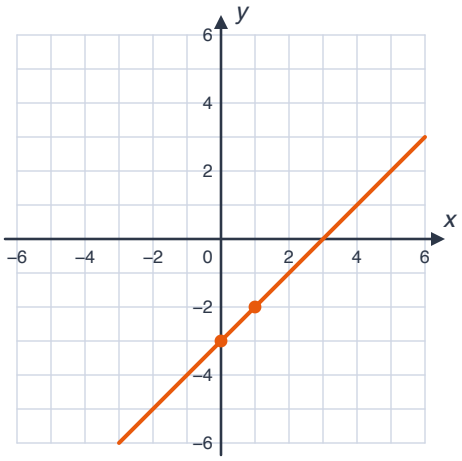
24. Find the x-intercept of the line $4x + 4y = 8$.

25. Find the x-intercept of $y = x + 1$ (the x-value where it crosses the x-axis).

26. Find the x-intercept of $y = -6x - 6$ (the x-value where it crosses the x-axis).

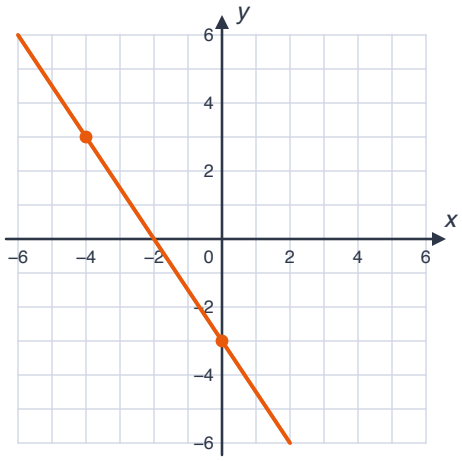
27. Find the x-intercept of the line $-5x + 4y = 25$.

28. Which equation describes this line?



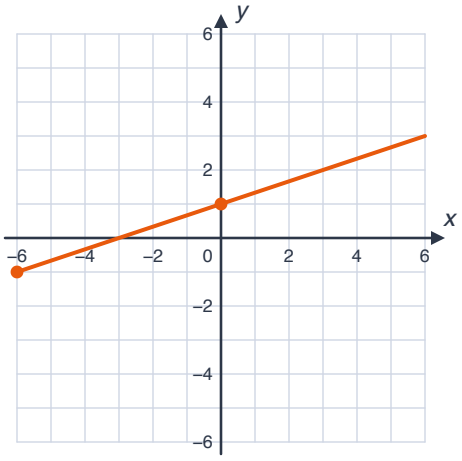
(A) $y = -x - 3$ (B) $y = x - 3$
(C) $y = x - 4$ (D) $y = x + 3$

29. Which equation describes this line?



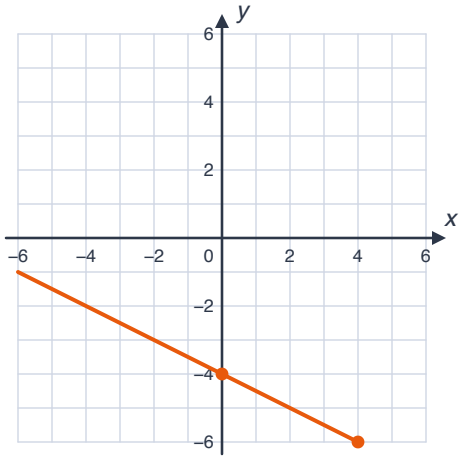
(A) $y = -\frac{3}{2}x - 3$ (B) $y = -\frac{3}{2}x + 3$
(C) $y = \frac{3}{2}x - 3$ (D) $y = -\frac{2}{3}x - 3$

30. Which equation describes this line?



(A) $y = \frac{1}{3}x - 1$ (B) $y = 3x + 1$
(C) $y = \frac{1}{3}x + 1$ (D) $y = -\frac{1}{3}x + 1$

31. Which equation describes this line?



(A) $y = \frac{1}{2}x - 4$ (B) $y = -\frac{1}{2}x + 4$
(C) $y = -2x - 4$ (D) $y = -\frac{1}{2}x - 4$

32. Which is the equation of the line through $(-1, -4)$ and $(5, 2)$?

(A) $y = -x - 3$ (B) $y = x - 4$

(C) $y = x - 3$ (D) $y = x + 3$

33. A line passes through $(-5, -16)$ and $(5, 24)$. Its equation is $y = mx + b$. Find b.

34. Which is the equation of the line through $(-5, -20)$ and $(6, 24)$?

(A) $y = -4x$ (B) $y = 4x - 20$

(C) $y = \frac{1}{4}x$ (D) $y = 4x$

35. A line passes through $(-3, 6)$ and $(6, 9)$. Its equation is $y = mx + b$. Find b.

36. The point $(k, 17)$ lies on the line $y = 2x + 7$. Find k.

37. The point $(k, 8)$ lies on the line $y = 3x - 7$. Find k.

38. The line $y = -4x + c$ passes through $(2, -7)$. Find c.

Part C — Challenge

39. The lines $y = -x + 9$ and $y = kx + 4$ are perpendicular. Find k.

40. What is the slope of a line perpendicular to $6x + 6y = 5$?

41. What is the slope of a line parallel to $y = -5x - 8$?

42. The lines $y = 3x + 13$ and $y = -x - 3$ cross at one point. What is its x-coordinate?

43. The lines $y = -2x + 10$ and $y = 3x + 5$ cross at one point. What is its x-coordinate?

44. The lines $y = -5$ and $y = 3x + 13$ cross at one point. What is its x-coordinate?

45. A phone plan costs \$12 a month plus \$4 for each gigabyte of data used. One month the bill was \$72. How many gigabytes were used?

46. A candle is 23 cm tall and burns down 2 cm every hour, so its height is $h = 23 - 2t$. After how many hours is it 3 cm tall?

47. A tank already holds 40 litres of water, and a hose adds 15 litres every minute. After how many minutes does the tank hold 160 litres?

48. The table shows points on a straight line. What is y when $x = 20$?

x	1	3	5	7
y	-3	-13	-23	-33

49. The table shows points on a straight line. What is y when $x = 15$?

x	3	5	7	9
y	-25	-35	-45	-55

50. The table shows points on a straight line. What is y when $x = 19$?

x	2	3	4	5
y	-17	-21	-25	-29

Answer Key — Linear Functions

1. **(C) C**
   Start at the origin, move 5 right and 4 down: that is point C.

2. **(C) $(2, -1)$**
   Point B is 2 right of the y-axis and 1 below the x-axis: $(2, -1)$. The x-coordinate always comes first.

3. **(A) A**
   Start at the origin, move 1 right and 1 up: that is point A.

4. **(A) Quadrant I**
   x is positive (right) and y is positive (up), so it is in Quadrant I.

5. **(C) Quadrant III**
   x is negative (left) and y is negative (down), so it is in Quadrant III.

6. **(B) Quadrant II**
   New point: $(-10 - 5,\ 7 + 9) = (-15, 16)$, which is in Quadrant II.

7. 0
   $y = -2(3) + 6 = -6 + 6 = 0.$

8. 5
   $y = -1(2) + 7 = -2 + 7 = 5.$

9. -16
   $y = 4(-3) - 4 = -12 - 4 = -16.$

10. 0
    The y-intercept is the value of y when $x = 0$: $b = 0$.

11. -2
    In $y = mx + b$ the slope is the number multiplying x: $m = -2$.

12. $-\frac{3}{2}$
    In $y = mx + b$ the slope is the number multiplying x: $m = -\frac{3}{2}$.

13. **(D) Undefined**
    Rise $= 4$, run $= 0$. The run is 0 (a vertical line), and you cannot divide by 0: the slope is not defined.

14. **(B) Negative**
    Rise $= -1$, run $= 2$. Rise ÷ run is negative.

15. **(C) Zero**
    The line is flat (horizontal): slope 0.

16. $-\frac{7}{5}$
    $m = \dfrac{6 - (-1)}{-1 - 4} = \dfrac{7}{-5} = -\frac{7}{5}.$

17. 3
    $m = \dfrac{2 - (-1)}{-5 - (-6)} = \dfrac{3}{1} = 3.$

18. 2
    $m = \dfrac{1 - 3}{2 - 3} = \dfrac{-2}{-1} = 2.$

19. 0
    $m = \dfrac{-5 - (-5)}{-1 - 2} = \dfrac{0}{-3} = 0.$

20. $-\frac{3}{5}$
    From $(-4, 1)$ to $(1, -2)$: run 5 right, rise -3 (down). Slope $= -\frac{3}{5}$.

21. -1
    From $(-5, 1)$ to $(-1, -3)$: run 4 right, rise -4 (down). Slope $= -1$.

22. 1
    From $(-1, -1)$ to $(3, 3)$: run 4 right, rise 4. Slope $= 1$.

23. 2
    From $(-4, -3)$ to $(-3, -1)$: run 1 right, rise 2. Slope $= 2$.

24. 2
    Set $y = 0$: $4x = 8$, so $x = 2$.

25. -1
    Set $y = 0$: $0 = x + 1$, so $x = -1$.

26. -1
    Set $y = 0$: $0 = -6x - 6$, so $x = -1$.

27. -5
    Set $y = 0$: $-5x = 25$, so $x = -5$.

28. **(B) $y = x - 3$**
    It crosses the y-axis at $(0, -3)$, so $b = -3$. From there to $(1, -2)$: rise 1 over run 1, so $m = 1$. Equation: $y = x - 3$.

29. **(A) $y = -\frac{3}{2}x - 3$**
    It crosses the y-axis at $(0, -3)$, so $b = -3$. From there to $(-4, 3)$: rise 6 over run -4, so $m = -\frac{3}{2}$. Equation: $y = -\frac{3}{2}x - 3$.

30. **(C)** $y = \frac{1}{3}x + 1$
It crosses the y-axis at $(0, 1)$, so $b = 1$. From there to $(-6, -1)$: rise -2 over run -6, so $m = \frac{1}{3}$. Equation: $y = \frac{1}{3}x + 1$.

31. **(D)** $y = -\frac{1}{2}x - 4$
It crosses the y-axis at $(0, -4)$, so $b = -4$. From there to $(4, -6)$: rise -2 over run 4, so $m = -\frac{1}{2}$. Equation: $y = -\frac{1}{2}x - 4$.

32. **(C)** $y = x - 3$
Slope: $m = \dfrac{2 - (-4)}{5 - (-1)} = 1$. Then $-4 = 1 \times (-1) + b$, so $b = -3$ and the line is $y = x - 3$.

33. 4
Slope: $m = \dfrac{24 - (-16)}{5 - (-5)} = 4$. Then $-16 = 4 \times (-5) + b$, so $b = 4$.

34. **(D)** $y = 4x$
Slope: $m = \dfrac{24 - (-20)}{6 - (-5)} = 4$. Then $-20 = 4 \times (-5) + b$, so $b = 0$ and the line is $y = 4x$.

35. 7
Slope: $m = \dfrac{9 - 6}{6 - (-3)} = \frac{1}{3}$. Then $6 = \frac{1}{3} \times (-3) + b$, so $b = 7$.

36. 5
Substitute $y = 17$: $17 = 2k + 7$, so $2k = 10$ and $k = 5$.

37. 5
Substitute $y = 8$: $8 = 3k - 7$, so $3k = 15$ and $k = 5$.

38. 1
Substitute: $-7 = -4 \times 2 + c = -8 + c$, so $c = 1$.

39. 1
$-1 \times k = -1$, so $k = 1$.

40. 1
Solve for y: $6y = -6x + 5$, so the slope is -1. A perpendicular slope is the negative reciprocal: 1.

41. -5
Parallel lines have the same slope: -5.

42. -4
Set the right-hand sides equal: $3x + 13 = -x - 3$, so $4x = -16$ and $x = -4$. Then $y = 3 \times (-4) + 13 = 1$. They meet at $(-4, 1)$.

43. 1
Set the right-hand sides equal: $-2x + 10 = 3x + 5$, so $-5x = -5$ and $x = 1$. Then $y = -2 \times 1 + 10 = 8$. They meet at $(1, 8)$.

44. -6
Set the right-hand sides equal: $-5 = 3x + 13$, so $-3x = 18$ and $x = -6$. Then $y = 0 \times (-6) - 5 = -5$. They meet at $(-6, -5)$.

45. 15 **GB**
Bill $= 4g + 12$. So $4g = 72 - 12 = 60$ and $g = 15$ GB.

46. 10 **h**
$23 - 2t = 3$, so $2t = 20$ and $t = 10$ hours.

47. 8 **min**
Volume $V = 15t + 40$. So $15t = 120$ and $t = 8$ minutes.

48. -98
y changes by -10 each time x goes up by 2, so $m = -5$. Going back from $x = 1$ to $x = 0$ gives $b = 2$, so $y = -5x + 2$. At $x = 20$: $y = -98$.

49. -85
y changes by -10 each time x goes up by 2, so $m = -5$. Going back from $x = 3$ to $x = 0$ gives $b = -10$, so $y = -5x - 10$. At $x = 15$: $y = -85$.

50. -85
y changes by -4 each time x goes up by 1, so $m = -4$. Going back from $x = 2$ to $x = 0$ gives $b = -9$, so $y = -4x - 9$. At $x = 19$: $y = -85$.