

EXERCISE SET 3 ANSWER KEY

Part 1: No Calculator

1. **7/3 or 2.33**

$$x - 2(1 - x) = 5$$

Distribute:

$$x - 2 + 2x = 5$$

Simplify:

$$3x - 2 = 5$$

Add 2:

$$3x = 7$$

Divide by 3:

$$x = 7/3$$

2. **9**

$$f(k) = -2k + 8 = -10$$

Subtract 8:

$$-2k = -18$$

Divide by -2:

$$k = 9$$

3. **1/3 or .333**

$$\text{slope} = \frac{5 - 3}{4 - (-2)} = \frac{2}{6} = \frac{1}{3}$$

4. **10/3 or 3.33**

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

Multiply by 2xy:

$$\frac{2xy}{x} + \frac{2xy}{2x} = \frac{10xy}{y}$$

Simplify:

$$2y + y = 10x$$

Simplify:

$$3y = 10x$$

Divide by 3:

$$y = \frac{10}{3}x$$

5. **11/5 or 2.2**

The slope of the given line is $-5/11$, so the slope of the line perpendicular to it is $11/5$.

6. **9/5 or 1.8**

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

Multiply by 10:

$$(x+1) + 4x = 10$$

Simplify:

$$5x + 1 = 10$$

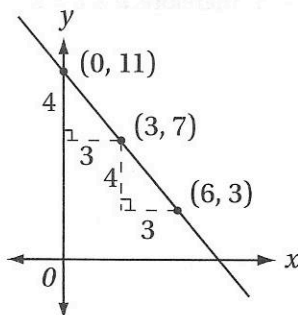
Subtract 1:

$$5x = 9$$

Divide by 5:

$$x = 9/5$$

7. **11** There are a variety of ways of solving this problem, but perhaps the simplest is to draw a quick sketch:



Notice that to get from (6, 3) to (3, 7) we must go left 3 units and up 4 units (in other words, the slope is $-4/3$). If we simply repeat this from (3, 7), we arrive at the y-intercept, which is (0, 11).

8. **8** This line has a slope of -2 and contains the points (3, 1) and (b, -9). Therefore $-2 = \frac{-9-1}{b-3}$

Simplify:

$$-2 = \frac{-10}{b-3}$$

Multiply by $b - 3$:

$$-2b + 6 = -10$$

Subtract 6:

$$-2b = -16$$

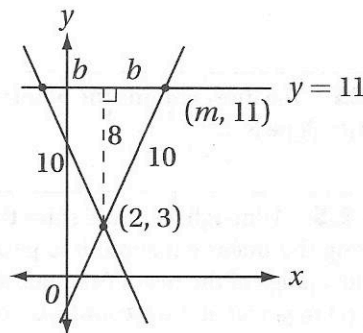
Divide by -2 :

$$b = 8$$

9. **C** Since the tanks starts with 200 gallons, the amount it has left is $200 -$ the number of gallons used. The number of gallons used is

$$t \text{ hours} \times \frac{60 \text{ miles}}{1 \text{ hour}} \times \frac{1 \text{ gallon}}{4 \text{ miles}} = 15t \text{ gallons}$$

10. **B** Once again, a quick sketch can be very helpful. Notice that traveling from point



$A(2, 3)$ to point $B(m, 11)$ requires going up 8 units and right (or left) some unknown distance b . We can find b with the

Pythagorean Theorem:

$$8^2 + b^2 = 10^2$$

Simplify:

$$64 + b^2 = 100$$

Subtract 64:

$$b^2 = 36$$

Take the square root:

$$b = 6$$

Therefore, m is either $2 - 6 = -4$ or $2 + 6 = 8$, and the slope of this line is either $8/6 = 4/3$ or $8/(-6) = -4/3$. The only equation among the choices that is satisfied by the ordered pair (2, 3) and has a slope of either $4/3$ or $-4/3$ is (B).

11. **D** Recall that the slopes of perpendicular lines are opposite reciprocals. The slope of the segment from (0, 0) to (5, 6) is $6/5$, so the slope of its perpendicular is $-5/6$.

$$\text{Therefore} \quad \frac{6-0}{5-k} = -\frac{5}{6}$$

$$\text{Cross-multiply:} \quad -36 = 5(5-k)$$

$$\text{Distribute:} \quad -36 = 25 - 5k$$

$$\text{Subtract 25:} \quad -61 = -5k$$

$$\text{Divide by } -5: \quad 61/5 = k$$

Part 2: Calculator

12. **12** The slope of this line is $\frac{20-4}{8-2} = \frac{16}{6} = \frac{8}{3}$,

$$\text{therefore,} \quad \frac{k-4}{5-2} = \frac{8}{3}$$

$$\text{Cross-multiply:} \quad 3k - 12 = 24$$

$$\text{Add 12:} \quad 3k = 36$$

$$\text{Divide by 3:} \quad k = 12$$

13. **4/3 or 1.33** Since the slope and y -intercept are given, it is easy to express the linear equation in slope-intercept form: $y = 3x - 4$.

The x -intercept is the value of x on the line for which $y = 0$:

$$0 = 3x - 4$$

$$\text{Add 4:} \quad 4 = 3x$$

$$\text{Divide by 3:} \quad 4/3 = x$$

14. **1/4 or .25** The line contains the points $(-1, 1)$ and $(3, 2)$, so its slope is $\frac{2-1}{3-(-1)} = \frac{1}{4}$

15. **5/2 or 2.5** Although we could solve this problem by deriving the linear equation, it is perhaps easier to take advantage of the result from question 14. The slope of $1/4$ means that the y -coordinate of any point on the line increases by $1/3$ each time the x -coordinate increases by 1. Since the x -coordinate increases by 2 between $f(3)$ and $f(5)$, the y -coordinate must therefore increase by $2(1/4) = 1/2$, so $f(5) = 2 + 1/2 = 2.5$.

16. **4** The line contains the points $(2b, 0)$ and $(0, -8b)$; therefore, it has a slope of $\frac{0-(-8b)}{2b-0} = \frac{8b}{2b} = 4$.

17. **3/5 or .6**

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

$$\text{Multiply by } 5x: \quad 10 + 2 = 20x$$

$$\text{Simplify:} \quad 12 = 20x$$

$$\text{Divide by } 20: \quad x = 12/20 = 3/5$$

18. **4** The x -intercept is the value of x for which $y = 0$:

$$3x - 2(0) = 12$$

$$\text{Simplify:} \quad 3x = 12$$

$$\text{Divide by } 3: \quad x = 4$$

19. **15** Recall that the slope of a line in standard form $ax + by = c$ is $-a/b$. Therefore, the slope of $5x - 2y = 5$ is $5/2$ and the slope of $6x + ky = 9$ is $-6/k$. If these lines are perpendicular, then their slopes are opposite reciprocals:

$$\frac{k}{6} = \frac{5}{2}$$

$$\text{Multiply by } 6: \quad k = 30/2 = 15$$

20. **A** The total revenue for selling n calculators at \$98 each is $\$98n$ the cost for making and selling n calculators is $\$(35n + 120,000)$. Therefore the profit is $\$(98n - 35n - 120,000) = 63n - 120,000$ dollars.

21. **C** This line contains the points $(5, 0)$ and $(0, 6)$ and therefore has a slope of $\frac{0-6}{5-0} = -\frac{6}{5}$.

Since its y -intercept is 6, its slope-intercept form is

$$y = -\frac{6}{5}x + 6 \text{ or, subtracting 6 from both sides,}$$

$$y - 6 = -\frac{6}{5}x$$

22. **B** Since f is a linear function, it has a slope that we can call m . Recall that it's often useful to think of the slope of a line as the "unit change," that is, the amount that y changes each time x increases by 1. Since the x values increase by 1 with each step in our table, the y values must therefore increase by m with each step. This means that $a = 8 - m$ and $b = 8 + m$. Therefore, $a + b = 8 - m + 8 + m = 16$.