HOMEWORK & EXTRA PRACTICE SCENARIOS

Algebra 1 Series

Book 6 Homework Guide

A NOTE TO PARENTS AND TEACHERS:
Each book in the Summit Math Algebra 1 Series has 2 parts. The first half of the book is the Guided Discovery Scenarios. The second half of the book is the Homework & Extra Practice Scenarios. Each section has a separate Answer Key. If the Answer Key does not provide enough guidance, you can access more information about how to solve each scenario using the resources listed below.

1. ***GUIDED DISCOVERY SCENARIOS***

   If you would like to get step-by-step guidance for the Guided Discovery Scenarios in each Algebra 1 book, you can subscribe to the Algebra 1 Videos for $9/month or $60/year ($5/mo.). With a subscription, you can access videos for every book in the Series. The videos show you how to solve each scenario in the Guided Discovery Scenarios section of the Algebra 1 books. You can find out more about these videos at www.summitmathbooks.com/algebra-1-videos.

2. ***HOMEWORK & EXTRA PRACTICE SCENARIOS***

   If you would like to get step-by-step guidance for the Homework & Extra Practice Scenarios in the book, you can use this Homework Guide. It provides more detailed guidance for solving the Homework & Extra Practice Scenarios in Book 6 of the Algebra 1 Series. Some scenarios are not included. If you would like something included in this Homework Guide, please email the author and explain which scenario(s) you would like to see included or which scenario(s) you would like more guidance for in this Homework Guide.

ANSWER KEY

3a.
Since the Monarch is 1200 miles away after 8 days and 900 miles away after 12 days, you can subtract the miles to see that it has flown 300 miles in 4 days.
300 divided by 4 is 75. It is flying 75 miles per day.
If it was 1200 miles away after 8 days and it was flying 75 miles per day, you can find out how far it flew in 8 days.
75x8 = 600. It flew 600 miles in 8 days.
If it is 1200 miles away from its destination after 8 days, and it has flown 600 miles in those first 8 days, then it start 1200 + 600 = 1800 miles away from its destination. When it finishes its trip, it will have flown 1800 miles.

3b.
After 12 days, it is 900 miles away. Find how long it takes to fly 900 miles at a rate of 75 miles per day.
900 divided by 75 is 12. It will take 12 days to fly 900 miles.
12 days plus 12 days is 24 days.
It will reach its destination after flying a total of 24 days.

7b.
To find the coordinates of one more point, use the equation and replace one of the variables with a number. Solve the resulting equation to find the value of the other variable.
For example, if $x = 2$, the equation $2x + 5y = -10$ becomes $2(2) + 5y = -10$.
$\rightarrow\ 2(2) + 5y = -10\ \rightarrow\ 4 + 5y = -10\ \rightarrow\ 5y = -14\ \rightarrow\ y = -2.8$. When x is 2, y is -2.8 so you can plot the point $(2, -2.8)$.
As another example, if $x = -2$, the equation $2x + 5y = -10$ becomes $2(-2) + 5y = -10$.
$\rightarrow\ 2(-2) + 5y = -10\ \rightarrow\ -4 + 5y = -10\ \rightarrow\ 5y = -0.4\ \rightarrow\ y = -1.2$. When x is -2, y is -1.2 so you can plot the point $(-2, -1.2)$.
Other points on the line are $(-6, 0.4)$, $(-4, -0.4)$, $(-3, -0.8)$, $(1, -2.4)$ and $(3, -3.2)$.

8a.
To move from (3, 1) to (7, 2), you can move up 1 unit and then right 4 units. If you put those movements in a ratio of $\frac{\text{rise}}{\text{run}}$, the slope of the line is $\frac{1}{4}$.

To move from (−5, −1) to (3, 1), you can move up 2 units and then right 8 units. If you put those movements in a ratio of $\frac{\text{rise}}{\text{run}}$, the slope of the line is $\frac{2}{8}$, which can be simplified as $\frac{1}{4}$.

To move from (−5, −1) to (7, 2), you can move up 3 units and then right 12 units. If you put those movements in a ratio of $\frac{\text{rise}}{\text{run}}$, the slope of the line is $\frac{3}{12}$, which can be simplified as $\frac{1}{4}$.

8b.
To move from (0, −2) to (3, −4), you can move down 2 unit and then right 3 units. If you put those movements in a ratio of $\frac{\text{rise}}{\text{run}}$, the slope of the line is $\frac{-2}{3}$, which can be written as $-\frac{2}{3}$.

To move from (−6, 2) to (0, −2), you can move down 4 units and then right 6 units. If you put those movements in a ratio of $\frac{\text{rise}}{\text{run}}$, the slope of the line is $\frac{-4}{6}$, which can be simplified as $-\frac{2}{3}$.

To move from (−6, 2) to (3, −4), you can move down 6 units and then right 9 units. If you put those movements in a ratio of $\frac{\text{rise}}{\text{run}}$, the slope of the line is $\frac{-6}{9}$, which can be simplified as $-\frac{2}{3}$.

9a.
If you pick any two points on the dashed line, the horizontal change between the points will be 0 so the slope of the line will be a nonzero number divided by 0, which is an undefined number. Thus, the slope of the dashed line is referred to as undefined.

9b.
If you pick any two points on the solid line, the vertical change between the points will be 0 so the slope of the line will be 0 divided by a nonzero number, which is equal to 0. Thus, the slope of the solid line is referred to as 0.

10.
To write the equation in Slope-Intercept Form, $y = mx + b$, find the slope and the y-intercept. To find the slope, you need to know the rise and the run. The rise is the difference between the y-values. The run is the difference between the x-values. You can also refer to the slope formula below:
$m = \frac{y_2 - y_1}{x_2 - x_1} \rightarrow m = \frac{11-(-4)}{-6-(-1)} \rightarrow m = \frac{15}{-5} \rightarrow m = -3$
The slope is -3, so you can write the equation as $y = -3x + b$. Pick one of the points on the line, replace x and y with those values and solve for b. If you use the point (−1, −4), the equation is:
$-4 = -3(-1) + b$
You can multiply -3 and -1 to get 3, which makes the equation $-4 = 3 + b$, so $b = -7$. Now you know that the y-intercept is -7. In Slope-Intercept Form, the equation is $y = -3x - 7$.

11a.
$2x \cdot 3x^2 \rightarrow 2 \cdot 3 \cdot x \cdot x^2 \rightarrow 6 \cdot x^{1+2} \rightarrow 6x^3$

11b.
$3^{-2} \rightarrow \frac{1}{3^2} \rightarrow \frac{1}{9}$

11c.
Method 1: Make each negative exponent positive by moving x^{-4} down to the denominator and by moving y^{-1} up to the numerator.
$\frac{2x^{-4}}{3y^{-1}} \rightarrow \frac{2y^1}{3x^4} \rightarrow \frac{2y}{3x^4}$

Method 2: Make each negative exponent positive by writing x^{-4} as $\frac{1}{x^4}$ and by writing y^{-1} as $\frac{1}{y}$.

$\frac{2x^{-4}}{3y^{-1}} \rightarrow \frac{2 \cdot \frac{1}{x^4}}{3 \cdot \frac{1}{y}} \rightarrow \frac{\frac{2}{1} \cdot \frac{1}{x^4}}{\frac{3}{1} \cdot \frac{1}{y}} \rightarrow \frac{\frac{2}{x^4}}{\frac{3}{y}} \rightarrow \frac{2}{x^4} \div \frac{3}{y} \rightarrow \frac{2}{x^4} \cdot \frac{y}{3} \rightarrow \frac{2y}{3x^4}$

11d.
$\left(x^{-2}\right)^{2} \;\rightarrow\; x^{-2\cdot 2} \;\rightarrow\; x^{-4} \;\rightarrow\; \frac{1}{x^4}$

12c.
$(x+3)(x+3)$
$x(x+3)+3(x+3)$
$x\cdot x \;+\; x\cdot 3 \;+\; 3\cdot x \;+\; 3\cdot 3$
$x^2 \;+\; 3x \;+\; 3x \;+\; 9$
x^2+6x+9

12d.
$(2x-1)(2x+1)$
$2x(2x+1)-1(2x+1)$
$2x\cdot 2x \;+\; 2x\cdot 1 \;-\; 1\cdot 2x \;-\; 1\cdot 1$
$4x^2 \;+\; 2x \;-\; 2x \;-\; 1$
$4x^2-1$

13d.
$18-2x^2$ → factor out a GCF of 2
$2\left(9-x^2\right)$ → factor the binomial inside parentheses, which is a difference of squares
$2(3-x)(3+x)$

14a.
$x+y=3$ → subtract x on both sides
$y=3-x$ → rewrite the equation in the form $y = Ax + B$
$y=-x+3$

14b.
$3x-2y=6$ → subtract $3x$ on both sides
$-2y=6-3x$ → divide by -2 on both sides
$y=\frac{6}{-2}-\frac{3x}{-2}$ → simplify the fractions
$y=-3+\frac{3}{2}x$ → rewrite the equation in the form $y = Ax + B$
$y=\frac{3}{2}x-3$

14c.
$-5x-10y=7$ → add $5x$ on both sides
$-10y=7+5x$ → divide by -10 on both sides
$y=\frac{7}{-10}+\frac{5x}{-10}$ → simplify the fractions
$y=-\frac{7}{10}-\frac{1}{2}x$ → rewrite the equation in the form $y = Ax + B$
$y=-\frac{1}{2}x-\frac{7}{10}$

15a.
$x+y<3$ → subtract x on both sides
$y<3-x$ → rewrite the equation in the form $y < Ax + B$
$y<-x+3$

15b.

$3x - 2y \geq 6$ → subtract 3x on both sides

$-2y \geq 6 - 3x$ → divide by -2 on both sides

$y \leq \frac{6}{-2} - \frac{3x}{-2}$ → switch the inequality direction when you divide both sides by a negative number

$y \leq \frac{6}{-2} - \frac{3}{-2}x$ → simplify the fractions

$y = -3 + \frac{3}{2}x$ → rewrite the equation in the form y = Ax + B

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

15c.

$-5x - 10y < 7$ → add 5x on both sides

$-10y < 7 + 5x$ → divide by -10 on both sides

$y > \frac{7}{-10} + \frac{5x}{-10}$ → switch the inequality direction when you divide both sides by a negative number

$y > \frac{7}{-10} + \frac{5}{-10}x$ → simplify the fractions

$y = -\frac{7}{10} - \frac{1}{2}x$ → rewrite the equation in the form y = Ax + B

$y = -\frac{1}{2}x - \frac{7}{10}$

20.

The beetle starts 3000 feet away from the finish line and moves at a rate of 75 feet per minute. Since it moves 75 feet every minute, its distance from the finish line decreases by 75 feet every minute. After 1 minute, it is $3000 - 75$ feet away from the finish line. After 2 minutes, it is $3000 - 75(2)$ feet away. After 3 minutes, it is $3000 - 75(3)$ and so on. After t minutes, it is $3000 - 75(t)$ feet away. After t minutes, its distance from the finish line, d, can be modeled by the equation $d = 3000 - 75t$.

22a.

An equation in Slope-Intercept Form looks like $y = mx + b$, where m is the line's slope and b is the line's y-intercept. This line crosses the y-axis at (0, −3), so its b-value is −3. To find the line's slope, pick two points on the line, such as (−2, 0) and (0, −3). To move from (−2, 0) to (0, −3), you go down 3 units and right 2 units. Slope is a ratio of rise over run, $\frac{\text{rise}}{\text{run}}$, so the slope of this line is $\frac{-3}{2}$, which can be written as $-\frac{3}{2}$. The line's y-intercept is −3 and its slope is $-\frac{3}{2}$, so the line's equation is $y = -\frac{3}{2}x + (-3)$, which can be written as $y = -\frac{3}{2}x - 3$.

22b.

An equation in Slope-Intercept Form looks like $y = mx + b$, where m is the line's slope and b is the line's y-intercept. This line crosses the y-axis at (0, 0), so its b-value is 0. To find the line's slope, pick two points on the line, such as (−2, 6) and (1, −3). To move from (−2, 6) to (1, −3), you go down 9 units and right 3 units. Slope is a ratio of rise over run, $\frac{\text{rise}}{\text{run}}$, so the slope of this line is $\frac{-9}{3}$, which can be simplified and written as $-\frac{3}{1}$ or just −3. The line's y-intercept is 0 and its slope is −3, so the line's equation is $y = -3x + 0$, which can be written as $y = -3x$.

23a.

$y = -\frac{3}{2}x - 3 \quad \rightarrow$ add $\frac{3}{2}x$ to both sides

$y + \frac{3}{2}x = -3 \quad \rightarrow$ multiply both sides by 2 to clear the fractions

$2 \cdot \left(y + \frac{3}{2}x\right) = (-3) \cdot 2 \quad \rightarrow$ simplify both sides

$2y + 3x = -6 \quad \rightarrow$ switch the order of the x and y terms to make it look like $Ax + By = C$

$3x + 2y = -6$

24a.

Every point on the vertical line has an x-value of 3, so the line's equation is "x equals 3" or $x = 3$.

24b.

Every point on the horizontal line has a y-value of −1, so the line's equation is "y equals −1" or $y = -1$.

26b.

Replace x with −1 and solve for y.

$y = -x + 10 \quad \rightarrow \quad y = -(-1) + 10 \quad \rightarrow \quad y = 1 + 10 \quad \rightarrow \quad y = 11$

26c.

Replace y with 0 and solve for x.

$0 = -x + 10 \quad \rightarrow \quad -10 = -x \quad \rightarrow \quad x = 10$

27a.

$y = -\frac{3}{2}x - 2 \quad \rightarrow$ replace x with $-\frac{4}{5}$ and solve for y

$y = -\frac{3}{2}\left(-\frac{4}{5}\right) - 2 \quad \rightarrow$ multiply $-\frac{3}{2}$ and $-\frac{4}{5}$

$y = \frac{12}{10} - 2 \quad \rightarrow \quad y = \frac{6}{5} - 2 \quad \rightarrow \quad y = \frac{6}{5} - \frac{10}{5} \quad \rightarrow \quad y = -\frac{4}{5}$

27b.

$y = -\frac{3}{2}x - 2 \quad \rightarrow$ replace y with 4 and solve for x

$4 = -\frac{3}{2}x - 2 \quad \rightarrow$ add 2 to both sides

$6 = -\frac{3}{2}x \quad \rightarrow$ multiply both sides by $-\frac{2}{3}$

$-\frac{2}{3} \cdot 6 = -\frac{3}{2}x \cdot -\frac{2}{3} \quad \rightarrow$ simplify

$-\frac{2}{3} \cdot \frac{6}{1} = x \quad \rightarrow \quad -\frac{12}{3} = x \quad \rightarrow \quad -4 = x$

28.

$y = \frac{1}{4}x + 1 \quad \rightarrow$ replace x with $-\frac{8}{9}$ and solve for y

$y = \frac{1}{4}\left(-\frac{8}{9}\right) + 1 \quad \rightarrow$ multiply $\frac{1}{4}$ and $-\frac{8}{9}$

$y = -\frac{8}{36} + 1 \quad \rightarrow \quad y = -\frac{2}{9} + 1 \quad \rightarrow \quad y = -\frac{2}{9} + \frac{9}{9} \quad \rightarrow \quad y = \frac{7}{9}$

29.

Convert $-1\frac{3}{5}$ to an improper fraction: $-\frac{8}{5}$

$y = -\frac{5}{6}x + 4 \quad \rightarrow$ replace x with $-\frac{8}{5}$ and solve for y

$y = -\frac{5}{6}\left(-\frac{8}{5}\right) + 4 \quad \rightarrow$ multiply $-\frac{5}{6}$ and $-\frac{8}{5}$

$y = \frac{40}{30} + 4 \quad \rightarrow \quad y = \frac{4}{3} + 4 \quad \rightarrow \quad y = \frac{4}{3} + \frac{12}{3} \quad \rightarrow \quad y = \frac{16}{3}$ or $5\frac{1}{3}$

30a.
The line is slanting downward as you move from left to right so the slope is negative. If you calculate the slope, you will also see that the slope is negative. To move from (−3, 4) to (4, 3), you go down 1 unit and right 7 units. Slope is a ratio of rise over run, $\frac{\text{rise}}{\text{run}}$, so the slope of this line is $\frac{-1}{7}$, which can be written as $-\frac{1}{7}$.

30b.
The line is slanting upward as you move from left to right so the slope is positive. If you calculate the slope, you will also see that the slope is positive. To move from (−1, −5) to (2, 4), you go up 9 units and right 3 units. Slope is a ratio of rise over run, $\frac{\text{rise}}{\text{run}}$, so the slope of this line is $\frac{9}{3}$, which can be simplified and written as 3.

30c.
The line is horizontal so the slope is zero. If you calculate the slope, you will also see that the slope is zero. To move from (−1, 4) to (2, 4), you go up 0 units and right 3 units. Slope is a ratio of rise over run, $\frac{\text{rise}}{\text{run}}$, so the slope of this line is $\frac{0}{3}$, which can be simplified and written as 0.

35.
The *y*-values of the two lines are equal at their intersection point. To find the *x*-value at the intersection point, make the expression $\frac{3}{4}x + 1$ equal the expression $-x - 13$ and solve for *x*.

$\frac{3}{4}x + 1 = -x - 13 \;\rightarrow\;$ add *x* to both sides: $\frac{3}{4}x + x \;\rightarrow\; \frac{3}{4}x + \frac{4}{4}x \;\rightarrow\; \frac{7}{4}x$

$\frac{7}{4}x + 1 = -13 \;\rightarrow\;$ subtract 1 on both sides

$\frac{7}{4}x = -14 \;\rightarrow\;$ multiply both sides by $\frac{4}{7}$

$\frac{4}{7} \cdot \frac{7}{4}x = -14 \cdot \frac{4}{7} \;\rightarrow\;$ simplify

$x = -\frac{14}{1} \cdot \frac{4}{7} \;\rightarrow\; x = -\frac{56}{7} \;\rightarrow\; x = -8$

Solve for *y* by replacing *x* with −8 in either of the two equations.

$y = -(-8) - 13 \;\rightarrow\; y = 8 - 13 \;\rightarrow\; y = -5$

The lines intersect at $(-8, -5)$.

38.
The *y*-values of the two lines are equal at their intersection point. To find the *x*-value at the intersection point, make the expression $-\frac{1}{2}x + 3$ equal the expression $2x - 1$ and solve for *x*.

$-\frac{1}{2}x + 3 = 2x - 1 \;\rightarrow\;$ add $\frac{1}{2}x$ to both sides: $2x + \frac{1}{2}x \;\rightarrow\; \frac{4}{2}x + \frac{1}{2}x \;\rightarrow\; \frac{5}{2}x$

$3 = \frac{5}{2}x - 1 \;\rightarrow\;$ add 1 to both sides

$4 = \frac{5}{2}x \;\rightarrow\;$ multiply both sides by $\frac{2}{5}$

$\frac{2}{5} \cdot 4 = \frac{5}{2}x \cdot \frac{2}{5} \;\rightarrow\;$ simplify

$\frac{2}{5} \cdot 4 = x \;\rightarrow\; \frac{2}{5} \cdot \frac{4}{1} = x \;\rightarrow\; \frac{8}{5} = x$

Solve for *y* by replacing *x* with $\frac{8}{5}$ in either of the two equations.

$y = 2\left(\frac{8}{5}\right) - 1 \;\rightarrow\; y = \frac{16}{5} - 1 \;\rightarrow\; y = \frac{16}{5} - \frac{5}{5} \;\rightarrow\; y = \frac{11}{5}$

The lines intersect at $\left(\frac{8}{5}, \frac{11}{5}\right)$ or $\left(1\frac{3}{5}, 2\frac{1}{5}\right)$ or $(1.6, 2.2)$.

39.
$\frac{1}{4}x - 7 = -x + 3 \quad \rightarrow$ add x to both sides: $\frac{1}{4}x + x \quad \rightarrow \quad \frac{1}{4}x + \frac{4}{4}x \quad \rightarrow \quad \frac{5}{4}x$
$\frac{5}{4}x - 7 = 3 \quad \rightarrow$ add 7 to both sides
$\frac{5}{4}x = 10 \quad \rightarrow$ multiply both sides by $\frac{4}{5}$
$\frac{4}{5} \cdot \frac{5}{4}x = 10 \cdot \frac{4}{5} \quad \rightarrow$ simplify
$x = 10 \cdot \frac{4}{5} \quad \rightarrow \quad x = \frac{40}{5} \quad \rightarrow \quad x = 8$
Solve for y by replacing x with 8 in either of the two equations.
$y = -(8) + 3 \quad \rightarrow \quad y = -8 + 3 \quad \rightarrow \quad y = -5$
The lines intersect at $(8, -5)$.

40.
In each equation, isolate y by converting the equation to Slope-Intercept Form.
<u>Equation 1:</u>
$4x - 5y = 10 \quad \rightarrow$ subtract $4x$ on both sides
$-5y = 10 - 4x \quad \rightarrow$ divide by -5 on both sides
$y = \frac{10}{-5} - \frac{4x}{-5} \quad \rightarrow$ simplify the fractions
$y = -2 + \frac{4}{5}x \quad \rightarrow$ rewrite the equation in the form y = Ax + B
$y = \frac{4}{5}x - 2$
<u>Equation 2:</u>
$30 - 10y = 2x \quad \rightarrow$ subtract 30 on both sides
$-10y = 2x - 30 \quad \rightarrow$ divide by -10 on both sides
$y = \frac{2x}{-10} - \frac{30}{-10} \quad \rightarrow$ simplify the fractions
$y = -\frac{1}{5}x + 3$
To find the intersection point of the two lines, make the right sides of the equations equal and solve.
$\frac{4}{5}x - 2 = -\frac{1}{5}x + 3 \quad \rightarrow$ add $\frac{1}{5}x$ to both sides: $\frac{4}{5}x + \frac{1}{5}x \quad \rightarrow \quad \frac{5}{5}x \quad \rightarrow \quad x$
$x - 2 = 3 \quad \rightarrow \quad x = 5$
Solve for y by replacing x with 5 in either of the two equations.
$y = \frac{4}{5}(5) - 2 \quad \rightarrow \quad y = \frac{20}{5} - 2 \quad \rightarrow \quad y = 4 - 2 \quad \rightarrow \quad y = 2$
The lines intersect at $(5, 2)$.

41.
To find the intersection point of the two lines, make the right sides of the equations equal and solve.
$-3x + 3 = 2x - 3 \quad \rightarrow$ add $3x$ to both sides
$3 = 5x - 3 \quad \rightarrow$ add 3 to both sides
$6 = 5x \quad \rightarrow$ divide by 5 on both sides
$\frac{6}{5} = x$
Solve for y by replacing x with $\frac{6}{5}$ in either of the two equations.
$y = 2\left(\frac{6}{5}\right) - 3 \quad \rightarrow \quad y = \frac{12}{5} - 3 \quad \rightarrow \quad y = \frac{12}{5} - \frac{15}{5} \quad \rightarrow \quad y = -\frac{3}{5}$
The lines intersect at $\left(\frac{6}{5}, -\frac{3}{5}\right)$.

42.

To write the equation in Slope-Intercept Form, $y = mx + b$, find the slope and the y-intercept. To find the slope, you need to know the rise and the run. The rise is the difference between the y-values. The run is the difference between the x-values. You can also refer to the slope formula below:

$m = \frac{y_2 - y_1}{x_2 - x_1} \rightarrow m = \frac{5 - 15}{16 - (-24)} \rightarrow m = \frac{-10}{40} \rightarrow m = -\frac{1}{4}$

The slope is $-\frac{1}{4}$, so you can write the equation as $y = -\frac{1}{4}x + b$. Pick one of the points on the line, replace x and y with those values and solve for b. If you use the point (16, 5), the equation is:

$5 = -\frac{1}{4}(16) + b$

You can multiply $-\frac{1}{4}$ and 16 to get -4, which makes the equation $5 = -4 + b$, so $b = 9$. Now you know that the y-intercept is 9. In Slope-Intercept Form, the equation is $y = -\frac{1}{4}x + 9$.

44.

$y = -\frac{1}{4}x + 9 \rightarrow$ replace y with 0 and solve for x

$0 = -\frac{1}{4}x + 9 \rightarrow$ subtract 9 on both sides

$-9 = -\frac{1}{4}x \rightarrow$ multiply both sides by the reciprocal of $-\frac{1}{4}$, which is -4

$-4 \cdot -9 = -\frac{1}{4}x \cdot -4 \rightarrow$ simplify

$36 = x$

If $y = 0$, $x = 36$. The x-intercept of the line is (36, 0).

45b.

To find the intersection point of the two lines, make the right sides of the equations equal and solve.

$\frac{5}{4}x + 5 = 5x - 20 \rightarrow$ subtract $\frac{5}{4}x$ on both sides: $5x - \frac{5}{4}x \rightarrow \frac{20}{4}x - \frac{5}{4}x \rightarrow \frac{15}{4}x$

$5 = \frac{15}{4}x - 20 \rightarrow$ add 20 to both sides

$25 = \frac{15}{4}x \rightarrow$ muliply by $\frac{4}{15}$ on both sides

$\frac{4}{15} \cdot 25 = \frac{15}{4}x \cdot \frac{4}{15} \rightarrow$ simplify: $\frac{4}{15} \cdot 25 \rightarrow \frac{100}{15} \rightarrow \frac{20}{3}$

$\frac{20}{3} = x$

Solve for y by replacing x with $\frac{20}{3}$ in either of the two equations.

$y = 5\left(\frac{20}{3}\right) - 20 \rightarrow y = \frac{100}{3} - 20 \rightarrow y = \frac{100}{3} - \frac{60}{3} \rightarrow y = \frac{40}{3}$

The lines intersect at $\left(\frac{20}{3}, \frac{40}{3}\right)$ or $\left(6\frac{2}{3}, 13\frac{1}{3}\right)$.

50a.

To graph the line $y = \frac{1}{3}x + 1$, plot a point at the y-intercept, which is (0, 1). Use the slope to plot more points. Since the slope is $\frac{1}{3}$, you can plot another point by moving up 1 and right 3 to (3, 2). You can also point another point by starting at the y-intercept and moving down 1 and left 3 to (-3, 0), since the ratio $\frac{-1}{-3}$ is equivalent to $\frac{1}{3}$.

To graph the line $4x - 3y = 15$, it may be easier to convert the equation to Slope-Intercept Form.

$4x - 3y = 15 \rightarrow$ subtract $4x$ on both sides

$-3y = 15 - 4x \rightarrow$ divide by -3 on both sides

$y = \frac{15}{-3} - \frac{4x}{-3} \rightarrow$ simplify the fractions

$y = -5 + \frac{4}{3}x \rightarrow$ rewrite the equation in the form $y = Ax + B$

$y = \frac{4}{3}x - 5$

(continued from previous page)
To graph the line $y = \frac{4}{3}x - 5$, plot a point at the y-intercept, which is $(0,\ -5)$. Use the slope to plot more points. Since the slope is $\frac{4}{3}$, you can plot another point by moving up 4 and right 3 to $(3,\ -1)$.

50b.
$4x - 3\left(\frac{1}{3}x + 1\right) = 15$ → distribute the -3 to both terms inside parentheses
$4x - x - 3 = 15$ → combine like terms
$3x - 3 = 15$ → add 3 to both sides
$3x = 18$ → divide by 3
$x = 6$

51b.
Equation 1:
$y = \frac{1}{3}x + 1$ → $y = \frac{1}{3}(6) + 1$ → $y = 2 + 1$ → $y = 3$
Equation 2:
$4x - 3y = 15$ → $4(6) - 3y = 15$ → $24 - 3y = 15$ → $-3y = -9$ → $y = 3$

53.
$y = \frac{3}{4}(8 - 4y) - 4$ → $y = 6 - 3y - 4$ → $y = 2 - 3y$ → $4y = 2$ → $y = \frac{1}{2}$

55.
$5x + 2(3x - 7) = 19$ → distribute the 2 to both terms inside parentheses
$5x + 6x - 14 = 19$ → combine like terms
$11x - 14 = 19$ → add 14 to both sides
$11x = 33$ → divide by 11
$x = 3$
Solve for y by replacing x with 3 in either of the two equations.
$y = 3(3) - 7$ → $y = 9 - 7$ → $y = 2$
The lines intersect at $(3, 2)$.

56.
$2(7y - 7) + 5y = 5$ → distribute the 2 to both terms inside parentheses
$14y - 14 + 5y = 5$ → combine like terms
$19y - 14 = 5$ → add 14 to both sides
$19y = 19$ → divide by 19
$y = 1$
Solve for x by replacing y with 1 in either of the two equations.
$x = 7(1) - 7$ → $x = 7 - 7$ → $x = 0$
The lines intersect at $(0, 1)$.

57a.
$-2x + 4\left(-\frac{3}{4}x + 2\right) = 28$ → distribute the 4 to both terms inside parentheses
$-2x - 3x + 8 = 28$ → combine like terms
$-5x + 8 = 28$ → subtract 8 on both sides
$-5x = 20$ → divide by -5
$x = -4$ → Solve for y by replacing x with -4 in either of the two equations.
$y = -\frac{3}{4}(-4) + 2$ → $y = 3 + 2$ → $y = 5$
The lines intersect at $(-4, 5)$.

57b.
$3\left(-\frac{1}{3}y+4\right)-5y=3 \quad \rightarrow$ distribute the 3 to both terms inside parentheses
$-y+12-5y=3 \quad \rightarrow$ combine like terms
$-6y+12=3 \quad \rightarrow$ subtract 12 on both sides
$-6y=-9 \quad \rightarrow$ divide by -6
$y=\frac{-9}{-6} \quad \rightarrow \quad y=\frac{3}{2}$
Solve for x by replacing y with $\frac{3}{2}$ in either of the two equations.
$x=-\frac{1}{3}\left(\frac{3}{2}\right)+4 \quad \rightarrow \quad x=-\frac{1}{2}+4 \quad \rightarrow \quad x=-\frac{1}{2}+\frac{8}{2} \quad \rightarrow \quad x=\frac{7}{2}$
The lines intersect at $\left(\frac{3}{2}, \frac{7}{2}\right)$ or $(1.5,\ 3.5)$.

58.
Isolate either variable in either equation. Suppose you isolate x in the equation $-4x-8y=8$.
$-4x-8y=8 \quad \rightarrow \quad -4x=8+8y \quad \rightarrow \quad x=\frac{8}{-4}+\frac{8y}{-4} \quad \rightarrow \quad x=-2-2y$
In the other equation, $3x-2y=10$, replace x with the expression $-2-2y$.
$3(-2-2y)-2y=10 \quad \rightarrow$ distribute the 3 to both terms inside parentheses
$-6-6y-2y=10 \quad \rightarrow$ combine like terms
$-6-8y=10 \quad \rightarrow$ add 6 on both sides
$-8y=16 \quad \rightarrow$ divide by -8
$y=-2$
Solve for x by replacing y with -2 in either of the two equations.
$x=-2-2y \quad \rightarrow \quad x=-2-2(-2) \quad \rightarrow \quad x=-2+4 \quad \rightarrow \quad x=2$
The lines intersect at $(2,\ -2)$.

59b.
In the equation, $-3x+7y=5$, replace y with the expression $-x+9$.
$-3x+7(-x+9)=5 \quad \rightarrow$ distribute the 7 to both terms inside parentheses
$-3x-7x+63=5 \quad \rightarrow$ combine like terms
$-10x+63=5 \quad \rightarrow$ subtract 63 on both sides
$-10x=-58 \quad \rightarrow$ divide by -10
$x=5.8$
Solve for y by replacing x with 5.8 in either of the two equations.
$y=-x+9 \quad \rightarrow \quad y=-(5.8)+9 \quad \rightarrow \quad y=-5.8+9 \quad \rightarrow \quad y=3.2$
The lines intersect at $(5.8,\ 3.2)$.
Glenna's solution of $(6,\ 3)$ is close but not exact.

60.
For these 2 equations, the easiest variable to isolate is y in the equation $-3x-y=19$.
$-3x-y=19 \quad \rightarrow \quad -y=19+3x \quad \rightarrow \quad y=-(19+3x) \quad \rightarrow \quad y=-19-3x$
In the equation, $5x-\frac{1}{2}y=3$, replace y with the expression $-19-3x$.
$5x-\frac{1}{2}(-19-3x)=3 \quad \rightarrow$ distribute the $\frac{1}{2}$ to both terms inside parentheses
$5x+\frac{19}{2}+\frac{3}{2}x=3 \quad \rightarrow$ combine like terms: $5x+\frac{3}{2}x \quad \rightarrow \quad \frac{10}{2}x+\frac{3}{2}x \quad \rightarrow \quad \frac{13}{2}x$
$\frac{13}{2}x+\frac{19}{2}=3 \quad \rightarrow$ subtract $\frac{19}{2}$ on both sides: $3-\frac{19}{2} \quad \rightarrow \quad \frac{6}{2}-\frac{19}{2} \quad \rightarrow \quad -\frac{13}{2}$
$\frac{13}{2}x=-\frac{13}{2} \quad \rightarrow$ multiply by $\frac{2}{13}$ on both sides
$\frac{2}{13}\cdot\frac{13}{2}x=-\frac{13}{2}\cdot\frac{2}{13} \quad \rightarrow \quad x=-1$
Solve for y by replacing x with -1 in the equation $y=-19-3x \quad \rightarrow \quad y=-19-3(-1) \quad \rightarrow \quad y=-19+3$
The lines intersect at $(-1,\ -16)$.

61.
For these 2 equations, the easiest variable to isolate is y in the equation $-4x + 2y = 6$.
$-4x + 2y = 6 \quad \rightarrow \quad 2y = 6 + 4x \quad \rightarrow \quad y = \dfrac{6 + 4x}{2} \quad \rightarrow \quad y = 3 + 2x$
In the equation, $9x - 4y = 11$, replace y with the expression $3 + 2x$.
$9x - 4(3 + 2x) = 11 \quad \rightarrow$ distribute the -4 to both terms inside parentheses
$9x - 12 - 8x = 11 \quad \rightarrow$ combine like terms
$x - 12 = 11 \quad \rightarrow$ add 12 on both sides
$x = 23$
Solve for y by replacing x with 23 in the equation $y = 3 + 2x \quad \rightarrow \quad y = 3 + 2(23) \quad \rightarrow \quad y = 3 + 46$
The lines intersect at $(23,\ 49)$.

62.
Find the equations of the two lines.
The line with a positive slope has a y-intercept of 5 and a slope of $\frac{3}{2}$. Its equation is $y = \frac{3}{2}x + 5$.
The line with a negative slope has a y-intercept of -4 and a slope of $-\frac{1}{2}$. Its equation is $y = -\frac{1}{2}x - 4$.
Find the intersection point by making the equations equal. Solve the equation
$\frac{3}{2}x + 5 = -\frac{1}{2}x - 4 \quad \rightarrow$ add $\frac{1}{2}x$ on both sides: $\frac{3}{2}x + \frac{1}{2}x \quad \rightarrow \quad \frac{4}{2}x \quad \rightarrow \quad 2x$
$2x + 5 = -4 \quad \rightarrow$ subtract 5 on both sides
$2x = -9 \quad \rightarrow$ divide by 2 on both sides
$x = -\frac{9}{2}$
Solve for y by replacing x with $-\frac{9}{2}$ in either of the two equations.
$y = \frac{3}{2}\left(-\frac{9}{2}\right) + 5 \quad \rightarrow \quad x = -\frac{27}{4} + 5 \quad \rightarrow \quad x = -\frac{27}{4} + \frac{20}{4} \quad \rightarrow \quad x = -\frac{7}{4}$
The lines intersect at $\left(-\frac{9}{2},\ -\frac{7}{4}\right)$ or $(-4.5,\ -1.75)$.

63.
Start by finding the equation of each line.
The caterpillar starts closer to the finish line so the dashed line represents the caterpillar. The marks on the vertical axis count by 300, so the dashed line has a d-intercept of (0, 1200). To find the slope, pick 2 points on the line. Note that the marks on the horizontal axis count by 4. Two easy points to identify are (0, 1200) and (12, 900).
Using these points, the slope of the dashed line is $\frac{y_2 - y_1}{x_2 - x_1} \quad \rightarrow \quad \frac{900 - 1200}{12 - 0} \quad \rightarrow \quad \frac{-300}{12} \quad \rightarrow \quad -25$
The equation of the dashed line is $d = -25t + 1200$.
The solid line represents the beetle. This line has a d-intercept of (0, 3000). To find the slope, pick 2 points on the line. Two easy points to identify are (0, 3000) and (4, 2700).
Using these points, the slope of the dashed line is $\frac{y_2 - y_1}{x_2 - x_1} \quad \rightarrow \quad \frac{2700 - 3000}{4 - 0} \quad \rightarrow \quad \frac{-300}{4} \quad \rightarrow \quad -75$
The equation of the dashed line is $d = -75t + 3000$.
At the moment the beetle catches the caterpillar, they will both be the same distance away from the finish line. To find this point, make the beetle's distance equal the caterpillar's distance. This create the equation $-25t + 1200 = -75t + 3000$. Solve for t.
$-25t + 1200 = -75t + 3000 \quad \rightarrow \quad 50t + 1200 = 3000 \quad \rightarrow \quad 50t = 1800 \quad \rightarrow \quad t = 36$
The beetle catches the caterpillar after 36 seconds.
After 36 seconds, the beetle is $-75(36) + 3000$ feet away from the finish line. This can be simplified.
$-75(36) + 3000 \quad \rightarrow \quad -2700 + 3000 \quad \rightarrow \quad 300$
The beetle is 300 feet away from the finish line.

65a.

A + B is $(6x + 5y) + (x - 4y) \rightarrow 6x + x + 5y + (-4y) \rightarrow 7x + y$

65b.

Since 50 + 50 = 100, you can add $3x - y$ and $2x + 9y$ to get an expression that equals 100.

$(3x - y) + (2x + 9y) \rightarrow 3x + 2x + (-y) + 9y \rightarrow 5x + 8y$

66c.

If you add the equations, you will get $8x - 7y = 11$. To make the left sides of the equations combine to form $10x - 11y$, you can double the first equation to make it $4x - 8y = 2$.

Since $4x - 8y = 2$ and $6x - 3y = 10$, you can add the equations to get $10x - 11y = 10$.