**Linear Functions: Systems of Equations**

**Systems of Equations: a coordinate at which two lines meet**



**Solve the system *y* – 2*x* = 4 and *y* = 2*x* by graphing.**

Write *y* – 2*x* = 4 in slope-intercept form.



Graph each equation on the same coordinate plane.



The lines appear to be parallel. So, there is no solution.

**Model with Mathematics Refer to the graphic novel frame below for Exercises a-b.**



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**a.** The equation *y* = 0.71*x* represents the total cost *y* of *x* tickets at the rate of 7 tickets for $5. The equation *y* = 25 represents the cost of a wristband. Graph each equation on the same coordinate plane.

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**b.** How many rides must each person ride for the wristband to be the better deal?

Find the intersection point of the two lines to find the place where the cost is the same for individual tickets and for the wristband.

The two lines intersect at 35 tickets. Since each ride uses 2 tickets, 35 ÷ 2 = 17.5 rides. So, the wristband is a better deal at 18 rides.

**Solve the system *y* = *x* – 10 and *y* = –12 algebraically.**

Since *y* = *x* − 10 and *y* = −12, substitute −12 in for *y* in the first equation and solve for *x*.

*y* = *x* − 10 Write the equation.

−12 = *x* − 10 Replace *y* with −12.

−12 + 10 = *x* − 10 + 10 Addition Property of Equality

−2 = *x* Simplify.

Since *y* = −12, the solution to the system is the point (−2, −12).



**The cost of 8 muffins and 2 quarts of milk is $18. The cost of 3 muffins   
and 1 quart of milk is $7.50. How much does 1 muffin and 1 quart of   
milk cost? Write and solve a system of equations. Use a bar diagram if needed. Interpret the solution.**

Let *x =* the cost for 1 muffin and *y* = the cost for 1 quart of milk.

8*x* + 2*y* = 18 8 muffins and 2 quarts of milk cost $18.

3*x* + *y* = 7.5 3 muffins and 1 quart of milk cost $7.50.

Solve for *y* in the second equation.

3*x* + *y* = 7.5 Write the equation.

3*x* − 3*x* + *y* = 7.5 − 3*x* Subtraction Property of Equality

*y* = 7.5 − 3*x* Simplify.

Since 8*x* + 2*y* = 18 and *y* = 7.5  3*x*, substitute 7.5  3*x* in for *y* in the first equation and solve for *x*.

8*x* + 2*y* = 18 Write the equation.

8*x* + 2(7.5  3*x*) = 18 Replace *y* with 7.5  3*x*.`

8*x* + 15  6*x* = 18 Distributive Property

2*x* + 15 = 18 Simplify.

2*x* = 3 Addition Property of Equality

*x* = 1.5 Division Property of Equality

Since *x* = 1.5, substitute 1.5 for *x* in the equation *y* = 7.5  3*x*.

*y* = 7.5  3*x* Write the equation.

*y* = 7.5 – 3(1.5) Replace *x* with 1.5.

*y* = 3 Simplify.

The solution is (1.5, 3). This means that one muffin costs $1.50 and one quart of milk costs $3.