

2.13 Real World Applications

For Linear Equations, Inequalities,
Systems & Functions

Standards:

A.REI.3

F.IF.5

A.CED.1

A.CED.2

A.CED.3

F.BF.1



Tips for creating Linear Functions :

Step 1: determine what is the quantity that varies — that's the variable, and what is the quantity that will remain the same — that's the constant.

Step 2: denote what is the independent variable (x) and what is the dependent variable ($f(x)$)

Step 3: Create the function : (i.e.) Dep. Var = Ind var + constant
 $f(x) = mx + c$

Step 4: Answer the question appropriately.

[Example] Ahmed has a saving's plan. His parent's will give him \$250 to start his investment and add \$50 each month. Model this situation.

- quantity that varies = \$50 per month
- quantity remaining the same = \$250

Let x = month and $f(x)$ = total amount.

$$f(x) = 50x + 250.$$

How much does Ahmed have in his savings account after 3 months?
 $x = 3$

$$\begin{aligned} f(3) &= 50(3) + 250 \\ &= \$400. \end{aligned}$$

How many months will Ahmed have to wait if he wants \$1150 in his savings account?

$$f(x) = 1150.$$

$$\begin{array}{r} f(x) = 50x + 250 \\ 1150 = 50x + 250 \\ -250 \quad \quad -250 \\ \hline 900 = 50x \\ 18 \text{ months} = x. \end{array}$$

Tips for creating Linear Inequalities

- very similar to creating Linear Equations, except solving will most likely involve shading.
- Be familiar with language like:
 - (examples)
 - Less than $<$ \rightarrow fewer than, is below
 - greater than $>$ \rightarrow more than, exceeds,
 - less than or equal to $\rightarrow \leq$ at most, maximum value of
 - greater than or equal to $\rightarrow \geq$ at least, minimum value of

[Example] Michelle is selling jewelry to earn money for camp. Bracelets sell for \$2 and necklaces sell for \$23 and she needs to make at least \$350 in revenue to cover the cost of camp. Create the inequality.

- both quantities vary = \$2 per b & \$23 per n

- Let b = bracelet & n = necklace
- at least \rightarrow greater than or equal to \geq

$$2b + 23n \geq 350$$

Tips for Systems of Equations

step 1: Define your variables

step 2: Write 2 linear equations — one most likely will be explicitly read in problem & the other may be implicit in the problem.

step 3: Solve the system of equation appropriately (usually elimination is the most efficient)

[Example] An exam contains 50 questions. Some questions are worth two points and some are worth five points with a total of 145 points on the exam. Create the system.

- Let x be 2-point questions & let y be 5-point questions.

$$\begin{aligned} 2x + 5y &= 145 \\ x + y &= 50 \end{aligned}$$

How many 2-point & 5-point questions are on the test?

$$\begin{aligned} 2x + 5y &= 145 \\ -2(x + y) &= -100 \end{aligned} \Rightarrow \begin{aligned} 2x + 5y &= 145 \\ -2x - 2y &= -100 \\ \hline 3y &= 45 \\ \frac{3y}{3} &= \frac{45}{3} \end{aligned}$$

Sub 15 for y:

$$x + 15 = 50$$

$$x = 35$$

$y = 15$ (five-point ques) (two-point ques.)

Tips for Systems of Linear Inequalities

- very similar to creating linear systems, except solving will most likely involve shading.

[Example] Pete is fishing in a lake for salmon & trout. You can sell the salmon for \$3 each & trout for \$5 each. Regulations say that you can't catch more than 15 fish a day, and you can't catch more than \$55 of fish a day. Create the system of inequality

- let s = salmon & t = trout.

$$\begin{aligned} 3x + 5y &\leq 55 \\ x + y &\leq 15 \end{aligned}$$