

## It's In the System: Homework Examples from ACE

Investigation 1: *Linear Equations with Two Variables*, ACE #3

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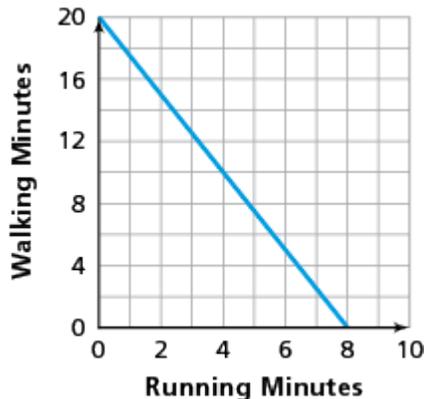
### Investigation 1: *Linear Equations with Two Variables* ACE #3

3. Students in Eric's gym class must cover a distance of 1,600 meters by running or walking. Most students run part of the way and walk part of the way. Eric can run at an average speed of 200 meters per minute and walk at an average speed of 80 meters per minute.

- Suppose Eric runs for 4 minutes and walks for 8 minutes. How close is he to the 1,600-meter goal?
- Write an equation for the distance  $d$  Eric will cover if he runs for  $x$  minutes and walks for  $y$  minutes.
- Find three combinations of running and walking times for which Eric would cover 1,600 meters.
- Plot the ordered pairs from part (c) on a graph. Use the graph to estimate several other combinations of running and walking times for which Eric would cover 1,600 meters.

3.

- $4(200)+8(80)=1,440$  meters, so he is 160 meters from his goal.
- $d = 200x + 80y$
- Combinations include  $(0, 20)$ ,  $(8, 0)$ ,  $(4, 10)$ , and so on.
- There are many other combinations, including  $(2, 15)$  and  $(5, 7)$ , shown in the graph.



Investigation 2: *Solving Linear Systems Symbolically*

ACE #15-16

15. A sixth-grade class sells pennants and flags. They earn +1 profit for each pennant sold and +6 profit for each flag sold. They sell 50 items in total for a profit of +115.

a. Write two equations that represent the relationship between the number of pennants sold  $p$  and the number of flags sold  $f$ .

b. How many pennants and how many flags were sold?

16. A seventh-grade class sells mouse pads and cell phone cases with their school logo on them. The class earns +2 profit for each mouse pad sold and +4 profit for each cell phone case sold. They sell 100 items in total for a profit of +268.

a. Write two equations that represent the relationship between the number of mouse pads sold  $m$  and the number of cell phone cases sold  $c$ .

b. How many mouse pads and how many cell phone cases were sold?

15.

a.  $p+f=50$  ;  $p+6f=115$

b. Students might solve both equations for  $p$  ,  $p=50-f$  and  $p=115-6f$ , and then set both equations equal to each other and solve:  $50-f=115-6f$  .  $f=13$ ,  $p=37$ .

16.

a.  $m+c=100$  ;  $2m+4c=268$

b. Students might solve both equations for  $m$  :  $m=100-c$ ;  $m=134-2c$ .  $m=66$ ,  $c=34$ .

Investigation 3: *Systems of Functions and Inequalities*  
ACE #9

9. When a soccer ball is kicked into the air, its height  $h$  in feet at any time  $t$  seconds later can be estimated by the function  $h = -16t^2 + 32t$ . For each question, write and solve an equation or inequality.

- When does the ball return to the ground ( $h = 0$  feet)?
- When is the ball 12 feet above the ground?
- When is the ball at least 12 feet above the ground?
- When is the ball at most 12 feet above the ground?
- When is the ball 16 feet above the ground?

9.

- $-16t^2 + 32t = 0$  when  $t=2$  (also when  $t=0$ )
- $-16t^2 + 32t = 12$  when  $t=0.5$  and  $t=1.5$  (both answers are needed, as it occurs once on the way up and once on the way down)
- $-16t^2 + 32t \geq 12$  when  $0.5 \leq t \leq 1.5$
- $-16t^2 + 32t \leq 12$  when  $t \leq 0.5$  and when  $1.5 \leq t$

**Note:** The ball hits the ground at  $t=2$  and presumably stays there, so the equation for the height is not valid for  $t > 2$ .

- $-16t^2 + 32t = 16$  when  $t=1$

Investigation 4: *Systems of Linear Inequalities*

ACE #4

4. Math Club members are selling games and puzzles. They make a profit of \$10 per game and \$8 per puzzle. They would like to make a profit of at least \$200.

- What are some possibilities for the number of games and the number of puzzles the Math Club can sell to reach its goal?
- Write an inequality to model this situation.
- Draw a graph of all the pairs (*number of games, number of puzzles*) that meet the goal.

4.

- Possible (*games, puzzles*) pairs include (20,0), (0,25), and (8,15).
- Let  $x$  represent the number of games. Let  $y$  represent the number of puzzles:  
 $10x + 8y \geq 200$

c.

