### 1.7 Modeling with Functions

Target 1E: Model real world situations and use regressions with the use of functions

## Review of Prior Concepts

1. Write as a mathematical expression: five less than twice a number
2. A small company has $\$ 1000$ to distribute to its employees as a bonus. Write a mathematical expression for how much money each employee will get.
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                    More Practice
Writing Mathematical Expressions
https://www.khanacademy.org/math/algebra-basics/core-algebra-expressions/core-algebra-variables-
and-expressions/v/writing-expressions-1
http://www.learnnc.org/lp/media/uploads/2008/08/9writing_expressions.pdf
https://www.youtube.com/watch?v=CfUvzKZgPJQ
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## SAT Connection

## Heart of Algebra

1. Create, solve, or interpret a linear expression or equation in one variable Example:
If $16+4 x$ is 10 more than 14 , what is the value of $8 x$ ?
A) 2
B) 6
C) 16
D) 80

## Solution

## Change English Statements into Mathematical Expression

- Write a mathematical expression for the quantity described verbally. (An expression has no equal sign, and, therefore, can NOT be solved.)


## Example 1:

a) A number $x$ decreased by six and then doubled.
b) A salary after a $4.4 \%$ increase, if the original salary is $x$ dollars.

## Write Equations to Model Given Situations

- Write an equation for each of the following statements.


## Example 2:

a) One leg of a right triangle is three times as long as the other. Write the length of the hypotenuse as a function of the length of the shorter leg.
b) The diameter of a right circular cylinder equals half its height. Write the volume of the cylinder as a function of its height. The volume of a right circular cylinder is given by $V=\pi r^{2} h$.

## Use Equations to Solve Percentage and Mixture Problems

- For each statement below, do the following:

1. Write an equation (be sure to define any variables used).
2. Solve the equation, and answer the question.

## Example 3:

a) One positive number is twice another positive number. The sum of the two numbers is 390 . Find the two numbers.
b) Joe Pearlman received a $3.5 \%$ pay decrease. His salary after the decrease was $\$ 27,985$. What was his salary before the decrease?
c) Jackie has $\$ 25,000$ to invest. She invests part of the money at $5.5 \%$ annual interest and the remaining balance at $8.3 \%$ annual interest. How much is invested at each rate if Jackie receives a 1year interest payment of $\$ 1571$ ?
d) The chemistry lab at the University of Ellannoy keeps two acid solutions on hand. One is $20 \%$ acid and the other is $35 \%$ acid. How much $20 \%$ acid solution and how much $35 \%$ acid solution should be used to prepare 25 liters of a $26 \%$ acid solution?

## More Practice

## Modeling with Functions

http://cims.nyu.edu/~kiryl/Precalculus/Section_1.6-
Modeling\%20with\%20Equations/Modeling\%20with\%20Equations.pdf
https://socratic.org/precalculus/functions-defined-and-notation/modeling-with-functions

## SAT Connection <br> Solution

Choice C is correct. The description " $16+4 x$ is 10 more than 14 " can be written as the equation $16+4 x=10+14$, which is equivalent to $16+4 x=24$. Subtracting 16 from each side of $16+4 x=24$ gives $4 x=8$. Since $8 x$ is 2 times $4 x$, multiplying both sides of $4 x=8$ by 2 gives $8 x=16$. Therefore, the value of $8 x$ is 16 .

Choice A is incorrect because it is the value of $x$, not $8 x$. Choices B and D are incorrect; those choices may be a result of errors in rewriting $16+4 x=$ $10+14$. For example, choice $D$ could be the result of subtracting 16 from the left side of the equation and adding 16 to the right side of $16+4 x=10+14$, giving $4 x=40$ and $8 x=80$.

