# 2.3 Applications of Linear Equations

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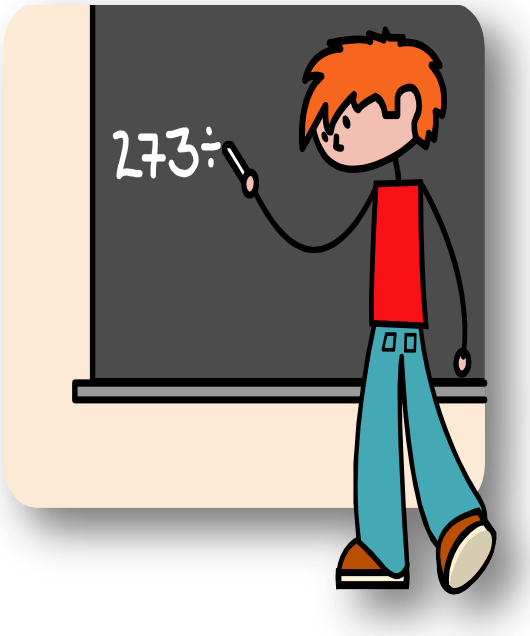



## Objectives:

- **Translate from words to mathematical expressions.**
- **Write equations from given information.**
- **Distinguish between simplifying expressions and solving equations.**
- **Use the six steps in solving an applied problem.**
- **Solve percent problems.**
- **Solve investment problems.**
- **Solve mixture problems.**

# **Objective 1** – Translate from words to mathematical expressions.

There are usually key words and phrases in a verbal problem that translate into mathematical expressions involving addition, subtraction, multiplication, and division.

- Addition
- Subtraction

- Multiplication
- Division
- Equals

# Example 1

- Translate each verbal sentence into an equation, using $x$ as the variable.

| Verbal Sentence | Equation |
| --- | --- |
| The sum of a number and 6 is 28. | |
| The product of a number and 7 is twice the number plus 12. | |
| The quotient of a number and 6, added to twice the number, is 7. | |

# Example 2

Decide whether each is an *expression* or an *equation.* Simplify any expressions, and solve any equations.

- $5x - 3(x + 2) = 7$
- $5x - 3(x + 2)$

# Objective 4 – Use the six steps in solving an applied problem

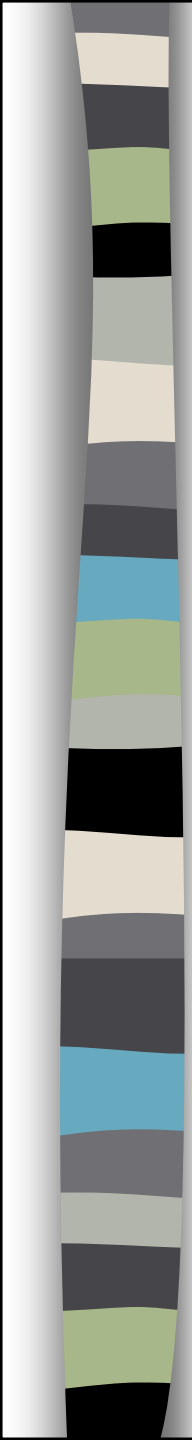
- _____ the problem carefully, several times if necessary, until you understand what is given and what is to be found.

- _____ to represent the unknown value. Use a sketch, diagram or table as needed. **Write down what the variable represents.** If necessary, express any other unknown values in terms of the variable.

- _____using the variable expression(s).
- _____ the equation.
- _____ Label it appropriately. Does it seem reasonable?
- _____ the answer in the words of the *original* problem.

# Example 3

- The length of a rectangle is 5 cm more than its width.  The perimeter is five times the width.  What are the dimensions of the rectangle?



# Example 4

- For the 2009 regular season, the MLB batting leaders in number of hits were Ichiro Suzuki and Derek Jeter. These two players had a total of 437 hits. Suzuki had 13 more hits than Jeter. How many hits did each player have?

# Example 5

- In 2002, there were 301 long-distance area codes in the United States, an increase of 250% over the number when the area code plan originated in 1947.  How many area codes were there in 1947?

# Example 6

- A man has $34,000 to invest. He invests some of the money at 5% and the balance at 4%. His total annual interest income is $1,545. Find the amount invested at each rate.

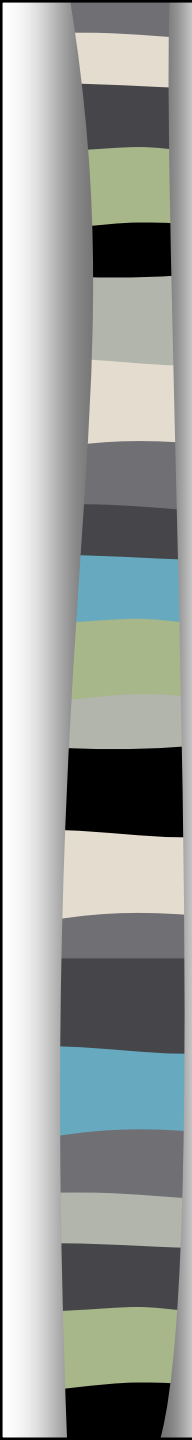
| Principal | Rate *(as a decimal)* | Time *(years)* | Interest |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

$$0.05x + 0.04(34000 - x) = 1545$$

# Example 7

- How many pounds of candy worth $8 per lb should be mixed with 100 lb of candy worth $4 per lb to get a mixture that can be sold for $7 per lb?

| Number of Pounds | $ Amount | Pounds of Candy worth $7 |
|---|---|---|
| | | |
| | | |
| | | |



# Example 8

- How much water must be added to 20 L of 50% antifreeze solution to reduce it to 40% antifreeze solution?

| Number of Liters | Percent *(as a decimal)* | Liters of Pure Antifreeze |
|---|---|---|
| | | |
| | | |
| | | |