# An Introduction to Applications of Linear Equations

## Translating Phrases into Math Expressions

### Addition

| Words | Expression |
|---|---|
| the sum of $x$ and 4 | $x + 4$ |
| $x$ plus $y$ | $x + y$ |
| 3 added to $n$ | $n + 3$ |
| 2 more than a number | $n + 2$ |
| $t$ increased by 10 | $t + 10$ |

### Subtraction

| Words | Expression |
|---|---|
| the difference of $x$ and 4 | $x - 4$ |
| $x$ minus $y$ | $x - y$ |
| **3 subtracted from $n$** | $\boldsymbol{n - 3}$ |
| **2 less than a number** | $\boldsymbol{n - 2}$ |
| $t$ decreased by 10 | $t - 10$ |

### Multiplication

| Words | Expression |
|---|---|
| the product of 4 and $x$ | $4x$ |
| 7 times $y$ | $7y$ |
| 5 multiplied by $n$ | $5n$ |
| twice a number | $2n$ |
| triple the number | $3n$ |
| $\frac{1}{2}$ of $x$ | $\frac{1}{2}x$ |

### Division

| Words | Expression |
|---|---|
| the quotient of $x$ and 4 | $x \div 4$ |
| $x$ divided by $y$ | $x \div y$ |
| $x$ divided *into* $y$ | $y \div x$ |

### Exponents and Roots

| Words | Expression |
|---|---|
| $c$ squared | $c^2$ |
| the square of $b$ | $b^2$ |
| $k$ cubed | $k^3$ |
| the cube of $b$ | $b^3$ |
| $n$ to the fourth power | $n^4$ |
| $y$ raised to the fifth power | $y^5$ |
| the square root of $x$ | $\sqrt{x}$ |

**Ex 1.**

If 5 is added to the product of 9 and a number, the result is 19 less than the number. Find the number.

**To solve problems:**

1. Select a **variable** to represent an unknown.
2. If there are other unknowns, write expressions for them in terms of the variable.
3. Write an equation using the variable and expressions from 1 and 2.
4. Solve the equation.

**Ex 2.**

A two-ingredient smoothie recipe calls for 2 cups of strawberries for every 1 cup of bananas. If we want to make 10 cups of smoothie, how many cups of strawberries and bananas should we use?

**Ex 3.**

Find two consecutive even integers such that six times the lesser added to the greater gives a sum of 86.

**Ex 4.**

A piece of pipe is 50 in. long.  It is cut into 3 pieces.  The longest piece is 10 in. more than the middle-sized piece, and the shortest piece measures 5 in. less than the middle-sized piece.  Find the lengths of the three pieces.

## Practice

1. If four times a number is added to 8, the result is three times the number, added to 5.  Find the number.

2. A lawn trimmer uses a mixture of gasoline and oil.  The mixture contains 16 oz of gasoline for each 1 ounce of oil.  If the tank holds 68 oz of the mixture, how many ounces of oil and how many ounces of gasoline does it require when it is full?

3. Find two consecutive odd integers such that twice the greater is 17 more than the lesser.

4. Two pages that face each other in a book have 569 as the sum of their page numbers.  What are the page numbers?