

8.1 Investigation Interest: Simple Interest

Goal: Use the simple interest formula to solve problems.

Whenever you *invest* or *borrow* money you will either earn money on the investment or have to pay money on the loan. The money that is earned or paid is called *interest*.

Terminology

- **Interest:** the cost of borrowing money or the money earned from an investment
- **Principal:** an original sum of money that is borrowed or invested.

Calculating Simple Interest

Simple interest is calculated as a percentage of the principal on an investment or loan using the formula $I = Prt$ where:

$$I = \frac{\text{Interest Amount}}{\text{Principal}} \text{ (accumulated over } \textit{time} \text{)}$$

$$P = \frac{\text{Principal}}{\text{Principal}} \text{ (the } \textit{original} \text{ amount)}$$

$$r = \frac{\text{Interest rate}}{\text{Interest rate}} \text{ (expressed as a } \textit{decimal} \text{)}$$

$$t = \frac{\text{Time}}{\text{Time}} \text{ (expressed in terms of } \textit{YEARS} \text{)}$$

Simple interest is added to the principal at the end of the period using the formula $A = P + I$, where

$$A = \frac{\text{Accumulated Amount}}{\text{Principal} + \text{interest}} \text{ (principal + interest)}$$

Using these two formulas together, the amount can also be defined as:

$$A = P + I$$

$$A = P + Prt$$

$$A = P(1 + rt)$$

Interest Rate (r)

Show the following interest rates as they would appear in the simple interest formula as r .
(Hint: Divide by 100, or move decimal 2 spaces to the left)

a) 13%

$$= \frac{13}{100} = 0.13$$

b) 2.5%

$$= \frac{2.5}{100} = 0.025$$

c) 0.5%

$$= \frac{0.5}{100} = 0.005$$

Time (t)

Express the following lengths of time in terms of years (t in the simple interest formula)

a) 24 months

$$= \frac{24}{12} = 2$$

b) 8 months

$$= \frac{8}{12}$$

c) 14 weeks

$$= \frac{14}{52}$$

d) 82 days

$$= \frac{82}{365}$$

**** no need to convert to decimals**

Example 1 Calculate how much interest is earned and the value of the investment if \$2 000 is invested at 4.5% **simple interest** for 26 weeks.

$$I = ?$$

$$I = Prt$$

$$P = 2000$$

$$I = 2000 \times 0.045 \times \frac{26}{52}$$

$$r = 4.5\% = 0.045$$

$$= 45$$

$$t = \frac{26}{52}$$

Therefore interest earned is \$45

The Simple Interest Triangle

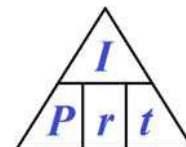
Use the simple interest triangle to find the formula for interest, principal, rate, and time.

$$I = Prt$$

$$P = \frac{I}{rt}$$

$$r = \frac{I}{Pt}$$

$$t = \frac{I}{Pr}$$



Example 2 What principal is needed to earn \$500 interest in 2 years invested at 6% **simple interest**?

$$I = 500$$

$$P = ?$$

$$r = 6\% = 0.06$$

$$t = 2$$

$$P = \frac{I}{rt}$$

$$= \frac{500}{(0.06)(2)} = \frac{500}{0.12} = 4166.67$$

Therefore, you need to invest \$4166.67

Example 3 What rate of **simple interest** is needed to get \$7 000 to grow to \$10 000 in 5 years?

$$I = 3000$$

$$P = 7000$$

$$r = ?$$

$$t = 5$$

$$r = \frac{I}{Pt}$$

$$= \frac{3000}{(7000)(5)} = \frac{3000}{35000} = 0.08571 = 8.6\%$$

Therefore, the interest rate is 8.6%

Example 4 How long would it take \$1 500 to double at a **simple interest** rate of 3%?

$$I = 1500$$

$$P = 1500$$

$$r = 3\% = 0.03$$

$$t = ?$$

$$t = \frac{I}{Pr}$$

$$= \frac{1500}{(1500)(0.03)} = \frac{1}{0.03} = 33.3$$

Therefore it would take approx 33.3 years

Example 5 5 years ago, Dylan loaned Matt money. Matt repaid Dylan a total of \$2100, which included **simple interest** charged at 10%. How much did Dylan originally loan Matt?

$$I = 2100 - P$$

$$P = ?$$

$$r = 10\% = 0.1$$

$$t = 5$$

$$P = \frac{I}{rt} = \frac{2100 - P}{(0.1)(5)}$$

$$0.5P = 2100 - P$$

$$0.5P + P = 2100$$

$$P(0.5 + 1) = 2100 \rightarrow P = \frac{2100}{(0.5 + 1)} = 1400$$

Therefore the loan was for \$1400

Class work / Homework: