

# Interest Problems

Interest is calculated using the following formula:

$$\text{Interest} = \text{Principal} \times \text{Rate} \times \text{Time}$$

The **principal** is the amount of money invested, the **rate** is the annual rate of interest, and the **time**, as it is used in the formula, is the number of **years** that the money will be invested for.

**HINT:** For problems involving **annual interest**, time is equal to 1. In such cases, time is not a factor in interest calculations and can be excluded from the equation above. It is also important to know that **time** has to be in terms of **years** before using the formula. Ex. if the time given is 6 months, convert this time to years by dividing the number of months by 12. ( $6/12 = \frac{1}{2} = 0.5$ )

**Example:** Mr. Silver invested part of \$50,000 in an account paying 6%. He invested the rest into a separate account paying 8%. If the total annual interest is \$3360, how much was invested at each rate?

Let  $x$  = amount in dollars invested at 6%  
 $50000 - x$  = amount in dollars invested at 8%

We use  $50000 - x$  for the amount in dollars invested at 8% because  $x$  dollars out of the total \$50000 was invested at 6%. Since time is equal to 1, we can exclude it from our calculations.

| Account   | Interest Rate | Amount      | Interest           |
|-----------|---------------|-------------|--------------------|
| <b>6%</b> | .06           | $x$         | .06 $x$            |
| <b>8%</b> | .08           | $50000 - x$ | .08( $50000 - x$ ) |

The **interest** in dollars of each account can be obtained by multiplying the interest rate by the amount invested in that account. We can then form the equation by **adding** the **interest** from each account and setting this sum equal to the total annual interest in dollars.

$$\begin{array}{rclcl}
 \underline{\text{Interest @ 6\%}} & + & \underline{\text{Interest @ 8\%}} & = & \underline{\text{Total Annual Interest}} \\
 .06x & + & .08(50000 - x) & = & 3360
 \end{array}$$

**Equation:**

$$\begin{aligned}
 .06x + .08(50000 - x) &= 3360 \\
 .06x + 4000 - .08x &= 3360 \\
 -.02x &= -640 \\
 x &= 32000
 \end{aligned}$$

Mr. Silver invested **\$32000** at 6% and **\$18000** at 8%.


Comment:  $50000 - x = 50000 - 32000$

**Sample Problems:**

1. Hania had saved \$6000, which she wished to invest. She put part in a term bank savings account at 8% and part in a regular savings account at  $5\frac{1}{2}\%$ . How much was invested in each account if her total yearly income amounted to \$425?

Let  $x$  = amount in dollars invested at 8%

$6000 - x$  = amount in dollars invested at 5.5%

| Account | Interest Rate | Amount     | Interest         |
|---------|---------------|------------|------------------|
| 8%      | .08           | X          | .08x             |
| 5.5%    | .055          | $6000 - x$ | $.055(6000 - x)$ |

**Equation:**  $.08x + .055(6000 - x) = 425$   
 $.08x + 330 - .055x = 425$   
 $.025x = 95$   
 $x = 3800$

Hania invested **\$3800** at 8% and **\$2200** at 5.5%.

↑ Comment:  $6000 - x = 6000 - 3800$

2. Mr. Rogers wishes to invest a sum of money so that the interest would help pay for his son's college expenses. If the money is to be invested at 8% for 4 years, and his son's college expense at the end of 4 years would be \$30000, how much should Mr. Rogers invest?

Let  $x$  = amount in dollars invested at 8%

| Account | Interest Rate | Amount | Time | Interest      |
|---------|---------------|--------|------|---------------|
| 8%      | .08           | x      | 4    | $(.08)(x)(4)$ |

**Equation:**  $(.08)(x)(4) = 30000$   
 $.32x = 30000$   
 $x = 93750$

Mr. Rogers would need to invest **\$93750**.