

# SOLVING INVESTMENT AND UNIFORM MOTION VERBAL PROBLEMS

## 1. Investment Problems

Basic equation: principal  $\times$  rate = interest

*Example:* \$1000 (principal) invested at a rate of 8% (rate) yields  $(.08)1000 = 80$  dollars of interest

Usual equation to solve for the variable:

$$\text{Interest from account 1} + \text{Interest from account 2} = \text{Total interest (or income)}$$

## 2. Uniform Motion Problems

Basic equation: rate  $\times$  time = distance

*Example:* A car traveling at a constant speed of 60 miles per hour (rate) for 2 hours (time) travels a distance of  $2(60) = 120$  miles.

Usual equations to solve for the variable:

$$\text{Distance of trip 1 (or vehicle 1)} = \text{Distance of trip 2 (or vehicle 2)}$$

$$\text{Distance of trip 1} + \text{Distance trip 2} = \text{Total Distance}$$

### Model Problems:

**Example 1:** Two investments earn an annual income of \$575. One investment earns an annual simple interest rate of 8.5% and the other investment earns an annual simple interest rate of 6.4%. The total amount invested is \$8000. How much is invested in each account?

Let  $x$  = amount invested in the 8.5% account.

Then the amount invested in the 6.4% account is the total amount invested minus the amount invested in the 8.5% account, which is  $8000 - x$ . A table is very useful for investment problems:

|              | Principal  | Rate | Interest         |
|--------------|------------|------|------------------|
| 8.5% account | $x$        | .085 | $.085x$          |
| 6.4% account | $8000 - x$ | .064 | $.064(8000 - x)$ |

The interest from the two accounts must add up to the total income, which is \$575, so the equation is:

$$.085x + .064(8000 - x) = 575.$$

Solving for  $x$  you find that  $x = 3000$ . So \$3000 is invested in the account paying 8.5%, and \$8000-\$3000 or \$5000 is invested in the account paying 6.4%.

**Example 2:** A helicopter traveling 130 mph overtakes a speeding car traveling 80 mph. The car had a 0.5-hour head start. How far from the starting point does the helicopter overtake the car?

Let  $t$  = time for helicopter to overtake car.

|            | Rate | Time      | Distance      |
|------------|------|-----------|---------------|
| Helicopter | 130  | $t$       | $130t$        |
| Car        | 80   | $t + 0.5$ | $80(t + 0.5)$ |

We want to know when the helicopter overtakes the car, which means when the helicopter and car have traveled the same distance, so the equation becomes:

$$130t = 80(t + 0.5)$$

Solving for  $t$ , you find that  $t = \frac{4}{5}$  hour. This is not the final answer, however. We want the distance that the helicopter has traveled, which is  $130 \cdot \frac{4}{5} = 104$  miles.

### Practice:

1. Walter made two deposits in his account – one check deposited at a 6% annual interest rate and a second check deposited at an 11% annual rate. The total amount of money deposited initially was \$2500. The interest accumulated from the two deposits was \$200. Find how much was invested at each rate.
2. Mrs. Jacobs invested a certain amount of money at 6% and a second amount, \$500 more than the first, at 8%. If she earned \$180 in interest, how much did she invest at each rate?
3. A family going on vacation drives 19mph in the city and 63mph on the highway. If they spend 2 hours more on the highway than in city traffic, how long will it take to complete 454-mile journey?
4. On a business trip, a businesswoman drives 5 hours commuting to her meeting by car. On the way back from the meeting, she takes the train which travels 25 mph faster than the car. If the commute home takes 3 hours, how long is the commute in miles?

### Answers:

1. \$1000 @ 11%; \$1500 @ 6%
2. \$1000@6% and \$1500 @ 8%
3. 10 hours
4. 187.5 miles