

**Example 1:** Mr Solomon invests \$3000 into an account that pays 1.2% interest compounded monthly. If he leaves his money in the account for 10 years, how much will his investment be worth?

$$A = P(1+i)^n$$

$$A = 3000(1.001)^{120}$$

$$A = \$3382.29$$

∴ his investment will be worth \$3382.29

$$\left. \begin{array}{l} A = ? \\ P = 3000 \\ i = 0.012 \div 12 = 0.001 \\ n = 120 \end{array} \right\}$$

**Example 2:** Erli borrowed \$7000 to buy a car. The interest rate on the loan was 9%, compounded quarterly. He is expected to repay the loan in full after 4 years.

a) How much must he repay?

$$A = P(1+i)^n$$

$$A = 7000(1.0225)^{16}$$

$$A = \$9993.35$$

∴ he must repay \$9993.35

b) How much of the amount that Erli repays will be interest?

$$I = A - P$$

$$I = 9993.35 - 7000 \quad \therefore \quad \$2993.35 \text{ is interest.}$$

$$I = 2993.35$$

$$\left. \begin{array}{l} A = ? \\ P = 7000 \\ i = 0.09 \div 4 = 0.0225 \\ n = 16 \end{array} \right\}$$

**Note:** What do you notice about the interest rates in examples 1 and 2? How do they compare? Is this realistic?

What if you want a formula that will help you find P?

$$A = P(1+i)^n$$

Isolate for P (get P by itself)

Therefore,  $P = \frac{\text{present value}}{(1+i)^n}$

Or

$$P = \frac{A}{(1+i)^n}$$

**P** represents the **principal** value of a loan or investment. It is also called the **PRESENT VALUE**  
**A** represents the **amount** a loan or investment is worth after a period of time. It is also known as the **FUTURE VALUE**

**Note:** Future value always comes **AFTER** the present value

**Example 3:** Samantha wants to invest enough money today to have \$5000 for tuition when she goes to college in two years. She invests her money at 5% per year, compounded annually.

a) How much does she need to invest?

$$P = \frac{A}{(1+i)^n}$$

$$P = \frac{5000}{(1.05)^2}$$

$$P = \$4535.15$$

$\therefore$  She needs to invest approx \$4535.15

$$A = 5000$$

$$P = ?$$

$$i = 0.05 \div 1 = 0.05$$

$$n = 2$$

b) How much interest does she earn?

$$5000 - 4535.15 = \$464.85$$

**Example 4:** Israi wants to invest enough money today to have \$15 000 to purchase a car in 6 years after college. She invests her money at 6% per year, compounded quarterly.

a) How much does she need to invest?

$$P = \frac{A}{(1+i)^n}$$

$$P = \frac{15000}{(1.015)^{24}}$$

$$P = \$10493.16$$

$\therefore$  She needs to invest \$10493.16

$$A = 15000$$

$$P = ?$$

$$i = 0.06 \div 4 = 0.015$$

$$n = 24$$

b) How much interest does she earn?

$$15000 - 10493.16 = \$4506.84$$

**Example 5:** Ms. Moodie purchases a new computer. She gets a loan and pays off the computer 3 years after the time of purchase. She is charged 16% interest, compounded monthly and after 3 years she must pay \$2000.

a) What was the original price of the computer?

$$P = \frac{A}{(1+i)^n}$$

$$P = \frac{2000}{(1.0133)^{36}}$$

$$P = \$1241.51$$

$\therefore$  the original price of the computer was \$1241.51

$$A = 2000$$

$$P = ?$$

$$i = 0.16 \div 12 = 0.0133$$

$$n = 36$$

b) How much interest was she charged?

$$I = A - P$$

$$I = 2000 - 1241.51$$

$$I = \$758.49$$

$\therefore$  She was charged \$758.49 interest.

**Example 6:** James purchases a used car. He puts down \$500 and gets a loan for the rest. He is charged 8% interest, compounded semi-annually. When he pays back his loan in 2.5 years, he owes \$5600.

a) What was the original price of the car?

$\therefore$  the original price of the car is \$4602.79

$$P = \frac{A}{(1+i)^n}$$

$$P = \frac{5600}{(1.04)^5}$$

$$P = \$4602.79$$

$$A = 5600$$

$$P = ?$$

$$i = 0.08 \div 2 = 0.04$$

$$n = 5$$

b) How much interest was he charged?

$$I = A - P$$

$$I = 56000 - 46002.79$$

$$I = \$997.21$$

∴ he was charged \$997.21 interest.

**Homework:**

1. Fatima wants to invest enough money today to have \$6000 to buy a car after she graduates from college in three years. She invests her money at 1.2% per year, compounded semi-annually.

c) How much does she need to invest?

$$P = \frac{A}{(1+i)^n}$$

$$P = \frac{6000}{(1.006)^6}$$

$$P = \$5788.46$$

∴ she needs to invest \$5788.46

$$A = 6000$$

$$P = ?$$

$$i = 0.012 \div 2 = 0.006$$

$$n = 6$$

d) How much interest does she earn?

$$I = A - P$$

$$I = 6000 - 5788.46$$

$$I = \$211.54$$

∴ interest earned is \$211.54

2. Ahlam wants to invest enough money today to have \$1700 to purchase an Apple Laptop in 2 years. She invests her money at 2% per year, compounded monthly.

c) How much does she need to invest?

$$P = \frac{A}{(1+i)^n}$$

$$P = \frac{1700}{(1.00167)^{24}}$$

$$P = \$1633.27$$

∴ he needs to invest \$1633.27

$$A = 1700$$

$$P = ?$$

$$i = 0.02 \div 12 = 0.00167$$

$$n = 24$$

d) How much interest does she earn?

$$I = A - P$$

$$I = 1700 - 1633.27$$

$$I = \$66.73$$

∴ She earns \$66.73 interest.

3. Mr. Walker purchases a new car. He gets a loan and pays off the car 4.5 years after the time of purchase. He is charged 7% interest, compounded quarterly, and after 4.5 years he must pay \$31 400.

$$P = \frac{A}{(1+i)^n}$$

$$P = \frac{31400}{(1.0175)^{18}}$$

$$P = \$22977.89$$

$$A = 31400$$

$$P = ?$$

$$i = 0.07 \div 4 = 0.0175$$

$$n = 18$$

c) What was the original price of the car?

see work on previous page. The original price of the car is \$22 977.89

d) How much interest was he charged?

$$I = A - P$$
$$I = 31400 - 2$$

∴ he was charged \$ in interest

4. Mr. Solomon went on a cruise in July. He put down \$250 towards the cost of the cruise and gets a loan for the rest. He is charged 14% interest, compounded monthly. In January - 6 months later - he must pay \$1250 to cover the cost of his loan.

a) What was the original price of the cruise?

$$P = \frac{A}{(1+i)^n}$$

$$P = \frac{1250}{(1.01167)^6}$$

$P = \$1165.94$  ∴ the original value of the loan is \$1165.94

$$A = 1250$$

$$P = ?$$

$$i = 0.14 \div 12 = 0.01167$$

$$n = 6$$

b) How much interest was he charged?

$$I = A - P$$

$$I = 1250 - 1165.94$$

$$I = \$84.06$$

∴ he was charged \$84.06 in interest.

② To calculate the original price of the cruise is:

original loan + deposit = price of cruise

$$1165.94 + 250 = \text{price of cruise}$$

$$\$1415.94 = \text{price of cruise}$$

∴ the original price of the cruise is \$1165.94