

Worksheet 7.3 Compound Interest 複利息

Objective: To understand the concept of compound interest and to solve problems involving compound interest.

If the amount got in each period is used as the principal for calculating the interest in the next period, the method of calculating interest used is called compound interest.

In general, if we deposit \$ P at an interest rate 利率 of $r\%$ per period and the interest is compounded at the end of each period 時期, then the amount 本利和 \$ A after n periods is given by:

$$A = P(1 + r\%)^n$$

➤ The compound interest 複利息 \$ I earned is given by: $I = A - P$

1. A sum of \$10 000 is deposited at an interest rate of 2% p.a. for 5 years, compounded yearly. Find

- (a) the amount 本利和 ,
(b) the interest 利息.

(Give the answers correct to the nearest \$0.01.)

Demonstration

A sum of \$4000 is deposited at an interest rate of 3% p.a. for 6 years, compounded yearly. Find

- (a) the amount,
(b) the interest.

(Give the answers correct to the nearest \$0.01.)

Solution

- (a) Amount = $\$4000 \times (1 + 3\%)^6$
 $= \$4000 \times 1.03^6$
 $= \underline{\$4776.21}$, cor. to the nearest \$0.01
 (b) Interest = $\$(4000 \times 1.03^6 - 4000)$
 $= \underline{\$776.21}$, cor. to the nearest \$0.01

2. A sum of money is deposited in a bank. Using the information shown, complete the following table.

| | Deposit time | Annual interest rate | Duration of each period | Number of periods | Interest rate per period |
|-----|--------------|----------------------|-------------------------|-------------------|--------------------------|
| (a) | 4 years | 8% | a half year | | |
| (b) | 3 years | 4% | a quarter | | |
| (c) | 9 months | 6% | a month | | |
| (d) | 30 months | 10% | a quarter | | |

3. A sum of \$8500 is deposited at an interest rate of 5% p.a. for 3 years, compounded half-yearly. Find the amount.

(Give the answer correct to the nearest dollar.)

Demonstration

A sum of \$5000 is deposited at an interest rate of 3.5% p.a. for 2 years, compounded quarterly. Find the amount.

(Give the answer correct to the nearest dollar.)

Solution

$$\begin{aligned} \text{Amount} &= \$5000 \times \left(1 + \frac{\text{Interest rate per quarter}}{4}\right)^{\text{Number of periods}} \\ &= \underline{\$5361} \text{, cor. to the nearest dollar} \end{aligned}$$

4. A sum of \$50 000 is deposited at an interest rate of 4.6% p.a. for 2.5 years, compounded half-yearly. Find the amount. (Give the answer correct to the nearest dollar.)

What are the interest rate per period and the number of periods?

5. Terry deposits a sum of money in a bank at an interest rate of 3.6% p.a., compounded monthly. After one year, he will receive an amount of \$20 732. Find the amount deposited by Terry. (Give the answer correct to the nearest thousand dollars.)

Demonstration
 Joey deposits a sum of money in a bank at an interest rate of 4% p.a., compounded half-yearly. After two years, she will receive an amount of \$14 070. Find the amount deposited by Joey. (Give the answer correct to the nearest thousand dollars.)

Solution
 Let \$P\$ be the sum of money deposited.

$$\begin{aligned} \text{Amount} &= \$P \left(1 + \frac{4\%}{2} \right)^4 \\ &= \$P(1.02)^4 \\ P(1.02)^4 &= 14\,070 \\ P &= \frac{14\,070}{1.02^4} \\ &= 13\,000, \text{ cor. to the nearest thousand} \\ \therefore \text{Joey deposits } \$13\,000. \end{aligned}$$

6. Ben deposits a sum of money in a bank at an interest rate of 5.1% p.a., compounded quarterly. After two years, he will receive an amount of \$44 270. Find the amount deposited by Ben. (Give the answer correct to the nearest thousand dollars.)

Set up an equation using the amount deposited as the unknown and solve it.

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7. Alice deposits a sum of money in a bank at an interest rate of 7% p.a., compounded quarterly. After three years, she will receive interest of \$3610. Find the amount deposited by Alice. (Give the answer correct to the nearest hundred dollars.)