

Application of Mathematics in Practical Situations

Example

1

\$18 500 is deposited into a savings account which pays 6% per year compound interest semi annually. If the money is left in the account for 5 years, find
(a) the total amount of money in the account after 5 years,
(b) the total interest earned after 5 years.

Solution: (a) The calculation done semi-annually:

$$\begin{aligned}R &= 6\% \div 2 \\ &= 3\%\end{aligned}$$

In 5 years, there will be 10 computations:

$$n = 10$$

$$\begin{aligned}\text{Total amount} &= \$18\,500 \left(1 + \frac{3}{100}\right)^{10} \\ &= \$24\,862.45\end{aligned}$$

$$\begin{aligned}\text{(b) Total interest} &= \$24\,862.45 - \$18\,500 \\ &= \$6362.45\end{aligned}$$

Example

2

A bank loaned a sum of money to a customer at 10% per year simple interest. After 4 years, the bank received a total repayment of \$8960 from the customer. Calculate how much the bank loaned to the customer.

Solution: Let the principal of the loan be \$ P .

$$\begin{aligned}I &= \frac{P \times 10 \times 4}{100} \\ &= 0.4P\end{aligned}$$

$$\begin{aligned}\text{Total repayment} &= P + I \\ &= P + 0.4P \\ &= 1.4P\end{aligned}$$

$$1.4P = 8960$$

$$\begin{aligned}P &= \frac{8960}{1.4} \\ &= 6400\end{aligned}$$

\therefore The bank loaned \$6400 to the customer.

Example

3

Use the tax rates in the table below to solve the following questions.

- (a) Calculate the tax payable for Peter if his chargeable income is \$65 000.
(b) Calculate the chargeable income for Ryan if his tax payable is \$480.

Tax rates for resident individuals from YA 2012 onwards

Chargeable Income	Rate (%)	Gross Tax Payable (s)
First \$20 000	0	0
Next \$10 000	2	200
First \$30 000	–	200
Next \$10 000	3.50	350
First \$40 000	–	550
Next \$40 000	7	2800
First \$80 000	–	3350
Next \$40 000	11.5	4600
First \$120 000	–	7950
Next \$ 40 000	15	6000
First \$160 000	–	13 950
Next \$ 40 000	17	6800
First \$200 000	–	20 750
Next \$120 000	18	21 600
First \$320 000	–	12350
Above \$320 000	20	

Solution: (a) Divide the chargeable income into two parts, \$40 000 and \$25 000.

Payable tax for first \$40 000 = \$550

$$\begin{aligned}\text{Payable tax for remaining } \$25\,000 &= 7\% \times \$25\,000 \\ &= \frac{7}{100} \times \$25\,000 \\ &= \$1750\end{aligned}$$

$$\begin{aligned}\text{Total payable tax} &= \$550 + \$1750 \\ &= \$2300\end{aligned}$$

(b) As the payable tax is \$480 (< \$550), the chargeable income ranges from \$30 000 to \$40 000.

Payable tax for first \$30 000 = \$200

$$\begin{aligned}\text{Payable tax for the remaining } \$y &= \$480 - \$200 \\ &= \$280\end{aligned}$$

The remaining \$y is taxed at 3.5%.

$$3.5\% \text{ of } \$y = \$280$$

$$\$0.035y = \$280$$

$$\begin{aligned}y &= \frac{280}{0.035} \\ &= 8000\end{aligned}$$

$$\begin{aligned}\text{Chargeable income} &= \$30\,000 + \$8000 \\ &= \$38\,000\end{aligned}$$

\therefore Chargeable income of Ryan is \$38 000.

Adapted:

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Example

4

- (a) Jenny exchanged S\$7200 to Malaysian ringgit (RM) for investment at a rate of RM250 = S\$100. Calculate the amount of Malaysian ringgit she received.
- (b) She made a profit of 15% from the investment. Calculate the profit, in RM.
- (c) She exchanged the total amount of money of her investment, including the profit, at the same exchange rate as (a). Calculate the total amount of money, in S\$, she received.

Solution: (a) S\$100 = RM250

$$\begin{aligned} \text{S\$7200} &= \text{RM}\left(\frac{250}{100} \times 7200\right) \\ &= \text{RM18 000} \end{aligned}$$

\therefore Jenny received RM 18 000.

(b) Profit = 15% of RM18 000

$$\begin{aligned} &= \frac{15}{100} \times \text{RM18 000} \\ &= \text{RM2700} \end{aligned}$$

The profit was RM 2700

(c) Total = RM18 000 + RM2700

$$\begin{aligned} &= \text{RM20 700} \\ \text{RM250} &= \text{S\$100} \\ \text{RM20 700} &= \text{S\$100} \\ \text{RM20 700} &= \text{S\$}\left(\frac{100}{250} \times 20\,700\right) \\ &= \text{S\$8280} \end{aligned}$$

She received S\$8280.

Example

5

Lawrence buys a car at \$98 000. He pays 30% deposit and the outstanding balance plus interest in 5 years. The outstanding balance is charged at 2.5% simple interest per year.

Calculate

- (a) the monthly instalment,
(b) the total hire purchase price of the car.

Solution: (a) Outstanding balance = 70% of \$98 000
 $= 0.7 \times \$98\,000$
 $= \$68\,600$

$$\text{Interest } I = \frac{\$68\,600 \times 2.5 \times 5}{100}$$
$$= \$8575$$

$$\text{Total instalment} = \$68\,600 + \$8575$$
$$= \$77\,175$$

$$\text{Monthly instalment} = \frac{\$77\,175}{60}$$
$$= \$1286.25$$

\therefore The monthly instalment is \$1286.25.

(b) Hire purchase price = cash price + interest
 $= \$98\,000 + \8575
 $= \$106\,575$