INTERESTS

A DEFINITIONS

A.1 FINDING THE INTEREST

Ex 1: Louis lends Hugo 100 dollars. After one year, Hugo repays Louis 110 dollars.
Find the interest paid.

$$\boxed{10} \text{ dollars}$$

Solution: The interest paid is the difference between the amount repaid and the original amount lent:

$$\text{Interest} = \text{Amount repaid} - \text{Original amount}$$
$$= 110 - 100$$
$$= 10 \text{ dollars}$$

Ex 2: Maria borrows 200 dollars from John. After one year, Maria repays John 230 dollars.
Find the interest paid.

$$\boxed{30} \text{ dollars}$$

Solution: The interest paid is the difference between the amount repaid and the original amount lent:

$$\text{Interest} = \text{Amount repaid} - \text{Original amount}$$
$$= 230 - 200$$
$$= 30 \text{ dollars}$$

Ex 3: Jack lends Sarah 500 dollars. After one year, Sarah repays Jack 525 dollars.
Find the interest paid.

$$\boxed{25} \text{ dollars}$$

Solution: The interest paid is the difference between the amount repaid and the original amount lent:

$$\text{Interest} = \text{Amount repaid} - \text{Original amount}$$
$$= 525 - 500$$
$$= 25 \text{ dollars}$$

Ex 4: A bank lends 1 000 dollars to a customer. After one year, the customer repays the bank 1 080 dollars.
Find the interest paid.

$$\boxed{80} \text{ dollars}$$

Solution: The interest paid is the difference between the amount repaid and the original amount lent:

$$\text{Interest} = \text{Amount repaid} - \text{Original amount}$$
$$= 1\,080 - 1\,000$$
$$= 80 \text{ dollars}$$

A.2 FINDING THE TOTAL AMOUNT

Ex 5: A customer borrows 2 500 dollars from a bank, with 150 dollars of interest.
Find the total amount the customer needs to repay the bank.

$$\boxed{2650} \text{ dollars}$$

Solution: The total amount to be repaid is the sum of the original amount borrowed (the principal) and the interest:

$$\text{Amount to repay} = \text{Principal} + \text{Interest}$$
$$= 2\,500 + 150$$
$$= 2\,650 \text{ dollars}$$

Ex 6: Maria borrows 300 dollars from John with 30 dollars of interest.
Find the amount Maria needs to repay.

$$\boxed{330} \text{ dollars}$$

Solution: The total amount to be repaid is the sum of the original amount borrowed (the principal) and the interest:

$$\text{Amount to repay} = \text{Principal} + \text{Interest}$$
$$= 300 + 30$$
$$= 330 \text{ dollars}$$

Ex 7: Jack lends Sarah 500 dollars with 50 dollars of interest.
Find the total amount Sarah needs to repay Jack.

$$\boxed{550} \text{ dollars}$$

Solution: The total amount to be repaid is the sum of the original amount borrowed (the principal) and the interest:

$$\text{Amount to repay} = \text{Principal} + \text{Interest}$$
$$= 500 + 50$$
$$= 550 \text{ dollars}$$

Ex 8: A bank lends 1 000 dollars to a customer with 80 dollars of interest.
Find the total amount the customer needs to repay the bank.

$$\boxed{1080} \text{ dollars}$$

Solution: The total amount to be repaid is the sum of the original amount borrowed (the principal) and the interest:

$$\text{Amount to repay} = \text{Principal} + \text{Interest}$$
$$= 1\,000 + 80$$
$$= 1\,080 \text{ dollars}$$

A.3 FINDING THE PRINCIPAL

Ex 9: Emma repaid 330 dollars in total, including 30 dollars of interest.Find the original amount (principal) that Emma borrowed.

$$\boxed{300} \text{ dollars}$$

Solution: The principal is the difference between the total amount repaid and the interest paid:

$$\text{Principal} = \text{Amount repaid} - \text{Interest}$$
$$= 330 - 30$$
$$= 300 \text{ dollars}$$

Ex 10: Lucas repaid 550 dollars in total, including 50 dollars of interest. Find the original amount (principal) that Lucas borrowed.

$$\boxed{500} \text{ dollars}$$

Solution: The principal is the difference between the total amount repaid and the interest paid:

$$\text{Principal} = \text{Amount repaid} - \text{Interest}$$
$$= 550 - 50$$
$$= 500 \text{ dollars}$$

Ex 11: Sophia repaid 1,080 dollars in total, including 80 dollars of interest. Find the original amount (principal) that Sophia borrowed.

$$\boxed{1000} \text{ dollars}$$

Solution: The principal is the difference between the total amount repaid and the interest paid:

$$\text{Principal} = \text{Amount repaid} - \text{Interest}$$
$$= 1,080 - 80$$
$$= 1,000 \text{ dollars}$$

Ex 12: Mia repaid 750 dollars in total, including 150 dollars of interest. Find the original amount (principal) that Mia borrowed.

$$\boxed{600} \text{ dollars}$$

Solution: The principal is the difference between the total amount repaid and the interest paid:

$$\text{Principal} = \text{Amount repaid} - \text{Interest}$$
$$= 750 - 150$$
$$= 600 \text{ dollars}$$

B SIMPLE INTEREST

B.1 FINDING THE INTEREST

Ex 13: Find the simple interest on a principal of $500 at a rate of 3% per year over 5 years (you can use a calculator).

$$\boxed{75} \text{ dollars}$$

Solution:

$$\text{Interest} = \text{Number of years} \times \text{Percentage of the principal}$$
$$= 5 \times 3\% \text{ of } 500$$
$$= 5 \times \frac{3}{100} \times 500$$
$$= 75 \text{ dollars}$$

Ex 14: Find the simple interest on a principal of $1\,000 at a rate of 4% per year over 3 years (you can use a calculator).

$$\boxed{120} \text{ dollars}$$

Solution:

$$\text{Interest} = \text{Number of years} \times \text{Percentage of the principal}$$
$$= 3 \times 4\% \text{ of } 1\,000$$
$$= 3 \times \frac{4}{100} \times 1\,000$$
$$= 120 \text{ dollars}$$

Ex 15: Find the simple interest on a principal of $750 at a rate of 5% per year over 2 years (you can use a calculator).

$$\boxed{75} \text{ dollars}$$

Solution:

$$\text{Interest} = \text{Number of years} \times \text{Percentage of the principal}$$
$$= 2 \times 5\% \text{ of } 750$$
$$= 2 \times \frac{5}{100} \times 750$$
$$= 75 \text{ dollars}$$

Ex 16: Find the simple interest on a principal of $1\,200 at a rate of 6% per year over 4 years (you can use a calculator).

$$\boxed{288} \text{ dollars}$$

Solution:

$$\text{Interest} = \text{Number of years} \times \text{Percentage of the principal}$$
$$= 4 \times 6\% \text{ of } 1\,200$$
$$= 4 \times \frac{6}{100} \times 1\,200$$
$$= 288 \text{ dollars}$$

B.2 FINDING THE INTEREST OVER MIXED TIME PERIODS

Ex 17: Find the simple interest on a principal of $600 at a rate of 4% per year over 18 months (you can use a calculator).

$$\boxed{36} \text{ dollars}$$

Solution:

- Convert the time from months to years:

$$18 \text{ months} = \frac{18}{12} \text{ years}$$
$$= 1.5 \text{ years}$$

- Calculate the interest:

$$\text{Interest} = \text{Number of years} \times \text{Percentage of the principal}$$
$$= 1.5 \times 4\% \text{ of } 600$$
$$= 1.5 \times \frac{4}{100} \times 600$$
$$= 36 \text{ dollars}$$

Ex 18: Find the simple interest on a principal of $700 at a rate of 5% per year over 180 days (you can use a calculator).

$\boxed{17.26}$ dollars (round at two decimal place)

Solution:

- Convert the time from days to years:

$$180 \text{ days} = \frac{180}{365} \text{ years}$$
$$\approx 0.493 \text{ years}$$

- Calculate the interest:

$$\text{Interest} = \text{Number of years} \times \text{Percentage of the principal}$$
$$= 0.493 \times 5\% \text{ of } 700$$
$$= 0.493 \times \frac{5}{100} \times 700$$
$$= 17.26 \text{ dollars}$$

Ex 19: Find the simple interest on a principal of \$800 at a rate of 4% per year over 9 months (you can use a calculator).

$\boxed{24}$ dollars

Solution:

- Convert the time from months to years:

$$9 \text{ months} = \frac{9}{12} \text{ years}$$
$$= 0.75 \text{ years}$$

- Calculate the interest:

$$\text{Interest} = \text{Number of years} \times \text{Percentage of the principal}$$
$$= 0.75 \times 4\% \text{ of } 800$$
$$= 0.75 \times \frac{4}{100} \times 800$$
$$= 24 \text{ dollars}$$

Ex 20: Find the simple interest on a principal of \$1 200 at a rate of 4% per year over 2 years and 6 months (you can use a calculator).

$\boxed{120}$ dollars

Solution:

- Convert the time from years and months to just years:

$$2 \text{ years } 6 \text{ months} = 2 + \frac{6}{12} \text{ years}$$
$$= 2 + 0.5 \text{ years}$$
$$= 2.5 \text{ years}$$

- Calculate the interest:

$$\text{Interest} = \text{Number of years} \times \text{Percentage of the principal}$$
$$= 2.5 \times 4\% \text{ of } 1 200$$
$$= 2.5 \times \frac{4}{100} \times 1 200$$
$$= 120 \text{ dollars}$$

B.3 FINDING THE TOTAL AMOUNT

Ex 21: Jack lends Sarah 500 dollars with simple interest over 3 years at a rate of 3% per year.
Find the total amount Sarah needs to repay Jack (you can use a calculator).

$\boxed{545}$ dollars

Solution:

- The total amount to be repaid is the sum of the original amount borrowed (the principal) and the interest.

- Calculate the interest

$$\text{Interest} = \text{Number of years} \times \text{Percentage of the principal}$$
$$= 3 \times \frac{3}{100} \times 500$$
$$= 45 \text{ dollars}$$

- Calculate the total amount to repay:

$$\text{Amount to repay} = \text{Principal} + \text{Interest}$$
$$= 500 + 45$$
$$= 545 \text{ dollars}$$

Ex 22: Emma borrows 600 dollars from a bank with simple interest over 4 years at a rate of 2.5% per year.
Find the total amount Emma needs to repay the bank (you can use a calculator).

$\boxed{660}$ dollars

Solution:

- The total amount to be repaid is the sum of the original amount borrowed (the principal) and the interest.

- Calculate the interest

$$\text{Interest} = \text{Number of years} \times \text{Percentage of the principal}$$
$$= 4 \times \frac{2.5}{100} \times 600$$
$$= 60 \text{ dollars}$$

- Calculate the total amount to repay:

$$\text{Amount to repay} = \text{Principal} + \text{Interest}$$
$$= 600 + 60$$
$$= 660 \text{ dollars}$$

Ex 23: Michael lends 800 dollars to a friend with simple interest over 2 years at a rate of 4% per year.
Find the total amount the friend needs to repay Michael (you can use a calculator).

$\boxed{864}$ dollars

Solution:

- The total amount to be repaid is the sum of the original amount borrowed (the principal) and the interest.

- Calculate the interest

$$\text{Interest} = \text{Number of years} \times \text{Percentage of the principal}$$
$$= 2 \times \frac{4}{100} \times 800$$
$$= 64 \text{ dollars}$$

- Calculate the total amount to repay:

$$\text{Amount to repay} = \text{Principal} + \text{Interest}$$
$$= 800 + 64$$
$$= 864 \text{ dollars}$$

Ex 24: Sophia borrows 1 200 dollars with simple interest over 5 years at a rate of 2.5% per year.
Find the total amount Sophia needs to repay (you can use a calculator).

$$\boxed{1350} \text{ dollars}$$

Solution:

- The total amount to be repaid is the sum of the original amount borrowed (the principal) and the interest.

- Calculate the interest

$$\text{Interest} = \text{Number of years} \times \text{Percentage of the principal}$$
$$= 5 \times \frac{2.5}{100} \times 1\,200$$
$$= 150 \text{ dollars}$$

- Calculate the total amount to repay:

$$\text{Amount to repay} = \text{Principal} + \text{Interest}$$
$$= 1\,200 + 150$$
$$= 1\,350 \text{ dollars}$$

B.4 FINDING THE PRINCIPAL

Ex 25: Find the original amount invested if a flat rate of 4% per year produces \$1 800 interest in 5 years (you can use a calculator).

$$\boxed{9000} \text{ dollars}$$

Solution: We can use the simple interest formula to find the original amount (principal):

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

Rearranging to solve for the principal:

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

Substituting the values:

$$\text{Principal} = \frac{1800}{5 \times \frac{4}{100}}$$
$$= \frac{1800}{5 \times 0.04}$$
$$= \frac{1800}{0.2}$$
$$= 9\,000 \text{ dollars}$$

Ex 26: Find the original amount invested if a flat rate of 5% per year produces \$2 500 interest in 10 years (you can use a calculator).

$$\boxed{5000} \text{ dollars}$$

Solution: We can use the simple interest formula to find the original amount (principal):

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

Rearranging to solve for the principal:

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

Substituting the values:

$$\text{Principal} = \frac{2\,500}{10 \times \frac{5}{100}}$$
$$= \frac{2\,500}{10 \times 0.05}$$
$$= \frac{2\,500}{0.5}$$
$$= 5\,000 \text{ dollars}$$

Ex 27: Find the original amount invested if a flat rate of 6% per year produces \$720 interest in 4 years (you can use a calculator).

$$\boxed{3000} \text{ dollars}$$

Solution: We can use the simple interest formula to find the original amount (principal):

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

Rearranging to solve for the principal:

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

Substituting the values:

$$\text{Principal} = \frac{720}{4 \times \frac{6}{100}}$$
$$= \frac{720}{4 \times 0.06}$$
$$= \frac{720}{0.24}$$
$$= 3\,000 \text{ dollars}$$

Ex 28: Find the original amount invested if a flat rate of 5% per year produces \$1 250 interest in 2 years (you can use a calculator).

$$\boxed{12500} \text{ dollars}$$

Solution: We can use the simple interest formula to find the original amount (principal):

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

Rearranging to solve for the principal:

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

Substituting the values:

$$\text{Principal} = \frac{1\,250}{2 \times \frac{5}{100}}$$
$$= \frac{1\,250}{2 \times 0.05}$$
$$= \frac{1\,250}{0.1}$$
$$= 12\,500 \text{ dollars}$$

B.5 FINDING THE INTEREST RATE

Ex 29: Find the interest rate per year if an original investment of \$8 000 earns \$960 in interest over 3 years (you can use a calculator).

$$\boxed{4}\%$$

Solution: We can use the simple interest formula to find the interest rate:
$$\text{Interest} = \text{Time} \times \text{Rate} \times \text{Principal}$$

Rearranging to solve for the rate:
$$\text{Rate} = \frac{\text{Interest}}{\text{Time} \times \text{Principal}}$$

Substituting the values:
$$\begin{aligned}\text{Rate} &= \frac{960}{3 \times 8\,000} \\ &= \frac{960}{24\,000} \\ &= 0.04 \\ &= 4\%\end{aligned}$$

Ex 30: Find the interest rate per year if an original investment of \$5 000 earns \$600 in interest over 4 years (you can use a calculator).

$$\boxed{3}\%$$

Solution: We can use the simple interest formula to find the interest rate:
$$\text{Interest} = \text{Time} \times \text{Rate} \times \text{Principal}$$

Rearranging to solve for the rate:
$$\text{Rate} = \frac{\text{Interest}}{\text{Time} \times \text{Principal}}$$

Substituting the values:
$$\begin{aligned}\text{Rate} &= \frac{600}{4 \times 5\,000} \\ &= \frac{600}{20\,000} \\ &= 0.03 \\ &= 3\%\end{aligned}$$

Ex 31: Find the interest rate per year if an original investment of \$7 500 earns \$900 in interest over 5 years (you can use a calculator).

$$\boxed{2.4}\%$$

Solution: We can use the simple interest formula to find the interest rate:
$$\text{Interest} = \text{Time} \times \text{Rate} \times \text{Principal}$$

Rearranging to solve for the rate:
$$\text{Rate} = \frac{\text{Interest}}{\text{Time} \times \text{Principal}}$$

Substituting the values:
$$\begin{aligned}\text{Rate} &= \frac{900}{5 \times 7\,500} \\ &= \frac{900}{37\,500} \\ &= 0.024 \\ &= 2.4\%\end{aligned}$$

Ex 32: Find the interest rate per year if an original investment of \$10 000 earns \$1 200 in interest over 4 years (you can use a calculator).

$$\boxed{3}\%$$

Solution: We can use the simple interest formula to find the interest rate:
$$\text{Interest} = \text{Time} \times \text{Rate} \times \text{Principal}$$

Rearranging to solve for the rate:
$$\text{Rate} = \frac{\text{Interest}}{\text{Time} \times \text{Principal}}$$

Substituting the values:
$$\begin{aligned}\text{Rate} &= \frac{1\,200}{4 \times 10\,000} \\ &= \frac{1\,200}{40\,000} \\ &= 0.03 \\ &= 3\%\end{aligned}$$

B.6 FINDING THE TIME

Ex 33: Find the time required for an original investment of \$6 000 to earn \$720 in interest at an interest rate of 4% per year (you can use a calculator).

$$\boxed{3} \text{ years}$$

Solution: We can use the simple interest formula to find the time:
$$\text{Interest} = \text{Time} \times \text{Rate} \times \text{Principal}$$

Rearranging to solve for the time:
$$\text{Time} = \frac{\text{Interest}}{\text{Rate} \times \text{Principal}}$$

Substituting the values:
$$\begin{aligned}\text{Time} &= \frac{720}{0.04 \times 6\,000} \\ &= \frac{720}{240} \\ &= 3 \text{ years}\end{aligned}$$

Ex 34: Find the time required for an original investment of \$4 500 to earn \$540 in interest at an interest rate of 3% per year (you can use a calculator).

$$\boxed{4} \text{ years}$$

Solution: We can use the simple interest formula to find the time:

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

Rearranging to solve for the time:

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

Substituting the values:

$$\text{Time} = \frac{540}{0.03 \times 4\,500}$$
$$= \frac{540}{135}$$
$$= 4 \text{ years}$$

Ex 35: Find the time required for an original investment of $2\,500 to earn $375 in interest at an interest rate of 5% per year (you can use a calculator).

$$\boxed{3} \text{ years}$$

Solution: We can use the simple interest formula to find the time:

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

Rearranging to solve for the time:

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

Substituting the values:

$$\text{Time} = \frac{375}{0.05 \times 2\,500}$$
$$= \frac{375}{125}$$
$$= 3 \text{ years}$$

Ex 36: Find the time required for an original investment of $7\,000 to earn $840 in interest at an interest rate of 4% per year (you can use a calculator).

$$\boxed{3} \text{ years}$$

Solution: We can use the simple interest formula to find the time:

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

Rearranging to solve for the time:

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

Substituting the values:

$$\text{Time} = \frac{840}{0.04 \times 7\,000}$$
$$= \frac{840}{280}$$
$$= 3 \text{ years}$$

C COMPOUND INTEREST

C.1 FINDING THE TOTAL AMOUNT USING A TABLE

Ex 37: $1000 is placed in an account that earns 10% interest per annum (p.a.), and the interest is allowed to compound over three years. This means the account is earning 10% p.a. in compound interest.

Fill the compound interest table (you can use a calculator).

Year	Amount	Compound interest
0	$1000	10% of $1000 = $100
1	$1000 + $100 = $1100	10% of $1100 = $110
2	$ 1210	121
3	$ 1331	

Find the amount at 3 years.

$$\boxed{1331} \text{ dollars}$$

Solution:

Year	Amount	Compound interest
0	$1000	10% of $1000 = $100
1	$1000 + $100 = $1100	10% of $1100 = $110
2	$1100 + $110 = $1210	10% of $1210 = $121
3	$1210 + $121 = $1331	

The amount at 3 years is 1331 dollars.

Ex 38: $3\,000 is placed in an account that earns 20% interest per annum (p.a.), and the interest is allowed to compound over three years. This means the account is earning 20% p.a. in compound interest.

Fill the compound interest table (you can use a calculator).

Year	Amount	Compound interest
0	$3\,000	20% of $3\,000 = $600
1	$3\,000 + $600 = $3\,600	20% of $3\,600 = $720
2	$ 4320	864
3	$ 5184	

Find the amount at 3 years.

$$\boxed{5184} \text{ dollars}$$

Solution:

Year	Amount	Compound interest
0	$3\,000	20% de $3\,000 = $600
1	$3\,000 + $600 = $3\,600	20% de $3\,600 = $720
2	$3\,600 + $720 = $4\,320	20% de $4\,320 = $864
3	$4\,320 + $864 = $5\,184	

The amount at 3 years is 5\,184 dollars.

Ex 39: $3\,000 is placed in an account that earns 20% interest per annum (p.a.), and the interest is allowed to compound over three years. This means the account is earning 20% p.a. in compound interest.

Fill the compound interest table (you can use a calculator).

Year	Amount	Compound interest
0	$3\,000	600
1	$ 3600	720
2	$ 4320	

Find the amount after 2 years.

$$\boxed{4320} \text{ dollars}$$

Solution:

Year	Amount	Compound interest
0	\$3 000	20% of \$3 000 = \$600
1	\$3 000 + \$600 = \$3 600	20% of \$3 600 = \$720
2	\$3 600 + \$720 = \$4 320	20% of \$4 320 = \$864

The amount at 3 years is 4 320 dollars.

C.2 FINDING THE TOTAL AMOUNT

Ex 40: Find the final amount on a principal of \$10 000 at a rate of 10% per year over 3 years compounded yearly (you can use a calculator).

$$\boxed{13310} \text{ dollars}$$

Solution:

- **Method 1: Amount over year**

  - Year 0: Initial amount = \$10 000
  - Year 1: \$10 000 + 10% of 10 000 = \$11 000
  - Year 2: \$11 000 + 10% of 11 000 = \$12 100
  - Year 3: \$12 100 + 10% of 12 100 = \$13 310

  So, the final amount after 3 years is \$13 310.

- **Method 2: Using the compound interest Formula**

$$
\begin{aligned}
A &= (1 + r)^t\, P \\
&= (1 + 0.10)^3\, 10\,000 \quad \text{(substituting the values)} \\
&= 13\,310
\end{aligned}
$$

  Thus, the final amount after 3 years is \$13 310.

Ex 41: Find the final amount on a principal of \$200 000 at a rate of 5% per year over 3 years compounded yearly (you can use a calculator).

$$\boxed{231525} \text{ dollars}$$

Solution:

- **Method 1: Amount over year**

  - Year 0: Initial amount = \$200 000
  - Year 1: \$200 000 + 5% of 200 000 = \$210 000
  - Year 2: \$210 000 + 5% of 210 000 = \$220 500
  - Year 3: \$220 500 + 5% of 220 500 = \$231 525

  So, the final amount after 3 years is \$231 525.

- **Method 2: Using the compound interest Formula**

$$
\begin{aligned}
A &= (1 + r)^t\, P \\
&= (1 + 0.05)^3\, 200\,000 \quad \text{(substituting the values)} \\
&= 231\,525
\end{aligned}
$$

  Thus, the final amount after 3 years is \$231 525.

Ex 42: Find the final amount on a principal of \$5 000 at a rate of 8% per year over 2 years compounded yearly (you can use a calculator).

$$\boxed{5\,832} \text{ dollars}$$

Solution:

- **Method 1: Amount over year**

  - Year 0: Initial amount = \$5 000
  - Year 1: \$5 000 + 8% of 5 000 = \$5 400
  - Year 2: \$5 400 + 8% of 5 400 = \$5 832

  So, the final amount after 2 years is \$5 832.

- **Method 2: Using the Compound Interest Formula**

$$
\begin{aligned}
A &= (1 + r)^t\, P \\
&= (1 + 0.08)^2\, 5\,000 \quad \text{(substituting the values)} \\
&= 5\,832
\end{aligned}
$$

  Thus, the final amount after 2 years is \$5 832.

Ex 43: Find the final amount on a principal of \$5 000 at a rate of 8% per year over 20 years compounded yearly (round at 2 decimal places).

$$\boxed{23304.79} \text{ dollars}$$

Solution: Using the compound interest formula,

$$
\begin{aligned}
A &= (1 + r)^t\, P \\
&= (1 + 0.08)^{20}\, 5\,000 \quad \text{(substituting the values)} \\
&\approx 23\,304.79 \text{ dollars}
\end{aligned}
$$

Thus, the final amount after 20 years is \$23 304.79.

C.3 FINDING THE BEST OPTION OF INVESTMENT

Ex 44: You have \$8000 to invest for 5 years and there are 2 possible options you have been offered:

- Option 1: Invest at 9% p.a. simple interest.

- Option 2: Invest at 8% p.a. compound interest.

You can use a calculator.

- Calculate the amount accumulated at the end of the 3 years for option 1 (round to the neareast integer)

$$\boxed{11600} \text{ dollars}$$

- Calculate the amount accumulated at the end of the 3 years for option 2 (round to the neareast integer)

$$\boxed{11755} \text{ dollars}$$

- Decide which option to take.
  $$\boxed{\textbf{Option 2}}$$

Solution:

- **Option 1: Simple Interest** For option 1, we substitute the values in the formula for simple interest:

$$A = (1 + t \times r) \times P$$
$$= (1 + 5 \times 0.09) \times 8\,000$$
$$= 11\,600 \text{ dollars}$$

Thus, the amount accumulated for option 1 after 5 years is $11\,600.

- **Option 2: Compound Interest**
  For option 2, we substitute the value in the formula for compound interest

$$A = (1 + r)^t \, P$$
$$= (1 + 0.08)^5 \times 8\,000$$
$$\approx 11\,755 \text{ dollars}$$

Thus, the amount accumulated for option 2 after 5 years is $11\,754.

- **Conclusion**
  Comparing the two options, we see that:

  – Option 1 (simple interest) gives $11\,600,

  – Option 2 (compound interest) gives $11\,755.

Since option 2 gives a higher final amount, it would be better to choose option 2 with compound interest.

Ex 45: You have $20\,000 to invest for 5 years and there are 2 possible options you have been offered:

- Option 1: Invest at 7% p.a. simple interest.

- Option 2: Invest at 6% p.a. compound interest.

You can use a calculator.

- Calculate the amount accumulated at the end of 5 years for option 1 (round to the nearest integer):

  $\boxed{27000}$ dollars

- Calculate the amount accumulated at the end of 5 years for option 2 (round to the nearest integer):

  $\boxed{26764}$ dollars

- Decide which option to take.
  $\boxed{\textbf{Option 1}}$

Solution:

- **Option 1: Simple Interest**
  For option 1, we substitute the values in the formula for simple interest:

$$A = (1 + t \times r) \times P$$
$$= (1 + 5 \times 0.07) \times 20\,000$$
$$= (1 + 0.35) \times 20\,000$$
$$= 1.35 \times 20\,000$$
$$= 27\,000 \text{ dollars}$$

Thus, the amount accumulated for option 1 after 5 years is $27\,000.

- **Option 2: Compound Interest**
  For option 2, we substitute the values in the formula for compound interest:

$$A = (1 + r)^t \times P$$
$$= (1 + 0.06)^5 \times 20\,000$$
$$= (1.06)^5 \times 20\,000$$
$$\approx 26\,764 \text{ dollars}$$

Thus, the amount accumulated for option 2 after 5 years is $26\,744.

- **Conclusion**
  Comparing the two options:

  – Option 1 (simple interest) gives $27\,000,

  – Option 2 (compound interest) gives $26\,764.

Since option 1 gives a higher final amount, it is better to choose option 1 with simple interest.

Ex 46: You have $50\,000 to invest for 30 years and there are 2 possible options you have been offered:

- Option 1: Invest at 10% p.a. simple interest.

- Option 2: Invest at 9% p.a. compound interest.

You can use a calculator.

- Calculate the amount accumulated at the end of the 30 years for option 1 (round to the nearest integer):

  $\boxed{200000}$ dollars

- Calculate the amount accumulated at the end of the 30 years for option 2 (round to the nearest integer):

  $\boxed{663384}$ dollars

- Decide which option to take.
  $\boxed{\textbf{Option 2}}$

Solution:

- **Option 1: Simple Interest**
  For option 1, we substitute the values in the formula for simple interest:

$$A = (1 + t \times r) \times P$$
$$= (1 + 30 \times 0.10) \times 50\,000$$
$$= (1 + 3.0) \times 50\,000$$
$$= 4.0 \times 50\,000$$
$$= 200\,000 \text{ dollars}$$

Thus, the amount accumulated for option 1 after 30 years is $200\,000.

- **Option 2: Compound Interest**
  For option 2, we substitute the values in the formula for compound interest:

$$A = (1 + r)^t \times P$$
$$= (1 + 0.09)^{30} \times 50\,000$$
$$= (1.09)^{30} \times 50\,000$$
$$\approx 663\,384 \text{ dollars}$$

Thus, the amount accumulated for option 2 after 30 years is $663\,384.

- **Conclusion**

  Comparing the two options:

  - Option 1 (simple interest) gives \$200 000,
  - Option 2 (compound interest) gives \$663 384.

  Since option 2 gives a much higher final amount, it is better to choose option 2 with compound interest.