INTERESTS

A DEFINITIONS

A.1 FINDING THE INTEREST

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

$$\boxed{10}\ \$$$

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

$$\begin{aligned}\text{Interest} &= \text{Amount repaid} - \text{Original amount}\\ &= 110 - 100\\ &= 10\ \$\end{aligned}$$

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

$$\boxed{30}\ \$$$

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

$$\begin{aligned}\text{Interest} &= \text{Amount repaid} - \text{Original amount}\\ &= 230 - 200\\ &= 30\ \$\end{aligned}$$

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

$$\boxed{25}\ \$$$

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

$$\begin{aligned}\text{Interest} &= \text{Amount repaid} - \text{Original amount}\\ &= 525 - 500\\ &= 25\ \$\end{aligned}$$

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

$$\boxed{80}\ \$$$

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

$$\begin{aligned}\text{Interest} &= \text{Amount repaid} - \text{Original amount}\\ &= 1\,080 - 1\,000\\ &= 80\ \$\end{aligned}$$

A.2 FINDING THE TOTAL AMOUNT

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

$$\boxed{2650}\ \$$$

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

$$\begin{aligned}\text{Amount to repay} &= \text{Principal} + \text{Interest}\\ &= 2\,500 + 150\\ &= 2\,650\ \$\end{aligned}$$

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

$$\boxed{330}\ \$$$

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

$$\begin{aligned}\text{Amount to repay} &= \text{Principal} + \text{Interest}\\ &= 300 + 30\\ &= 330\ \$\end{aligned}$$

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

$$\boxed{550}\ \$$$

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

$$\begin{aligned}\text{Amount to repay} &= \text{Principal} + \text{Interest}\\ &= 500 + 50\\ &= 550\ \$\end{aligned}$$

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

$$\boxed{1080}\ \$$$

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

$$\begin{aligned}\text{Amount to repay} &= \text{Principal} + \text{Interest}\\ &= 1\,000 + 80\\ &= 1\,080\ \$\end{aligned}$$

A.3 FINDING THE PRINCIPAL

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

$$\boxed{300}\ \$$$

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

$$\begin{aligned}\text{Principal} &= \text{Amount repaid} - \text{Interest}\\ &= 330 - 30\\ &= 300\ \$\end{aligned}$$

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

$$\boxed{500}\ \$$$

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

$$\begin{aligned}\text{Principal} &= \text{Amount repaid} - \text{Interest}\\ &= 550 - 50\\ &= 500\ \$\end{aligned}$$

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

$$\boxed{1000}\ \$$$

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

$$\begin{aligned}\text{Principal} &= \text{Amount repaid} - \text{Interest}\\ &= 1\,080 - 80\\ &= 1\,000\ \$\end{aligned}$$

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

$$\boxed{600}\ \$$$

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

$$\begin{aligned}\text{Principal} &= \text{Amount repaid} - \text{Interest}\\ &= 750 - 150\\ &= 600\ \$\end{aligned}$$

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.

$$\boxed{75}\ \$$$

Answer:

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

Ex 14:  Find the simple interest on a principal of \$1 000 at a rate of 4% per year over 3 years.

$$\boxed{120}\ \$$$

Answer:

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

Ex 15:  Find the simple interest on a principal of \$750 at a rate of 5% per year over 2 years.

$$\boxed{75}\ \$$$

Answer:

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

Ex 16:  Find the simple interest on a principal of \$1 200 at a rate of 6% per year over 4 years.

$$\boxed{288}\ \$$$

Answer:

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

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.

$\boxed{36}$ \$

Answer:

- Convert the time from months to years:

$$\begin{aligned} 18 \text{ months} &= \frac{18}{12} \text{ years} \\ &= 1.5 \text{ years} \end{aligned}$$

- Calculate the interest:

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

Ex 18: Find the simple interest on a principal of \$700 at a rate of 5% per year over 180 days.

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

Answer:

- Convert the time from days to years:

$$\begin{aligned} 180 \text{ days} &= \frac{180}{365} \text{ years} \\ &\approx 0.493 \text{ years} \end{aligned}$$

- Calculate the interest:

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

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

$\boxed{24}$ \$

Answer:

- Convert the time from months to years:

$$\begin{aligned} 9 \text{ months} &= \frac{9}{12} \text{ years} \\ &= 0.75 \text{ years} \end{aligned}$$

- Calculate the interest:

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

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.

$\boxed{120}$ \$

Answer:

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

$$\begin{aligned} 2 \text{ years } 6 \text{ months} &= 2 + \frac{6}{12} \text{ years} \\ &= 2 + 0.5 \text{ years} \\ &= 2.5 \text{ years} \end{aligned}$$

- Calculate the interest:

$$\begin{aligned} \text{Interest} &= \text{Number of years} \times \text{Percentage of the principal} \\ &= 2.5 \times 4\% \text{ of } 1\,200 \\ &= 2.5 \times \frac{4}{100} \times 1\,200 \\ &= 120 \text{ \$} \end{aligned}$$

B.3 FINDING THE TOTAL AMOUNT

Ex 21: Jack lends Sarah \$500 with simple interest over 3 years at a rate of 3% per year.
Find the total amount Sarah needs to repay Jack.

$\boxed{545}$ \$

Answer:

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

$$\begin{aligned} \text{Interest} &= \text{Number of years} \times \text{Percentage of the principal} \\ &= 3 \times \frac{3}{100} \times 500 \\ &= 45 \text{ \$} \end{aligned}$$

- Calculate the total amount to repay:

$$\begin{aligned} \text{Amount to repay} &= \text{Principal} + \text{Interest} \\ &= 500 + 45 \\ &= 545 \text{ \$} \end{aligned}$$

Ex 22: Emma borrows \$600 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.

$\boxed{660}$ \$

Answer:

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

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

- Calculate the total amount to repay:

$$\begin{aligned}\text{Amount to repay} &= \text{Principal} + \text{Interest} \\ &= 600 + 60 \\ &= 660 \text{ \$}\end{aligned}$$

Ex 23: Michael lends \$800 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.

$\boxed{864}$ \$

Answer:

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

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

- Calculate the total amount to repay:

$$\begin{aligned}\text{Amount to repay} &= \text{Principal} + \text{Interest} \\ &= 800 + 64 \\ &= 864 \text{ \$}\end{aligned}$$

Ex 24: Sophia borrows \$1 200 with simple interest over 5 years at a rate of 2.5% per year.
Find the total amount Sophia needs to repay.

$\boxed{1\,350}$ \$

Answer:

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

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

- Calculate the total amount to repay:

$$\begin{aligned}\text{Amount to repay} &= \text{Principal} + \text{Interest} \\ &= 1\,200 + 150 \\ &= 1\,350 \text{ \$}\end{aligned}$$