EQUITY
LEARNING PLACE

Elementary Math Topical (Simple and Compound Interest)

Question 1:

Aldric received an interest of $6159 from an investment that offers compound interest at 3.5% per annum after 10 years. What is the initial investment amount? Correct your answer to the nearest dollar.

$$P + 6159 = P\left(1 + \frac{3.5}{100}\right)^{10}$$

$$P + 6159 = 1.41059876P$$

$$6159 = 0.41058976P$$

$$P = 15000$$

Question 2:

Don wishes to deposit $3200 in a bank account for 24 months and has 2 options to consider. Bank A pays 6% per year simple interest while Bank B offers compound interest at 5.9% per annum. Which Bank should Don deposit his money in? You must show your calculations.

Bank A:

$$I = \frac{3200 \times 6 \times 2}{100}$$

$$I = 384$$

Bank B:

$$\text{Total Amount} = 3200\left(1 + \frac{5.9}{100}\right)^{2}$$

$$= 3588.74$$

$$I = 3588.74 - 3200$$

$$= 388.74$$

$\therefore$ Bank B, pays a higher amount of interest over 2 years.

Question 3:

A company takes up a loan from a bank. The bank charges an annual interest rate of 4% compounded quarterly. When the loan matures in 3.5 years, the company is projected to pay a total interest of $100,000. Calculate the original sum of the loan, giving your answer correct to the nearest dollar.

$$100000 + P = P\left(1 + \frac{1}{100}\right)^{14}$$

$$100000 = 1.149474P - P$$

$$P = 669012$$

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Question 4:

A bank offers simple interest rate of 2% per annum for deposits. Adam deposits $8 000 into the bank.

a) Calculate the interest he will get at the end of 8 years.

b) Calculate the total amount that will be in his account at the end of 8 years.

c) A hedge fund firm offers compound interest rate of 8% per annum compounded half-yearly. Chuni decides to invest $5000 into the hedge fund account. Find the profit that Chuni should make after 4 years.

a)

$$I = \frac{8000 \times 2 \times 8}{100}$$

$$I = 1280$$

b)

$$\text{Total Amount} = 1280 + 8000$$

$$= 9280$$

c)

$$\text{Total Amount} = 5000\left(1 + \frac{4}{100}\right)^8$$

$$= 6842.85$$

$$\text{Profit} = 6842.85 - 5000$$

$$= 1842.85$$

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Question 5:

Amirul has enrolled in a Science course at the National University of Singapore. The tuition fee for his course is $50 000. As a Singaporean, Amirul enjoys a government subsidy of 55% off his tuition fee. His parents have also agreed to pay 25% of the subsidised tuition fee.

a) Find the remaining amount that Amirul has to pay for his Science course.

Amirul decides to take a study loan to pay the remaining tuition fee. There are two loan schemes available for him to choose.

Scheme A: Simple interest of 6% per annum, with the loan payable over 6 years.

Scheme B: Compound interest of 4.8% per annum compounded yearly, with the loan payable over 5 years.

b) Find the total amount payable for Scheme A.

c) Find the total amount payable for Scheme B.

d) With Amirul's part time job, he is able to afford a maximum instalment of $330 per month. Which scheme should Amirul choose? You must show all your workings clearly.

a) After government subsidy

$$\frac{45}{100} \times 50000 = 22500$$

After parent

$$\frac{75}{100} \times 22500 = 16875$$

b)

$$I = \frac{16875 \times 6 \times 6}{100} = 6075$$

$$\text{Total amount} = 6075 + 16875 = 22950$$

c)

$$\text{Total amount} = 16875\left(1 + \frac{4.8}{100}\right)^5$$

$$= 21332.91$$

d) Scheme A:

$$\text{Monthly instalment} = 22950 \div 72 = 318.75$$

Scheme B:

$$\text{Monthly instalment} = 21332.91 \div 60 = 355.55$$

$$\therefore \text{Scheme A is affordable for him.}$$

Note: We should not be discussing about repayment for compound interest in O level syllabus. The monthly instalment for compound interest is more complicated than what is shown above.

Question 6:

Jack has $100,000 to invest. He can either invest his money in Scheme *A* which earns 3% simple interest annually or in Scheme *B* which earns him 1.5% interest per annum compounded half yearly. Showing your calculations clearly, determine which scheme would give him more returns at the end of 5 years.

Scheme A:

$$I = \frac{100000 \times 3 \times 5}{100}$$

$$I = 15000$$

Scheme B:

$$\text{Total Amount} = 100000\left(1 + \frac{0.75}{100}\right)^{10}$$

$$= 107758.25$$

$$\text{Interest} = 107758.25 - 100000$$

$$= 7758.25$$

$$\therefore \text{Scheme A has a higher return}$$

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Question 7:

Michael intends to set up a cafe and he needs to take a loan of $80 000. There are 2 options offered by Bank *A* and Bank *B*.

Bank ***A*** charges a simple interest of 2.5% per annum for 5 years.

Bank ***B*** charges a compound interest of 3% per annum, compounded half-yearly for 4 years.

a) Calculate the amount of each monthly payment if Michael takes the offer from

i) Bank A

ii) Bank B

b) Explain with 2 possible reasons, which bank Michael should choose from.

ai)

$$I = \frac{80000 \times 2.5 \times 5}{100} = 10000$$

$$\text{Total amount} = 10000 + 80000 = 90000$$

$$\text{Monthly instalment} = 90000 \div 60 = 1500$$

aii)

$$\text{Total amount} = 80000\left(1 + \frac{1.5}{100}\right)^{8} = 90119.41$$

$$\text{Monthly instalment} = 90119.41 \div 48 = 1877.49$$

Note: Repayment for compound interest is not calculated in this manner. It is more complicated which is out of O level syllabus

b) Michael should choose Bank A because the total repayment amount is lesser and the monthly instalment is also lesser.

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Question 8:

Mr Lim invested $15000 in an account for 2 years which pays *x* % per year where the interest is compounded quarterly. Given that Mr Lim received $15640 when he closed the account, find the value of *x*.

$$15640 = 15000\left(1 + \frac{0.25x}{100}\right)^8$$

$$\frac{15640}{15000} = \left(1 + \frac{0.25x}{100}\right)^8$$

$$\sqrt[8]{\frac{15640}{15000}} = 1 + \frac{0.25x}{100}$$

$$x = 2.09$$

Question 9:

Mrs Yang has $50 000 to invest. Bank A offers 2% per annum simple interest. Bank B pays 1.5% per annum compound interest compounded yearly.

a) At the end of 3 years, calculate the total amount she will receive from each bank.

b) Which bank should she choose? Explain your answer.

a)

Bank A

$$I = \frac{50000 \times 2 \times 3}{100}$$

$$I = 3000$$

$$\text{Total amount} = 3000 + 50000$$

$$= 53000$$

Bank B

$$\text{Total amount} = 50000\left(1 + \frac{1.5}{100}\right)^3$$

$$= 52283.92$$

b) Choose Bank A because they total amount she received in the end is more than Bank B.

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Question 10:

Reese invested some money in a savings account for 4 years. The rate of compound interest was fixed at 3.5% per annum compounded yearly. At the end of 4 years, there was $8887.57 in her account. How much did Reese invest in the account? Give your answer correct to the nearest dollar.

$$8887.57 = P\left(1 + \frac{3.5}{100}\right)^4$$

$$P = 7745$$

Question 11:

a) Jay is thinking of investing $5000 in Bank Y with an interest of 4% per annum, compounded half-yearly. How much will the interest be after 7 years?

b) Jay has another option. He can also deposit the same amount of money into Bank X which offers a simple interest of 5% per annum for 7 years. Which bank should Jay deposit his money in? Justify your answer.

a)

$$\text{Total amount} = 5000\left(1 + \frac{2}{100}\right)^{14}$$

$$= 6597.39$$

$$\text{Interest} = 6597.39 - 5000 = 1597.39$$

b)

$$\text{Interest} = \frac{5000 \times 5 \times 7}{100} = 1750$$

Jay should deposit in Bank X because the interest earned is higher than Bank Y.

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Question 12:

Ean invested $10,800 in a bank that pays 2.8% compound interest per annum compounded every three months. Calculate the total amount he has in the bank after $3\frac{1}{2}$ years.

$$\text{Total amount} = 10800\left(1+\frac{0.7}{100}\right)^{14}$$

$$= 11907.93$$

Question 13:

John and Karen open separate bank accounts.

a) John deposits $800 in his account. This account pays simple interest at the rate of 5% per annum. Calculate the total amount in his account after 3 years.

b) Karen deposits $800 in her account. This account pays compound interest at the rate of 5% per year. Calculate how much more money there is in her account after 3 years than there is in John's account.

a)

$$I = \frac{800 \times 5 \times 3}{100} = 120$$

$$\text{Total amount} = 800 + 120 = 920$$

b)

$$\text{Total amount} = 800\left(1+\frac{5}{100}\right)^{3} = 926.10$$

$$\text{Excess} = 926.1 - 920 = 6.10$$

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Question 14:

Fred buys a laptop. To pay for it, he borrows the whole cost of $1599 for 4 years at compound interest of 3% per year. Calculate the amount of interest Fred has to pay.

$$\text{Total amount} = 1599\left(1+\frac{3}{100}\right)^4$$

$$= 1799.69$$

Question 15:

Andrea works in the sales department. Her monthly salary consists of a basic pay of $1200. On top of that, she will be given 5% bonus on all sales generated. In a particular month, her salary is $10 500.

a) Calculate her sales for the month.

Andrea decides to save 20% of the month salary in Bartley Bank for 4 years.

Barley Bank offers 2 types of saving plans as shown below.

Plan *A* : A simple interest of 3% per annum.

Plan *B* : A compound interest of 2.4% per annum.

b) Calculate the amount she is saving for the month.

c) Which Plan should Andrea choose?

a) $\text{Bonus} = 10500 - 1200 = 9300$

$$\text{Sales} = \frac{100}{5} \times 9300 = 18600$$

b) Amount to save $= \frac{20}{100} \times 10500 = 2100$

c) Plan A

$$I = \frac{2100 \times 3 \times 4}{100}$$

$$I = 252$$

$$\text{total amount} = 252 + 2100 = 2352$$

Plan B

$$\text{total amount} = 2100\left(1+\frac{2.4}{100}\right)^4$$

$$= 2308.97$$

Andrea should choose Plan A.