

TUTORIAL

CHAPTER 1: Fundamental Concepts of Mathematics (**ANSWER SCHEME**)

- 1) A theater has 60 seats in the first row, 68 seats in the second row, 76 seats in the third row, and so on in the same increasing pattern. If the theater has 20 rows of seats, how many seats are in the theater? (5 marks)

$$60, 68, 76, \dots, \dots, T_{20}$$

$$a = 8$$

$$d = 60$$

(Arithmetic Sequence)

$$S_{20} = \frac{20}{2} [2(60) + 19(8)] = 2720$$

- 2) The third term of a geometric sequence is 3 and the sixth term is $\frac{1}{9}$. Find the first term and common ratio. (5 marks)

(Geometric Sequence)

$$T_3 = 3$$

$$ar^2 = 3 \rightarrow (1)$$

$$T_6 = \frac{1}{9}$$

$$ar^5 = \frac{1}{9} \rightarrow (2)$$

$$\frac{(2)}{(1)} = \frac{ar^5 = \frac{1}{9}}{ar^2 = 3}$$

$$r^3 = \frac{1}{27}$$

$$r = \left(\frac{1}{27} \right)^{\frac{1}{3}}$$

$$r = \frac{1}{3}$$

Subs $r = \frac{1}{3}$ into (1):

$$a\left(\frac{1}{3}\right)^2 = 3$$

$$\frac{1}{9}a = 3$$

$$a = 27$$

3) The monthly rental values of a 25-storeyed building are as follows:

First floor = RM8,000 per month

Second floor = RM7,700 per month

Third floor = RM7,400 per month and so on.

i) Find the monthly rental value for the 25th floor. (2.5marks)

8000, 7700, 7400,

$$d = -300$$

$$a = 8000$$

(Arithmetic Sequence)

$$T_{25} = 8000 + (24)(-300)$$

$$= RM800$$

ii) A company rents the whole building. What is the total monthly payment?

(2.5 marks)

$$S_{25} = \frac{25}{2} [2(8000) + 24(-300)]$$

$$= RM110,000$$

- 4) Rita estimates that her expenditure will increase by 5% each year when her son starts attending primary school. The expenditure for the first year in school is estimated to be RM3, 600.

- i) Determine the sequence that can describe the expenditure above.

(1 mark)

$$3600, 3780, 3969, \dots$$

$$a = 3600$$

$$r = \frac{3780}{3600} = \frac{3969}{3780} = 1.05 > 1$$

\therefore This sequence is a Geometric Sequence.

- ii) Find the expenditure for the 10th year.

(2 marks)

$$\begin{aligned} T_{10} &= 3600(1.05)^9 \\ &= RM5,584.78 \end{aligned}$$

- iii) Find the total expenditure after 10 years.

(2 marks)

$$\begin{aligned} S_{10} &= \frac{3600(1.05^{10} - 1)}{1.05 - 1} \\ &= RM45,280.41 \end{aligned}$$

- 5) Shamir rents a shop on the first floor, Quah chooses the second floor and Darwisyah prefers the third floor in a shopping mall. They pay rents RM5700, RM5200, RM4700 respectively each month.

- i) Find the monthly rental of the sixth floor, if the sequence of the rent amounts maintained.

(2 marks)

$$5700, 5200, 4700, \dots$$

$$a = RM5700$$

$$d = RM - 500$$

(Arithmetic Sequence)

$$\begin{aligned} T_6 &= 5700 + 5(-500) \\ &= RM3,200 \end{aligned}$$

- ii) How many floors are there in the shopping mall if an owner of a shop of the highest floor must pay RM700 per month? (2 marks)

$$T_n = 700$$

$$5700 + (n - 1)(-500) = 700$$

$$-500n + 500 = -5000$$

$$5500 = 500n$$

$$11 = n$$

- 6) The seventh term of a geometric sequence exceeds the fifth term by 36. Find the sum of the first ten terms if the common ratio is 2. (4 marks)

$$T_7 - T_5 = 36$$

$$r = 2 > 1$$

$$ar^6 - ar^4 = 36$$

$$a(2)^6 - a(2)^4 = 36$$

$$64a - 16a = 36$$

$$48a = 36$$

$$a = \frac{3}{4}$$

$$S_{10} = \frac{\frac{3}{4}(2^{10} - 1)}{(2 - 1)}$$

$$= 767\frac{1}{4}$$

7) Given the sequence $2\frac{1}{8}, 3\frac{1}{4}, 4\frac{3}{8}, \dots, 12\frac{1}{4}$. Find

i) The number of terms in the sequence

(2 marks)

$$d = \frac{9}{8}$$

(Arithmetic Sequence)

$$T_n = 12\frac{1}{4}$$

$$2\frac{1}{8} + (n-1)\left(\frac{9}{8}\right) = 12\frac{1}{4}$$

$$\frac{9}{8}n - \frac{9}{8} = 10\frac{1}{8}$$

$$\frac{9}{8}n = 11\frac{1}{4}$$

$$n = 10$$

ii) Sum of all terms in the sequence

(2 marks)

$$\begin{aligned} S_{10} &= \frac{10}{2} \left[2\left(2\frac{1}{8}\right) + 9\left(\frac{9}{8}\right) \right] \\ &= 71\frac{7}{8} \end{aligned}$$

8) In a certain city, the condition of haze is measured by an index. On the first day of May, the haze index was 60. The index then continued to increase by 2% daily. Find the index on the tenth day.

(2 marks)

$$a = 60$$

$$r = \frac{61.2}{60} = \frac{62.424}{61.2} = 1.02$$

(Geometric Sequence)

$$\begin{aligned} T_{10} &= 60(1.02)^9 \\ &= 71.7056 \end{aligned}$$

9) Solve

i) $3(x+2) = 2x(x+2)$

(2 marks)

$$3x + 6 = 2x^2 + 4x$$

$$0 = 2x^2 + x - 6$$

$$x = \frac{3}{2} \text{ and } x = -2$$

ii) $\frac{n+1}{3} + \frac{n-2}{2} = 2$

(3 marks)

$$2\left(\frac{n+1}{3}\right) + 3\left(\frac{n-2}{2}\right) = 2$$

$$\frac{2n+2+3n-6}{6} = 2$$

$$5n - 4 = 2$$

$$5n = 6$$

$$n = 1\frac{1}{5}$$

iii) $\frac{n+3}{4} + \frac{n-3}{3} = 1$

(3 marks)

$$3\left(\frac{n+3}{4}\right) + 4\left(\frac{n-3}{3}\right) = 1$$

$$\frac{3n+9+4n-12}{12} = 1$$

$$7n - 3 = 12$$

$$7n = 15$$

$$n = 2\frac{1}{7}$$

iv) $2x(x+5) = 5(3+x)$

(2 marks)

$$2x^2 + 10 = 15 + 5x$$

$$2x^2 + 5x - 15 = 0$$

$$x = 1.7604 \text{ and } x = -4.2604$$

$$v) \quad \frac{x}{6} = 2 - \frac{3x-5}{2}$$

(3 marks)

$$\begin{aligned}\frac{x}{6} &= \frac{4-(3x-5)}{2} \\ \frac{x}{6} &= \frac{9-3x}{2} \\ 2x &= 6(9-3x) \\ 2x &= 54-18x \\ 20x &= 54 \\ x &= 2\frac{7}{10}\end{aligned}$$

$$vi) \quad \frac{x-5}{x+2} = \frac{2x}{x-3} - 1$$

(3 marks)

$$\begin{aligned}\frac{x-5}{x+2} &= \frac{2x-(x-3)}{x-3} \\ \frac{x-5}{x+2} &= \frac{x+3}{x-3} \\ (x-5)(x-3) &= (x+3)(x+2) \\ x^2 - 3x - 5x + 15 &= x^2 + 3x + 2x + 6 \\ -8x + 15 &= 5x + 6 \\ 9 &= 13x \\ \frac{9}{13} &= x\end{aligned}$$

10) Simplify the following algebraic fraction

(3 marks)

$$\begin{aligned}& \frac{m^2-1}{2m-3} \div \frac{3m+3}{2m^2-5m+3} \\ &= \frac{(m-1)(m+1)}{2m-3} \div \frac{3(m+1)}{(2m-3)(m-1)} \\ &= \frac{(m-1)(m+1)}{2m-3} \div \frac{3(m+1)}{(2m-3)(m-1)} \\ &= \frac{(m-1)(m+1)}{2m-3} \times \frac{(2m-3)(m-1)}{3(m+1)} \\ &= \frac{(m-1)(m-1)}{3} \\ &= \frac{(m-1)^2}{3}\end{aligned}$$

11) Calculate

i) $(46.61 \div 7.1) + [10.6(3 \times 9.4) - 15.2(8.5)]$ (2 marks)

$$\begin{aligned} &= (6.5648) + [10.6(28.2) - 15.2(8.5)] \\ &= (6.5648) + [298.92 - 129.2] \\ &= (6.5648) + [169.72] \\ &= 176.2848 \end{aligned}$$

ii) $(3.45 \times 9.4) + [12.6(36.61 \div 7.9) - 15.2(8.55)]$ (3 marks)

$$\begin{aligned} &= (32.43) + [58.3906 - 129.96] \\ &= 32.43 + (-71.5694) \\ &= -39.1394 \end{aligned}$$

iii) $3 - 2[[8.2(4.9 - 3.2) \div 2.45] - [1.86(2.56 - 1.2)]]$ (3 marks)

$$\begin{aligned} &= 3 - 2[[13.94 \div 2.45] - [2.5296]] \\ &= 3 - 2[[5.6898] - [2.5296]] \\ &= 3 - 2[3.1602] \\ &= -3.3204 \end{aligned}$$

12) Simplify

$3m(2m - 3n) - 4m^2 + 2n(4 - m)$ (2 marks)

$$\begin{aligned} &= 6m^2 - 9mn - 4m^2 + 8n - 2mn \\ &= 2m^2 - 11mn + 8n \end{aligned}$$