Penyelesaian Lengkap

PRAKTIS 5

Kertas 1

Bahagian A

1 (a) $(7u - 16) - 6u = (4u) - (7u - 16)$
$7u - 16 - 6u = 4u - 7u + 16$
$4u = 32$
$u = 8$

(b) $T_1 = 6(8) = 48$
$T_2 = 7(8) - 16 = 40$
$d = 40 - 48 = -8$
$T_n = a + (n - 1)d$
$T_{10} = (48) + (10 - 1)(-8)$
$= -24$

2 (a) $T_n = 7n - 10$
$T_1 = 7(1) - 10 = -3$
$T_2 = 7(2) - 10 = 4$

Hasil tambah dua sebutan pertama
Sum of the first two terms
$= -3 + 4$
$= 1$

(b) $d = T_2 - T_1$
$= 4 - (-3)$
$= 4 + 3$
$= 7$

3 (a) $24 - (x + 7) = (3x - 7) - 24$
$24 - x - 7 = 3x - 7 - 24$
$17 - x = 3x - 31$
$48 = 4x$
$x = 12$
$d = 24 - (12 + 7)$
$= 5$

(b) $a = 12 + 7 = 19$
$d = 5$

Hasil tambah/*Sum of* $T_{15} + T_{16} + \ldots + T_{25}$
$= S_{25} - S_{14}$
$= \frac{25}{2}[2(19) + (25 - 1)(5)] - \frac{14}{2}[2(19) + (14 - 1)(5)]$
$= 1\ 975 - 721$
$= 1\ 254$

4 (a) $S_n = \frac{n}{2}(13n - 5)$
$T_1 = S_1$
$= \frac{1}{2}[13(1) - 5]$
$= 4$
$T_2 = S_2 - S_1$
$= \frac{2}{2}[13(2) - 5] - 4$
$= 17$
$d = T_2 - T_1$
$= 17 - 4$
$= 13$

(b) **Kaedah/*Method* 1**
$T_9 = 4 + (9 - 1)13$
$= 108$

Kaedah/*Method* 2
$T_9 = S_9 - S_8$
$= \frac{9}{2}[13(9) - 5] - \frac{8}{2}[13(8) - 5]$
$= 504 - 396$
$= 108$

5 (a) $(2x + 4) - (x + 3) = 4x - (2x + 4)$
$2x + 4 - x - 3 = 4x - 2x - 4$
$-x = -5$
$x = 5$

(b) Tiga sebutan berturutan:
Three consecutive terms:
$5 + 3, 2(5) + 4, 4(5) = 8, 14, 20$
$d = 14 - 8 = 6$
$T_8 = 32$
$a + 7d = 32$
$a + 7(6) = 32$
$a = -10$

(c) $S_n = \frac{n}{2}(2a + (n - 1)d]$
$S_{15} = \frac{15}{2}[2(-10) + (15 - 1)(6)]$
$= 480$

6 (a) $T_1 = a = 10$
$T_n = 145$
$10 + (n - 1)d = 145$
$(n - 1)d = 135 \ldots ①$
$S_n = \frac{n}{2}[2a + (n - 1)d]$
$1\ 240 = \frac{n}{2}[2(10) + (n - 1)d]$

Daripada/*From* ①,
$1\ 240 = \frac{n}{2}[2(10) + 135]$
$1\ 240 = \frac{155n}{2}$
$n = 16$

(b) $T_{16} = 145$
$10 + 15d = 145$
$15d = 135$
$d = 9$

7 (a) $T_4 = 71$
$a + 3d = 71 \ldots ①$

$T_9 = 36$
$a + 8d = 36 \ldots ②$
$② - ①:\ 5d = -35$
$d = -7$

Daripada/*From* ①,
$a + 3(-7) = 71$
$a = 92$

(b) $a = 92,\ T_9 = 36$
$S_9 = \frac{9}{2}(92 + 36)$
$= 576$

8 (a) $S_n = \frac{3}{2}n^2 + 3n$
$S_1 = \frac{3}{2}(1)^2 + 3(1)$
$= \frac{9}{2}$
$\therefore T_1 = \frac{9}{2}$

(b) $S_1 = \frac{9}{2}$
$S_2 = \frac{3}{2}(2)^2 + 3(2) = 12$
$T_2 = S_2 - S_1$
$= 12 - \frac{9}{2}$
$= \frac{15}{2}$
$d = T_2 - T_1$
$= \frac{15}{2} - \frac{9}{2}$
$= 3$

(c) $a = \frac{9}{2},\ d = 3$
$T_n = a + (n - 1)d$
$= \frac{9}{2} + (n - 1)(3)$
$= \frac{9}{2} + 3n - 3$
$= 3n + \frac{3}{2}$

9 (a) $a = 7$
$r = \frac{14}{7} = 2$
$T_7 = ar^{n-1}$
$= (7)(2^{7-1})$
$= 448$

(b) $S_n = \frac{a(r^n - 1)}{r - 1}$
$S_9 = \frac{7(2^9 - 1)}{2 - 1}$
$= 7(512 - 1)$
$= 3\ 577$

10 (a) $T_3 = 72$
$ar^2 = 72 \ldots ①$
$T_3 + T_4 = 96$
$ar^2 + ar^3 = 96$
$ar^2(1 + r) = 96 \ldots ②$

$② \div ①$:
$\frac{ar^2(1 + r)}{ar^2} = \frac{96}{72}$
$1 + r = \frac{4}{3}$
$r = \frac{1}{3}$

Daripada/*From* ①,
$a\left(\frac{1}{3}\right)^2 = 72$
$\frac{a}{9} = 72$
$a = 648$

(b) $S_\infty = \frac{a}{1 - r}$
$= \frac{648}{1 - \frac{1}{3}}$
$= 648 \times \frac{3}{2}$
$= 972$

11 (a) $T_3 - T_2 = 24$
$ar^2 - ar = 24$
$ar(r - 1) = 24 \ldots ①$
$S_2 = 16$
$\frac{a(r^2 - 1)}{r - 1} = 16$
$\frac{a(r - 1)(r + 1)}{r - 1} = 16$
$a(r + 1) = 16 \ldots ②$

$① \div ②$,
$\frac{ar(r - 1)}{a(r + 1)} = \frac{24}{16}$
$\frac{r(r - 1)}{r + 1} = \frac{3}{2}$
$2r^2 - 2r = 3r + 3$
$2r^2 - 5r - 3 = 0$
$(2r + 1)(r - 3) = 0$
$2r + 1 = 0,\ r - 3 = 0$
$r = -\frac{1}{2},\ r = 3$
$T_2 < T_3,\ \therefore r = 3$

(b) Daripada/*From* ②,
$a(3 + 1) = 16$
$a = 4$
$T_6 = ar^5$
$= 4 \times 3^5$
$= 972$

12 (a) $\frac{3x}{x - 2} = \frac{14x + 5}{3x}$
$(3x)^2 = (x - 2)(14x + 5)$
$9x^2 = 14x^2 - 23x - 10$
$5x^2 - 23x - 10 = 0$
$(5x + 2)(x - 5) = 0$
$5x + 2 = 0,\ x - 5 = 0$
$x = -\frac{2}{5},\quad x = 5$

Oleh sebab $x > 0$, $x = 5$

Since $x > 0$, $x = 5$

(b) $a = 5 - 2 = 3$

$r = \frac{3(5)}{5-2} = 5$

$S_n = \frac{a(r^n - 1)}{r - 1}$

$S_6 = \frac{3(5^6 - 1)}{5 - 1}$

$= 11\ 718$

13 (a) Bagi nisbah sepunya $0 < r < 1$, apabila $n \to \infty$, $r^n \to 0$.

Maka,

For the common ratio $0 < r < 1$, *when* $n \to \infty$, $r^n \to 0$.

Thus,

$$S_n = \frac{a(1 - r^n)}{1 - r} = \frac{a[1 - (0)]}{1 - r} = \frac{a}{1 - r}$$

(b) (i) $0.6666 \ldots$

$= 0.6 + 0.06 + 0.006 + 0.0006 + \ldots$

$\frac{0.06}{0.6} = 0.1$, $\frac{0.006}{0.06} = 0.1$

Maka, janjang geometri dengan $r = 0.1$.

Thus, geometric progression with $r = 0.1$.

$$S_\infty = \frac{a}{1 - r} = \frac{0.6}{1 - 0.1} = \frac{0.6}{0.9} = \frac{2}{3}$$

(ii) $0.57575757 \ldots$

$= 0.57 + 0.0057 + 0.000057 + 0.00000057 + \ldots$

$\frac{0.0057}{0.57} = 0.01$, $\frac{0.000057}{0.0057} = 0.01$

Maka, janjang geometri dengan $r = 0.01$.

Thus, geometric progression with $r = 0.01$.

$$S_\infty = \frac{a}{1 - r} = \frac{0.57}{1 - 0.01} = \frac{0.57}{0.99} = \frac{19}{33}$$

Bahagian B

14 (a) $T_7 = 31$

$a + 6d = 31 \ldots$ ①

$S_{12} - S_7 = 215$

$\frac{12}{2}[2a + (12 - 1)d] - \frac{7}{2}[2a + (7 - 1)d] = 215$

$6(2a + 11d) - \frac{7}{2}(2a + 6d) = 215$

$12(2a + 11d) - 7(2a + 6d) = 430$

$24a + 132d - 14a - 42d = 430$

$10a + 90d = 430$

$a + 9d = 43 \ldots$ ②

② − ①: $3d = 12$

$d = 4$

Daripada/*From* ①,

$a + 6(4) = 31$

$a = 7$

(b) (i) $T_n = a + (n - 1)d$

$= 7 + (n - 1)(4)$

$= 7 + 4n - 4$

$= 4n + 3$

(ii) $S_n = \frac{n}{2}[2a + (n - 1)d]$

$= \frac{n}{2}[2(7) + (n - 1)(4)]$

$= \frac{n}{2}(14 + 4n - 4)$

$= \frac{n}{2}(4n + 10)$

$= \frac{n}{2}(2)(2n + 5)$

$= 2n^2 + 5n$

15 (a) $a = 5$, $d = 8.5 - 5 = 3.5$

$S_n = 291$

$\frac{n}{2}[2(5) + (n - 1)(3.5)] = 291$

$\frac{n}{2}(10 + 3.5n - 3.5) = 291$

$\frac{n}{2}[3.5n + 6.5) = 291$

$n(7n + 13) = 1\ 164$

$7n^2 + 13n - 1\ 164 = 0$

$(7n + 97)(n - 12) = 0$

$n = -\frac{97}{7}, n = 12$

Oleh sebab $n > 0$, maka $n = 12$

Since $n > 0$, *thus* $n = 12$

(b) (i) $T_1 = \frac{2}{3} \times \pi \times 12^3$

$T_2 = \frac{2}{3} \times \pi \times 6^3$

$T_3 = \frac{2}{3} \times \pi \times 3^3$

$$\frac{T_2}{T_1} = \frac{\frac{2}{3} \times \pi \times 6^3}{\frac{2}{3} \times \pi \times 12^3} = \frac{1}{8}$$

$$\frac{T_3}{T_2} = \frac{\frac{2}{3} \times \pi \times 3^3}{\frac{2}{3} \times \pi \times 6^3} = \frac{1}{8}$$

Nisbah sepunya/*Common ratio*, $r = \frac{1}{8}$

Sebutan pertama/*First term*

$a = \frac{2}{3} \times \pi \times 12^3 = 1\ 152\pi$

Jujukan isi padu hemisfera mengikut suatu janjang geometri dengan $a = 1\ 152\pi$ dan $r = \frac{1}{8}$.

The sequence of volume of the hemispheres follows a geometric progression with $a = 1\ 152\pi$ *and* $r = \frac{1}{8}$.

(b) (ii) Hasil tambah isi padu bagi semua hemisfera dalam jujukan

Sum of volume of all the hemispheres in the sequence

$$S_\infty = \frac{a}{1-r} = \frac{1\ 152\pi}{1-\frac{1}{8}} = \frac{1\ 152\pi}{\frac{7}{8}} = 1\ 152\pi \times \frac{7}{8} = 1\ 316.57\pi \text{ cm}^3$$

16 (a) $T_1 + T_2 = 180$

$a + ar = 180$ … ①

$T_2 + T_3 = 120$

$ar + ar^2 = 120$ … ②

② ÷ ①, $\frac{ar + ar^2}{a + ar} = \frac{120}{180}$

$\frac{ar(1+r)}{a(1+r)} = \frac{120}{180}$

$r = \frac{2}{3}$

Daripada/*From* ①,

$a + a\left(\frac{2}{3}\right) = 180$

$\frac{5a}{3} = 180$

$a = 108$

(b) $T_5 = ar^4$

$= 108\left(\frac{2}{3}\right)^4$

$= \frac{64}{3}$

$T_6 = ar^5$

$= 108\left(\frac{2}{3}\right)^5$

$= \frac{128}{9}$

$T_5 + T_6 = \frac{64}{3} + \frac{128}{9}$

$= \frac{320}{9}$

(c) $S_\infty = \frac{a}{1-r}$

$= \frac{108}{1-\frac{2}{3}}$

$= 324$

Kertas 2

Bahagian A

1 (a) $T_4 = 57$

$a + 3d = 57$ … ①

$S_8 = \frac{8}{2}(2a + 7d)$

$432 = 4(2a + 7d)$

$2a + 7d = 108$ … ②

① × 2: $2a + 6d = 114$ … ③

② – ③: $d = -6$

Daripada/*From* ①,

$a + 3(-6) = 57$

$a = 75$

(b) $T_n > 0$

$a + (n - 1)d > 0$

$75 + (n - 1)(-6) > 0$

$75 - 6n + 6 > 0$

$81 > 6n$

$n < 13.5$

$\therefore n = 13$

(c) $T_8 + …. + T_{12} + T_{13}$

$= \frac{6}{2}(T_8 + T_{13})$

$= 3[75 + 7(-6) + 75 + 12(-6)]$

$= 3(33 + 3)$

$= 108$

2 (a) Bilangan bata dari baris paling bawah:

Number of bricks from the bottom row:

300, 296, 292, …, 100

$a = 300$, $d = 296 - 300 = -4$

Bilangan baris = n

Number of rows = n

$T_n = 100$

$300 + (n - 1)(-4) = 100$

$300 - 4n + 4 = 100$

$-4n = -204$

$n = 51$

Tinggi struktur/*Height of structure*

= 51 × 8 cm

= 408 cm

(b) $S_{51} = \frac{51}{2}[2(300) + (51 - 1)(-4)]$

$= 10\ 200$

Jumlah bilangan bata = 10 200

Total number of bricks = 10 200

Jumlah harga bata/*Total price of bricks*

= 10 200 × RM1.50

= RM15 300

3 (a) $a = 768$

$T_3 = ar^2 = 432$

$(768)r^2 = 432$

$r^2 = \frac{9}{16}$

$r = 0.75$

(b) $T_9 = ar^9$

$= 768 \times 0.75^9$

$= 57.665 \text{ cm}^3$

(c)

$$S_n > 3\,000$$
$$\frac{768(1 - 0.75^n)}{1 - 0.75} > 3\,000$$
$$1 - 0.75^n > 0.9766$$
$$-0.75^n > -0.0234$$
$$0.75^n < 0.0234$$
$$\log_{10} 0.75^n < \log_{10} 0.0234$$
$$n \log_{10} 0.75 < \log_{10} 0.0234$$
$$n < \frac{-1.6308}{-0.1249}$$
$$n > 13.05$$
$$\therefore n = 14$$

4 (a) (i) $a = 6\,000$, $r = \frac{100 + 15}{100} = 1.15$

$T_4 = ar^3$

$= (6\,000)(1.15)^3$

$= 9\,125.25$

Maka, bilangan meja yang dihasilkan pada tahun 2024 ialah 9 125 buah.

Thus, the number of desks produced in the year 2024 *is* 9 125.

(ii)

$$T_n > ar^{n-1}$$
$$(6\,000)(1.15)^{n-1} > 12\,000$$
$$1.15^{n-1} > 2$$
$$\log_{10} (1.15)^{n-1} < \log_{10} 2$$
$$n - 1 < \frac{\log_{10} 2}{\log_{10} (1.15)}$$
$$n - 1 > 4.9595$$
$$n > 5.9595$$
$$\therefore n = 5$$

Bilangan meja melebihi 12 000 pada bulan Januari tahun 2026.

The number of desks exceeds 12 000 *in January year* 2026.

(b) (i) $0.\dot{2}\dot{7} = 0.272727 \ldots$

$= 0.27 + 0.0027 + 0.000027 + \ldots$

$r = \frac{0.0027}{0.27} = 0.01$

$S_\infty = \frac{0.27}{1 - 0.01}$

$= \frac{0.27}{0.99}$

$= \frac{3}{11}$

(ii) $0.77\dot{2}\dot{7}$

$= 0.5 + 0.272727 \ldots$

$= \frac{1}{2} + \frac{3}{11}$

$= \frac{17}{22}$

Bahagian B

5 (a) $T_1 = \pi(3^2)(4) = 36\pi$

$T_2 = \pi(3^2)(7) = 63\pi$

$T_3 = \pi(3^2)(10) = 90\pi$

$\frac{T_2}{T_1} = \frac{63}{36} = \frac{7}{4}$

$\frac{T_3}{T_2} = \frac{90}{63} = \frac{10}{7}$

$\frac{T_2}{T_1} \neq \frac{T_3}{T_3}$

Maka, jujukan isi padu silinder tidak mengikut suatu janjang geometri.

Thus, the sequence of volume of the cylinders does not follow a geometric progression.

(b) $T_2 - T_1 = 63\pi - 36\pi = 27\pi$

$T_3 - T_2 = 90\pi - 63\pi = 27\pi$

$d = 27\pi$

Jujukan isi padu silinder mengikut janjang aritmatik dengan $a = 36\pi$ dan $d = 27\pi$.

The sequence of volume of the cylinders follows an arithmetic progression with $a = 36\pi$ *and* $d = 27\pi$.

$T_6 = a + 5d$

$= 36\pi + 5(27\pi)$

$= 171\pi \text{ cm}^3$

(c) $S_n = \frac{n}{2}[2a + (n - 1)d]$

$= \frac{n}{2}[2(36\pi) + (n - 1)(27\pi)]$

$= \frac{n}{2}(72\pi + 27n\pi - 27\pi)$

$= \frac{n}{2}(45\pi + 27n\pi)$

$= \frac{\pi}{2}(45n + 27n^2)$

(d)

$$S_n = \frac{\pi}{2}(45n + 27n^2)$$
$$\frac{\pi}{2}(45n + 27n^2) = 1\,575\pi$$
$$45n + 27n^2 = 3\,150$$
$$27n^2 + 45n - 3\,150 = 0$$
$$3n^2 + 5n - 350 = 0$$
$$(3n + 35)(n - 10) = 0$$
$$n = -\frac{35}{3}, n = 10$$

Oleh sebab $n > 0$, maka $n = 10$

Since $n > 0$, *thus* $n = 10$