Penyelesaian Lengkap

SET 3

KERTAS 1

1 (a) $(5+2\sqrt{6})(5-2\sqrt{6}) = 5^2-(2\sqrt{6})^2$
$= 25-24$
$= 1$

$$5+2\sqrt{6} = \frac{1}{5-2\sqrt{6}}$$

$$\frac{\log_9(5+2\sqrt{6})}{\log_3(5-2\sqrt{6})}$$
$$= \frac{\log_9 \frac{1}{5-2\sqrt{6}}}{\log_3(5-2\sqrt{6})}$$
$$= \frac{\log_9(5-2\sqrt{6})^{-1}}{\log_3(5-2\sqrt{6})}$$
$$= \frac{-\log_9(5-2\sqrt{6})}{\log_3(5-2\sqrt{6})}$$
$$= \frac{\frac{-\log_3(5-2\sqrt{6})}{\log_3 9}}{\log_3(5-2\sqrt{6})}$$
$$= \frac{\frac{-\log_3(5-2\sqrt{6})}{2\log_3 3}}{\log_3(5-2\sqrt{6})}$$
$$= \frac{\frac{-\log_3(5-2\sqrt{6})}{2}}{\log_3(5-2\sqrt{6})}$$
$$= \frac{-\log_3(5-2\sqrt{6})}{2\log_3(5-2\sqrt{6})}$$
$$= -\frac{1}{2}$$

(b) $\log_8 x = (\log_2 x)^2$

$$\frac{\log_2 x}{\log_2 8} = (\log_2 x)^2$$
$$\frac{\log_2 x}{3} = (\log_2 x)^2$$

Katakan $\log_2 x = y$,
Let $\log_2 x = y$,

$$\frac{y}{3} = y^2$$
$$y = 3y^2$$
$$3y^2 - y = 0$$
$$y(3y-1) = 0$$

$y = 0$ atau/*or* $y = \frac{1}{3}$

Apabila $y = 0$,
When $y = 0$,
$\log_2 x = 0$
$x = 1$

Apabila $y = \frac{1}{3}$,
When $y = \frac{1}{3}$,

$\log_2 x = \frac{1}{3}$
$x = 2^{\frac{1}{3}}$

Oleh sebab $x > 1$, $x = 2^{\frac{1}{3}}$.
As $x > 1$, $x = 2^{\frac{1}{3}}$.

2 $m + \frac{5}{n} = 7 \ldots$ ①

$\frac{3}{m} + 5n = 8 \ldots$ ②

Daripada/*From* ①, $m = 7 - \frac{5}{n}$

$$m = \frac{7n-5}{n}$$

Gantikan $m = \frac{7n-5}{n}$ ke dalam ②,
Substitute $m = \frac{7n-5}{n}$ *into* ②,

$$\frac{3n}{7n-5} + 5n = 8$$
$$\frac{3n+5n(7n-5)}{7n-5} = 8$$
$$\frac{3n+35n^2-25n}{7n-5} = 8$$
$$\frac{35n^2-22n}{7n-5} = 8$$
$$35n^2-22n = 8(7n-5)$$
$$35n^2-22n = 56n-40$$
$$35n^2-78n+40 = 0$$
$$(7n-10)(5n-4) = 0$$

$n = \frac{10}{7}$ atau/*or* $n = \frac{4}{5}$

Apabila $n = \frac{10}{7}$,
When $n = \frac{10}{7}$,

$$m + 5\left(\frac{7}{10}\right) = 7$$
$$m = 7 - \frac{7}{2}$$
$$m = \frac{7}{2}$$

Apabila $n = \frac{4}{5}$,
When $n = \frac{4}{5}$,

$$m + 5\left(\frac{5}{4}\right) = 7$$
$$m = 7 - \frac{25}{4}$$
$$m = \frac{3}{4}$$

$\therefore m = \frac{7}{2}, n = \frac{10}{7}$ atau/*or* $m = \frac{3}{4}, n = \frac{4}{5}$

3 (a) (i) $f^{-1}(x) = \frac{x-5}{3}$

a ialah imej bagi 8 di bawah f^{-1}.

a is the image of 8 under f^{-1}.

$a = f^{-1}(8)$

$= \frac{8-5}{3}$

$= 1$

(ii) $gf^{-1}(x) = \frac{4}{x} + 3$

$g[f^{-1}(x)] = \frac{4}{x} + 3$

$g\left(\frac{x-5}{3}\right) = \frac{4}{x} + 3$

Katakan $\frac{x-5}{3} = u$

Let $\frac{x-5}{3} = u$

$x - 5 = 3u$

$x = 3u + 5$

$g(u) = \frac{4}{3u+5} + 3$

$\therefore g(x) = \frac{4}{3x+5} + 3, x \neq -\frac{5}{3}$

(b) $f(x) = \frac{1}{x^2}, x \neq 0$

$f^2(x) = f[f(x)]$

$= f\left(\frac{1}{x^2}\right)$

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

$= x^4$

$f^3(x) = f[f^2(x)]$

$= f(x^4)$

$= \frac{1}{(x^4)^2}$

$= \frac{1}{x^8}$

$f^5(x) = f^2[f^3(x)]$

$= f^2\left(\frac{1}{x^8}\right)$

$= \left(\frac{1}{x^8}\right)^4$

$= \frac{1}{x^{32}}$

$f^5(x) = \left(\frac{1}{x^2}\right)^5$

$= [f(x)]^5$

Kaedah alternatif
Alternative method

$f(x) = \frac{1}{x^2}, x \neq 0$

$f^2(x) = f[f(x)]$

$= f\left(\frac{1}{x^2}\right)$

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

$= x^4$

$f^5(x) = f^2 f^2[f(x)]$

$= f^2\left[f^2\left(\frac{1}{x^2}\right)\right]$

$= f^2\left[\left(\frac{1}{x^2}\right)^4\right]$

$= f^2\left(\frac{1}{x^8}\right)$

$= \left(\frac{1}{x^8}\right)^4$

$= \frac{1}{x^{32}}$

4 (a) $\frac{1+\sqrt[3]{9}}{3+\sqrt[3]{3}} = \frac{(1+\sqrt[3]{9})\sqrt[3]{3}}{(3+\sqrt[3]{3})\sqrt[3]{3}}$

$= \frac{\sqrt[3]{3}+\sqrt[3]{9}\sqrt[3]{3}}{(3+\sqrt[3]{3})\sqrt[3]{3}}$

$= \frac{\sqrt[3]{3}+\sqrt[3]{27}}{(3+\sqrt[3]{3})\sqrt[3]{3}}$

$= \frac{\sqrt[3]{3}+3}{(3+\sqrt[3]{3})\sqrt[3]{3}}$

$= \frac{1}{\sqrt[3]{3}}$

Kaedah alternatif
Alternative method

Katakan/*Let* $a = \sqrt[3]{3}$

$a^2 = \sqrt[3]{9}$

$a^3 = 3$

$\frac{1+\sqrt[3]{9}}{3+\sqrt[3]{3}} = \frac{1+a^2}{a^3+a}$

$= \frac{1+a^2}{a(1+a^2)}$

$= \frac{1}{a}$

$= \frac{1}{\sqrt[3]{3}}$

(b) $\frac{\sqrt[3]{5^{-\frac{3}{2}}\left(\frac{1}{5}\right)^{-3}}}{(\sqrt{5}-2)^2}$

$= \frac{\sqrt[3]{5^{-\frac{3}{2}}(5)^3}}{(\sqrt{5})^2 - 4\sqrt{5} + 4}$

$= \frac{\sqrt[3]{5^{-\frac{3}{2}+3}}}{5 - 4\sqrt{5} + 4}$

$= \frac{\sqrt[3]{5^{\frac{3}{2}}}}{9 - 4\sqrt{5}}$

$= \frac{\left(5^{\frac{3}{2}}\right)^{\frac{1}{3}}}{9 - 4\sqrt{5}}$

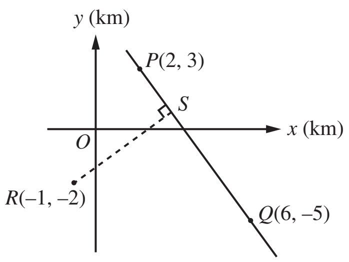
$= \frac{5^{\frac{1}{2}}}{9 - 4\sqrt{5}}$

$= \frac{\sqrt{5}(9+4\sqrt{5})}{(9-4\sqrt{5})(9+4\sqrt{5})}$

$= \frac{9\sqrt{5}+20}{81-80}$

$= 9\sqrt{5} + 20$

5



$m_{PQ} = \frac{3-(-5)}{2-6}$

$= \frac{8}{-4}$

$= -2$

Persamaan bagi PQ:

Equation of PQ:

$y - 3 = -2(x - 2)$

$y - 3 = -2x + 4$

$y = -2x + 7$ … ①

$m_{RS} = \frac{1}{2}$

Persamaan bagi RS:

Equation of RS:

$y - (-2) = \frac{1}{2}[x - (-1)]$

$2y + 4 = x + 1$

$2y = x - 3$ … ②

Gantikan $y = -2x + 7$ ke dalam ②,

Substitute $y = -2x + 7$ into ②,

$2(-2x + 7) = x - 3$

$-4x + 14 = x - 3$

$5x = 17$

$x = \frac{17}{5}$

Daripada ①,

From ①,

$y = -2\left(\frac{17}{5}\right) + 7$

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

$\therefore S\left(\frac{17}{5}, \frac{1}{5}\right)$

$RS = \sqrt{\left(-1 - \frac{17}{5}\right)^2 + \left(-2 - \frac{1}{5}\right)^2}$

$= \sqrt{\left(-\frac{22}{5}\right)^2 + \left(-\frac{11}{5}\right)^2}$

$= \frac{11}{5}\sqrt{5}$

$= 4.919$ km

$\therefore$ Jarak terdekat Danesh perlu berenang ialah 4.919 km.

$\therefore$ *The shortest distance Danesh requires to swim is* 4.919 km.

6 (a) Jika titik-titik A, B dan C adalah segaris, maka luas bagi $\Delta ABC = 0$.

If points A, B and C are collinear, then the area of $\Delta ABC = 0$.

$\frac{1}{2}(4k^2 - 5k - 21) = 0$

$4k^2 - 5k - 21 = 0$

$(4k + 7)(k - 3) = 0$

$k = -\frac{7}{4}$ atau/*or* $k = 3$

(b) $y = \frac{p}{\sqrt{x}} - 2x^2$

$y + 2x^2 = \frac{p}{\sqrt{x}}$

$Y = y + 2x^2, X = \frac{1}{\sqrt{x}}$

$Y = pX$

Gantikan $X = 3k$ dan $Y = \frac{2m}{3}$ ke dalam $Y = pX$,

Substitute $X = 3k$ *and* $Y = \frac{2m}{3}$ *into* $Y = pX$,

$\frac{2m}{3} = p(3k)$

$m = \frac{9kp}{2}$

7 (a) (i) Luas bagi rantau yang berlorek

Area of the shaded region

$= \int_a^b f(x)\,dx$

$= \int_{-1}^3 f(x)\,dx$

$\therefore a = -1, b = 3$

(ii) Luas bagi rantau yang dibatasi oleh $y = f(x)$, paksi-x, garis lurus $x = -4$ dan garis lurus $x = a$

Area of the region bounded by $y = f(x)$, *the x-axis, straight lines* $x = -4$ *and* $x = a$

$= 13 - 8$

$= 5$ unit^2/*units*^{2}

Luas bagi rantau yang dibatasi oleh $y = f(x)$, paksi-x, garis lurus $x = -4$ dan garis lurus $x = a$ terletak di bawah paksi-x.

The area of the region bounded by $y = f(x)$, *the x-axis, straight lines* $x = -4$ *and* $x = a$ *is located below the x-axis.*

$\therefore \int_{-4}^a f(x)\,dx = -5$

Kaedah alternatif
Alternative method

$-\int_{-4}^a f(x)\,dx + \int_a^b f(x)\,dx = 13$

$-\int_{-4}^a f(x)\,dx + 8 = 13$

$\int_{-4}^a f(x)\,dx = 8 - 13$

$= -5$

(b) $\frac{d}{dx}\left(\frac{x^2 + 1}{2x^2 + 1}\right)$

$= \frac{(2x^2 + 1)(2x) - (x^2 + 1)(4x)}{(2x^2 + 1)^2}$

$= \frac{4x^3 + 2x - 4x^3 - 4x}{(2x^2 + 1)^2}$

$= \frac{-2x}{(2x^2 + 1)^2}$

$\int_{-1}^0 \frac{-2x}{(2x^2 + 1)^2}\,dx = \left[\frac{x^2 + 1}{2x^2 + 1}\right]_{-1}^0$

$= \frac{0^2 + 1}{2(0)^2 + 1} - \frac{(-1)^2 + 1}{2(-1)^2 + 1}$

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

$= \frac{1}{3}$

$\int_{-1}^0 \frac{x}{2(2x^2 + 1)^2}\,dx = -\frac{1}{4}\int_{-1}^0 \frac{-2x}{(2x^2 + 1)^2}\,dx$

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

$= -\frac{1}{12}$

8 (a) Bilangan cara untuk memilih 5 orang lelaki

Number of ways to choose 5 *boys*

$= {}^7C_5$

$= 21$

Bilangan cara untuk memilih 3 orang perempuan

Number of ways to choose 3 *girls*

$= {}^6C_3$

$= 20$

Bilangan pasukan berlainan yang boleh dibentuk

Number of different teams that can be formed

$= 21 \times 20$

$= 420$

(b) Bilangan cara untuk memilih seorang perempuan dan 7 orang lelaki

Number of ways to choose one girl and 7 *boys*

$= {}^6C_1 \times {}^7C_7$

$= 6$

Bilangan cara untuk memilih 2 orang perempuan dan 6 orang lelaki

Number of ways to choose 2 *girls and* 6 *boys*

$= {}^6C_2 \times {}^7C_6$

$= 15 \times 7$

$= 105$

Bilangan pasukan berlainan yang boleh dibentuk

Number of different teams that can be formed

$= 6 + 105$

$= 111$

(c) Bilangan cara untuk memilih 4 orang lelaki dan 4 orang perempuan

Number of ways to choose 4 *boys and* 4 *girls*

$= {}^7C_4 \times {}^6C_4$

$= 35 \times 15$

$= 525$

Bilangan pasukan berlainan yang boleh dibentuk

Number of different teams that can be formed

$= 525$

9 (a) Katakan punca-punca persamaan kuadratik $3x^2 + 5x - 6 = 0$ ialah α dan β.

Let the roots of the quadratic equation $3x^2 + 5x - 6 = 0$ *be* α *and* β.

$\alpha + \beta = -\frac{5}{3}$

$\alpha\beta = -\frac{6}{3}$
$= -2$

Katakan punca-punca persamaan kuadratik $ax^2 + bx + c = 0$ ialah α' dan β'.
Let the roots of the quadratic equation $ax^2 + bx + c = 0$ be α' and β'.

$\alpha' = 3\alpha$
$\beta' = 3\beta$
$\alpha' + \beta' = 3(\alpha + \beta)$
$= 3\left(-\frac{5}{3}\right)$
$= -5$
$\alpha'\beta' = 9\alpha\beta$
$= 9(-2)$
$= -18$

$\therefore$ Persamaan kuadratik ialah $x^2 + 5x - 18 = 0$.
$\therefore$ *The quadratic equation is $x^2 + 5x - 18 = 0$.*

Kaedah alternatif
Alternative method

$3x^2 + 5x - 6 = 0$

$x = \frac{-5 \pm \sqrt{5^2 - 4(3)(-6)}}{2(3)}$

$= \frac{-5 \pm \sqrt{25 + 72}}{6}$

$= \frac{-5 \pm \sqrt{97}}{6}$

Katakan punca-punca persamaan kuadratik $ax^2 + bx + c = 0$ ialah α' dan β'.
Let the roots of the quadratic equation $ax^2 + bx + c = 0$ be α' and β'.

$\alpha' = 3\left(\frac{-5 + \sqrt{97}}{6}\right)$
$= \frac{-5 + \sqrt{97}}{2}$

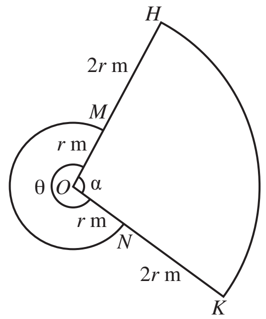
$\beta' = 3\left(\frac{-5 - \sqrt{97}}{6}\right)$
$= \frac{-5 - \sqrt{97}}{2}$

$\alpha' + \beta' = \frac{-5 + \sqrt{97}}{2} + \frac{-5 - \sqrt{97}}{2}$
$= -5$

$\alpha'\beta' = \left(\frac{-5 + \sqrt{97}}{2}\right)\left(\frac{-5 - \sqrt{97}}{2}\right)$
$= \frac{25 - 97}{4}$
$= \frac{-72}{4}$
$= -18$

$\therefore$ Persamaan kuadratik ialah $x^2 + 5x - 18 = 0$.
$\therefore$ *The quadratic equation is $x^2 + 5x - 18 = 0$.*

(b)



$\theta = 2\pi - \alpha$
$r(2\pi - \alpha) + (3r)(\alpha) + 4r = 70$
$2\pi r - r\alpha + 3r\alpha + 4r = 70$
$2\pi r + 2r\alpha + 4r = 70$
$2r(\pi + \alpha + 2) = 70$
$r = \frac{35}{\pi + \alpha + 2}$

10 (a) $f(x) = \frac{3}{4}x^2$

$f'(x) = \lim_{\delta x \to 0} \frac{f(x + \delta x) - f(x)}{\delta x}$

$= \lim_{\delta x \to 0} \frac{\frac{3}{4}(x + \delta x)^2 - \frac{3}{4}x^2}{\delta x}$

$= \frac{3}{4} \lim_{\delta x \to 0} \frac{(x + \delta x)^2 - x^2}{\delta x}$

$= \frac{3}{4} \lim_{\delta x \to 0} \frac{x^2 + 2x(\delta x) + (\delta x)^2 - x^2}{\delta x}$

$= \frac{3}{4} \lim_{\delta x \to 0} \frac{2x(\delta x) + (\delta x)^2}{\delta x}$

$= \frac{3}{4} \lim_{\delta x \to 0} (2x + \delta x)$

$= \frac{3}{4}(2x + 0)$

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

$f'\left(\frac{1}{2 - \sqrt{3}}\right) = \frac{3}{2}\left(\frac{1}{2 - \sqrt{3}}\right)$

$= \frac{3}{2}\left[\frac{2 + \sqrt{3}}{(2 - \sqrt{3})(2 + \sqrt{3})}\right]$

$= \frac{3}{2}\left[\frac{2 + \sqrt{3}}{4 - 3}\right]$

$= \frac{3}{2}(2 + \sqrt{3})$

(b) $f(x) = x^3 g(x)$
$f'(x) = x^3 g'(x) + g(x)(3x^2)$
$= x^3 g'(x) + 3x^2 g(x)$
$f'(1) = (1)^3 g'(1) + 3(1)^2 g(1)$
$= 1(3) + 3(5)$
$= 3 + 15$
$= 18$

11 (a) $T_n = a + (n - 1)\,d$
$= (a - d) + dn$

$a - d = 3 \ldots$ ①

$d = \frac{38 - 3}{7 - 0}$
$= 5 \ldots$ ②

Daripada ①,
From ①,
$a - 5 = 3$
$a = 8$

∴ Sebutan pertama dan beza sepunya bagi janjang aritmetik itu masing-masing ialah 8 dan 5.
∴ *The first term and the common difference of the arithmetic progression are* 8 *and* 5 *respectively.*

> **Kaedah alternatif**
> ***Alternative method***
>
> Kecerunan
> *Gradient*
> $m = \dfrac{38 - 3}{7 - 0}$
> $= 5$
> Persamaan garis lurus:
> *Equation of straight line*:
> $T_n = 5n + 3$
>
> Apabila $n = 1$,
> *When* $n = 1$,
> $T_1 = 5(1) + 3$
> $= 8$
>
> Apabila $n = 2$,
> *When* $n = 2$,
> $T_2 = 5(2) + 3$
> $= 13$
> $T_2 - T_1 = 13 - 8$
> $= 5$
>
> ∴ Sebutan pertama dan beza sepunya bagi janjang aritmetik itu masing-masing ialah 8 dan 5.
> ∴ *The first term and the common difference of the arithmetic progression are* 8 *and* 5 *respectively.*

(b)
$$S_n > 1\,200$$
$$\frac{n}{2}[2(8) + (n - 1)(5)] > 1\,200$$
$$n(16 + 5n - 5) > 2\,400$$
$$n(11 + 5n) > 2\,400$$
$$5n^2 + 11n > 2400$$
$$n^2 + \frac{11}{5}n > 480$$
$$\left(n + \frac{11}{10}\right)^2 - \frac{121}{100} > 480$$
$$\left(n + \frac{11}{10}\right)^2 > 481.21$$
$$n + \frac{11}{10} > 21.94 \quad \text{atau/}or \quad n + \frac{11}{10} < -21.94$$
$$n > 20.84 \quad \text{atau/}or \quad n < -23.04$$

Oleh sebab $n > 0$, $n > 20.84$.
As $n > 0$, $n > 20.84$.

∴ Nilai terkecil bagi n ialah 21.
∴ *The least value of n is* 21.

12 (a) $\overrightarrow{PT} = 2\overrightarrow{TR}$
$= \dfrac{2}{3}\overrightarrow{PR}$
$= \dfrac{2}{3}(\overrightarrow{PS} + \overrightarrow{SR})$
$= \dfrac{2}{3}(9\underset{\sim}{a} + 12\underset{\sim}{b})$
$= 6\underset{\sim}{a} + 8\underset{\sim}{b}$

(b) $\overrightarrow{OP} + \overrightarrow{PQ} = \overrightarrow{OQ}$
$\overrightarrow{PQ} = \overrightarrow{OQ} - \overrightarrow{OP}$
$= (-2\underset{\sim}{i} + k\underset{\sim}{j}) - (h\underset{\sim}{i} - 3\underset{\sim}{j})$
$= (-2 - h)\underset{\sim}{i} + (k + 3)\underset{\sim}{j}$

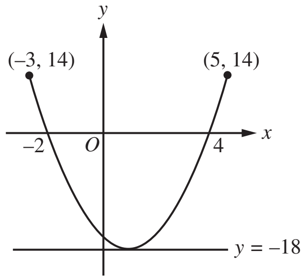
$\overrightarrow{PQ} = m\underset{\sim}{u} + 3\underset{\sim}{v}$
$(-2 - h)\underset{\sim}{i} + (k + 3)\underset{\sim}{j} = m(3\underset{\sim}{i} + 2\underset{\sim}{j}) + 3(\underset{\sim}{i} + 4\underset{\sim}{j})$
$(-2 - h)\underset{\sim}{i} + (k + 3)\underset{\sim}{j} = (3m + 3)\underset{\sim}{i} + (2m + 12)\underset{\sim}{j}$

Bandingkan pekali bagi $\underset{\sim}{i}$,
Comparing the coefficients of $\underset{\sim}{i}$,
$-2 - h = 3m + 3$
$h + 3m = -5$ … ①

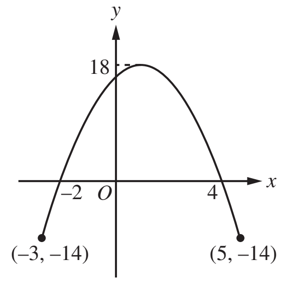
Bandingkan pekali bagi $\underset{\sim}{j}$,
Comparing the coefficients of $\underset{\sim}{j}$,
$k + 3 = 2m + 12$
$k - 2m = 9$ … ②
① × 2 + ② × 3, $2h + 3k = -10 + 27$
$2h + 3k = 17$

13 (a) $f(x) = 2(x - m)^2 + 3n$
$m = \dfrac{-2 + 4}{2}$
$= 1$
$3n = -18$
$n = -6$

(b)



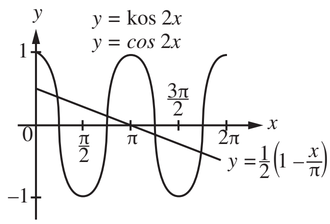
(c)



$g(x) = -2(x - 1)^2 + 18$

14 (a) $\tan^2 x + 2\cos^2 x - \sec^2 x = \tan^2 x + 2\cos^2 x - (1 + \tan^2 x)$
$= \tan^2 x + 2\cos^2 x - 1 - \tan^2 x$
$= 2\cos^2 x - 1$
$= \cos 2x$

(b)



(c) $2(\tan^2 x + 2\cos^2 x - \sec^2 x) = 1 - \dfrac{x}{\pi}$
$$\tan^2 x + 2\cos^2 x - \sec^2 x = \frac{1}{2}\left(1 - \frac{x}{\pi}\right)$$
$$\cos 2x = \frac{1}{2}\left(1 - \frac{x}{\pi}\right)$$
$$y = \frac{1}{2}\left(1 - \frac{x}{\pi}\right)$$

Daripada graf, garis lurus $y = \frac{1}{2}\left(1 - \frac{x}{\pi}\right)$ memotong graf $y = \text{kos } 2x$ pada 4 titik.

$\therefore$ Bilangan penyelesaian bagi persamaan

$2(\tan^2 x + 2 \text{ kos}^2 x - \text{sek}^2 x) = 1 - \frac{x}{\pi}$ untuk $0 \leqslant x \leqslant 2\pi$ ialah 4.

From the graph, the straight line $y = \frac{1}{2}\left(1 - \frac{x}{\pi}\right)$ *cuts the graph* $y = \cos 2x$ *at* 4 *points.*

$\therefore$ *The number of solutions for the equation*

$2(\tan^2 x + 2\cos^2 x - \sec^2 x) = 1 - \frac{x}{\pi}$ *for* $0 \leqslant x \leqslant 2\pi$ *is* 4.

15 (a) $X \sim N(\mu, \sigma^2)$

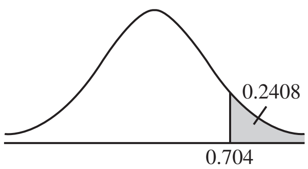
Daripada graf, $\mu = 12$

From the graph, $\mu = 12$

$$P(X > 17) = 0.33$$
$$P\left(Z > \frac{17 - 12}{\sigma}\right) = 0.33$$
$$P\left(Z > \frac{5}{\sigma}\right) = 0.33$$
$$\frac{5}{\sigma} = 0.44$$
$$\sigma = \frac{5}{0.44}$$
$$= 11.36$$

(b) (i) $P(10 < X < 17)$
$$= P\left(\frac{10 - 12}{11.36} < Z < \frac{17 - 12}{11.36}\right)$$
$$= P(-0.176 < Z < 0.44)$$
$$= 1 - P(Z > 0.176) - P(Z > 0.44)$$
$$= 1 - 0.4301 - 0.33$$
$$= 0.2399$$

(ii)
$$P(3X + a < 67) = 0.7592$$
$$P\left(X < \frac{67 - a}{3}\right) = 0.7592$$
$$P\left(Z < \frac{\frac{67 - a}{3} - 12}{11.36}\right) = 0.7592$$
$$P\left(Z < \frac{31 - a}{34.08}\right) = 0.7592$$
$$1 - P\left(Z > \frac{31 - a}{34.08}\right) = 0.7592$$
$$P\left(Z > \frac{31 - a}{34.08}\right) = 0.2408$$

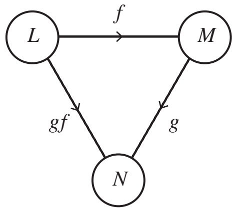


$$\frac{31 - a}{34.08} = 0.704$$
$$31 - a = 24$$
$$a = 7$$

KERTAS 2

1 (a)
$$h(x) = \frac{1}{1 + \frac{4}{1 + \frac{2}{x}}}$$
$$= \frac{1}{1 + \frac{4}{\frac{x + 2}{x}}}$$
$$= \frac{1}{1 + \frac{4x}{x + 2}}$$
$$= \frac{1}{\frac{(x + 2) + 4x}{x + 2}}$$
$$= \frac{x + 2}{5x + 2}$$
$$h\left(\frac{1}{2}\right) = \frac{\frac{1}{2} + 2}{5\left(\frac{1}{2}\right) + 2}$$
$$= \frac{1 + 4}{5 + 4}$$
$$= \frac{5}{9}$$

(b) (i)



Fungsi yang memetakan set L kepada set M ialah $f : x \rightarrow \frac{x - 1}{4}$.

The function that maps set L to set M is $f : x \rightarrow \frac{x - 1}{4}$.

(ii) $f(x) = \frac{x - 1}{4}$

$$gf : x \rightarrow 2x^2 + 5x - 9$$
$$g[f(x)] = 2x^2 + 5x - 9$$
$$g\left(\frac{x - 1}{4}\right) = 2x^2 + 5x - 9$$

Katakan $\frac{x - 1}{4} = u$

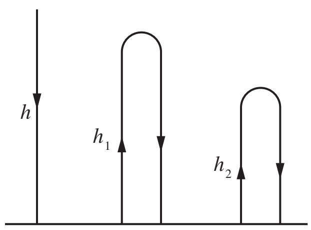
Let $\frac{x - 1}{4} = u$

$$x - 1 = 4u$$
$$x = 4u + 1$$
$$g(u) = 2(4u + 1)^2 + 5(4u + 1) - 9$$
$$= 2(16u^2 + 8u + 1) + 5(4u + 1) - 9$$
$$= 32u^2 + 16u + 2 + 20u + 5 - 9$$
$$= 32u^2 + 36u - 2$$
$$g(x) = 32x^2 + 36x - 2$$

$\therefore$ Fungsi yang memetakan set M kepada set N ialah $g : x \rightarrow 32x^2 + 36x - 2$.

$\therefore$ *The function that maps set M to set N is* $g : x \rightarrow 32x^2 + 36x - 2$.

2



(a) $h_1, h_2, h_3, \ldots$

$\frac{3}{4}h, \left(\frac{3}{4}\right)^2 h, \left(\frac{3}{4}\right)^3 h, \ldots$

Apabila $h = 250$, sebutan pertama,

When $h = 250$, *first term,*

$a = \frac{3}{4}(250)$
$= 187.5$

Nisbah sepunya, $r = \frac{3}{4}$

Common ratio, $r = \frac{3}{4}$

$$T_n < 45$$
$$187.5\left(\frac{3}{4}\right)^{n-1} < 45$$
$$\left(\frac{3}{4}\right)^{n-1} < 0.24$$
$$(n-1)\log\frac{3}{4} < \log 0.24$$
$$n - 1 > \frac{\log 0.24}{\log\frac{3}{4}}$$
$$n - 1 > 4.96$$
$$n > 5.95$$

$\therefore$ Bilangan lantunan apabila tinggi maksimum bagi bola dari lantai ialah kurang daripada 45 cm buat kali pertama ialah $n = 6$.

$\therefore$ *The number of bounces when the maximum height of the ball from the floor is less than* 45 cm *for the first time is* $n = 6$.

(b) Jumlah jarak yang dilalui
Total distance covered

$= h + 2(h_1 + h_2 + h_3 + \dots)$

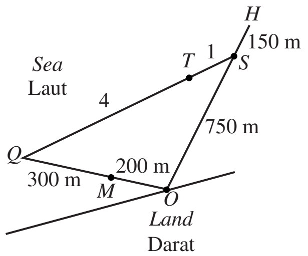
$= 250 + 2\left[\dfrac{187.5}{1 - \frac{3}{4}}\right]$

$= 250 + 1\,500$
$= 1\,750$ cm

$\therefore$ Jumlah jarak yang dilalui oleh bola itu sehingga ia berhenti pada akhirnya ialah 1 750 cm.

$\therefore$ *The total distance covered by the ball until it finally stopped is* 1 750 cm.

3 (a)



$|\underset{\sim}{a}| = 100$ m

$|\overrightarrow{OQ}| = 500$ m

$\therefore \overrightarrow{OQ} = 5\underset{\sim}{a}$

$|\underset{\sim}{b}| = 150$ m

$|\overrightarrow{OH}| = 900$ m

$\therefore \overrightarrow{OH} = 6\underset{\sim}{b}$

(i) $\overrightarrow{OT} = \overrightarrow{OQ} + \overrightarrow{QT}$
$= \overrightarrow{OQ} + \frac{4}{5}\overrightarrow{QS}$
$= \overrightarrow{OQ} + \frac{4}{5}\left(\overrightarrow{OS} - \overrightarrow{OQ}\right)$
$= 5\underset{\sim}{a} + \frac{4}{5}(5\underset{\sim}{b} - 5\underset{\sim}{a})$
$= 5\underset{\sim}{a} + 4\underset{\sim}{b} - 4\underset{\sim}{a}$
$= \underset{\sim}{a} + 4\underset{\sim}{b}$

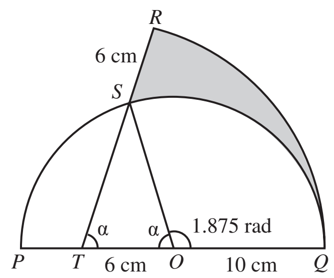
(ii) $\overrightarrow{OM} + \overrightarrow{MT} = \overrightarrow{OT}$
$\overrightarrow{MT} = \overrightarrow{OT} - \overrightarrow{OM}$
$= (\underset{\sim}{a} + 4\underset{\sim}{b}) - 2\underset{\sim}{a}$
$= 4\underset{\sim}{b} - \underset{\sim}{a}$

(b) $\overrightarrow{OM} + \overrightarrow{MH} = \overrightarrow{OH}$
$\overrightarrow{MH} = \overrightarrow{OH} - \overrightarrow{OM}$
$= 6\underset{\sim}{b} - 2\underset{\sim}{a}$
$= 2(3\underset{\sim}{b} - \underset{\sim}{a})$
$\overrightarrow{MH} \neq \lambda\overrightarrow{MT}$

$\therefore$ Chalet M, T dan H adalah bukan segaris.

$\therefore$ *Chalets M, T and H are not collinear.*

4



(a) Panjang lengkok QS
Length of arc QS
$= 10 \times 1.875$
$= 18.75$ cm
$\alpha = \pi - 1.875$
$= 1.267$ rad

Panjang lengkok QR
Length of arc QR
$= 16 \times 1.267$
$= 20.272$ cm

Perimeter bagi rantau berlorek
Perimeter of the shaded region
$= 18.75 + 20.272 + 6$
$= 45.02$ cm

(b) Luas rantau berlorek
Area of the shaded region

$= \frac{1}{2} \times 16^2 \times 1.267 - \frac{1}{2} \times 10^2 \times 1.875 - \frac{1}{2} \times 10 \times 6 \times \sin 1.267^r$
$= 162.176 - 93.75 - 28.63$
$= 39.80 \text{ cm}^2$

5 (a) $y = x^3 - 3x^2$
$\frac{dy}{dx} = 3x^2 - 6x$

Pada titik P, $x = -1$,
At point P, $x = -1$,
$\frac{dy}{dx} = 3(-1)^2 - 6(-1)$
$= 3 + 6$
$= 9$

Persamaan tangen pada $P(-1, -4)$:
Equation of tangent at $P(-1, -4)$:
$y - (-4) = 9[x - (-1)]$
$y + 4 = 9(x + 1)$
$y + 4 = 9x + 9$
$y = 9x + 5$

(b) Luas rantau berlorek
Area of shaded region
$= \int_{-2}^{-1} [(9x + 5) - (x^3 - 3x^2)]\, dx$
$= \int_{-2}^{-1} (9x + 5 - x^3 + 3x^2)\, dx$

$$= \left[\frac{9x^2}{2} + 5x - \frac{x^4}{4} + x^3\right]_{-2}^{-1}$$

$$= \left[\frac{9(-1)^2}{2} + 5(-1) - \frac{(-1)^4}{4} + (-1)^3\right] - \left[\frac{9(-2)^2}{2} + 5(-2) - \frac{(-2)^4}{4} + (-2)^3\right]$$

$$= \left[\frac{9}{2} - 5 - \frac{1}{4} - 1\right] - [18 - 10 - 4 - 8]$$

$$= \frac{9}{2} - \frac{1}{4} - 2$$

$$= \frac{9}{4} \text{ unit}^2/\textit{units}^2$$

6 (a) Bilangan nombor tiga digit yang dibentuk
Number of three-digit numbers formed
$= {}^4P_3$
$= 24$

Bilangan nombor empat digit yang dibentuk
Number of four-digit numbers formed
$= {}^4P_4$
$= 24$

Bilangan nombor tiga digit dan empat digit yang boleh dibentuk
Number of three-digit and four-digit numbers that can be formed
$= 24 + 24$
$= 48$

(b) Nombor tiga digit:
Three-digit numbers:

3	2	1
↑ 7, 8, 9		↑ 5

2	2	1
↑ 8, 9		↑ 7

2	2	1
↑ 7, 8		↑ 9

Bilangan nombor ganjil tiga digit lebih besar daripada 700
Number of three-digit odd numbers greater than 700
$= 3 \times 2 \times 1 + 2 \times 2 \times 1 + 2 \times 2 \times 1$
$= 6 + 4 + 4$
$= 14$

Nombor empat digit:
Four-digit numbers:

3	2	1	3
			↑ 5, 7, 9

Bilangan nombor ganjil empat digit lebih besar daripada 700
Number of four-digit odd numbers greater than 700
$= 3 \times 2 \times 1 \times 3$
$= 18$

Bilangan nombor ganjil tiga digit dan empat digit lebih besar daripada 700 yang dibentuk
Number of three-digit and four-digit odd numbers greater than 700 *that are formed*
$= 14 + 18$
$= 32$

7 (a) X = Bilangan soalan yang dijawab dengan betul
X = *Number of questions that are answered correctly*

$$X \sim B\left(60, \frac{1}{4}\right)$$

(i) Min $= np$
Mean $= np$
$= 60 \times \frac{1}{4}$
$= 15$

∴ Min bilangan soalan yang dijawab dengan betul ialah 15.
∴ *The mean number of questions that are answered correctly is* 15.

(ii) $\sigma^2 = npq$
$= 60 \times \frac{1}{4} \times \left(1 - \frac{1}{4}\right)$
$= 11.25$

∴ Sisihan piawai, $\sigma = 3.354$
∴ *Standard deviation,* $\sigma = 3.354$

(b) (i) Y = Bilangan soalan yang dijawab dengan betul
Y = *Number of questions that are answered correctly*

$$Y \sim B\left(15, \frac{1}{4}\right)$$

P(menjawab 50 soalan dengan betul)
P(*answered* 50 *questions correctly*)
$= P(Y = 5)$
$= {}^{15}C_5\left(\frac{1}{4}\right)^5\left(1 - \frac{1}{4}\right)^{10}$
$= 0.1651$

(ii) P(menjawab sekurang-kurangnya 48 soalan dengan betul)
P(*answered at least* 48 *questions correctly*)
$= P(Y \geqslant 3)$
$= 1 - P(Y < 3)$
$= 1 - P(Y = 0) - P(Y = 1) - P(Y = 2)$
$= 1 - {}^{15}C_0\left(\frac{1}{4}\right)^0\left(1 - \frac{1}{4}\right)^{15} - {}^{15}C_1\left(\frac{1}{4}\right)^1\left(1 - \frac{1}{4}\right)^{14} - {}^{15}C_2\left(\frac{1}{4}\right)^2\left(1 - \frac{1}{4}\right)^{13}$
$= 1 - 0.01336 - 0.06682 - 0.1559$
$= 0.7639$

8 (a)

$$PS = PQ$$
$$PS^2 = PQ^2$$
$$(x - 1)^2 + (y - 1)^2 = (x + 5)^2$$
$$x^2 - 2x + 1 + y^2 - 2y + 1 = x^2 + 10x + 25$$
$$y^2 - 2y - 12x - 23 = 0$$

∴ Persamaan bagi lintasan titik P ialah $y^2 - 2y - 12x - 23 = 0$.
∴ *The equation of the path of point P is* $y^2 - 2y - 12x - 23 = 0$.

(b) $y^2 - 2y - 12x - 23 = 0 \ldots$ ①

$m_{HS} = \frac{13 - 1}{10 - 1}$
$= \frac{12}{9}$
$= \frac{4}{3}$

Persamaan bagi HK:
Equation of HK:

$y - 1 = \frac{4}{3}(x - 1)$
$3y - 3 = 4x - 4$
$3y = 4x - 1 \ldots$ ②

Gantikan $3y = 4x - 1$ ke dalam ①,
Substitute $3y = 4x - 1$ *into* ①,
$y^2 - 2y - 3(3y + 1) - 23 = 0$
$y^2 - 2y - 9y - 3 - 23 = 0$
$y^2 - 11y - 26 = 0$

$(y-13)(y+2)=0$
$y=13$ atau/*or* $y=-2$

Apabila $y=-2$,
When $y=-2$,
$4x=3(-2)+1$
$4x=-5$
$x=-\frac{5}{4}$

$\therefore$ Koordinat bagi titik K ialah $\left(-\frac{5}{4},-2\right)$.

$\therefore$ *The coordinates of point K are* $\left(-\frac{5}{4},-2\right)$.

(c) Katakan $HS:SK=m:n$
Let $HS:SK=m:n$

$$(1,1)=\left(\frac{m\left(-\frac{5}{4}\right)+n(10)}{m+n},\frac{m(-2)+n(13)}{m+n}\right)$$

Kaedah 1/*Method* 1:

$$1=\frac{-2m+13n}{m+n}$$
$m+n=-2m+13n$
$3m=12n$
$m=4n$

Kaedah 2/*Method* 2:

$$1=\frac{m\left(-\frac{5}{4}\right)+n(10)}{m+n}$$
$m+n=-\frac{5}{4}m+10n$
$\frac{9}{4}m=9n$
$m=4n$
$m:n=4:1$
$\therefore HS:SK=4:1$

(d) Luas bagi ΔGHK
Area of ΔGHK

$$=\frac{1}{2}\begin{vmatrix}-2 & -\frac{5}{4} & 10 & -2\\ 1 & -2 & 13 & 1\end{vmatrix}$$

$$=\frac{1}{2}\left|\left[(-2)(-2)+\left(-\frac{5}{4}\right)(13)+10(1)\right]-\left[\left(-\frac{5}{4}\right)(1)+10(-2)+(-2)(13)\right]\right|$$

$$=\frac{1}{2}\left|\left[4-\frac{65}{4}+10\right]-\left[-\frac{5}{4}-20-26\right]\right|$$

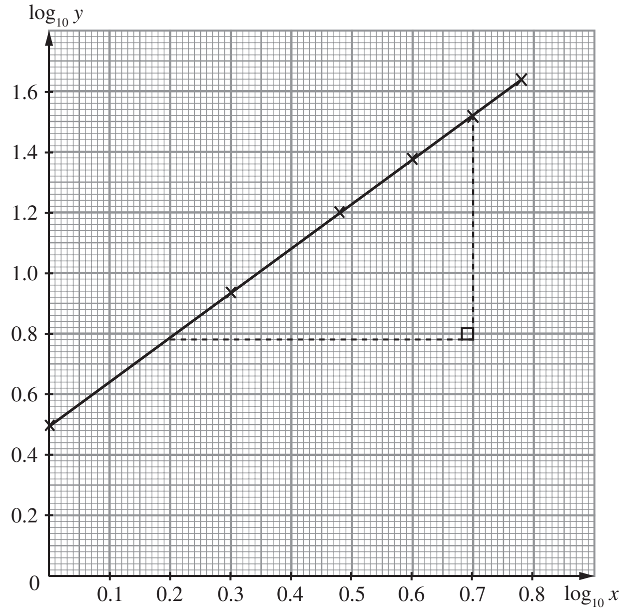
$$=\frac{1}{2}\left|-\frac{9}{4}+\frac{189}{4}\right|$$

$=22\frac{1}{2}$ unit^2/*units*^{2}

9 (a)

$\log_{10} x$	0	0.30	0.48	0.60	0.70	0.78
$\log_{10} y$	0.49	0.93	1.19	1.38	1.53	1.64

(b)



(c) $y=ax^{\frac{a}{b}}$

$\log_{10} y=\log_{10} a+\log_{10} x^{\frac{a}{b}}$

$\log_{10} y=\log_{10} a+\frac{a}{b}\log_{10} x$

$Y=\log_{10} y, X=\log_{10} x$

$Y=\log_{10} a+\frac{a}{b}X$

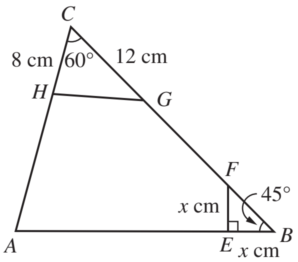
Pintasan-Y:
Y-intercept:
$\log_{10} a=0.48$
$a=10^{0.48}$
$=3.02$

Kecerunan:
Gradient:
$\frac{a}{b}=\frac{1.53-0.78}{0.7-0.2}$

$\frac{3.02}{b}=\frac{0.75}{0.5}$

$b=3.02\times\frac{0.5}{0.75}$
$=2.01$

10



(a) (i) $GH^2=8^2+12^2-2(8)(12)\cos 60°$
$=112$
$GH=10.58$ cm

(ii) $\angle BAC=180°-45°-60°$
$=75°$

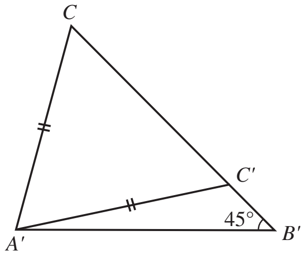
$\frac{AC}{\sin 45°}=\frac{33}{\sin 75°}$

$AC=\frac{33\sin 45°}{\sin 75°}$
$=24.16$ cm
$AH=24.16-8$
$=16.16$ cm

(b) Luas bagi $\Delta CGH = 3 \times$ Luas bagi ΔBEF
Area of $\Delta CGH = 3 \times$ *Area of* ΔBEF

$$\frac{1}{2}(8)(12)\sin 60^\circ = 3 \times \frac{1}{2} \times BE \times EF$$
$$83.14 = 3x^2$$
$$x^2 = 27.71$$
$$x = 5.26$$
$$EF = 5.26 \text{ cm}$$

(c)



11 (a)
$$y = \frac{6 + x^2}{1 + x^2}$$
$$\frac{dy}{dx} = \frac{(1 + x^2)(2x) - (6 + x^2)(2x)}{(1 + x^2)^2}$$
$$= \frac{2x + 2x^3 - 12x - 2x^3}{(1 + x^2)^2}$$
$$= \frac{-10x}{(1 + x^2)^2}$$

Apabila $\frac{dy}{dx} = 0$,
When $\frac{dy}{dx} = 0$,
$$\frac{-10x}{(1 + x^2)^2} = 0$$
$$-10x = 0$$
$$x = 0$$

Apabila $x = 0$,
When $x = 0$,
$$y = \frac{6 + 0}{1 + 0}$$
$$= 6$$

x	< 0	0	> 0
Tanda untuk $\frac{dy}{dx}$ ***Sign for*** $\frac{dy}{dx}$	+	0	–
Lakaran tangen ***Sketch of the tangent***	/	—	\

$\therefore$ (0, 6) ialah titik maksimum.
$\therefore$ (0, 6) *is a maximum point.*

(b)
$$y = \frac{6 + x^2}{1 + x^2}$$
$$y(1 + x^2) = 6 + x^2$$
$$y + yx^2 = 6 + x^2$$
$$yx^2 - x^2 = 6 - y$$
$$(y - 1)x^2 = 6 - y$$
$$x^2 = \frac{6 - y}{y - 1}$$

$y - 1 \neq 0$
$\therefore y \neq 1$

Oleh sebab $x^2 \geqslant 0$, $\frac{6 - y}{y - 1} \geqslant 0$

As $x^2 \geqslant 0$, $\frac{6 - y}{y - 1} \geqslant 0$

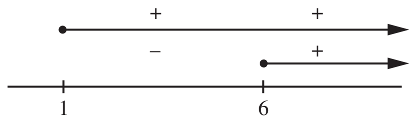
	$y < 1$	$1 < y \leqslant 6$	$y > 6$
$6 - y$	+	+	–
$y - 1$	–	+	+
$\frac{6 - y}{y - 1}$	–	+	–

$\therefore 1 < y \leqslant 6$

Kaedah alternatif
Alternative method
$$y = \frac{6 + x^2}{1 + x^2}$$
$$y(1 + x^2) = 6 + x^2$$
$$y + yx^2 = 6 + x^2$$
$$yx^2 - x^2 + y - 6 = 0$$
$$(y - 1)x^2 + (y - 6) = 0$$

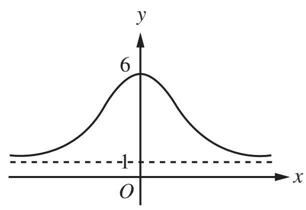
Pekali bagi x^2 tidak boleh 0.
The coefficient of x^2 *cannot be* 0.
$y - 1 \neq 0$
$\therefore y \neq 1$

Oleh sebab x adalah nyata, $b^2 - 4ac \geqslant 0$.
As x *is real,* $b^2 - 4ac \geqslant 0$.
$$0^2 - 4(y - 1)(y - 6) \geqslant 0$$
$$-4(y - 1)(y - 6) \geqslant 0$$
$$(y - 1)(y - 6) \leqslant 0$$



$\therefore 1 < y \leqslant 6$

(c)



12 (a)
$$\sin 2x = \frac{2 \sin x \cos x}{\cos^2 x + \sin^2 x}$$
$$= \frac{\frac{2 \sin x \cos x}{\cos^2 x}}{\frac{\cos^2 x + \sin^2 x}{\cos^2 x}}$$
$$= \frac{\frac{2 \sin x}{\cos x}}{1 + \frac{\sin^2 x}{\cos^2 x}}$$
$$= \frac{2 \tan x}{1 + \tan^2 x}$$

$$\cos 2x = \frac{\cos^2 x - \sin^2 x}{\cos^2 x + \sin^2 x}$$
$$= \frac{\frac{\cos^2 x - \sin^2 x}{\cos^2 x}}{\frac{\cos^2 x + \sin^2 x}{\cos^2 x}}$$
$$= \frac{1 - \frac{\sin^2 x}{\cos^2 x}}{1 + \frac{\sin^2 x}{\cos^2 x}}$$
$$= \frac{1 - \tan^2 x}{1 + \tan^2 x}$$

(b) $t = \tan x$

$\sin 2x = \dfrac{2t}{1 + t^2}$

$\cos 2x = \dfrac{1 - t^2}{1 + t^2}$

$4 \sin 2x - 3 \cos 2x = 2$

$4\left(\dfrac{2t}{1 + t^2}\right) - 3\left(\dfrac{1 - t^2}{1 + t^2}\right) = 2$

$\dfrac{8t - 3 + 3t^2}{1 + t^2} = 2$

$8t - 3 + 3t^3 = 2 + 2t^2$

$t^2 + 8t - 5 = 0$

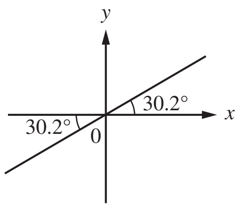
$a = 1, b = 8, c = -5$

$t = \dfrac{-8 \pm \sqrt{8^2 - 4(-5)}}{2}$

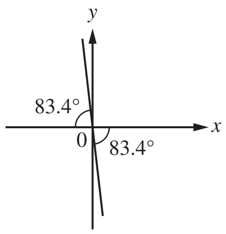
$= \dfrac{-8 \pm \sqrt{84}}{2}$

$t = 0.5826$ atau/*or* $t = -8.583$

Apabila $t = 0.5826$,
When $t = 0.5826$,
$\tan x = 0.5826$
$x = 30.2°, 210.2°$



Apabila $t = -8.583$,
When $t = -8.583$,
$\tan x = -8.583$
$x = 96.6°, 276.6°$



$\therefore x = 30.2°, 96.6°, 210.2°, 276.6°$

13 (a) $v = 3t(4 - t)$
$= 12t - 3t^2$

$a = \dfrac{dv}{dt}$
$= 12 - 6t$

Apabila $\dfrac{dv}{dt} = 0$,

When $\dfrac{dv}{dt} = 0$,

$12 - 6t = 0$
$6t = 12$
$t = 2$

$\dfrac{d^2v}{dt^2} = -6 < 0$

$\therefore$ v adalah maksimum apabila $t = 2$.
$\therefore$ *v is maximum when* $t = 2$.

Apabila $t = 2$,
When $t = 2$,
$v = 3(2)(4 - 2)$
$= 12$

$\therefore$ Halaju maksimum bagi zarah itu ialah 12 m s^{-1}.
$\therefore$ *The maximum velocity of the particle is* 12 m s^{-1}.

(b) Apabila $v = 0$,
When $v = 0$,
$3t(4 - t) = 0$
$t(4 - t) = 0$

$t = 0$ atau/*or* $t = 4$

$\therefore$ Zarah itu berehat seketika apabila $t = 4$.
$\therefore$ *The particle is momentarily at rest when* $t = 4$.

Apabila $t = 4$,
When $t = 4$,
$a = 12 - 6(4)$
$= -12$

$\therefore$ Pecutan zarah itu apabila ia berehat seketika ialah -12 m s^{-2}.
$\therefore$ *The acceleration of the particle when it is momentarily at rest is* -12 m s^{-2}.

(c) $s = \int (12t - 3t^2)\, dt$
$= 6t^2 - t^3 + c$

Apabila $t = 0, s = 0, c = 0$
When $t = 0, s = 0, c = 0$
$s = 6t^2 - t^3$

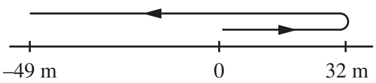
Apabila $s = 0$,
When $s = 0$,
$6t^2 - t^3 = 0$
$t^2(6 - t) = 0$

$t = 0$ atau/*or* $t = 6$

$\therefore$ Masa apabila zarah itu melalui titik O sekali lagi ialah 6 s.
$\therefore$ *The time when the particle passes through point O again is* 6 s.

(d) Apabila $t = 4$,
When $t = 4$,
$s = 6(4)^2 - 4^3$
$= 32$ m

Apabila $t = 7$,
When $t = 7$,
$s = 6(7)^2 - 7^3$
$= -49$ m



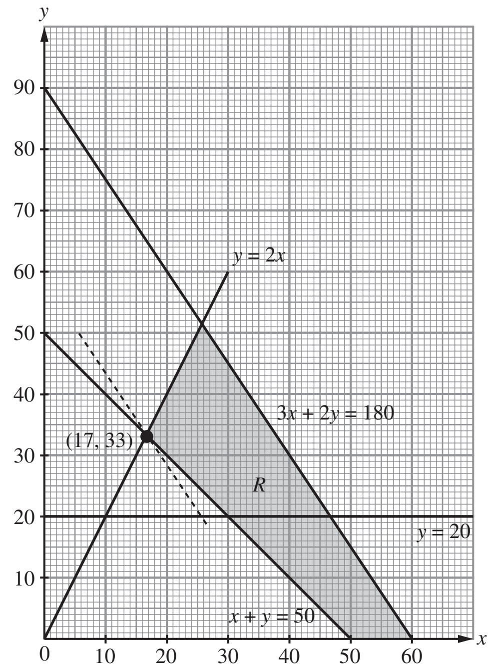
Jumlah jarak yang dilalui
Total distance moved
$= 2(32) + 49$
$= 113$ m

14 (a) x = Bilangan peserta bagi kalkulator grafik
x = *Number of participants for graphic calculator*

y = Bilangan peserta bagi perisian Maple
y = *Number of participants for Maple software*

$x + y \geqslant 50$
$y \leqslant 2x$
$90x + 60y \leqslant 5\,400$
$3x + 2y \leqslant 180$

(b)



(c) (i) Apabila $y = 20$, nilai maksimum $x = 46$ dan nilai minimum $x = 30$.

$\therefore$ Bilangan maksimum peserta bagi kalkulator grafik ialah 46 orang.

$\therefore$ Bilangan minimum peserta bagi kalkulator grafik ialah 30 orang.

When $y = 20$, *the maximum value of* $x = 46$ *and the minimum value of* $x = 30$.

$\therefore$ *The maximum number of participants for graphic calculator is* 46.

$\therefore$ *The minimum number of participants for graphic calculator is* 30.

(ii) Apabila $x = 17$ dan $y = 33$,

When $x = 17$ *and* $y = 33$,

$$90x + 60y = 90(17) + 60(33)$$
$$= 3\,510$$

Kos minimum = RM3 510

Minimum cost = RM3 510

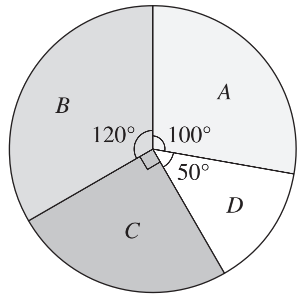
15 (a) $I_{2008/2005} = \frac{P_{2008}}{P_{2005}} \times 100$

$$x = \frac{4.20}{4.00} \times 100$$
$$= 105$$

$$\frac{y}{2.25} \times 100 = 140$$
$$y = \frac{2.25}{100} \times 140$$
$$= 3.15$$

$$\frac{2.10}{z} \times 100 = 120$$
$$z = \frac{2.10}{120} \times 100$$
$$= 1.75$$

(b) (i)



$$\bar{I} = \frac{\Sigma I_i w_i}{\Sigma w_i}$$
$$= \frac{105(100) + 140(120) + 175(90) + 120(50)}{360}$$
$$= \frac{49\,050}{360}$$
$$= 136.25$$

(ii) $\bar{I}_{2008/2005} = \frac{P_{2008}}{P_{2005}} \times 100$

$$136.25 = \frac{109}{P_{2005}} \times 100$$
$$P_{2005} = \frac{109}{136.25} \times 100$$
$$= 80$$

$\therefore$ Kos untuk menghasilkan seliter cat baharu yang sepadan bagi tahun 2005 ialah RM80.

$\therefore$ *The corresponding cost of making a litre of the new paint in* 2005 *was* RM80.

(c) $\bar{I}_{2010/2005} = \frac{P_{2010}}{P_{2005}} \times 100$

$$= \frac{P_{2010}}{P_{2008}} \times \frac{P_{2008}}{P_{2005}} \times 100$$
$$= \frac{120}{100} \times 136.25$$
$$= 163.5$$

$\therefore$ Indeks gubahan bagi kos untuk menghasilkan cat baharu itu pada tahun 2010 berasaskan tahun 2005 ialah 163.5.

$\therefore$ *The composite index for the cost of making the new paint in the year* 2010 *based on the year* 2005 *was* 163.5.