

1(a) $4,70$

(b) 800

(c) $2,31 \times 10^{-3}$

2(a) $7 \times 8^3 + 8 + 6$
 $= 3584 + 14$
 $= 3598$

$$\begin{array}{r|l} 8 & 3598 \\ 8 & 447 \text{ r } 6 \\ 8 & 56 \text{ r } 1 \\ 8 & 7 \text{ r } 0 \\ & 0 \text{ r } 7 \end{array}$$

$= 7016_8$

(b)
$$\begin{array}{r|l} 6 & 57 \\ 6 & 9 \text{ r } 3 \\ 6 & 1 \text{ r } 3 \\ & 0 \text{ r } 1 \end{array}$$

$= 133_6$

(c)
$$\begin{array}{r} 111_2 \\ + 121_2 \\ \hline 1000_2 \\ = 1000_2 \end{array}$$

3(a) 02:17am

(b) 2

(ii) 2.

4 $f(x) = 3x - 1$

(a) $f(-2) = 3(-2) - 1$
 $= -6 - 1$
 $= -7$

(b) $x \neq f(x) = 5$
 $3x - 1 = 5$
 $\frac{3x}{3} = \frac{8}{3}$
 $\therefore x = 2$

5(a) $(-3m)^4$
 $= 81m^4$

(b)(i) $49^{3/2}$
 $= \sqrt[2]{(49)^3}$
 $= 7^3$
 $= 343$

(ii) $2^{-3} = \frac{1}{8}$

(b)
$$\begin{cases} 3x + 2y = 8 \\ 5x + 3y = 4,5 \end{cases} \times 3$$

 $9x + 6y = 24$
 $- 10x + 6y = 9$
 $-x = 15$

$x = -15$

$5(-15) + 3y = 4,5$

$-75 + 3y = 4,5$

$3y = 79,5$

$y = 26,5$

$\therefore y = 26,5; x = -15$

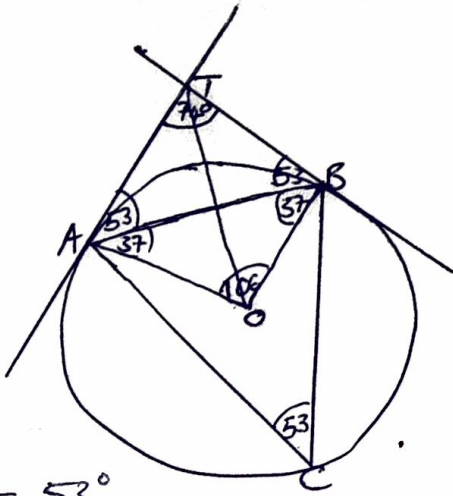
Proof.

$3(-15) + 2(26,5) = 8$

$8 = 8$

$5(-15) + 3(26,5) = 4,5$

$4,5 = 4,5$



(a) $\hat{AOT} = 53^\circ$

(b) $\hat{BOT} = 53^\circ$

(c) $\hat{ACB} = 53^\circ$

(d) Perimeter of a shaded part =

Perimeter of shaded = Perimeter of bigger semi-circle - perimeter of small circles

$$P = \frac{\pi d}{2} - \left(\frac{\pi d}{2} + \frac{\pi d}{2} \right)$$

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

$$= 5\pi - 5\pi$$

$$= 0 \text{ cm}$$

9(a) $\bar{x} = \frac{\sum x}{n}$

$$\bar{x} = \frac{14 + x + 15 + 19 + 15 + 13}{6}$$

$$6 \times 13 = \frac{76 + x}{6} \times 6$$

$$78 = 76 + x$$

$$\underline{x = 2}$$

(b) mode = 15

(c) median $2, 14, 15, 15, 13$
 $\frac{14 + 15}{2} = 14.5$

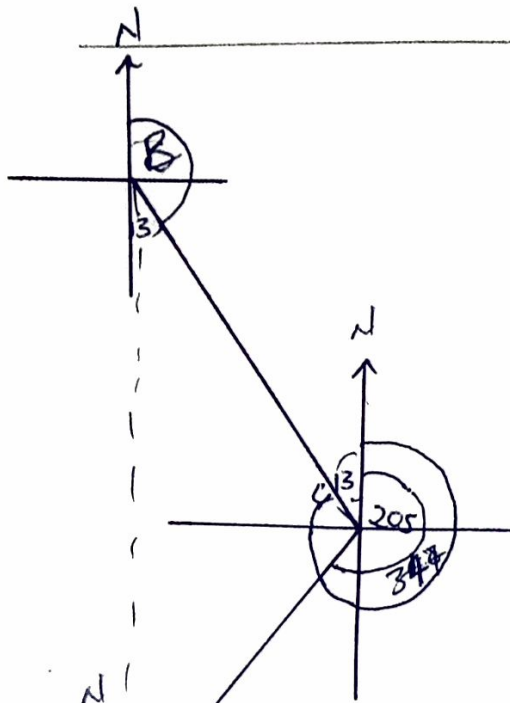
(10)(a) 1cm : 10km

1 : 1 000 000

(b)(i) 1cm = 10km
 2.7cm = more
 $2.7 \times 10 = 27 \text{ km}$

(ii) 1cm : 10km
 Area factor
 $1 \text{ cm}^2 : 100 \text{ km}^2$
 more : 120 km^2
 $\frac{120 \text{ km}^2}{100 \text{ km}^2} \times \frac{1 \text{ cm}^2}{1} = 1.2 \text{ cm}^2$

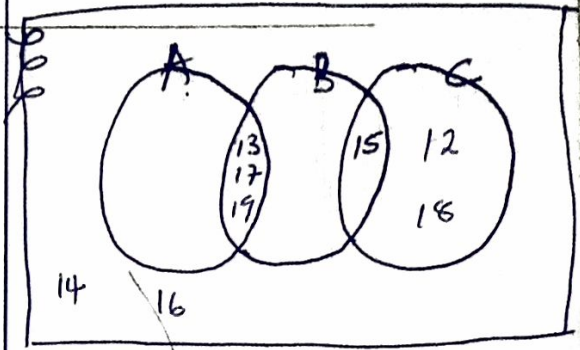
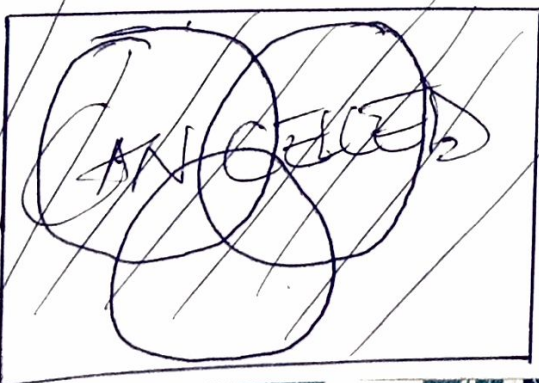
(11)



(a) $\hat{A}CB = 347^\circ - 205^\circ$
 $= 142^\circ$

(b) Bearing of C from B
 $= 90^\circ + 77^\circ$
 $= \underline{167^\circ}$

12(a) $A = \{13, 17, 19\}$
 $B = \{13, 15, 17, 19\}$
 $C = \{12, 15, 18\}$



(b) Elements of A = $\{13, 17, 19\}$

(c) $n(A \cap C) = 0$

13(a) $\cos \hat{A}CD = -0,8$

(b) Area = $\frac{1}{2} ab \sin \theta$
 $= \frac{1}{2} (10 \times 9) 0,6$
 $= 45 \times 0,6$
 $= \underline{27 \text{ cm}^2}$

14(a) $\frac{1}{c} = \sqrt{b-a}$
 $\frac{1}{c} = \sqrt{21-4}$
 $\frac{1}{c} = \sqrt{17}$
 $c \times \frac{1}{c} = 5 \times c$
 $\frac{1}{5} = \frac{5c}{8}$
 $\therefore c = \underline{\frac{1}{5}}$

$$\left(\frac{1}{c}\right)^2 = (\sqrt{b-a})^2$$

$$\frac{1}{c^2} = b-a$$

$$a = b - \frac{1}{c^2}$$

$$15(a) (5m-3)(2m+1) = 0$$

$$10m^2 + 5m - 6m - 3 = 0$$

$$10m^2 - m - 3 = 0$$

$$-30m^2$$

$$10m^2 + 5m - 6m - 3 = 0$$

$$5m(2m+1) - 3(2m+1) = 0$$

$$(5m-3)(2m+1) = 0$$

$$\frac{5m}{5} = \frac{3}{5} \text{ or } \frac{2m}{2} = -\frac{1}{2}$$

$$\therefore m = \frac{3}{5} \text{ or } -\frac{1}{2}$$

$$(b) \frac{2}{8n-1} \neq \frac{3}{n+2}$$

$$2n+4 = 9n-3$$

$$4+3 = 9n-2n$$

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

$$\therefore n = 1$$

$$(16(a)) \begin{pmatrix} 2 & 1 \\ -3 & 0 \end{pmatrix} \begin{pmatrix} x \\ 5 \end{pmatrix}$$

$$= \begin{pmatrix} 4+5 \\ -6+0 \end{pmatrix}$$

$$= \begin{pmatrix} 9 \\ -6 \end{pmatrix}$$

$$(b) A^{-1} = \begin{pmatrix} 2 & 1 \\ -3 & 0 \end{pmatrix}$$

$$\text{Det} = (2 \times 0) - (1 \times -3)$$

$$= 0 + 3$$

$$= \underline{\underline{3}}$$

~~$$\frac{1}{3} \begin{pmatrix} 2 & 1 \\ -3 & 0 \end{pmatrix}$$~~

$$\frac{1}{3} \begin{pmatrix} 0 & -1 \\ 3 & 2 \end{pmatrix}$$

$$17(a) |\vec{OP}| = \sqrt{x^2 + y^2}$$

$$= \sqrt{4^2 + 1^2}$$

$$= \sqrt{16+1}$$

$$= \underline{\underline{\sqrt{17} \text{ units}}}$$

$$(b) \vec{QR} = \begin{pmatrix} -2 \\ -3 \end{pmatrix}$$

$$\vec{QR} = \vec{OR} - \vec{OQ} = \begin{pmatrix} -2 \\ -3 \end{pmatrix}$$

$$\begin{pmatrix} x \\ y \end{pmatrix} - \begin{pmatrix} 1 \\ 5 \end{pmatrix} = \begin{pmatrix} -2 \\ -3 \end{pmatrix}$$

$$\begin{pmatrix} x-1 \\ y-5 \end{pmatrix} = \begin{pmatrix} -2 \\ -3 \end{pmatrix}$$

$$x = -1$$

$$y = 2$$

\(\therefore\) coordinates of R are

$$\underline{\underline{(-1, 2)}}$$

$$(ii) \vec{PR} = \vec{OR} - \vec{OP}$$

$$= \begin{pmatrix} -1 \\ 2 \end{pmatrix} - \begin{pmatrix} 4 \\ 1 \end{pmatrix}$$

$$= \begin{pmatrix} -5 \\ 1 \end{pmatrix}$$

(18) 3 inequalities defining unshaded region R

(i) ~~$y \geq 1$~~ ~~$y \leq 1$~~ $y \leq 1$

(ii) (0; 6) (5; 0)

$$\text{Grad} = \frac{6-0}{0-5}$$
$$= -\frac{6}{5}$$

$$\text{Equation} = \frac{y-6}{x-0} = -\frac{6}{5}$$
$$= 5y - 30 = -6x$$
$$= 6x + 5y = 30$$
$$= \underline{\underline{6x + 5y \geq 30}}$$

(iii) (0; 6) (2; 0)

$$\text{Grad} = \frac{6-0}{0-2}$$
$$= \underline{\underline{-3}}$$

$$\text{Equation} = \frac{y-6}{x-0} = \frac{-3}{1}$$
$$= y - 6 = -3x$$
$$3x + y = 6$$
$$\underline{\underline{3x + y \leq 6}}$$

$$\begin{aligned} \text{Acceleration} &= \frac{v-u}{t} \\ &= \frac{30-20}{4} \\ &= \frac{10}{4} \\ &= \underline{\underline{2,5 \text{ m/s}^2}} \end{aligned}$$

(b) Distance = Area under the graph

$$\begin{aligned} &= L \times W \\ &= 20 \times 3 \\ &= \underline{\underline{60 \text{ m}}} \end{aligned}$$

(c) Speed = $\frac{\text{Distance}}{\text{Time}}$

Area of trapezium = $\frac{1}{2}(a+b)h$

$$\begin{aligned} &= \frac{1}{2}(20+30)4 \\ &= \underline{\underline{100 \text{ m}}} \end{aligned}$$

Area of triangle = $\frac{1}{2}bh$

$$\begin{aligned} &= \frac{1}{2}(3 \times 30) \\ &= \underline{\underline{45 \text{ m}}} \end{aligned}$$

Total Distance = $\frac{100 \text{ m} + 60 \text{ m} + 45 \text{ m}}{205 \text{ m}}$

Speed = $\frac{205 \text{ m}}{10 \text{ s}}$

$$= \underline{\underline{20,5 \text{ m/s}}}$$

20(a) Factorise

$$14x^2 - 21x$$

$$2x(7x-1)$$

(b) $30 - 3x - 6x^2$

$$3(10 - x - 2x^2)$$

$$= 3(10 - 5x + 4x - 2x^2)$$

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

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

21(a) $C = k + hN$

$$C = k + hN$$

$$70 = k + 2h$$

$$- 85 = k + 3h$$

$$\underline{\quad -15 = -h}$$

$$h = 15$$

$$70 = k + 30$$

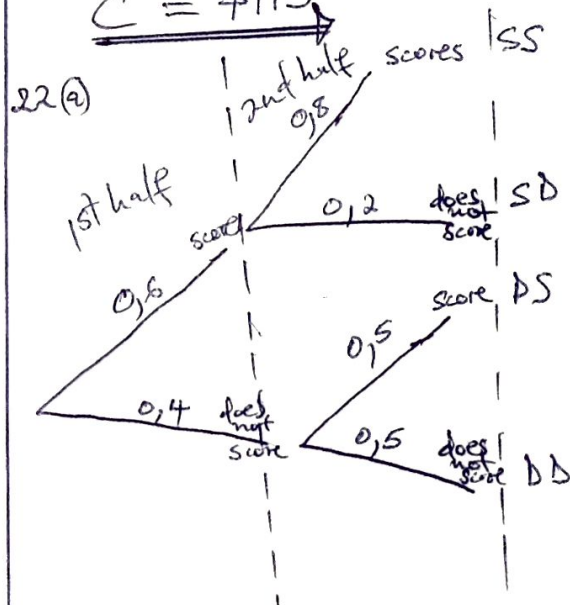
$$k = 40$$

$$C = 40 + 15N$$

(b) $C = 40 + 15(5)$

$$C = 40 + 75$$

$$C = \underline{\underline{\$115}}$$



$$\begin{aligned} \text{(i) Both halves} \\ &= 0,6 \times 0,8 \\ &= \underline{\underline{0,48}} \quad \frac{12}{25} \end{aligned}$$

$$\begin{aligned} \text{(ii) Only one} \\ &= (0,6 \times 0,2) + (0,4 \times 0,5) \\ &= 0,12 + 0,2 \\ &= \underline{\underline{0,32}} \quad \frac{8}{25} \end{aligned}$$

$$23 \log 8 = 0,9031$$

$$\begin{aligned} \text{(a) } \log 0,8 \\ &= \log \left(\frac{8}{10} \right) \\ &= \log 8 - \log 10 \\ &= 0,9031 - 1 \\ &= \underline{\underline{-0,0969}} \end{aligned}$$

$$\begin{aligned} \text{(b) } \log 512 &= \log 8^3 \\ &= 3 \log 8 \\ &= 3(0,9031) \\ &= \underline{\underline{2,7093}} \end{aligned}$$

$$\begin{aligned} \text{(c) } \log 2 &= \log 8^{1/3} \\ &= \frac{1}{3} \log 8 \\ &= \frac{1}{3}(0,9031) \\ &= \underline{\underline{0,3010}} \end{aligned}$$

24 (a) (i)

$$\begin{aligned} &3\frac{1}{4} - \frac{2}{7} \\ &= \frac{21 - 8}{28} \end{aligned}$$

$$= \underline{\underline{\frac{13}{28}}}$$

$$\begin{aligned} \text{(ii) } 2\frac{1}{4} \div 3 \\ &= \frac{9}{4} \times \frac{1}{3} \\ &= \frac{3}{4} \end{aligned}$$

$$\begin{aligned} \text{(b) } 0,135 \text{ as a common fraction} \\ &\frac{135}{1000} = \frac{27}{200} \end{aligned}$$