June 98

Paper 2

1- $52 - 3\,(4.1 - 1.8) = 52 - 3\,(2.3) = 45.1$ Answer: 45.1

2- (a) $3 \text{ cm / min} = \frac{3}{100 \times 1000} \times 60 = 0.0018$ Answer: 0.0018 Km / h

(b) $0.0018 = 1.8 \times 10^{-3} km/h$ Answer: $1.8 \times 10^{-3} km/h$

3- (a) $\angle ABT = \frac{1}{2}\angle AOT = \frac{1}{2} \times 64 = 32°$ Answer: Angle ABT = 32°

(b) AB perpendicular to OT

$\angle OTB = 90 - \angle ABT = 90 - 32 = 58°$ Answer: Angle OTB = 58°

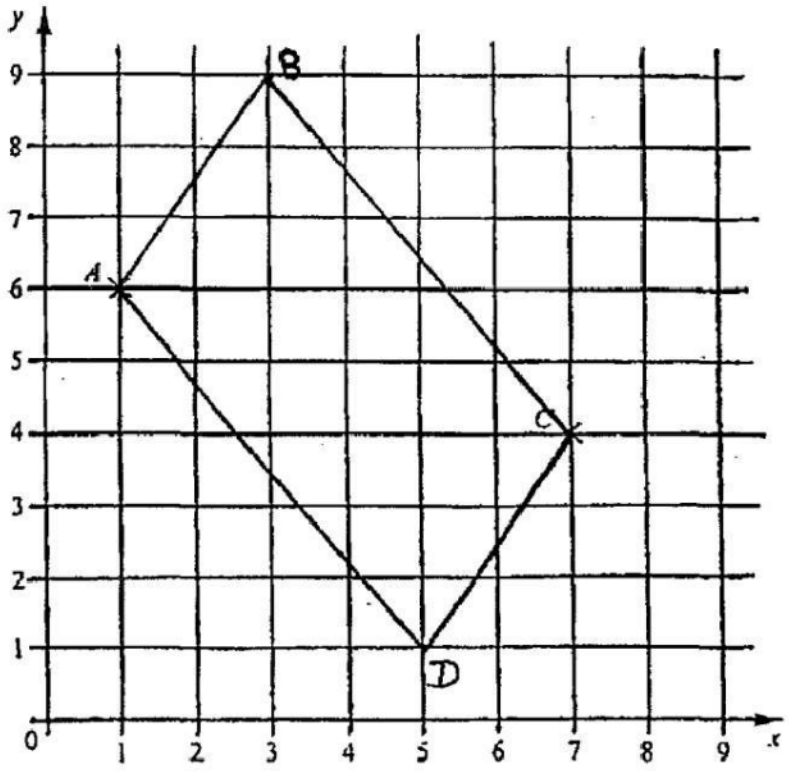
4- $I = \frac{PRT}{100}$

$50 = \frac{250 \times R \times 5}{100}$

$5000 = 1250\,R$

$R = 4$ Answer: R = 4

5- (a)



(b) $\overrightarrow{AD} = \overrightarrow{BC} = \begin{pmatrix} 4 \\ -5 \end{pmatrix}$ Answer: $\overrightarrow{AD} = \begin{pmatrix} 4 \\ -5 \end{pmatrix}$

6- $\frac{a}{6} + \frac{b}{21} = \frac{17}{42}$ all times 42

$7a + 2b = 17$

now we can select any positive integer for a and then find b

try $a = 1$

$7 \times 1 + 2b = 17$

$2b = 10$ $b = 5$

as b obtained is positive integer, it is correct Answer: $a = 1$ $b = 5$

7- 2 min 23 sec $= 2\frac{23}{60} = 2.383$

(or use calculator 2 [,,,,] 23 [,,,,] = 2.383).

2.3 is 2.3

$2\frac{1}{3} = 2.333$

$2.23 = 2.23$ Answer: $2.23 < 2.3 < 2\frac{1}{3} < 2$ min 23 sec

8- $3x - y = 4$ (1)

$x - y = 8$ (2)

$-x + y = -8$ (2) $\times -1$

$3x - y = 4$ (1)

$2x = -4$

$x = -2$

substitute to get y

$3(-2) - y = 4$

$-6 - y = 4$

$-y = 10$ $y = -10$ Answer: $x = -2$, $y = -10$

9- (a) Look at the graph, Locate where the gradient of the graph is Largest.

It is in the part of the graph after 18 sec

You will find that the gradient is largest at $t = 19$

(b) Total distance travelled = 2 d

$$\text{Average speed} = \frac{Total distance}{Total time}$$

$$1.5 = \frac{2d}{24}$$

$2d = 24 \times 1.5 = 36$ $d = 18$ m

10- (a) $\angle OAM = 180 - 83 = 97°$

$\angle AOM = 180 - (97 + 58) = 25°$

OR $\angle AOM = 83 - 58 = 25°$

(b) Given AM : MB = 1 : 2

AM : AB = 1 : 3

Area of parallelogram = 96 cm^2

Area of $\Delta AOB = \frac{1}{2} \times 96 = 48 cm^2$

$\Delta's$ AOM and AOB have the same height but different base

base AM = $\frac{1}{3}$ base AB

Area of $\Delta AOM = \frac{1}{3}$ area of ΔAOB

$= \frac{1}{3} \times 48 = 16 cm^2$ Answer: $16 cm^2$

11- sin x = -0.866 cos x = -0.5 $0 \leq x \leq 360°$

The quadrant in which sine and cosine are both negative is the 3rd. Quad

Using calculator the angle whose sine = 0.866 (or its cosine 0.5) is 60°

$\therefore$ x = 180 + 60 = 240° Answer: x = 240°

12- (a) $3x - 2 < 15$

$3x < 17$ $x < \frac{17}{3}$ $x < 5\frac{2}{3}$

$\therefore$ A = { 1,2,3,4,5 } n (A) = 5 Answer: n (A) = 5

(b) $4x + 1 \geq 13$ $4x \geq 12$ $x \geq 3$

B = { 3,4,5, ... etc }

Answer: A $\cap$ B = { 3,4,5 }

13- (a) $\frac{360}{20} = 18$ $180 - 18 = 162°$ Answer: Angle ABC = 162°

(b) $\angle ACB = \frac{180 - 162}{2} = 9°$ Answer: Angle ACB = 9°

14- (a) $50 - \frac{5}{2} \leq$ mass $< 50 + \frac{5}{2}$

(i) 47.5 g $\leq$ mass $<$ 52.5 g

(ii) 8.5 $cm^3 \leq$ volume $<$ 9.5 cm^3

(b) Least possible density $= \frac{Least mass}{Largest volume}$

$= \frac{47.5}{9.5} = 5$ Answer: 5 g / cm^3

15- (a) $\sqrt{x^{36}} = (x^{36})^{1/2} = x^{18}$ Answer: P = 18

(b) $10^q = 1$ $q = 0$ Answer: q = 0

(c) $r^{-\frac{1}{2}} = \frac{1}{4}$

$r = \left(\frac{1}{4}\right)^{-2} = \left(\frac{4}{1}\right)^2 = 16$ Answer: 16

16- (a) Answer Angle OBC = 90 – 50 = 40°

(b) (i) $\angle OAB = 50°$

Bearing of B from A is 180 – 50 = 130° Answer: 130°

(ii) $\angle OCB = \angle OBC = 40°$

Bearing of B from C is 040°

Bearing of C from B is 180 + 40 = 220° Answer: 220°

17- $\frac{T}{W+3} = V$

(W + 3) V = T

$W + 3 = \frac{T}{V}$

$W = \frac{T}{V} - 3$ Answer: $W = \frac{T}{V} - 3$

18- (a) Number of boys $= \frac{5}{12} \times 480 = 200$

Number of girls = 480 – 200 = 280 Answer: 280

(b) Number of students aged 15 or over $= \frac{3}{10} \times 480 = 144$

Number of students aged under 15 = 480 – 144 = 336 Answer: 336

(c) Number of girls under 15 $= \frac{7}{16} \times 480 = 210$

Number of girls 15 or above $= 280 - 210 = 70$

Number of boys aged 15 or over $= 144 - 70 = 74$ Answer: 74

Boys	Girls	
	70	15 or over 15, Total 144
	210	Under 15, Total 336
200	280	Total

19- (a) $fg(5) = f(2\times 5+1) = f(11) = 11^2 = 121$ Answer: 121

(b) $y = 2x + 1$

$2x = y - 1$

$x = \frac{y-1}{2}$

$g^{-1}(x) = \frac{x-1}{2}$ Answer: $g^{-1}(x) = \frac{x-1}{2}$

20- Answer: $x \geq 1$

$y \leq 5$

$y \leq x + 2$

21- (a) (i) Ratio of areas is K^2

$K^2 = 36$ $K = 6$ Answer: 6 : 1

(ii) Length = 6 x 0.7 = 4.2 m Answer: 4.2 m

(b) Ratio of volumes = $K^3 = 6^3 = 216$

$\frac{RealVolume}{ModelVolume} = K^3$

$\frac{0.54}{ModelVolume} = 216$ Answer: $2.5\times 10^{-3} m^3$

$ModelVolume = \frac{0.54}{216} = 2.5\times 10^{-3} m^3$

22- (a) $Sin\angle AOC = \frac{12}{13}$

$\angle AOC = 67.4°$

(b) (i) Area of sector $= \frac{\theta}{360} \times \pi \times R^2$

$= \frac{67.4}{360} \times \pi \times 13^2 = 99.4 cm^2$ Answer: $99.4 cm^2$

(ii) shaded area = area of sector – area of triangle

Third side of the triangle $= \sqrt{13^2 - 12^2} = 5$

area of triangle $= \frac{1}{2} \times 12 \times 5 = 30$

Shaded area $= 99.4 - 30$

$= 69.4 \ cm^2$ Answer: $69.4 \ cm^2$

23- (a) Pyramid

(b) By measurement

Length of one side of the square base = 6 cm

Height of each of the triangular faces is = 5.2 cm

Total surface area $= 6 \times 6 + 4 \times \frac{1}{2} \times 6 \times 5.2$

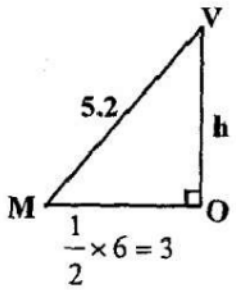
$= 98.4 \ cm^2$ Answer: $98.4 \ cm^2$

(c) VM is the height of one of the triangular faces = 5.2

h is the height of pyramid

height $h = \sqrt{5.2^2 - 3^2}$

$= 4.25$ cm



24- (a) (i) $x(x-1)(x+1) = 40(x + x - 1 + x + 1)$

$x(x-1)(x+1) = 40(3x)$

(ii) $x(x^2 - 1) = 120x$

$x^3 - x = 120x$

$x^3 - 121x = 0$

(b) $x^3 - 121x = x(x^2 - 121) = x(x+11)(x-11)$

(c) $x(x+11)(x-11) = 0$

$x = 0, -11, 11$

Possible answer is 11

Three positive integers are 10, 11, 12

Math 0580

NOV. 1998

Paper 2

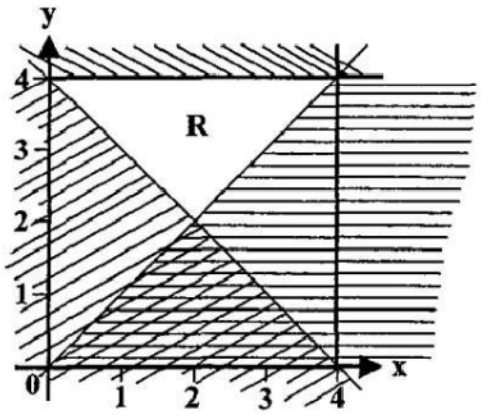
1- Using calculator Angle A = 22.5°

2-

Sugar	fruit
3	$2\frac{1}{2}$
?	4

Quantity of sugar = $\frac{4 \times 3}{2\frac{1}{2}} = 4.8\,kg$

3-



4- x - 4, x, 2x, 2x + 12

Median is the average of x and 2x,

the two middle numbers, therefore $\frac{x + 2x}{2} = 9$

3x = 18 x = 6

5- (a) $\frac{20}{2} = 10$ 220 - 10 ≤ r < 220 + 10

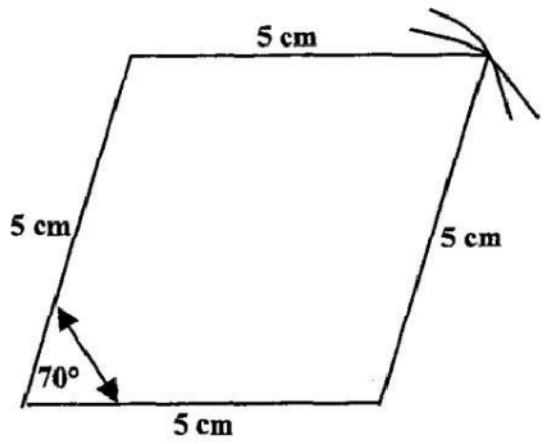
210 ≤ r < 230

(b) Circumference = $2\pi r = 2 \times 3.142 \times 210$

= 1319.64 ≈ 1320 cm

6- (a) Trapezium.

(b)



7- Time difference between 2034 and 1634 is 4 hours

The new train journey time is $80\% = \frac{80}{100} \times 4 = 3.2$ hours

Using calculator 16 [,,,] 34 [,,,] [+] 3.2 [=] shift [,,,] 1946

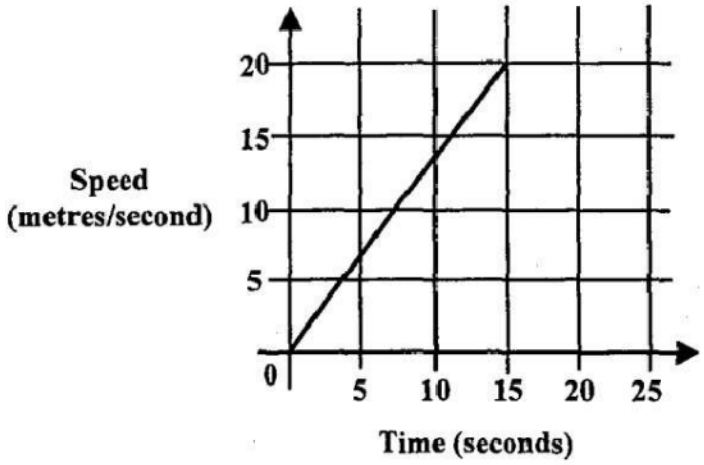
8- (a) $2x^2 - 5x - 3 = (2x + 1)(x - 3)$

(b) $2x^2 - 5x - 3 = 0$

$(2x + 1)(x - 3) = 0$

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

9-(a)



(b) Acceleration $= \frac{20}{15} = \frac{4}{3} m / s^2$

(c) Distance = area under the graph.

$= \frac{1}{2} \times 15 \times 20 = 150\ m$

10- $\frac{x+3}{2} - \frac{x-4}{5} = \frac{5(x+3) - 2(x-4)}{10} = \frac{5x + 15 - 2x + 8}{10} = \frac{3x + 23}{10}$

11- (a) (i) $x = 4 \cos (180t)°$

$t = 0.4$ $\quad x = 4 \cos (180 \times 0.4)$

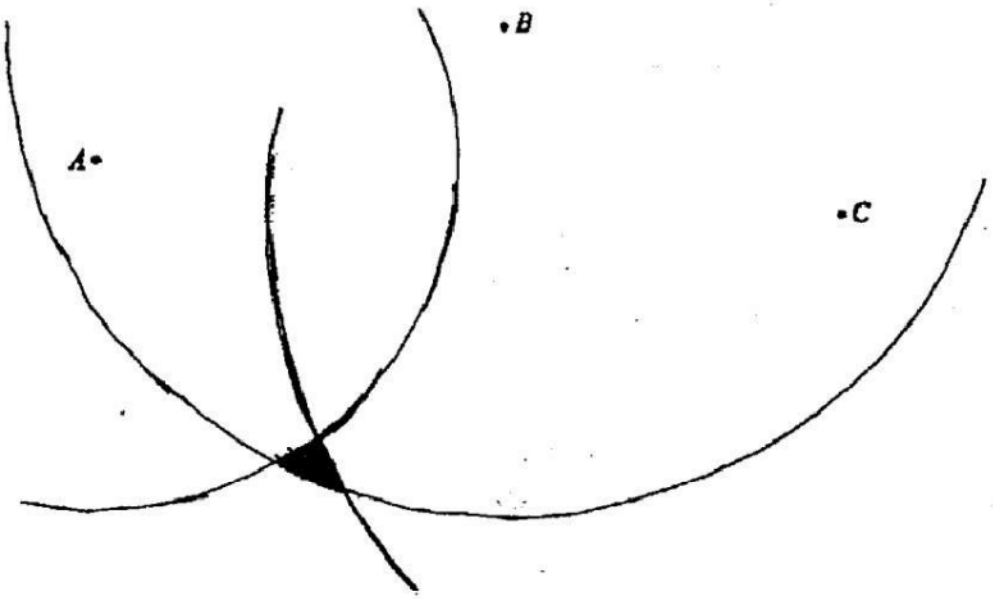
$= 4 \cos 72° = 1.236 \approx 1.24$

(ii) $x = 4 \cos (180 \times 1.3)$

$= 4 \cos 234° = -2.351$

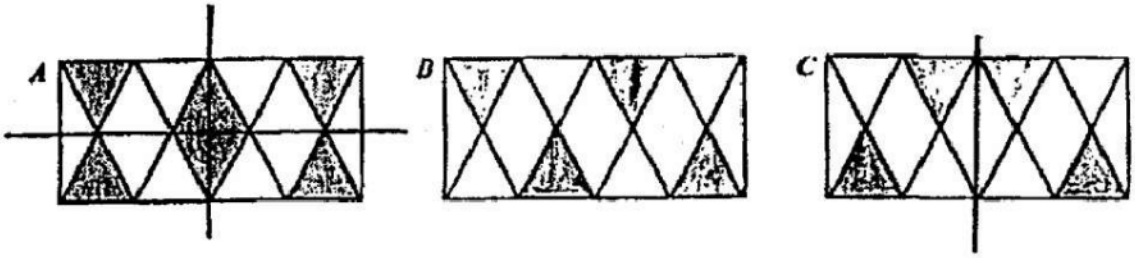
(b) negative x means to the left of the vertical line (or on the other side).

12-



13- (a) Answer: C

(b)



14- (a) (i) $\frac{L}{100} = (0.9)^{5d} = (0.9)^{5\times1.4} = (0.9)^{7}$

$L = 100 \times 0.4783 = 47.83\ \%$

(ii) $\frac{L}{100} = (0.9)^{5\times2.7} = (0.9)^{13.5} = 0.2411$

$L = 24.1\%$

(b) $\frac{81}{100} = (0.9)^{5d}$ $\qquad 0.81 = (0.9)^2$

$\therefore 5d = 2$ $\qquad d = \frac{2}{5} = 0.4$

15- $\angle x = 180 - (135 + 27) = 180 - 162 = 18°$

$\frac{12}{\sin 135} = \frac{YZ}{\sin 18°}$ $\qquad YZ = \frac{12 \sin 18°}{\sin 135°} = 5.24 cm$

16- (a) gradient m $= \frac{8-2}{8-0} = \frac{6}{8} = \frac{3}{4}$

y intercept c is 2

(b) AB $= \sqrt{(8-0)^2 + (8-2)^2} = \sqrt{64+36} = \sqrt{100} = 10$

17- (a) Cost for 5 days = 5 x 23 = 115

Free kilometres = 5 x 40 = 200 Km

Extra distance charge = (350 – 200) x 0.25 = 37.5

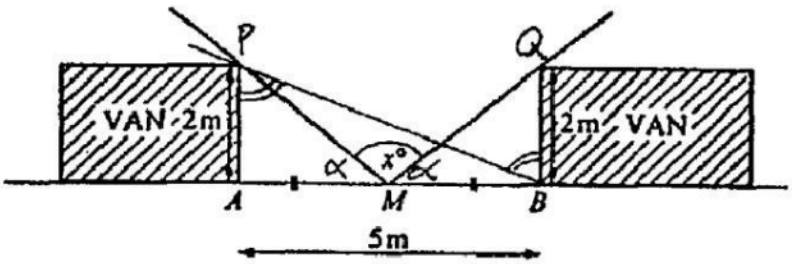
Total cost = 115 + 37.5 = 152.5 $

(b) Cost for p days = 23 p

Extra distance charge = (q – 40 p) x 0.25 = $\frac{1}{4}q$ - 10 p

Total cost = 23 p + $\frac{1}{4}q$ - 10 p = 13 p + $\frac{1}{4}q$ $

18-



(a) $\tan\alpha = \frac{2}{2.5}$ $\qquad \alpha = 38.66°$

Angle x = 180 - 2x = 102.68 = 102.7°

(b) Angle of view now is angle PBQ = angle APB

$\tan\theta = \frac{5}{2} = 2.5$ $\qquad$ Angle = 68.2

19-(a) $h \ \alpha \ v^2$ $\qquad \therefore h = kv^2$

v = 4 $\qquad$ h = 80

$\therefore 80 = k4^2 = 16k$ $\qquad k = \frac{80}{16} = 5$

$\therefore h = 5v^2$

(b) (i) $h = 5v^2 = 5(6)^2 = 180\,cm$

(ii) h = 20 m = 20 x 100 = 2000 cm

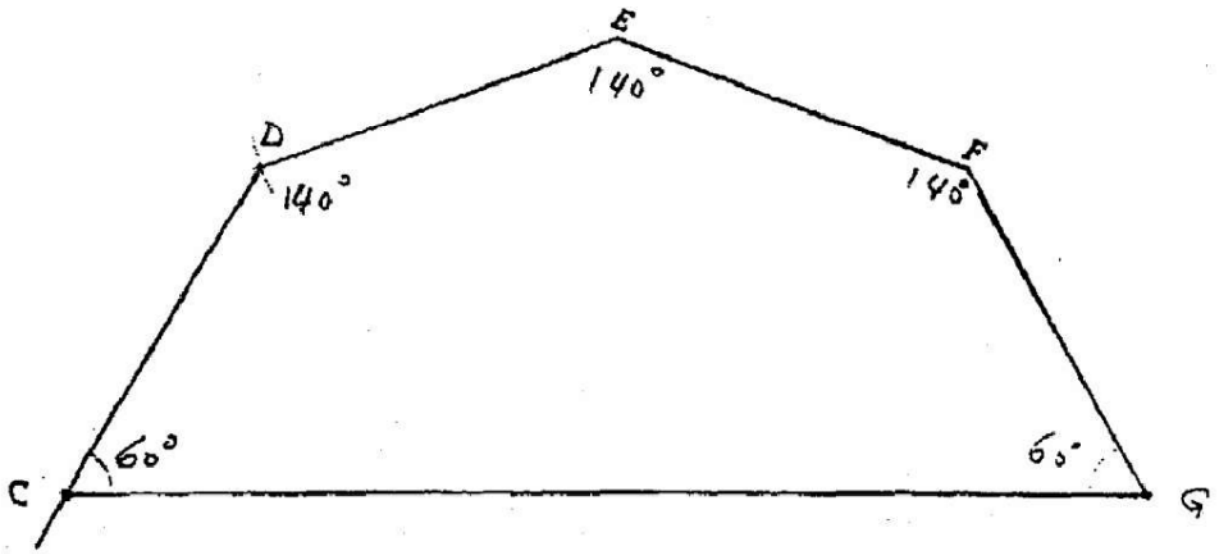
$2000 = 5v^2$ $\qquad v^2 = \frac{2000}{5} = 400$

v = 20 m/s

20- (a) Each Exterior angle = $\frac{360}{9} = 40°$

Each Interior angle = $180 - 40 = 140°$

(b) (i)



(ii) Angle DCG = 60° Angle FGC = 60°

(iii) The shape CDEFG is a 5 sided polygon (pentagon)

The sum of all its interior angles = (2n - 4) x 90 = (2 x 5 – 4) x 90 = 540°

Three of its angles are each 140

140 x 3 = 420

(Sum of the other two angles) = 540 – 420 = 120°

Value of each angle = $\frac{120}{2} = 60$