Mathematics 0580

June 2001

Paper 2

1- $\dfrac{7.7}{3+\sqrt{6.25}} = 1.4$

2- 1 cm = 1 x 250000 cm

$= \dfrac{250000}{100\times1000} = 2.5$ Km

3- (a) 12.6 Gigabytes = 12.6×10^{9} bytes

$= 1.26 \times 10^{10}$ bytes

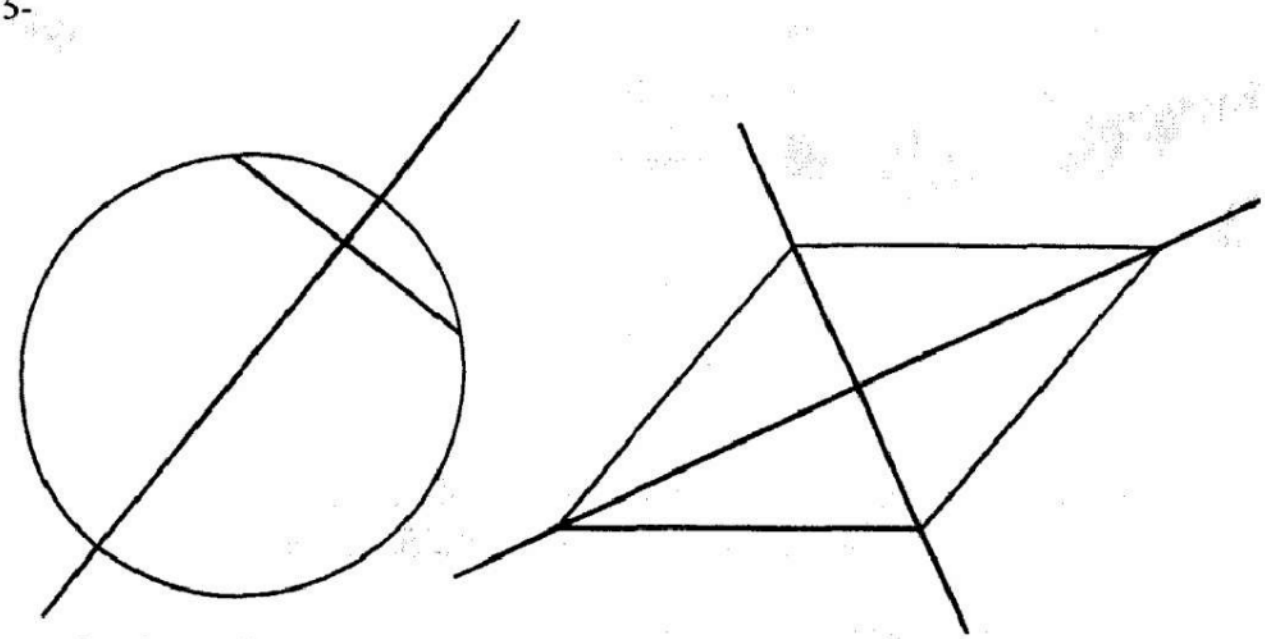
(b) 150 picoseconds = 150×10^{-12}

$= 1.5 \times 10^{-10}$ sec

4- $\tan\theta = \dfrac{30}{43}$

$\theta = 34.9°$

5-



6- $25 - 3x < 7$

$-3x < 7 - 25$

$-3x < -18$

$x > 6$

7- Ratio of volume $= \left(\frac{100}{50}\right)^3 = 8$

Ratio 8 : 1

8- 2 hosepipes 2 h 30 min
3 hosepipes ?
It is inverse proportion so
The time $= \frac{2 \times 2h30\,\text{min}}{3}$
$=$ 1 h 40 min

9- (a) 1999 2000
100 90
1320 ?
tax paid in 2000 $= \frac{90 \times 1320}{100} =$ \$ 1188

(b) 1998 1999
100 110
? 1320
tax paid in 1998 = \$ 1200

10- $3x + 4y = 27$ (1)
$4x - 2y = 25$ (2)

(2) x 2 $8x - 4y = 50$
(1) $3x + 4y = 27$

adding $11x = 77$
$x = 7$

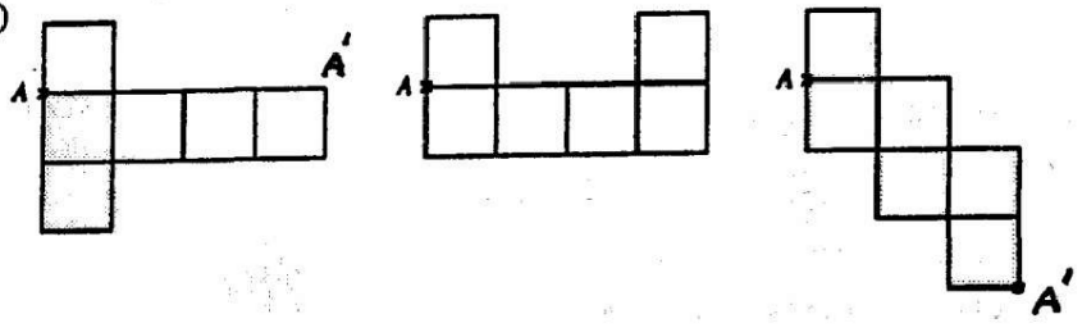
using $3x + 4y = 27$
$21 + 4y = 27$
$4y = 6$
$y = 1.5$

11- (a) (i) The minimum capacity of the jug is **3.45** litres.
(ii) The maximum capacity of the glass is **0.255** litres.

(b) Greatest number we can sure to fill $= \frac{3.45}{0.255} = 13.52$
Therefore the answer is 13

12- (a) Diagram 2

(b)



13- $x = \dfrac{4+\sqrt{y}}{3}$

$4 + \sqrt{y} = 3x$

$\sqrt{y} = 3x - 4$

$y = (3x-4)^2$

14- (a) angle 50 in the second quadrant

$= 180 - 50 = 130$

$\therefore \quad x = 130°$

(b) angle 50 in the third and fourth quadrant $= 180 + 50$ and $360 - 50$

$= 230°$, $310°$

$x = 230$ or $x = 310$

15- $\dfrac{4x-3}{8} - \dfrac{3x-4}{12}$

$= \dfrac{3(4x-3)-2(3x-4)}{24}$

$= \dfrac{12x-9-6x+8}{24} = \dfrac{6x-1}{24}$

16- (a) Time = 1116 - 0940 = 1.6 h

Length of the race = 30 x 1.6 = 48 Km

(b) Difference = 1.6 - 1 h 25 min 27 sec

= 10 min 33 sec

17- (a) The size of the interior angle of a regular hexayan $= 180 - \dfrac{360}{n}$

$= 180 - \dfrac{360}{6} = 120°$

Size of the interior angle of the n – sided polygon = 120 + 48 = 168

(b) exterior angle of the n – sided polygon = 180 - 168 = 12

$$n = \frac{360}{12} = 30$$

18- (a) area $= \frac{\theta}{360}\pi r^2$

$$= \frac{40}{360} \times \pi \times 6^2 = 12.566\ cm^2$$

answer area $= 12.6 cm^2$

(b) (i) area of one hole $= \pi r^2$

$$= \pi(0.3)^2 = 0.2827 = 0.283 cm^2$$

(ii) Area of the brooch = 12.566 - 4 x 0.2827

$= 11.4\ cm^2$

19- (a) (i) $(x^2-1)(x^2+1) = x^4 - 1$

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

(b) $9999 = 3^2 \times 11 \times 101$

3	9999
3	3333
11	1111
101	101
	1

20- (a) $f(x) = \frac{x+1}{3x}$

(i) $f\left(\frac{3}{4}\right) = \frac{\frac{3}{4}+1}{3\times\left(\frac{3}{4}\right)} = \frac{\frac{7}{4}}{\frac{9}{4}} = \frac{7}{9}$

(ii) $gf\left(\frac{3}{4}\right) = g\left(\frac{7}{9}\right) = 3 - 3\left(\frac{7}{9}\right)$

$$= 3 - \frac{21}{9} = \frac{6}{9} = \frac{2}{3}$$

(b) $g(x) = 3 - 3x$

$y = 3 - 3x$

$3x = 3 - y$

$x = \frac{3-y}{3}$

$g^{-1}(x) = \frac{3-x}{3}$

$g^{-1}(18) = \frac{3-18}{3} = -5$

21- w = 90° (angle of a semicircle)

x = 20° (isosceles triangle)

y = 40° (exterior angle of a triangle)
z = 180° - ∠D
∠D = 90 – 40 = 50
z = 180 – 50 = 130°

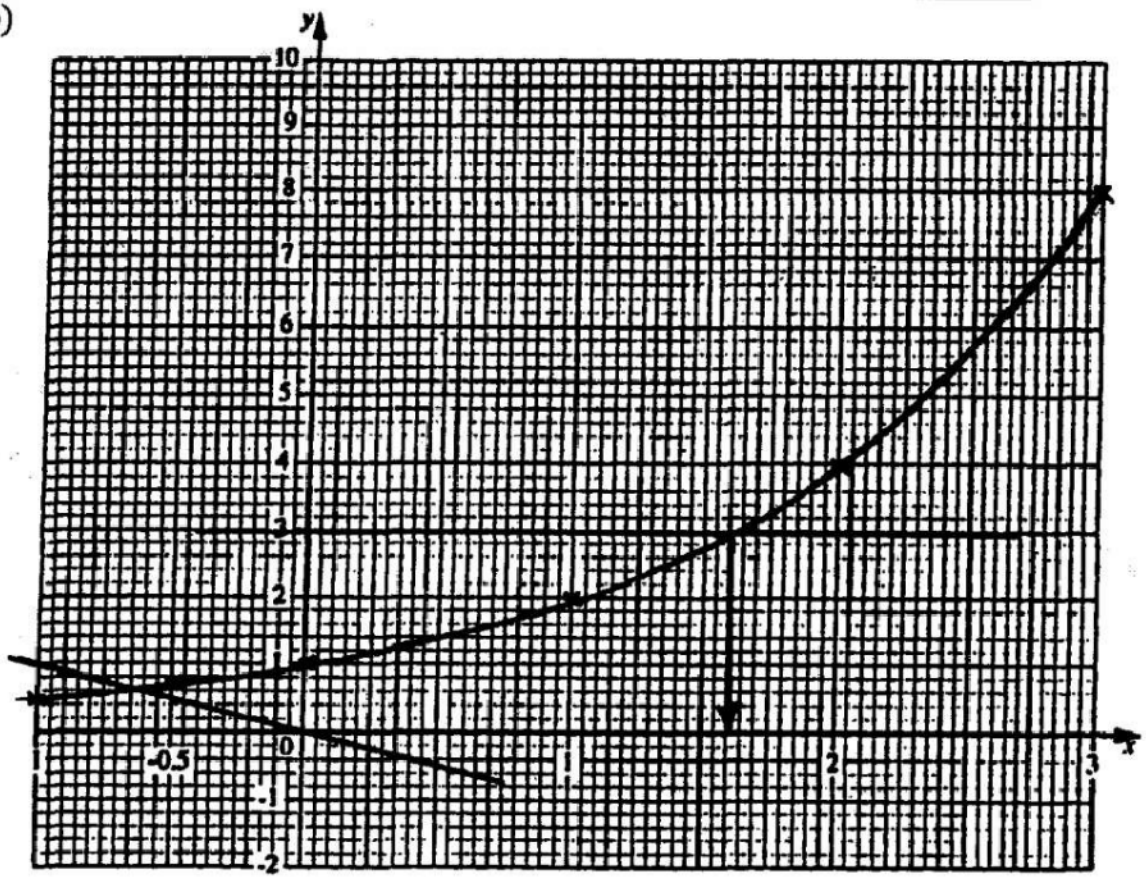
22- (a) (i) $\overrightarrow{WP} = \overrightarrow{WO} + \overrightarrow{OP} = -W + P = P - W$
(ii) $\overrightarrow{OB} = \overrightarrow{OA} + \overrightarrow{AB} = 3P + 3W$
(iii) $\overrightarrow{RV} = \overrightarrow{RW} + \overrightarrow{WV} = -3P + W = W - 3P$

(b) $\left|\overrightarrow{OB}\right| = \sqrt{(OA)^2 + (AB)^2} = \sqrt{15^2 + 15^2} = 21.2$

23- (a)

x	-1	-0.5	0	1	2	3
$f(x)$	***0.5***	***0.71***	***1.0***	***2***	***4***	***8***

(b)



(c) (i) $2^x = 3$
From graph y = 3 ∴ x = 1.6
(ii) Draw the line y = - x Using points (0 , 0) and (- 1 , 1)
The point of intersection with the curve is at x = - 0.6
Answer x = - 0.6

Mathematics 0580

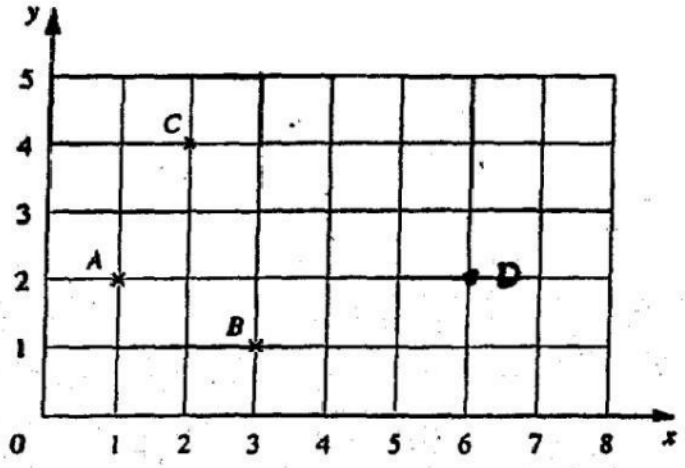
November 2001

Paper 2

1. $3.2 \times 5 - 2(4.1 - 2.9) = 13.6$

2. 4 [.,,,] 39 [.,,,] + 17 [.,,,] 36 [.,,,] = 22° 15° ,: e 22 15 h

3.



$$\overrightarrow{AB} = \begin{pmatrix} 2 \\ -1 \end{pmatrix} \qquad \overrightarrow{CD} = \begin{pmatrix} 4 \\ -2 \end{pmatrix}$$

$$\begin{pmatrix} 2 \\ 4 \end{pmatrix} + \begin{pmatrix} 4 \\ -2 \end{pmatrix} = \begin{pmatrix} 6 \\ 2 \end{pmatrix}$$

$\therefore$ point D is (6, 2)

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

4. (a) Difference $= 5.66 \times 10^{14} - 5.17 \times 10^{14}$
$= 4.9 \times 10^{14}$

(b) 530 nanometers $= 530 \times 10^{-9}$
$= 5.3 \times 10^{-7}$

5. $4 - 4 \times \frac{1}{100} = 3.96$

3.96 [shift] [.,,,] 3° 57° 36 3 h 57 m 36 s

6. $I = \frac{PRT}{100}$

$I = 39 \qquad R = 4 \qquad T = \frac{9}{12}$

$$39 = \frac{P \times 4 \times \frac{9}{12}}{100} = \frac{3P}{100}$$

$$P = \frac{100 \times 39}{3} = 1300$$

7. 0.75 tonnes = 0.75 x 1000 = 750 kg
error = 750 - 650 = 100 kg
60 000 grams = 60 kg
error = 650 - 60 = 590 kg

8. (a) 1 kilobyte = 2^{10} bytes
= 8 x 2^{10} bits
= $2^3 \times 2^{10} = 2^{13}$ bits
x = 13

(b) 4 kilobytes = $4 \times 2^{13} = 2^2 \times 2^{13} = 2^{15}$
y = 15

9. $\angle x = 2 \times 70 = 140°$
$\angle y = 90 - 40 = 50°$
$\angle z = y - \left(\frac{180 - x}{2}\right)$
$= 50 - \left(\frac{180 - 140}{2}\right)$
$= 30°$

10. (a) $6x^2 + 6x = 6x(x+1)$

(b) $6x^2 + 5x + 1 = (3x+1)(2x+1)$

11. Sam of inferior angles = $(n-2) \times 180$
$= (5-2) \times 180 = 540$
$2x + 3x + 4x + 5x + 6x = 540$
$20x = 540$
$x = 27$
Smallest angle = $2x = 54°$

12. (a) $\cos x = \frac{1}{2}$

shift $\cos \frac{1}{2} = 60°$

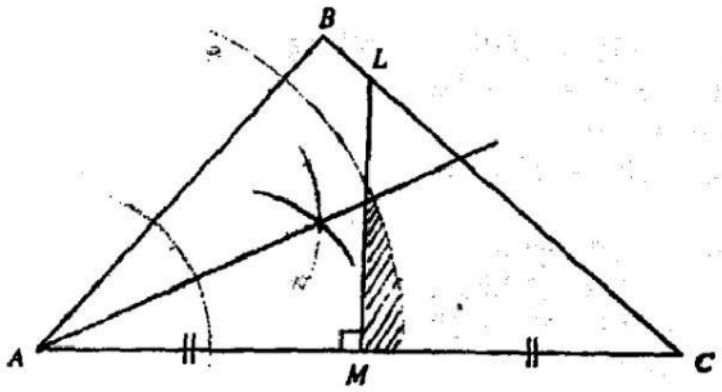
cosine is positive in the first and fourth quadrant

$\therefore$ x = 60° or 360 - 60

x = 60° or 300°

(b) from graph $270 < x < 300$

13.



14. $I = K\sqrt{P}$

$4 = K\sqrt{100}$ $\quad K = 0.4$

(a) $I = 0.4\sqrt{P}$

(b) P = 144

$I = 0.4\sqrt{144} = 0.4 \times 12$

$= 4.8$

15. (a) smallest A C is 2.5 cm

(b) $\tan A = \frac{BC}{AC}$

$\text{Largest } \tan A = \frac{\text{Largest BC}}{\text{Smallest AC}}$

$= \frac{10.5}{2.5} = 4.2$

Largest angle A = 76.6°

16. (a) Number of rands $= \frac{x}{24}$

(b) $\frac{x}{24} = 500 + 800$

$x = 24 \times 1300 = 31200$

17. (a)

Mass kg	$0 < x \leq 2$	$2 < x \leq 5$	$5 < x \leq 9$	$9 < x \leq 15$
Frequency	10	$3 \times 4 = 12$	$4 \times 3.5 = 14$	12

Frequency is the area

(b) Bar height $= \frac{12}{(15-9)} = \frac{12}{6} = 2$

A bar of height 2 units is drawn from x = 9 to x = 15

18. $y = \frac{3x}{2} + 5$

$y - 5 = \frac{3x}{2}$

$3x = 2(y-5)$

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

19. (a) $\overrightarrow{OP} = 6P$

$\therefore \overrightarrow{OA} = \overrightarrow{AB} = \overrightarrow{BP} = 2P$

$\overrightarrow{OB} = 4P$

(b) $\overrightarrow{BC} = \overrightarrow{BO} + \overrightarrow{OC} = \overrightarrow{OC} - \overrightarrow{OB}$

$= 2q - 4P$

(c) $\overrightarrow{AQ} = -2P + q = q - 2P$

(d) $\overrightarrow{BC} = 2\overrightarrow{AQ}$

$\therefore$ BC is parallel to AQ

20. (a) $\angle KTP = 70°$

(b) $\frac{KT}{\sin 35} = \frac{25}{\sin 70}$

$KT = \frac{25 \sin 35}{\sin 70} = 15.3 \text{ m}$

21. (a) Diagonals bisect each other for figures A, B, C, D

Probability $= \frac{4}{5}$

(b) A, C, E

(c) Parallelogram (B)
Rhombus (C)
Rectangle (D)

22. (a) $d = 42°$
$e = 74°$
$f = 64°$

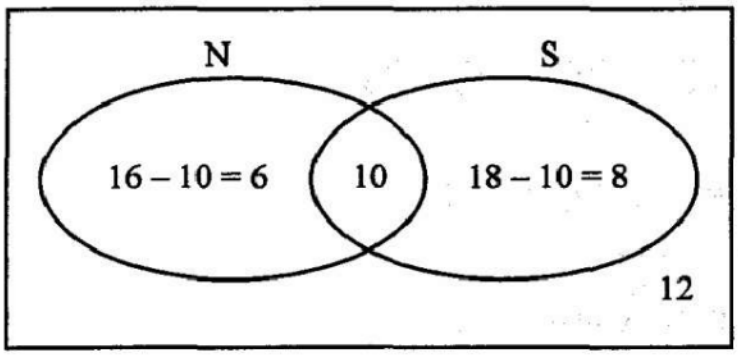
(b) 252°

23. (a) $\frac{1}{2} \times 36 = 18$

$\frac{4}{9} \times 36 = 16$

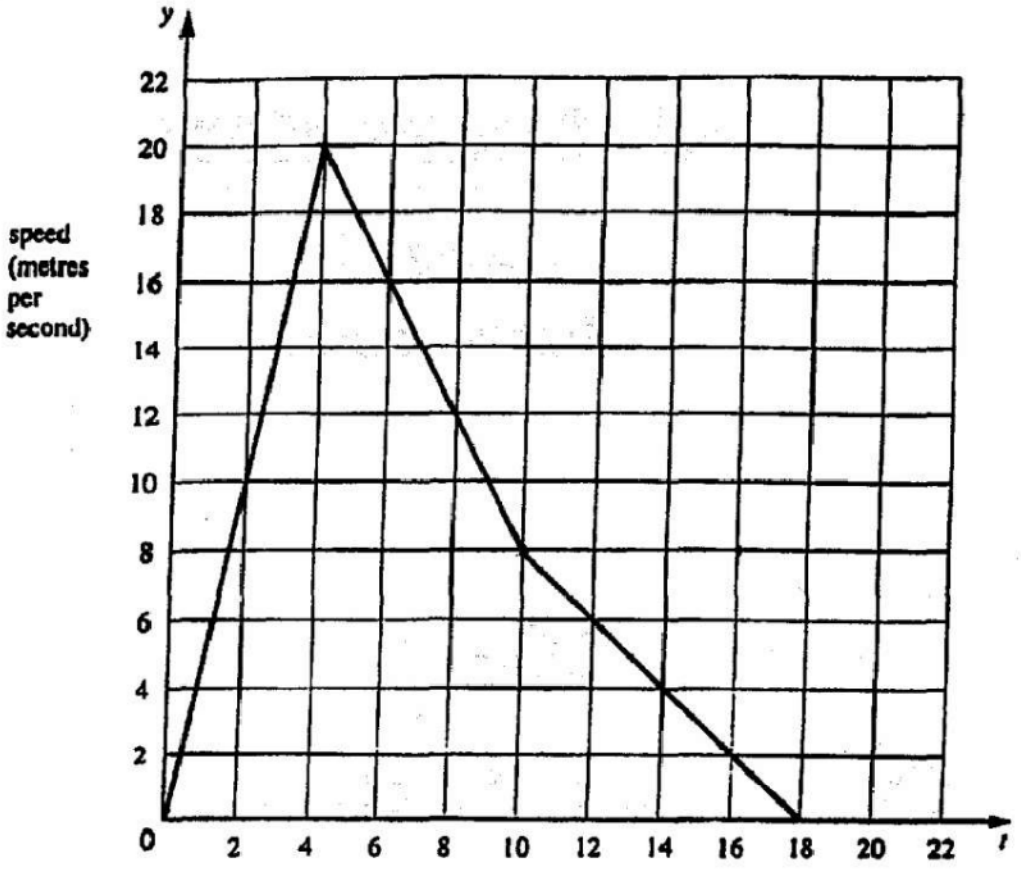
$\frac{1}{3} \times 36 = 12$

intersection of two sets $= 18 + 16 - (36 - 12) = 10$



(b) Probability $= \frac{10}{36} = \frac{5}{18}$

24. (a)



(b) Deceleration $d = \frac{\text{Change in speed}}{\text{Time}} = \frac{8}{8} = 1$

$d = 1$

(c) Distance = area of triangle $= \frac{1}{2} \times 4 \times 20 = 40$ m