



IGCSE

Mathematics
O.L

**Answers to
Examination
Papers**

June 1993 - June 2003

Math O.L
Answers
contant

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**Answers to
Examination
Paper**

2

June 1993

Paper 2

- 1- (a) $3.5 - (-1.5) = 5$
- (b) $3.5 - 4.75 = -1.25$

2- $PQ = \sqrt{(2-0)^2 + (-1-4)^2}$
 $= \sqrt{2^2 + 5^2}$
 $= \sqrt{29} = 5.385$
 $= 5.39$

3- $8x = 12$ adding given equations
 $x = \frac{12}{8} = 1.5$ or $1\frac{1}{2}$

4- $2.70 \times 10^8 + 1.02 \times 10^9 = 1.29 \times 10^9$
 using calculator $2.7 \text{ Exp } 8 + 1.02 \text{ Exp } 9 = 1.29 \text{ Exp } 9$
 $= 1.29 \times 10^9$

5-

	1990	1991	
percent	100	97	
actual	?	6.305	
	$\frac{6.305 \times 100}{97}$		= 6.5

6- $010 + 180 = 190^\circ$

7- 4 Swiss Francs = 4×1.23 D.M
 $= 4.92$ D.M
 no. of bottles = $\frac{4.92}{0.55} = 8.945$
 $= 8$

8- (a) $\frac{33x^2}{11x^{-4}} = \frac{33x^2 \cdot x^4}{11} = 3x^6$

(b) $\left(\frac{27}{64}\right)^{2/3} = \left[\sqrt[3]{\frac{27}{64}}\right]^2 = \left(\frac{3}{4}\right)^2 = \frac{9}{16}$

9-

Mark x	5	6	7	8	9	10	
Frequency f	2	0	10	9	5	4	30
fx	10	0	70	72	45	40	237

(a) 7

(b) $\frac{237}{30} = 7.9$

10- (a) $= \frac{\frac{1}{8} + 1}{3} = \frac{\frac{9}{8}}{3} = \frac{3}{8}$

(b) $\begin{array}{c} \xrightarrow{x \quad \boxed{+1} \quad \boxed{\div 3} \quad f(x)} \\ \xleftarrow{f^{-1}=3x-1 \quad \boxed{-1} \quad \boxed{\times 3} \quad x} \end{array}$ OR $y = \frac{x+1}{3}$

$$3y = x + 1$$

$$3y - 1 = x$$

$$x = 3y - 1$$

$$f^{-1} = 3x - 1$$

11-(a) $\frac{10000}{225000} = \frac{10}{225} = \frac{2}{45}$

(b) $\frac{2}{45} \times 100$
 $= 4\frac{4}{9}\% \quad \text{or} \quad 4.44\%$

12-(a) $2M = 2 \begin{pmatrix} 1 & 2 \\ -1 & 3 \end{pmatrix} = \begin{pmatrix} 2 & 4 \\ -2 & 6 \end{pmatrix}$

(b) $M^{-1} = \frac{1}{3 - (-2)} \begin{pmatrix} 3 & -2 \\ 1 & 1 \end{pmatrix}$
 $= \frac{1}{5} \begin{pmatrix} 3 & -2 \\ 1 & 1 \end{pmatrix}$
 $= \begin{pmatrix} \frac{3}{5} & -\frac{2}{5} \\ 1 & 1 \end{pmatrix} \quad \text{or} \quad \frac{1}{5} \begin{pmatrix} 3 & -2 \\ 1 & 1 \end{pmatrix}$

13-(a) $25.5 \text{ cm} \leq d < 26.5 \text{ cm}$

(b) $C = 2\pi r = \pi d$

$$3 \times 25.5 = 76.5$$

$$3.2 \times 26.5 = 84.8$$

$$76.5 \text{ cm} < C < 84.8 \text{ cm}$$

$$14- \quad P = \frac{k}{v}$$

$$70 = \frac{k}{0.5}$$

$$k = 35$$

$$P = \frac{35}{v}$$

$$28 = \frac{35}{v}$$

$$\therefore v = 1.25$$

$$15- \quad \text{Time} = \frac{465}{30} = 15.5 \text{ hours} = 15 \text{ h } 30 \text{ min}$$

$$18 \text{ h } 40 \text{ min} + 15 \text{ h } 30 \text{ min} = 34 \text{ h } 10 \text{ min}$$

$$34 \text{ h } 10 \text{ min} - 24 \text{ h} = 10 \text{ h } 10 \text{ min}$$

$$= 10 : 10$$

$$16-(a) \quad \$ 70$$

(b) p is the intersection of the line with y axis

$$p = 35$$

$$\text{additional cost per hour} = 55 - 35 = 20$$

$$p = 35$$

$$q = 20$$

$$17- \quad \tan \theta = \frac{4}{7} \quad \theta = 29.74^\circ$$

$$\angle APB = 2\theta = 59.48$$

$$= 59.5^\circ$$

$$18- \quad \frac{1}{4} \pi r^2 = 16.5$$

$$r^2 = \frac{16.5 \times 4}{\pi} = \frac{16.5 \times 4}{3.142} = 21.006$$

$$r = 4.58$$

$$19-(a) \quad -5 \leq 2x + 1$$

$$-6 \leq 2x$$

$$-3 \leq x$$

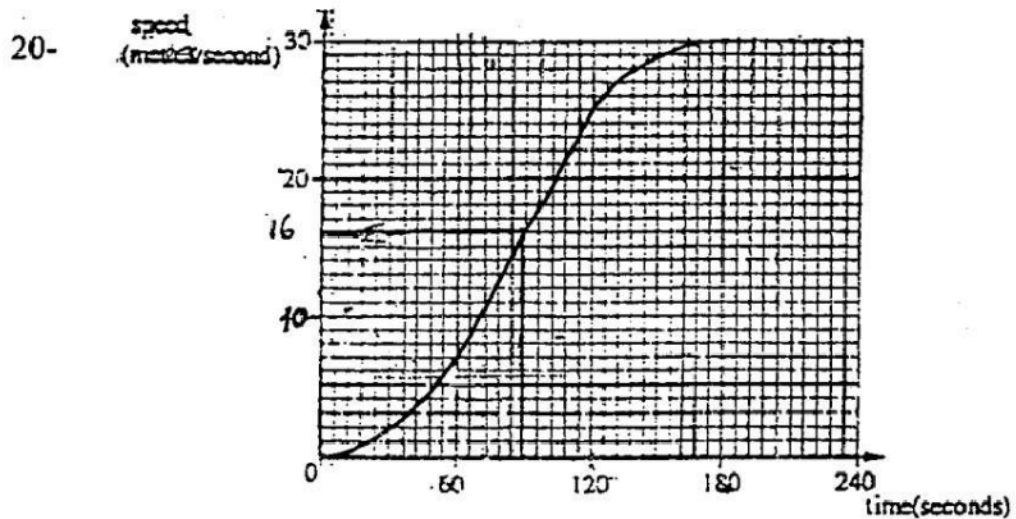
$$2x + 1 < 5$$

$$2x < 4$$

$$x < 2$$

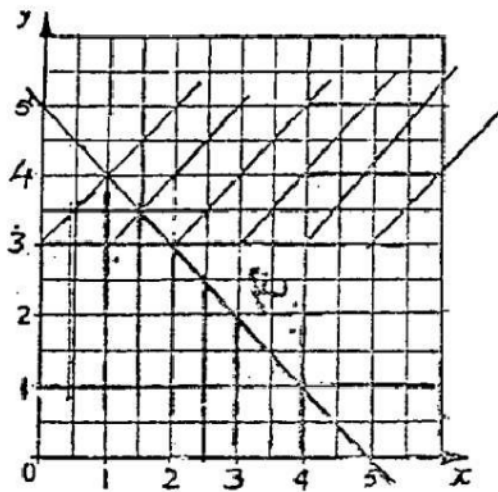
$$\{x: -3 \leq x < 2\}$$

(b) $\{-3, -2, -1, 0, 1\}$

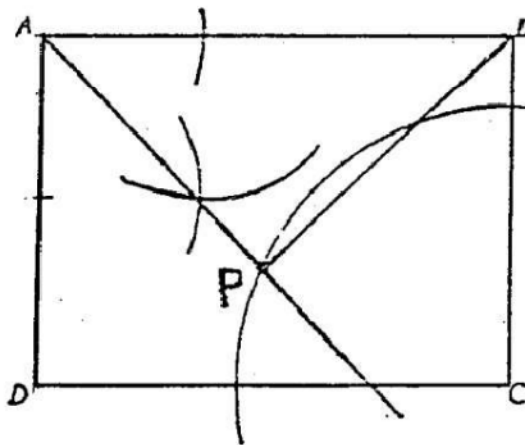


- (a) from graph = 16 m/s
- (b) from 60 s to 120 s the graph is a straight line
- $$\text{acceleration} = \frac{\text{change in speed}}{\text{time}} = \frac{25 - 7}{60} = \frac{18}{60} = 0.3 \text{ m/s}^2$$

21-



22-



(b) $BP = 4.9 \text{ cm}$

23-(a) $4x^2(x - 2y^2)$

(b) (i) $(2x + 3)(x - 2)$

$$(ii) 2x^2 - x - 6 = 0$$

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

$$2x + 3 = 0 \quad \text{or} \quad x - 2 = 0$$

$$x = -\frac{3}{2} \quad \text{or} \quad x = 2$$

24- (a) PQ is parallel to OR and equal $\frac{1}{2}$ of it

$$\overrightarrow{PQ} = \frac{1}{2}r$$

$$(b) \overrightarrow{QR} = \overrightarrow{QP} + \overrightarrow{PO} + \overrightarrow{OR}$$

$$= -\frac{1}{2}r - p - r$$

$$= \frac{1}{2}r - p$$

$$(c) \overrightarrow{OS} = \overrightarrow{OR} + \overrightarrow{RS}$$

$$= r - p$$

Nov. 1993

Paper 2

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

(b) $3^2 \div 2^{-3}$
 $= 9 \div \frac{1}{8} = 72$

or using calculator

2- $\frac{3x-4}{2} = 7$

$$3x - 4 = 14$$

$$3x = 18$$

$$x = 6$$

3- $1.42 \times 10^9 - 1.5 \times 10^8 = 1.27 \times 10^9$

4- $3 \frac{2}{9} \text{ m} = 3.22222 \text{ m}$

$$32.4 \text{ cm} = 0.324 \text{ m}$$

$$32.4 \text{ cm} < 3.22 \text{ m} < 3 \frac{2}{9} \text{ m}$$

5- $\text{Time} = \frac{\text{Distance}}{\text{speed}}$

$$\begin{aligned} \text{maximum time} &= \frac{\text{Distance}}{\text{Least speed}} \\ &= \frac{575}{11.5} = 50 \end{aligned}$$

6- no. of sides are 7

$$\text{Sum of all interior angles} = (2 \times 7 - 4) \times 90 = 900$$

$$\text{Sum of the five equal angles} = 900 - (100 + 100) = 700$$

$$\text{each angle} = \frac{700}{5} = 140$$

$$\text{Angle BCD} = 140^\circ$$

$$7- (a) = \frac{3(-4)+2}{-4-1}$$

$$= \frac{-10}{-5} = 2$$

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

$$3x+2 = 4x-4$$

$$2+4 = 4x-3x = x$$

$$x = 6$$

$$8- (a) \frac{1}{4} + \frac{1}{3} + \frac{1}{8} = \frac{6+8+3}{24} = \frac{17}{24}$$

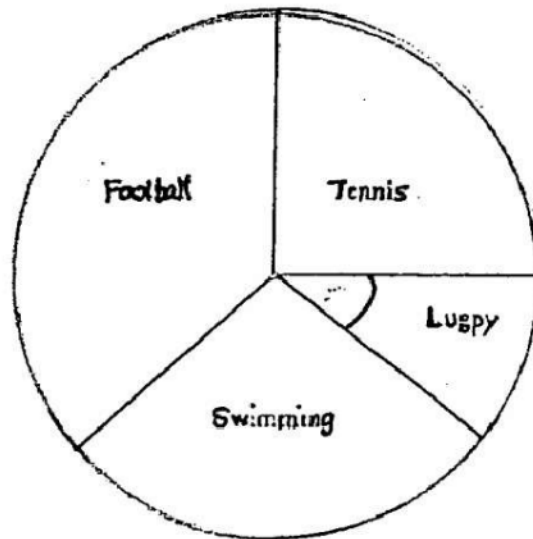
$$1 - \frac{17}{24} = \frac{7}{24}$$

$$(b) \frac{1}{8} \times 360 = 45^\circ$$

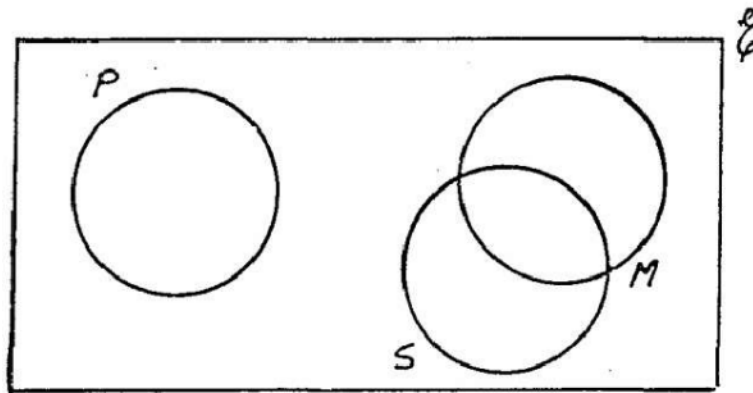
$$(c) \frac{1}{3} \quad 32$$

$$\frac{1}{4} \quad ? = \frac{\frac{1}{4} \times 32}{1/3} = \frac{8 \times 3}{1}$$

$$= 24$$



9-



$$(a) \mathcal{U} = \{x : 20 < x < 40\}$$

$$P = \{x : x \text{ is a prime number}\} = \{23, 29, 31, 37\}$$

$$M = \{x : x \text{ is a multiple of 3}\} = \{21, 24, 27, 30, 36, 39\}$$

$$S = \{x : x \text{ is a square number}\} = \{25, 36\}$$

$$(b) P \cap S = \Phi$$

$$(c) M \cup S = \{21, 24, 25, 27, 30, 33, 36, 39\}$$

$$n(M \cup S) = 8$$

$$10- \quad 2v = hk(a + B)$$

$$\frac{2v}{hk} = a + b$$

$$\frac{2v}{hk} - b = a$$

$$11- (a) \Delta_s \text{ DCB and DEA are similar}$$

$$(b) 7x = 1.7x + 8.5$$

$$5 + 3x = 8.5 \quad x = \frac{8.5}{5.3} = 1.604 = 1.6$$

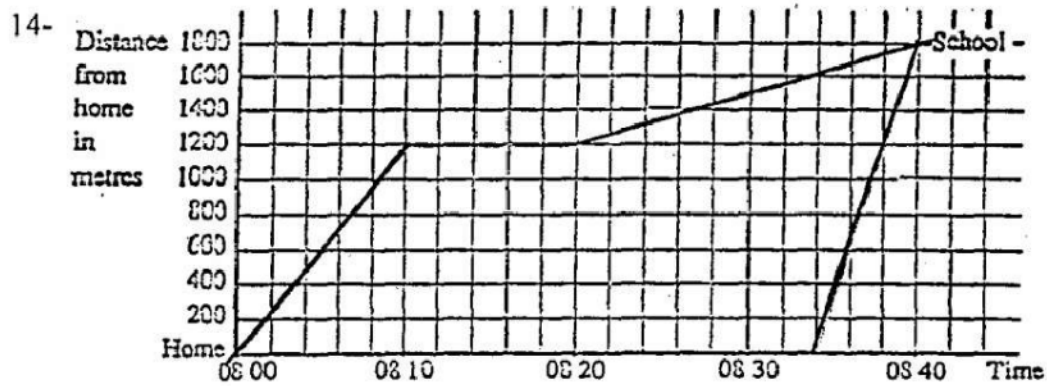
12- (a) 4 .

(b) (i) $\text{Area} = \pi R^2 - 4 \pi r^2$

(ii) $\pi (R^2 - 4 r^2)$
 $= \pi (R + 2 r) (R - 2 r)$

13- (a) $3 \begin{pmatrix} 3 \\ 5 \end{pmatrix} - 4 \begin{pmatrix} -2 \\ 3 \end{pmatrix}$
 $= \begin{pmatrix} 9 \\ 15 \end{pmatrix} - \begin{pmatrix} 8 \\ 12 \end{pmatrix} = \begin{pmatrix} 9-8 \\ 15-12 \end{pmatrix} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$

(b) $= \sqrt{(-2)^2 + (3)^2}$
 $= \sqrt{13}$
 $\sqrt{13} = 3.61$



(a) $\text{Speed} = \frac{\text{distance}}{\text{time}} = \frac{1200}{10 \times 60} = 2 \text{ m/s}$

(b) (ii) $\text{Time} = \frac{1800}{5} = 360 \text{ sec}$

$360 \text{ sec} = 6 \text{ min}$

$\text{time of departure} = 8 : 40 - 6 \text{ min} = 8 : 34$

$$\begin{aligned}
 15- (a) \text{ distance} &= \sqrt{(7-11)^2 + (4-1)^2} \\
 &= \sqrt{16+9} \\
 &= 5
 \end{aligned}$$

$$(b) \text{ CS} = 5$$

$$\text{greatest distance} = 5 + 3 = 8$$

$$\begin{aligned}
 16- (a) (i) \angle \text{CAB} &= \angle \text{CDB} \\
 &= x^\circ
 \end{aligned}$$

$$(ii) \angle \text{AED} = x + y$$

exterior angle of a Δ

$$\angle \text{AED} = (x + y)^\circ$$

$$(b) \frac{\text{area } \Delta \text{ ABE}}{\text{area } \Delta \text{ DCE}} = \left(\frac{\text{BE}}{\text{CE}}\right)^2 = \left(\frac{4}{5}\right)^2 = \frac{16}{25}$$

$$\Delta \text{ ABE} : \Delta \text{ DCE} = 16 : 25$$

$$17- \overrightarrow{\text{OC}} = \overrightarrow{\text{3OP}} = 3\mathbf{p}$$

$$\overrightarrow{\text{OD}} = \overrightarrow{\text{4OQ}} = 4\mathbf{q}$$

$$\begin{aligned}
 (a) \overrightarrow{\text{CD}} &= \overrightarrow{\text{OD}} - \overrightarrow{\text{OC}} \\
 &= 4\mathbf{q} - 3\mathbf{p}
 \end{aligned}$$

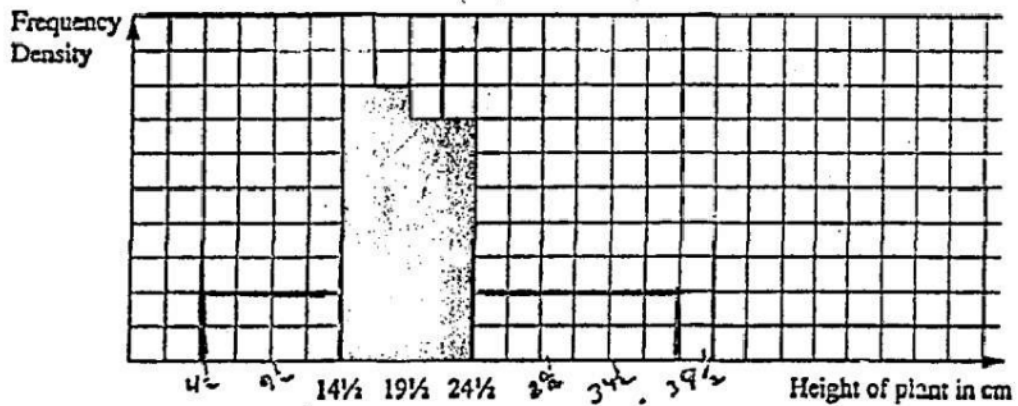
$$\begin{aligned}
 (b) \overrightarrow{\text{OM}} &= \frac{1}{2}(\overrightarrow{\text{OC}} + \overrightarrow{\text{OD}}) \\
 &= \frac{1}{2}(3\mathbf{p} + 4\mathbf{q}) \\
 &= 1\frac{1}{2}\mathbf{p} + 2\mathbf{q}
 \end{aligned}$$

- (a) $x + y < 30$
 $y > 17$
- (c) (i) $y - x = 8$
- (d) Solution is the point marked above
 $x = 10$ $y = 18$
 $10 + 18 = 28$

20-

Height in cm	Number of plants	Frequency density	Comulative frequency
5 - 14 4½ - 14½	4	$\frac{4}{10} = 0.4$	4
15 - 19 14½ - 19½	8	$\frac{8}{5} = 1.6$	12
20 - 24 19½ - 24½	7	$\frac{7}{5} = 1.4$	19
25 - 39 24½ - 39½	6	$\frac{6}{15} = 0.4$	25

(a)



(b) median is No. $\frac{25+1}{2} = 13$

$$\text{median} = 19\frac{1}{2} + \frac{13-12}{19-12} \times (24\frac{1}{2} - 19\frac{1}{2}) = 20.2$$

(c)

Height in cm	Mid-interval value (x)	Frequency (f)	fx
5 - 14	9½	4	38
15 - 19	17	8	136
20 - 24	22	7	154
25 - 39	32	6	192
		25	520

$$\text{Mean} = \frac{520}{25} = 20.8 \text{ cm}$$