Marking Scheme Paper 1

1. Find GCD of 280cm, 336cm, 476cm and 420cm

2	280	336	476	420
2	140	168	238	210
7	70	84	119	105
	10	12	17	15

M_1 - correct table

The greatest possible length is

$2 \times 2 \times 7 = 28cm$ ——— $M_1 A_1$

3 mks

2. $\frac{3}{5} \div \frac{2}{3} - \frac{1}{6} \times \frac{7}{12}$ of $\left(\frac{1}{2} + \frac{4}{5}\right)$

$= \frac{3}{5} \div \frac{2}{3} - \frac{1}{6} \times \frac{7}{12}$ of $\frac{13}{10}$ (brackets first) ——— M_1

$= \frac{3}{5} \div \frac{2}{3} - \frac{1}{6} \times \frac{7}{12} \times \frac{13}{10}$ ('of' next) ——— M_1

$= \frac{3}{5} \times \frac{3}{2} - \frac{1}{6} \times \frac{7}{12} \times \frac{13}{10}$ (division next)

$= \frac{9}{10} - \frac{91}{720}$ (Multiplication next) ——— M_1

$= \frac{648 - 91}{720} = \frac{557}{720}$ (finally subtraction) ——— A_1

4 mks

3. length of outer rectangle $= 50 + 1 + 1 = 52m$

Breath of outer rectangle $= 40 + 1 + 1 = 42m$

$\therefore$ Area of lawn together with the path

$= 52m \times 42m$

$= 2\,184m^2$ ——— M_1

Area of the lawn $= 50m \times 40m$

$= 2\,000m^2$

$\therefore$ Area of the path alone $= 2\,184m^2 - 2\,000m^2$ ——— M_1

$= 184m^2$ ——— A_1

3 mks

4. Length of Major arc + Minor arc = Circumference

$2\pi r = 154 + 110$

$2 \times \frac{22}{7} \times r = 264$ ——— M1

$r = 264 \times \frac{7}{22} \times \frac{1}{2} = 42\text{cm}$ ——— A1

If the angle is x, then;

$\frac{x}{360} \times 2\pi r =$ arc length

$\frac{x}{360} \times 2 \times \frac{22}{7} \times 42 = 110$ ——— M1

$x = \frac{110 \times 7 \times 360}{2 \times 22 \times 42}$

$x = 150^\circ$ ——— A1

4MKS

5 $\log_{10} 20 + \log_{10} 40 - \log_{10} 8 = \log_{10}\left(\frac{20 \times 40}{8}\right)$ ——— M1

$= \log_{10} 100$

$= 2$ ——— A1

2MKS

6 Good eggs: $\frac{90}{100} \times 360 = 324$ trays

1 tray = 30 eggs 1 dozen = 12 eggs

∴ Good eggs are $\frac{324 \times 30}{12} = 810$ dozens ——— M1

Cost price of eggs $= 360 \times 120$

Selling price of good eggs $= \frac{150}{100} \times 360 \times 120$ ——— M1

∴ Selling price per dozen $= \frac{150}{100} \times \frac{360 \times 120}{810}$ ——— M1

$=$ Sh 80 ——— A1

4MKS

7. In Matrix form, the eqn is;

$$\begin{pmatrix} 4 & -5 \\ 3 & -2 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 13 \\ 8 \end{pmatrix} \quad \ldots\ldots (i)$$ — M_1

Take coefficients Matrix $M = \begin{pmatrix} 4 & -5 \\ 3 & -2 \end{pmatrix}$

$$\det. M = (4 \times -2) - (3 \times -5)$$
$$= (-8) - (-15)$$
$$= 7$$

Inverse $M^{-1} = \frac{1}{7}\begin{pmatrix} -2 & 5 \\ -3 & 4 \end{pmatrix}$

Pre-Multiply both sides of eqn(i) by M^{-1}

$$\Rightarrow \frac{1}{7}\begin{pmatrix} -2 & 5 \\ -3 & 4 \end{pmatrix}\begin{pmatrix} 4 & -5 \\ 3 & -2 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{7}\begin{pmatrix} -2 & 5 \\ -3 & 4 \end{pmatrix}\begin{pmatrix} 13 \\ 8 \end{pmatrix}$$ — M_1

$$I\begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{7}\begin{pmatrix} -2 \times 13 + 5 \times 8 \\ -3 \times 13 + 4 \times 8 \end{pmatrix}$$

$$\begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{7}\begin{pmatrix} -26 + 40 \\ -39 + 32 \end{pmatrix}$$

$$\begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{7}\begin{pmatrix} 14 \\ -7 \end{pmatrix}$$

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

$\therefore x = 2,\ y = -1$ — A_1 (both)

3MKS

8. Original total Marks $= 41 \times 30 = 1\,230$

New total Marks $= 42{\cdot}5 \times 30 = 1\,270$ — M_1

$\therefore$ Marks added $= 1\,275 - 1\,230$

$= 45$ — A_1

Karimi got $4/9 \times 45 = 20$

Nduku got $3/9 \times 45 = 15$ — m_1

Hence Karimi got 5 more Marks. — A_1

4MKS

9. $\frac{b^2}{4a} = c$

$\frac{1}{3} + k = 1$

$\frac{(-10)^2}{4 \times 25} = \frac{1}{3} + k$ ——— M_1

$k = \frac{2}{3}$ ✓ A_1

$\frac{100}{100} = \frac{1}{3} + k$

$1 = \frac{1}{3} + k$ ——— M_1 simplification

3mk

10. $3 - 2x < x - 3$ | $x - 3 \leq 4$

$3 + 3 < 3x$ | $x \leq 7$ ——— B_1

$6 < 3x$

$2 < x$ ——— B_1

$2 < x \leq 7$

Integers $\{3, 4, 5, 6, 7\}$ ——— B_1 (All)

3mk

11. $\tan 60^\circ = \frac{5}{x}$

$x = \frac{5}{\tan 60^\circ} = 2.88675$

$\sin 60^\circ = \frac{5}{L}$

$L = \frac{5}{\sin 60^\circ} = 5.7735$

Area $= (5.7735 \times 10) + (\frac{1}{2} \times 10 \times 2.88675) \times 2$ ——— M_1 M_1

$= 57.735 + 28.8675$

$= 86.6025$

$= 86.60$ ——— A_1

3mk

12. Total time taken for the journey
Arrived time:

$\frac{1000}{60} + 2\frac{1}{3} = 19\text{hrs}$ ——— M_1

1130 + 1900 hrs

$= 3030 - 2400\text{hrs}$ ——— M_1

$= 0630\text{hrs}$

$\therefore$ Tuesday at 6.30 am ——— A_1

3 mk

13. $\frac{4}{x} - 1 = \frac{3-x}{x+3}$

$\frac{4-x}{x} = \frac{3-x}{x+3}$ ——— M_1

Cross Multiplying

$\Rightarrow (x+3)(4-x) = x(3-x)$ ——— M_1 Cross-multiply

$4x - x^2 + 12 - 3x = 3x - x^2$

$x + 12 = 3x$

$12 = 2x$

$\therefore x = 6$ ——— A_1

14. Distance moved in 1 revolution $= \pi d$

Distance covered in 1 minute $= 200\pi d$

$= 200 \times 22/7 \times 70\text{cm}$ ——— M_1

Distance moved in 1 hour

$= 200 \times 22/7 \times \frac{70 \times 60}{100 \times 1000}\text{ km}$ ——— M_1 conversion

Hence speed $= 26.4\text{km/hr}$ ——— A_1

3 mk

15. $p = 2a - \frac{1}{3}b + c$

$= 2\begin{pmatrix}1\\-2\\1\end{pmatrix} - \frac{1}{3}\begin{pmatrix}6\\-3\\9\end{pmatrix} + \begin{pmatrix}-3\\2\\3\end{pmatrix}$ — correct substitution — M_1

$= \begin{pmatrix}2\\-4\\2\end{pmatrix} - \begin{pmatrix}2\\-1\\3\end{pmatrix} + \begin{pmatrix}-3\\2\\3\end{pmatrix}$

$= \begin{pmatrix}2-2+-3\\-4--1+2\\2-3+3\end{pmatrix} = \begin{pmatrix}-3\\-1\\2\end{pmatrix}$

$\therefore |p| = \sqrt{(-3)^2+(-1)^2+(2)^2}$ — M_1

$= \sqrt{9+1+4}$

$= \sqrt{14}$

$= 3.74$ — A_1

3MK

16. 15% of goods sold = sh 11 250

100% of goods sold = ?

$\frac{11\,250 \times 100}{15}$ — M_1

= sh. 75 000. — A_1

2MK

SECTION B

17. a) i) Distance in $2\frac{1}{2} = 2.5 \times 60$ — M_1

$= 150\text{km}$ — A_1

ii) Time taken $= \frac{150}{100-60}$ — M_1

$= 3.75\text{hrs} = 3\text{hrs } 45\text{minutes}$ — A_1

Distance $= 3.75 \times 100$ — M_1

$= 375\text{km}$ — A_1

b) Time taken by bus:

$= \frac{125}{60}$ — M_1

$= 2\frac{1}{12}$ — A_1

$= 2\frac{1}{12}\text{hrs}$ or 2hrs 05 minutes

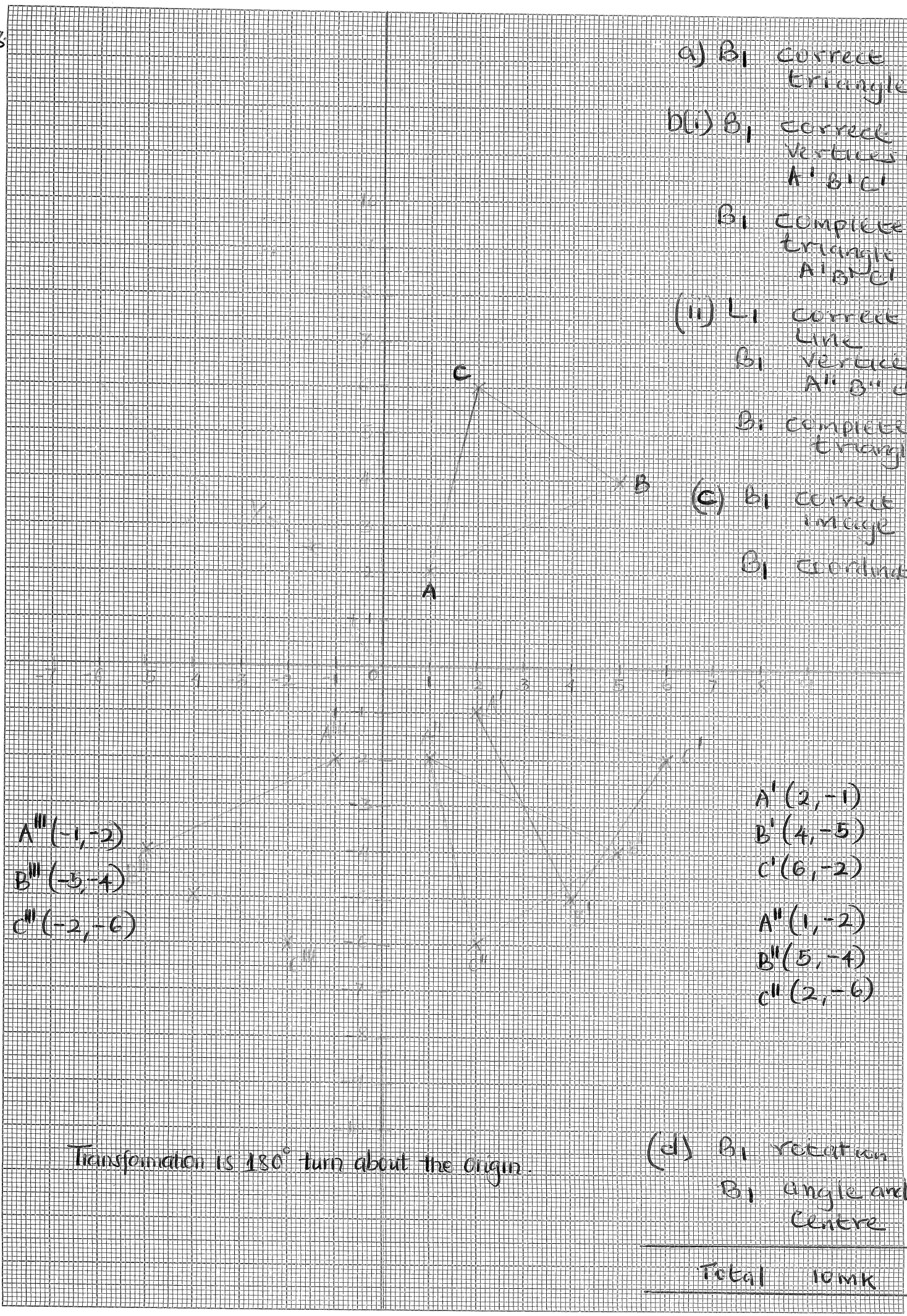
$\frac{25}{12} - 25/60 = 1\frac{2}{3}\text{hrs}$

Spd needed $= \frac{125}{1\frac{2}{3}}$ — M_1

$= 75\text{km}$ — A_1

Total 10mk

18.



a) B_1 correct triangle

b(i) B_1 correct vertices of $A'B'C'$

B_1 complete triangle $A'B'C'$

(ii) L_1 correct line

B_1 vertices $A''B''C''$

B_1 complete triangle

(c) B_1 correct image

B_1 coordinates

$A'(2,-1)$
$B'(4,-5)$
$C'(6,-2)$

$A''(1,-2)$
$B''(5,-4)$
$C''(2,-6)$

$A'''(-1,-2)$
$B'''(-3,-4)$
$C'''(-2,-6)$

(d) B_1 rotation

B_1 angle and centre

Transformation is 180° turn about the origin.

Total 10mk

19. a(i) $3(25) + 20 - 15$ — M_1

$75 + 20 - 15 = 80$ — A_1

ii) $3x^2 - 4x - 15 = 0$ — M_1 equating to zero

$3x^2 - 9x + 5x - 15 = 0$

$3x(x-3) + 5(x-3) = 0$

$(3x+5)(x-3) = 0$ — M_1

$3x + 5 = 0 \qquad x = 3$

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

Co-ordinates of turning point

$\left(-\frac{5}{3}, \frac{670}{27}\right) \quad (3, -26)$ — A_1

b) i) $\frac{ds}{dt} = 3t^2 - 12t + 8$ — M_1

$\frac{dv}{dt} = a = 6t - 12$ — M_1

When $t = 5$

$a = 30 - 12$

$a = 18 m/s^2$ — A_1

ii) at constant velocity, acceleration $= 0$.

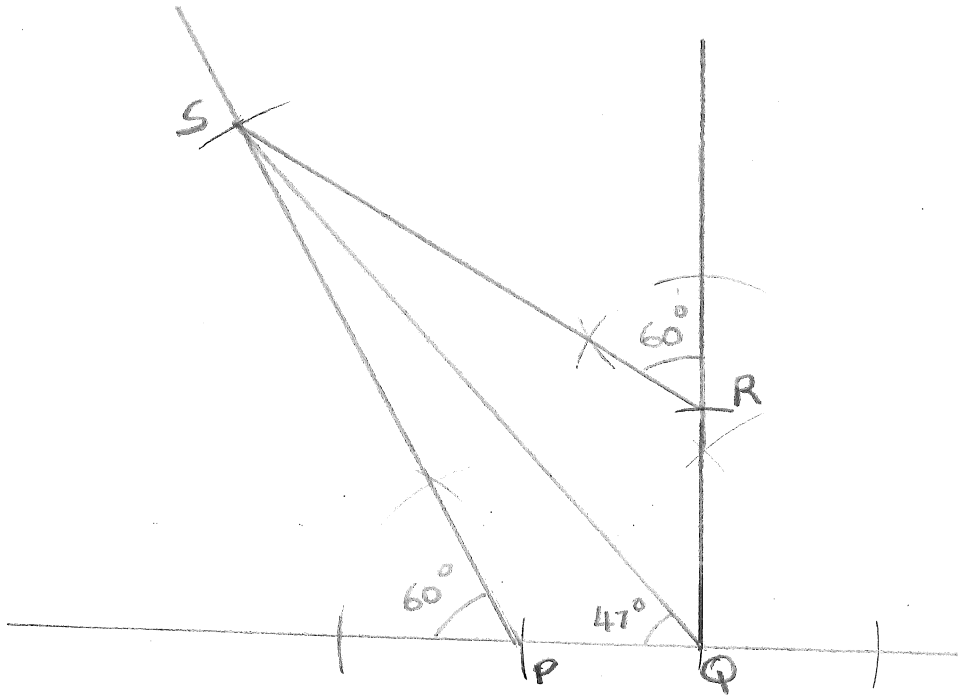
$6t - 12 = 0$ — M_1

$6t = 12$

$t = 2$ Seconds — A_1

10 MKS

20 a) Scale : 1cm = 50Km



Constructing
60° at P — B_1
90° at Q — B_1
60° at R — B_2
PQ = 2.4 ± 0.1 — B_1
QR = 3.2 ± 0.1 B_1

b i) Distance SP = 7.9 x 50 = 395 km (±5km) — B_1

ii) Distance SR = 7.4 x 50 = 370 km (±5km) — B_1

iii) Bearing of S from Q

= 270° + 47° = 317° (±1) — B_2

Total 10mks

21. a) $P \propto \frac{Q}{R^2}$

$P = K\frac{Q}{R^2}$

$18 = K\frac{24}{4^2} \Rightarrow K = \frac{18 \times 4^2}{24}$ — M_1

$K = 12$ — A_1

$Q = 30$ and $r = 10$

$P = 12\frac{Q}{R^2}$

$12 \times \frac{30}{10^2} = 3.6$ — $M_1 A_1$

b) $P = 12\frac{Q}{R^2}$ — B_1

c) $P = K\frac{\frac{120}{100^2}Q}{\left(\frac{90}{100}R\right)^2}$ — M_1

$P = K\frac{1.2Q}{(0.9R)^2} \Rightarrow P = K1.48\frac{Q}{R^2}$ — M_1

$P_{new} = 1.48P$ — A_1

d) $P = 1.48\left(K\frac{Q}{R^2}\right)$ — M_1

$P = \frac{148}{100}\left(K\frac{Q}{R^2}\right)$

P increases by 48% — A_1

10 MK

22 a) i) BA

$\vec{BA} = \vec{BO} + \vec{OA}$

$= -\underset{\sim}{b} + \underset{\sim}{a}$

$= \underset{\sim}{a} - \underset{\sim}{b}$ ——— B_1

ii) NB

$\vec{NB} = \frac{1}{3}\vec{AB}$

$= \frac{1}{3}\underset{\sim}{b} - \frac{1}{3}\underset{\sim}{a}$ ——— B_1

iii) ON

$\vec{ON} = \vec{OA} + \vec{AN}$

$= \underset{\sim}{a} + \frac{2}{3}\vec{AB}$

$= \frac{1}{3}\underset{\sim}{a} + \frac{2}{3}\underset{\sim}{b}$ ——— B_1

b) $\vec{OX} = k(\frac{1}{3}\underset{\sim}{a} + \frac{2}{3}\underset{\sim}{b})$ ——— B_1

$\vec{OX} = \frac{1}{3}k\underset{\sim}{a} + \frac{2}{3}k\underset{\sim}{b}$ ..... (i)

$\vec{OX} = \vec{OB} + \vec{BX}$

$= \underset{\sim}{b} + h(\frac{1}{2}\underset{\sim}{a} - \underset{\sim}{b})$ ——— B_1

$\vec{OX} = (1-h)\underset{\sim}{b} + \frac{1}{2}h\underset{\sim}{a}$ ..... (ii)

$\frac{1}{3}k\underset{\sim}{a} + \frac{2}{3}k\underset{\sim}{b} = \underset{\sim}{b} - \underset{\sim}{b}h + \frac{1}{2}h\underset{\sim}{a}$ ——— M_1

$\frac{2}{3}K = 1 - h$ ——— M_1

$\frac{1}{2}h = \frac{1}{3}K$ ——— M_1

$h = \frac{1}{2}$ ——— A_1

$K = \frac{3}{4}$ ——— B_1

Total 10mk

23.

Marks	No. of Students(f)	Midpoint (X)	d (X-A)	fd	fd^2	C.F
41-45	3	43	-12	-36	432	3
46-50	7	48	-7	-49	343	10
51-55	14	53	-2	-28	56	24
56-60	13	58	3	39	117	37
61-65	7	63	8	56	448	44
66-70	3	68	13	39	507	47
	47			21	1903	

B_1 for Fd^2

The Actual mean Mark

$$\bar{X} = 55 + \frac{21}{47}$$ ——— M_1

$$= 55.45$$ ——— A_1

The Median Mark

$$50.5 + \left(\frac{24-10}{14}\right) \times 5$$ ——— M_1

$$= 55.5$$ ——— A_1

The semi-interquatile range

$$Q_1 = 50.5 + \left(\frac{12-10}{14}\right) \times 5 = 51.21$$

$$Q_3 = 55.5 + \left(\frac{36-24}{13}\right) \times 5 = 60.12$$ ——— M_1

$$S.I.Q.R = \left(\frac{60.12 - 51.21}{2}\right)$$ ——— M_1

$$= 4.453$$ ——— A_1

The standard deviation

$$S = \sqrt{\frac{1903}{47} - \left(\frac{21}{47}\right)^2}$$ ——— M_1

$$S = 6.347$$ ——— A_1

Total 10 mk

24.

a) volume of water $= \frac{1}{3} \times \frac{22}{7} \times 21^2 \times 30$ ——— M_1

$= 13,860 cm^3$ ——— A_1

b) i) $\frac{h}{H} = \frac{r}{R}$

$\frac{30}{36} = \frac{21}{R} \Rightarrow \frac{21 \times 36}{30} = 25.2 cm$ ——— M_1 A_1

ii) New volume $= \frac{1}{3} \times \frac{22}{7} \times 25.2^2 \times 36$ ——— M_1

$= 23950.08 cm^3$

Volume of sphere $= 23950.08 - 13860$ ——— M_1

$= 10090.08 cm^3$ ——— A_1

iii) $\frac{4}{3} \times \frac{22}{7} \times r^3 = 10090.08$ ——— M_1

$r^3 = \frac{10090.08 \times 21}{88}$

$r = \sqrt[3]{\frac{10090.08 \times 21}{88}}$ ——— M_1

$= 13.40 cm$ ——— A_1

10 MKS