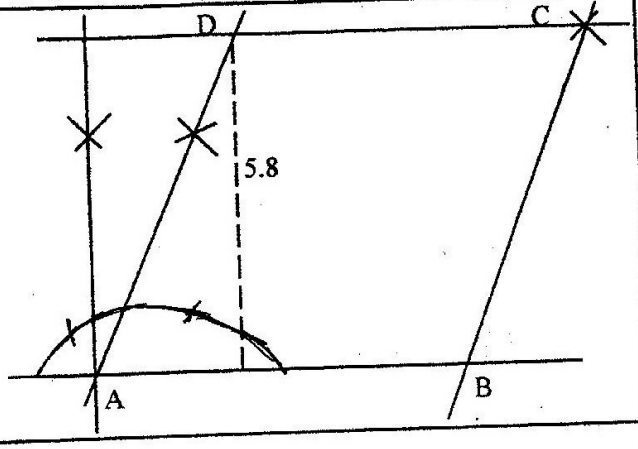
K.C.S.E 2001 MATHEMATICS PAPER 121/1 MARKING SCHEME

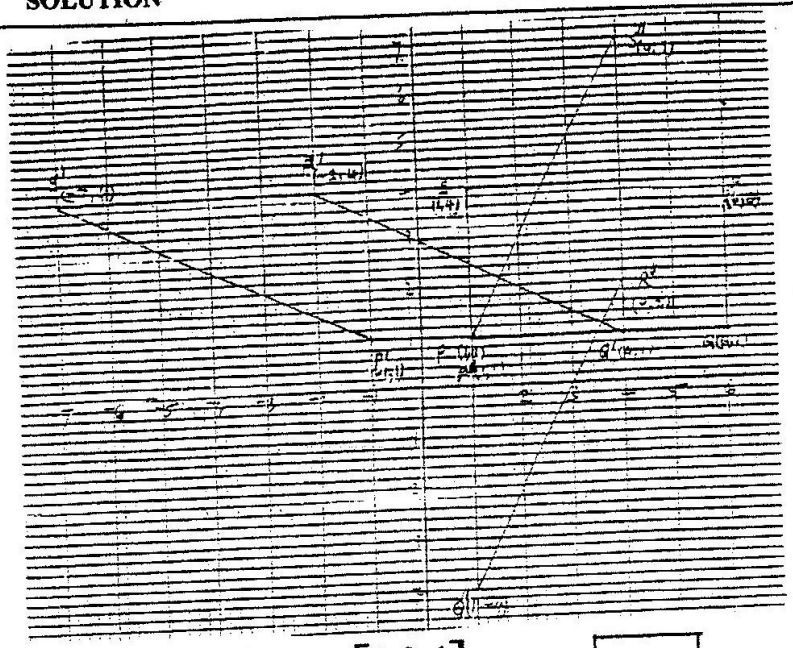
SOLUTION	MARKS	ALTERNATIVE METHOD
1. Reciprocal of $0.342 = 2.924$ $\sqrt{0.0625} = 0.25 \times 2.924$ 0.342 $= 0.731$	B1 M1 A1 3 marks	
2. BO - OD $= \sqrt{15^2 - 12^2} = \sqrt{81} - 9$ Area $= 1 \times '9' \times 12 \times 2 + 1 \times '9' \times 18 \times 2$ $= 108 + 162$ $= 270 cm^2$	M1 M1 A1 3 marks	
3. No. | Log. 3.256 | 0.5127 0.0536 | $\bar{2}.7292$ | $1.2419 : 3$ | $(\bar{3} + 2.2419) \div 3$ 0.5589 | 1.7473	M1 M1 M1 A1 4 marks	
4. $\frac{1}{3} \times \frac{22}{7} \times 6 \times 6 \times 9 + \frac{1}{2} \times \frac{4}{3} \times \frac{22}{7} \times 6 \times 6 \times 6$ $= 339.4 + 452.6$ $= 792$	M1 M1 A1 3 marks	
5. L1 : $\frac{y - 2}{x - 1} = 5$ $Y = 5x - 3$ L2 at $x = 4, y = 17$ $\frac{y - 17}{x - 4} = \frac{-1}{5}$ $y = \frac{-1}{5} x + \frac{89}{5}$	B1 B1 M1 A1 4 marks	$Y = 5x - 3$ C= 89 or 174 or 17.8 5 5 $y = -1 \times 89$ 5 5
6. $\frac{(3x - y)(x - y)}{(3x - y)(3x - y)}$ $= \frac{x - y}{3x + y}$	M1 M1 A1 3 marks	
7. $x(x + 4) = 32$ $x^2 + 4x - 32 = 0$ $(x - 4)(x + 8) = 0$ $x = 4$ or x length of room is $4 + 4 = 8m$	M1 A1 M1 A1	

SOLUTION	MARKS	ALTERNATIVE METHOD
8. 	B1 B1 B1 B1 4 marks	
9. $\frac{5}{100} \times 540 = 27$ $\frac{80}{100} \times 180 = 144$ P (sick) $= \frac{171}{720} = \frac{19}{80} = 0.2375$	M1 M1 A1 3 marks	$\frac{540}{720}$ or $\frac{3}{4}$ $\frac{3}{4} \times 0.05 + 1 \times 0.8$ $= 0.2375$
10. $S^2 = W^2 (a^2 - x^2)$ $\frac{S}{W} = \sqrt{a^2 - x^2}$ $W^2 x^2 = w^2 a^2 - S^2$ $\frac{S^2}{W^2} = a^2 - x^2$ $x^2 = \frac{w^2 a^2 - S^2}{W^2}$ $x^2 = \frac{a^2 - s^2}{W^2}$ $x = \sqrt{\frac{w^2 a^2 - S^2}{W^2}}$ $x = \sqrt{\frac{a^2 - s^2}{W^2}}$	M1 M1 A1 3 marks	$+ \sqrt{\frac{W^2 a^2 - S^2}{W^2}}$ OR $+ \sqrt{\frac{W^2 a^2 - S^2}{W^2}}$ $\sqrt{\frac{Wa - S \; Wa + S}{W^2}}$
11. Distance $= \frac{5}{2}\{(2.6 + 2(2.1 + 5.3 + 5.1 + 6.8 + 6.7 + 4.7)\}$ $= \frac{5}{2}(2.6 + 61.4)$ $= 160$ m	M1 M1 A1 3 marks	$\frac{5}{2}(64)$
12. $\cos 2x = \sin (90^\circ - 2x)$ $\sin (x + 30^\circ) = \sin (90^\circ - 2x)$ $x + 30^\circ = 90^\circ - 2x$ $3x = 60^\circ$ $x = 20^\circ$ $\cos 3x = \cos^2 60^\circ$ $= (\frac{1}{2})^2$ $= \frac{1}{4}$ or 0.25	M1 A1 B1 3 marks	

SOLUTION	MARKS	ALTERNATIVE METHOD
13. $\begin{pmatrix}2 & 3\\1 & 2\end{pmatrix}\begin{pmatrix}2 & -3\\-1 & 2\end{pmatrix} = \begin{pmatrix}1 & 0\\0 & 1\end{pmatrix}$ $\begin{pmatrix}x\\y\end{pmatrix}\begin{pmatrix}2 & 3\\1 & 2\end{pmatrix}\begin{pmatrix}5\\-3\end{pmatrix}$ $\begin{pmatrix}x\\y\end{pmatrix} = \begin{pmatrix}1\\-1\end{pmatrix}$ $x = 1 \qquad y = -1$	B1 M1 M1 A1 4 marks	
14. $2x + \frac{1}{2} \times 40^\circ + 110^\circ + 130^\circ + 160^\circ - 720^\circ$ $\frac{7x}{2} = 280^\circ$ $x = \frac{280 \times 2}{7} = 80^\circ$ Smallest angle $\frac{1}{2}x = 40^\circ$		
15. Let x be speed of zebra $3.5x = 1.5(x + 20) + 340$ $3.5x = 1.5x + 30 + 340$ $2x = 370$ $x = 185$km/h Buffalo's speed is $185 + 20 = 205$km/h	M1 M1, A1 3 marks	$3.5(x - 20) = 1.5x + 240$ $2x = 410$ $x = 205$ $\frac{340 + x}{3\frac{1}{2}} + 20 = \frac{2}{3}x$ Speed $+ \frac{2460}{8} \times \frac{2}{3}$ $= 205$
16. $PQ = 3i - 4i - 6j + 6k - 2k$ $= i - 9j + 4k$ or $4k - 7j - i$ **OR** $-9j + 4k - i$ Length $= \sqrt{(-1)^2 + (-9)^2 + 4}$ $= \sqrt{98}$ $= 7\sqrt{2}$ $\lvert PQ \rvert = \sqrt{1^2 + 9^2 + 4^2}$ $= 7\sqrt{2}$	B1 M1 marks	Column vector BO $PQ = -i - 3j - 3k$ $PQ = \sqrt{1^2 + 8^2 + 3^2}$

SOLUTION	MARKS	ALTERNATIVE METHOD
17. a) Total earnings $\frac{40480}{20}$ = £2024 435 x 2 = 870 435 x 3 = 1305 435 x 4 = 1740 435 x 5 = 2175 284 x 6 = 1704 7794 b) Net tax Sh 7794 - Sh 800 = Sh 6994 c) New earnings .15 x 2024 = 3036 £3036 - £2024 = 1012 excess tax = 1012 x 6 = Sh 6072 % age excess = $\frac{6072}{7794}$ x 100% = 77.91%	M1 M1 M1 A1 B1 M1 M1 A1 8 marks	$\frac{1012 \times 6 \times 100}{7794}$ %
18. $\begin{bmatrix} 1 & -2 \\ 0 & 1 \end{bmatrix}\begin{bmatrix} P & Q & R & S \\ 1 & 6 & 6 & 1 \\ 1 & 1 & 4 & 4 \end{bmatrix} = \begin{bmatrix} P^1 & Q^1 & R^1 & S^1 \\ 1 & 4 & -2 & -7 \\ 1 & 1 & 4 & 4 \end{bmatrix}$ $P^1(-1, 1)$ $q^1(4,1)$ $r^1(-2, 4)$ $S^1(-7, 4)$ ii) object drawn Image P^1 Q^1 R^1 S^1 drawn (iii) $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}\begin{bmatrix} P & Q & R & S \\ 1 & 4 & -2 & -7 \\ 1 & 1 & 4 & 4 \end{bmatrix} = \begin{bmatrix} P^{11} & Q^{11} & R^{11} & S^{11} \\ 1 & 1 & 4 & 4 \\ 1 & -4 & 2 & 7 \end{bmatrix}$ $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ Negative Quarter turn about the origin	A1 B1 B1	

SOLUTION	MARKS	ALTERNATIVE METHOD



18 (b) Single matrix in the in verse of $\begin{bmatrix} 1 & 2 & -1 \\ 1 & 1 & 0 \end{bmatrix}$

$\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}\begin{bmatrix} 1 & -2 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & 2 \end{bmatrix}$ Which is $\begin{bmatrix} 2 & -1 \\ 1 & 0 \end{bmatrix}$

19. a) i) $\underset{\sim}{QQ} = \underset{\sim}{P} + \underset{\sim}{r}$ B1

ii) $\underset{\sim}{QT} = \underset{\sim}{QR} + 1/5\,\underset{\sim}{RQ}$ B1

$= \underset{\sim}{r} + 1/5\underset{\sim}{P}$

b) i) $\underset{\sim}{QS} = m\,\underset{\sim}{QQ} = m(\underset{\sim}{p} + \underset{\sim}{r})$ B1

$= m\underset{\sim}{p} + m\underset{\sim}{r}$

(ii) $\underset{\sim}{QS} = \underset{\sim}{QT} + n\,\underset{\sim}{TP}$ B1

$= (\underset{\sim}{r} + 1/5\underset{\sim}{P}) (+ n(-\underset{\sim}{r} - 1/5\underset{\sim}{P} + \underset{\sim}{P})$

$= \underset{\sim}{r}(1-n) + \underset{\sim}{P}(1/5 + 4/5n)$

(iii) $m\underset{\sim}{p} + m\underset{\sim}{r} = \underset{\sim}{r}(\underset{\sim}{r}-n) + \underset{\sim}{p}(1/5 + 4/5n)$ M1

$m = 1/5 + 4/5n$ .....(1) M1

$\underline{m = 1-n}$ .....(2) A1

$5m = 1 + 4n = 1 + 4\,(1-m)$

$9m = 5$

$m = 5/9$

iv) $\underset{\sim}{QS} = {}^{4}/_{9}\underset{\sim}{p} + {}^{5}/_{9}\underset{\sim}{r}$ B1

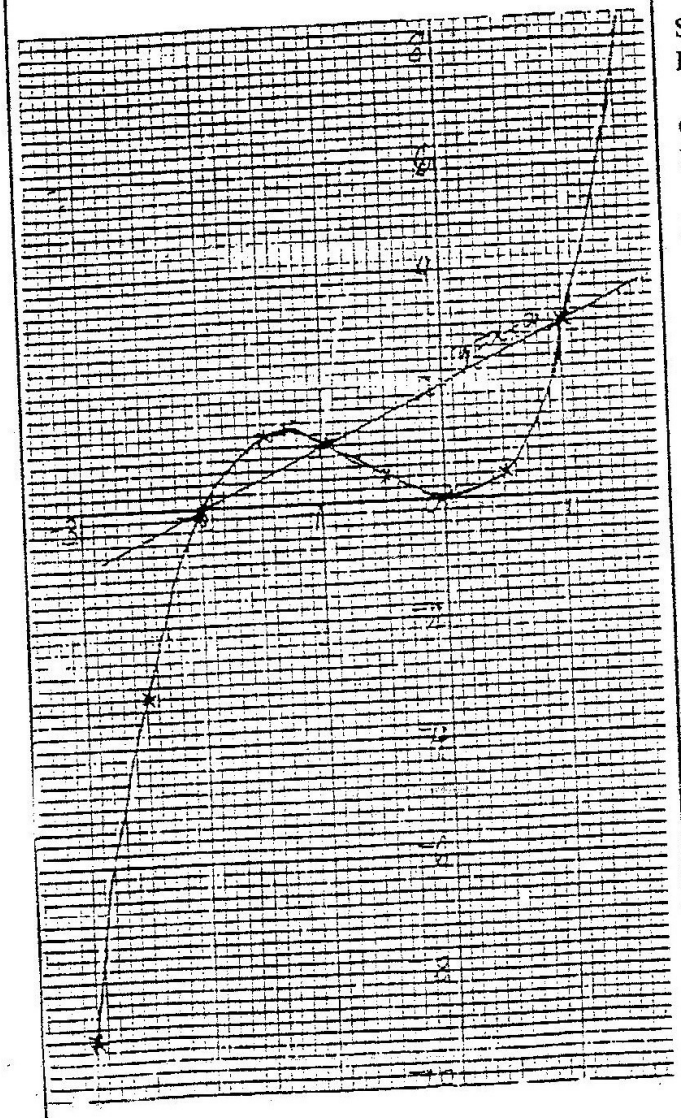
S divides OQ in the ration 5:4

8 marks

SOLUTION	MARKS	ALTERNATIVE METHOD

x	-3	-2.5	-1.5	-1	-0.5	0	0.5	1	1.5
x^3			15.06					1	
$2x^2$			12.5					2	
$y=x^3+2x^2$			-3.25					3	

B2 all 6
B1 at best
4 entries
PA - 1 if values minded off



S1 If Bo, Po.
P1 If B250 tr B8 S0m B15,
Uscale be linear
C1 (CAO
B1 $y = x + 2$

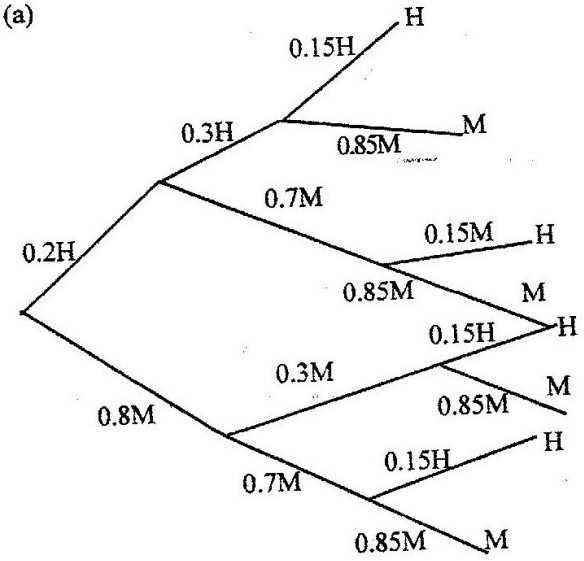
L1 Line drawn

$x = -2, -1, 1$

B2 S1 P1 C1
B2 S0 P1 C0
B1 S0 P1 C0
B1 S1 P1 C0
B0 S0 P0 C0
B0 S0 P0 C0
B2 S1 P1 C0

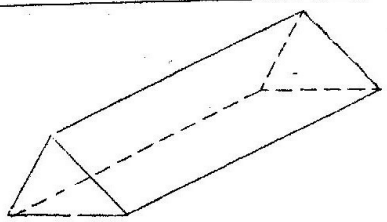
K.C.S.E 2001 MATHEMATICS PAPER 121/1 MARKING SCHEME

SOLUTION	MARKS	ALTERNATIVE METHOD
20 a) i) $<CBD = 90^\circ - 42^\circ = 48^\circ$ Subtended by diameter ii) $<BOD = 180^\circ - 42^\circ = 138^\circ$ cyclic quadrilateral Reflex $BOD = 360^\circ - 130^\circ = 222^\circ$ b) In ΔBAD $<BAD = {}^1/_2 \times 138^\circ = 69^\circ$ $<ADB = 180^\circ - 42^\circ + {}^1/_2 \times 138^\circ)$ $= 180^\circ - 111^\circ$ $= 69^\circ$	B1 B1 B1 B1 B1 B1 B1 B1 8 marks	$<BPD = 138^\circ$ $<AOB$ $= 360^\circ - (138 + 84o)$ $= 360^\circ - 222$ $= 138^\circ$
21. (a) $\int(2x^2 - 5)\,dx = \frac{2}{3}x^3 - 5x + C$ $y = \frac{2}{3}x^3 - 5x + C$ $3 - \frac{2}{3} \times 2^3\ 5x^2 + C$ $C = 7\frac{2}{3}$ or $\frac{23}{3}$ $y = \frac{2}{3}x^3 - 5x + 7\frac{2}{3}$	M1 M1 A1 3 marks	

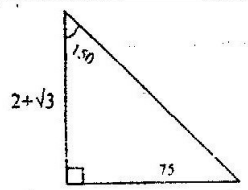
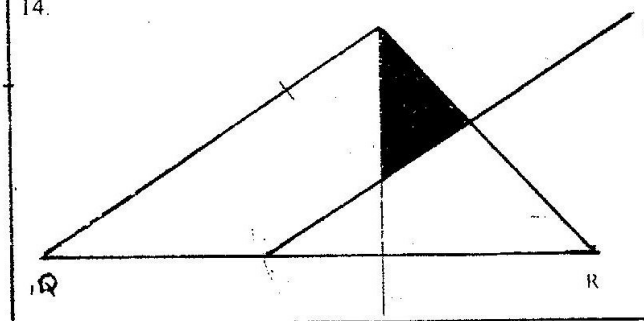
SOLUTION	MARKS	ALTERNATIVE METHOD
21. (b) $\int(2t^3 + t^2 - 1)\,dt = \frac{2}{4}t^4 + \frac{t^3}{3} - t + C$	M1	$\frac{2}{4}t^4 + \frac{1}{3}t^3 - t$
$\int(2t^3 + t^2 - 1)\,dt = \left[\frac{2}{4} \times 3^4 + \frac{3^3}{3} - 3\right] - \left[\frac{2}{4} + \frac{1}{3} - 1\right]$	M1	$\left[\frac{2}{4}t^4 + \frac{1}{3}t^3 - t\right]_1^3$
$= \left(\frac{81}{2} + 9 - 3\right) - \left(\frac{1}{2} + \frac{1}{3} - 1\right)$	M1	
$46\frac{1}{2}\ \left(\frac{1}{6}\right)$ $= 46\frac{2}{3}$	A1 8 marks	
22 (a) 		
b) (i) $0.2 \times 0.3 \times 0.15 = 0.009$ (ii) $0.2 \times 0.7 \times 0.85 = 0.119$ $0.8 \times 0.3 \times 0.85 = 0.204$ $0.8 \times 0.7 \times 0.15 = \underline{0.084}$ 0.407	M1 A1	
(iii) HHM $0.2 \times 0.3 \times 0.85 = 0.051$ HMH $0.2 \times 0.7 \times 0.15 = 0.021$ MHH $0.8 \times 0.3 \times 0.15 = 0.036$ HHH $0.2 \times 0.3 \times 0.15 = \underline{0.009}$ $0\ 117$	M1 A1 8 marks	$1-(0.407 + 0.476)$ $= 1-0883$ $= 0.117$

K.C.S.E 2001 MATHEMATICS 121/2 MARKING SCHEME

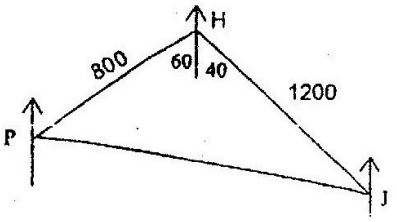
SECTION 1 (52 MARKS)

1.	$\frac{1}{3}\times\left(\frac{11}{4}-\frac{22}{4}\right)\times\frac{27}{7}\times\frac{4}{9}$ $\frac{1}{3}\times\frac{11}{4}\times\frac{27}{7}\times\frac{4}{9}$ $=-\frac{11}{7}$ or $-1\frac{4}{7}$	M1 A1 2 marks	All multiplication Simplified to lowest form
2.	$2^{5(x-3)}\times 2^{3(x+4)}=2^{6}\div 2^{x}$ $5(x-3)+3(x+4)=6-x$ $9x=9$ $x=1$	M1 M1 A1 3 marks	Mark for equating correct powers of 2 Mark for equating powers from above
3.	Mliwa: $\frac{3}{8}\times\frac{2}{3}x=\frac{1}{4}x$ Amina: $x-\left(\frac{1}{3}+\frac{1}{4}\right)x=\frac{5}{12}x$ $\frac{5}{12}x-\frac{1}{4}x=40000$ $\frac{2}{12}x=40000$ $x=240000$	B1 M1 A1 3 marks	Or $\frac{5}{12}$ $40000\times\frac{12}{2}$ do not award for 60
4.	$A=mB+nB$ $39=9m+3n$ $16=14m+n\ 14$ $420=126m+42n$ $144=126m+33.68n$ $276=8.32n$ $n=33.17$ $9m=30-99.51=-69.51$ $m=-7.723$ When B = 36, A = $-7.723\times36+33.17\times6$ $=-278.0+199.0$ $=-79$	M1 M1 M1 A1 4 marks	Mark for at least one equation Mark for attempt to solve equation Mark for substitution of pupils constants
5.	a)  b) Four (4) planes of Symmetry	B2 B1	B1 If dotted lines omitted or fully drawn Accept either (lines to be dotted)
6.	Kshs (4320 + 3060 + 2080) = 9660 Total bill = $9660\times\frac{115}{100}$ = 11109 (long mult) OR 11110 (Table)	M1 A1 3 marks	Or equivalent

7.	$\begin{pmatrix}5\\-4\end{pmatrix}-\begin{pmatrix}3\\2\end{pmatrix}=\begin{pmatrix}2\\-6\end{pmatrix}$ $OQ=\begin{pmatrix}2\\5\end{pmatrix}+\begin{pmatrix}2\\-6\end{pmatrix}=\begin{pmatrix}4\\-1\end{pmatrix}$ $\therefore PQ=\begin{pmatrix}4\\-1\end{pmatrix}-\begin{pmatrix}5\\-4\end{pmatrix}=\begin{pmatrix}-1\\3\end{pmatrix}$ $\lvert PQ\rvert=\sqrt{(-1)^2+3^2}$ $=\sqrt{10}$	B1 M1 A1 3 marks	**OR** $\sqrt{(4-5)^2+(-1+4)^2}$
8.	$\text{Log}\left(\frac{x+24}{3^2}\right)=\log(9-2x)$ $\frac{x+24}{9}=9-2x$ $19x=57$ $x=3$	M1 M1 A1 3 marks	
9.	Moving average of order **3** $x=331\times3-670=323$ $y=\frac{323+343+350}{3}=338^2/_3$	B1 B1 B1 3 marks	
10.	$(2+x)^5=2^5+2^4\times5x+2^3\times10x^2+2^2\times10x^3+\ldots$ $=32+80x+80x^2+40x^3$ $(2.03)^5=32+80\times0.03+80\times(0.03)^2+40\times(0.03)^3$ $=32+2.4+0.072+0.00108$ $=34.47308$ $\simeq 34.47$ (*4 significant figures*)		
11.	(a) $\frac{dy}{dx}=15x^2-14x+3$ Grad. $=15\times1^2-14\times1+3=4$ (b) $\frac{y-3}{x-1}=4$	M1 A1 M1 A1 4 marks	**OR** $y=4X-1$
12.	Area of pentagons $=\frac{1}{2}\times4.25\times4.25\sin72^0\times5\times2$ $=\frac{1}{2}\times4.25\times4.25\times0.9511\times5\times2$ $=18.06\times0.9511\times5$ $=85.88$ **OR** (85.9) Area of rectangle faces $=5\times12\times5=300$ Total area $=300+85.88$ $=385.88$	M1 A1 M1 A1 4 marks	Allow from area of one pentagon H = 11.81 = 3.43 Area $=\frac{1}{2}\times5\times3.43$ $=8.59$ Area $=\sqrt{6.75\times2.5^2\times1.75}$

13. 	$\tan 15 = \frac{1}{2+\sqrt{3}}$ $\frac{1}{2+\sqrt{3}} \times \frac{2-\sqrt{3}}{2-\sqrt{3}}$ $= 2 - \sqrt{3}$	B1 M1 A1 3 marks	
14. 		B1 B1 B1 3 marks	Angle bisector l bisector (mediator) of p mark for shading region
15. $4(1 - \cos^2\theta) + 4\cos\theta = 5$ $4\cos^2\theta - 4\cos\theta + 1 = 0$ $(2\cos\theta - 1)(2\cos\theta - 1) = 0$ $\cos\theta = \frac{1}{2}$ $\theta = 60^0, 300^0$		M1 M1 A1 3 marks	
16.		B1 B1 B1 B1 4 marks	Mark for shading Mark for labeling the region

17.



a) i) $PJ^2 = 800^2 + 1200^2 - 2 \times 800 \times 1200\cos 100$
$= 640.000 + 1.440.000 + 2 \times 960.000 \times 0.1736$
$= 2413312\ (2413000)$
$= PJ = 1553km$ — M1

ii) $\frac{\sin\theta}{800} = \frac{\sin 100}{1553}$ $\quad \sin\theta = \frac{800 \times 0.9848}{1553}$ — M1

$= 0.5075 \quad \theta = 30^0\,29'\ (30^0\,30')$
Bearing $= 360 - (40 + 30^0\,29'$
$= 289^0\,31'\ (289^0\,30')$ **OR** 289.5^0 — A1

b) Time for jet $= \frac{1553}{1035} = 1.501h$
$\therefore$ Time for helicopter $= 1.501 + 0.2$
$= \text{Speed} = \frac{800}{1.701} = 470.6$ — M1, A1

8 marks

ALT.

a)
i) From scale drawing — M1
Bearing dist. PH – B1
Bearing dist HJ – B1
PJ measured converted B1
$(15.5 \pm 0.1$ **OR** $7.75 \pm 0.2)$ — A1

ii) $\angle HJP = 30 \pm 1^0$
Bearing $= 360 - (40 + 30)$
$= 290^0$ — M1, A1

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18. a (i) $225 + 1196 + 144 = 169 + P^2 + 256 + 121 + 169 + 144 + 1289 = 1794$
$P^2 + 1713 = 1794$
$P^2 = 81$
$P = 9$ — M1, A1 — Mark for all values added; Mark for correct value of P

a (ii) ***Standard deviation***
Mean $= (915 + 14 + 12 + 13 + 9 + 16 + 11 + 13 + 12 + 17) \div 10 = 13.2$ — M1, A1 — Or equivalent

X	15	14	12	13	9	16	11	13	12	17
$X - \bar{X}$	1.8	0.8	-1.2	-0.2	-4.2	2.8	-2.2	-0.2	-1.2	3.8
$(X-\bar{X})^2$	3.24	0.64	1.44	0.04	17.74	7.84	4.84	0.04	1.44	14.44

$\sum(X - \bar{X})^2 = 51.6$

s.d $= \sqrt{\frac{51.6}{10}}$ OR $\sqrt{\frac{1794}{10} - (13.2)^2}$ — M1 — Mark for at least $(X - \bar{X})$
$= 2.272$ OR 2.28 — A1

b (i) New mean = 16.2 — B1
b (ii) New S.d = 2.272 — B1

8 marks

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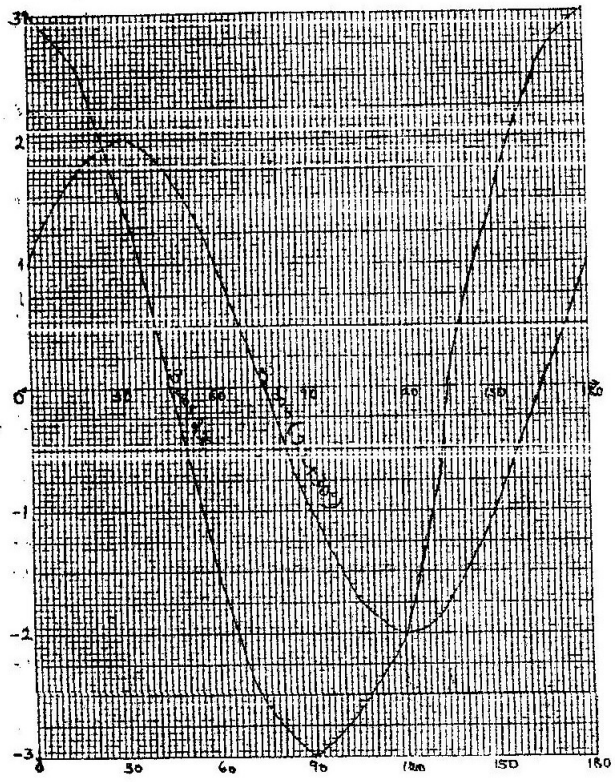
19. a) 5, 7, 9, 11 — B2 — OR $\frac{50}{2}5 + 2 \times 50 + 3$

b) $S_{50} = \frac{50}{2}\{2 \times 5 + (50 - 1)2\} = 2700$ — M1, A1

c) $S_n = \frac{n}{2}\{2 \times 5 + (n-1)2$ $= \frac{n}{2}(8+2n)$ $= 4n + n^2$	B1	Mark for following working
$n^2 + 4n < 725$ $n^2 + 4n - 725 < 0$ $(n + 29)(n-25) < 0$ $\therefore n = 24$	M1 A1 B1 8 marks	Allow if = used For n< 25
20. a) RA $= \frac{30}{\tan 26^0}$ or $= RA\ 30 \tan 64^0$ $= \frac{30}{0.4877}$ or 30×2.050 $= 61.51\ (61.5)$	M1 A1	
$RB = \frac{30}{\tan 32}$ or $= 30\tan 58^0$ $= \frac{30}{0.6249}$ or 30×1.600 $= 48.01\ (48)$	M1 A1 M1	
$AB = \sqrt{61.51^2 + 48.01^2}$ $= \sqrt{3783 + 2305} \quad - \sqrt{6088}$ $= 78.03$	A1 M1	OR $\sin 0 = \frac{48.01}{78.03}$
b) $\tan\theta = \frac{48.01}{61.51}$ $= 0.7805$ $\theta = 37^0\ 58'$ bearing $= 360 - 37^0\ 58'$ $= 322^0\ 2'\ (322.03)$	A1 8 marks	

21.

X^0	15^0	75^0	150^0	165^0
$3\cos 2x^0$		-2.598	1.5	
$2\sin(2x+30)$	1.732			0



B1	
B1	
S1	Mark for scale used
P1	Mark for all points
P1	
C1	Mark for all points
B1	Mark for smooth curves
B1	
8 marks	Mark for 25^0, 116^0 stated Accept (24^0 – 27) From his graphs read within 1^0 Mark for $25 \le x \le 116$

22.

a) $\dfrac{dx}{dt} = 3t^2 - 4t$ — M1

Velocity $= 3 \times 2^2 - 4 \times 2$ — M1 Mark for one term correct

$= 4$m/s — A1

b) (i) $3t^2 - 4t = 0 \Leftrightarrow t(3t-4) = 0$ — M1

$\therefore t = \dfrac{4}{3}$

$x = \left(\dfrac{4}{3}\right)^3 - 2\left(\dfrac{4}{3}\right)^2 + 6$ — M1

$= \dfrac{64}{27} - \dfrac{32}{9} + 6 = \dfrac{64-96}{27} + 6$

$= 4\dfrac{22}{27}$ (4.815) — A1

(ii) $\dfrac{d^2x}{dt^2} = 6t - 4$

$\therefore a = 6 \times \dfrac{4}{3} - 2$ — M1

$= 4\text{m } 15^2$ — A1

8 marks

23.			
a) i)	Vol. cylindrical part		
	$= \frac{22}{7} \times 0.7 \times 0.7 \times 1$	M1	
		A1	
	$= 1.54 m^3$	M1	
ii)	X-Section $= \frac{1}{2} \times 0.4^2 \times \sin 60^\circ \times 6$		
	$= \frac{1}{2} \cdot 0.4 \cdot 0.4 \cdot 0.866 \cdot 6$		
	= 0.41568 (0.4157)	M1	
	Vol. hexagonal part = 0.41568 × 4	A1	
	= 1.6628 (1.663)	M1	
b)	Volume of pillar (1.54 + 1.6628) – 0.25 ×5		
	= 3.2028 – 1.25 = 1.9528 (1.953)	M1	
c)	Mass = 1.953 × 2400	A1	
	= 4687.2kg (4687kg)	8 marks	
24. a)	800 x+ 1600y ≥ 8000(x + 2y ≥10)	B1	
	4x + 7y ≤ 41	B1	
	x ≥ 2 and y ≥2	B1	
		B1	Mark for each line draw and shaded
		B1	
		B1	Mark for type A = 3 & type B = 4
		B1	Mark for numbers of [illegible]ators 3 × [illegible] + 4 ×7 = 40
		[illegible]	
		8 [illegible]	