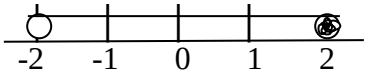
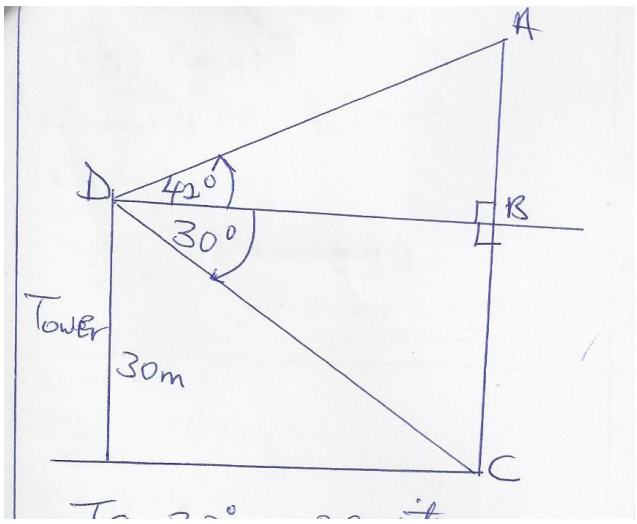
GATUNDU FORM 4 EVALUATION EXAM

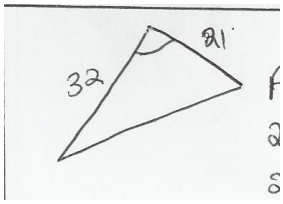
121/1
MATHEMATICS
PAPER 1
JULY/AUGUST 2015

MARKING SCHEME

1.	$\sqrt{\frac{384.16 \times 0.0625 \times 10^2}{96.04 \times 10^2}}$ $= \sqrt{\frac{38416 \times 0.0625}{9604}}$ $= \sqrt{4 \times 0.0625}$ 2×0.25 $= 0.5$	M1 M1 A1	
2.	$\frac{2(x^2-49)}{(3x+5)(x-7)} \times \frac{3x+4}{x+7}$ $\frac{2(x-7)(x+7)}{(3x+5)(x-7)} \times \frac{3x+4}{x+7}$ $\frac{2(3x+4)}{3x+5}$	M1 M1 M1 A1	Factorizing $2x^2 - 98$ Factorizing denomination simplifying
3.	$4x - 3 \leq \frac{1}{2}(x+8)$ $4x - \frac{1}{2}x \leq 4 + 3$ $3\frac{1}{2}x \leq 7$ $x \leq 2$ $\frac{1}{2}x + 4 < x + 5$ $-1 < \frac{1}{2}x$ $-2 < x$ $-2 < x \leq 2$  	M1 M1 B1	
4.	Price at 30% loss $\frac{70}{100} \times 6000 = sh.4200$ Betty price at 20% profit	M1	

	$\frac{120}{100} \times 4200 = sh.5040$	M1	
5.	$6x^2 + kx - 2 = 0 \quad x = {}^2/_3$ $6({}^2/_3)^2 + k({}^2/_3) - 2 = 0$ ${}^8/_3 + {}^2/_3k = 2$ ${}^2/_3k = -{}^2/_3$ $K = -1$ $6x^2 - x - 2 = 0$ $(2x + 1)(3x - 2) = 0$ $2x + 1 = 0 \quad x = -½$	 M1 A1 M1 A1	
6.	Tap A in 1 minute ¼ Tap B in 1 minute ${}^1/_6$ Retained ¼ - ${}^1/_6$ = ${}^1/_{12}$ In 2 min ${}^1/_{12}$ x 2 = ${}^1/_6$ Volume = ${}^1/_6$ x 3000 = 500 litres	 M1 M1 A1	
7.	 Tan 30° = opposite = BC Adjacent DB Tan 30° = 30M DB DB = 30m = 30m Tan 30° 51.96	 M1 M1 A1	

	AC = $51.96\tan 42^o + 30$m = 76.78m		
8.	A(3,9) B(7,5) Mid-point $(\frac{3+7}{2}, \frac{9+5}{2}) = (5, 7)$ (5, 7) (x, y) Gradient of AB = $\frac{5-9}{7-3} = \frac{-4}{4} = -1$ Gradient $M_2 = 1$ $\frac{y-7}{x-5} = 1$ $\quad y-7 = x-5$ $y - x - 2 = 0$	M1 M1 A1	Mid-point Gradient of 1 Equation
9.	$xy = 4$ - (i) $x + y = 5$ - (ii) $x = 5 - y$ $y(5-y) = 4$ $5y - y^2 - 4 = 0$ $y2 - 5y + 4$ $y2 - y - 4y + 4 = 0$ $y(y-1) - 4(y-1) = 0$ $(y-4)(y-1) = 0$ $y = 4 \quad y = 1$ $x = 1 \quad x = 4$		
10.	$\frac{1}{3}\begin{pmatrix}8\\-7\end{pmatrix} + \frac{2}{3}\begin{pmatrix}2\\5\end{pmatrix}$ $\begin{pmatrix}8/3\\-7/3\end{pmatrix} + \begin{pmatrix}4/3\\10/3\end{pmatrix} = \begin{pmatrix}12/3\\3/3\end{pmatrix} = \begin{pmatrix}4\\1\end{pmatrix}$ M(4,1)		
11.	<table><tr><td></td><td>Present</td><td>3 yrs time</td></tr><tr><td>Ruto</td><td>12</td><td>15 years</td></tr><tr><td>Father</td><td>15 x 3 = 45</td><td></td></tr></table> Father 45 – 12 = 33 years	M1 M1 A1	
12.	a:b = 6:7 b:c = 14:17 a:b 6:7 x 2 14:17 x 1 12:14:17 a:b:c = 12:14:17	M1 A1	

13.	Area under the curve (a) (½ x 4 x 80) + (16 x 80) + (½ x 4 x 80) = 160 + 1280 + 160 = 1600m (b) Deceleration = change in speed / time taken = $^{80}/_{4}$ = 20m/s		
14.	 Area = ½ ab sin Θ 240 = ½ x 21 x 32 sinΘ 240 = 336sinΘ Sin Θ= 240 / 336 = 0.7143 Θ = 45.59 Θ = 180 – 45.59 = 134.41	M1 M1 A1	
15.	$\left(\frac{1}{0.7235}\right)^2 - \frac{1}{10.56}$ Sq. root of 0.7235 = 72.35 x 10^{-2} = 0.8506 = $\left(\frac{1}{0.8506}\right)^2 - \frac{1}{10.56}$ $(1.1756)^2 – 0.09470$ 1.3820 – 0.09470 = 1.2873	M1 M1 A1	
16.	Surface Area of top and bottom 2 x $^{22}/_{7}$ x 142 – 142 = 840m^2 Curved S.A = $^{22}/_{7}$ x 28 x 30 = 2640m^2 Internal 4(4 x 30) = 480M^2 Total 396m^2	M1 M1 A1	
	SECTION II		

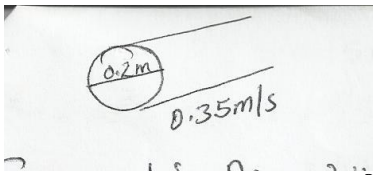
17.	400km MAK 120km MOM x a) Bus 11.45a.m 80km/h 1315 CAR 1:15 p.m -1145 120km/h 0130 1hr 30 min Distance by bus is 1 ½ hrs = 80 x $^3/_2$ = 120km Distance to be covered by Bus = x CAR = 120 + x Time by Bus = $\frac{x}{80}$ By car = $\frac{120 + x}{120}$ 120x = 9600 + 80x 40x = 9600 40x = 960 x=240 Time = $\frac{360}{120}$ = 3 hrs 240 + 120 = 360km 1:15 + 3.00 4.15 p.m	M1 M1 M1 M1 M1 A1	120km Expressing time Equating time - 3 hours - Time
	b) 400 – 360 = 40km Time taken by car = $\frac{40}{120}$ = 1/3hr = 20min By bus $\frac{40}{80}$ = ½ hr = 30min 30 min – 20 min = 10 minutes	M1 M1 M1 M1A1	
18.			

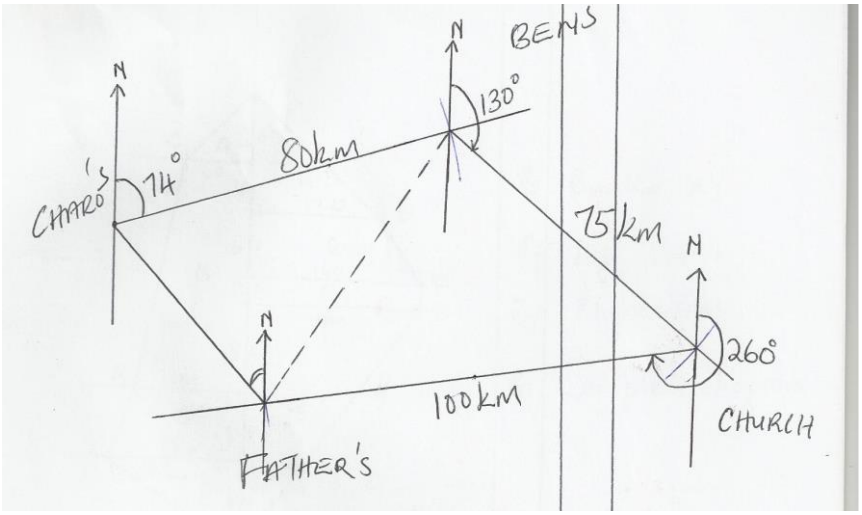
x	-3	-2	-1	0	1	2	3	4	5	6
y	-11	-3	3	7	9	9	7	3	-3	-11

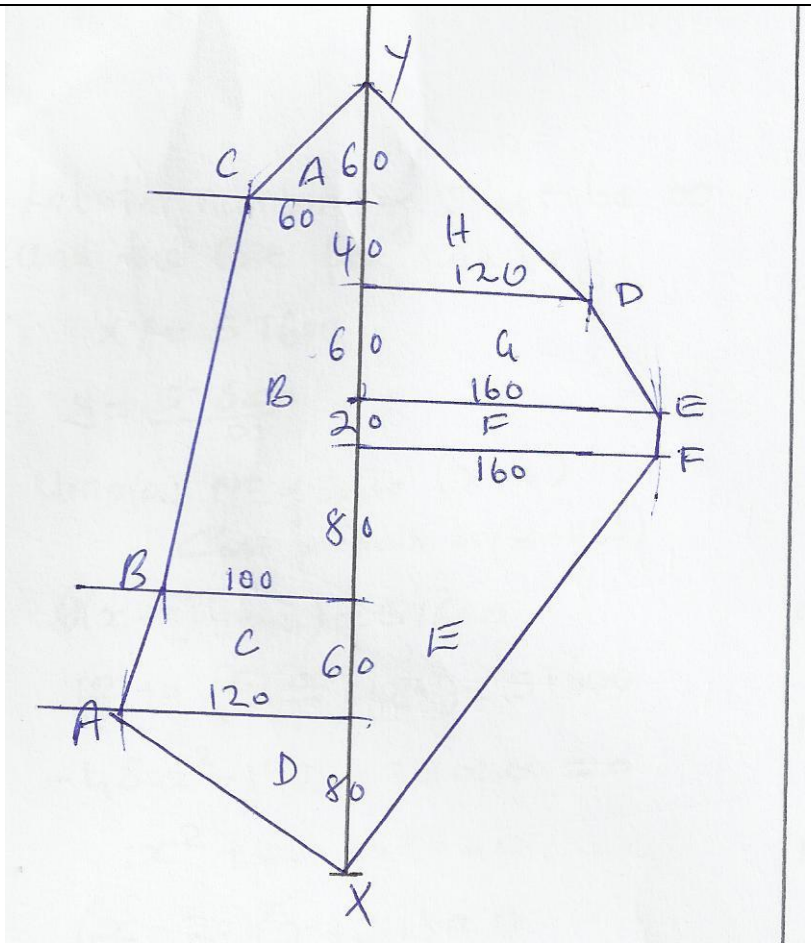
b) Graph - (back page)

c) $y = 7 + 3x – x^2$
$0 = -3 – 4x + x^{2+}$
$y = 4 - x$

x	0	2
y	4	2

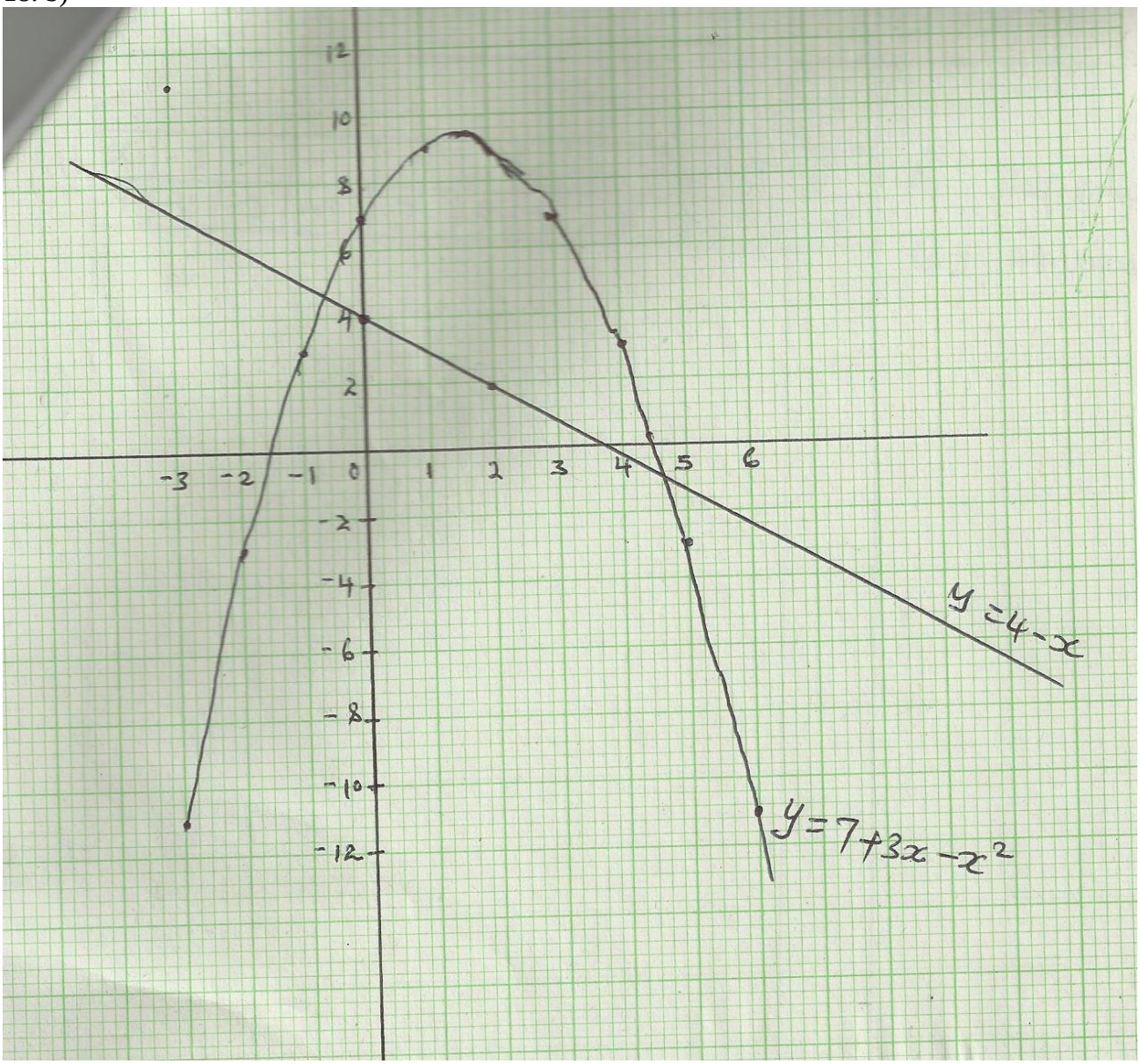
	d) x | 1.5 y | 9.2 Turning point (1.5, 9.2)		
19.	a)  cross- section Area = $3.142 \times 0.1^2 = 0.3142m^2$ in a second volume = 0.03142×0.35 $= 0.010997$ $= 0.011m^3$ In 1 hour = 0.0011×3600 = $= 39.6m^3$ $= 39.6 \times 1000$ $= 39,600$ litres b) $39600 \times 18 \times 25 = 17,820,000$ litres $\frac{17820,000}{2500}$ $= 7128$ $= 7100$ litres c) $\frac{7100}{100} \times 4.5 = sh.3195$	M1 M1 M1 A1 M1A1 B1 M1 A1	
20.	a) $15cm = \frac{15}{100} = 0.15m$ (i) $2(5 \times 3.3 \times 0.15) = 4.95m^3$ $2(7.5 \times 3.3 \times 0.15) = \underline{7.425m^3} +$ $12.375m^3$ (ii) Volume of the door and windows = 5×0.15 $= 0.750m^3$ Volume will = 12.375 – 0750 $= 11.625m^3$	M1 M1 M1 A1 M1	

	b) 1m = 1000mm volume of a block = $\frac{450}{1000} \times \frac{200}{1000} \times \frac{150}{1000}$ = 0.45 x 0.2 x 0.15 = $0.0135m^3$ Number of block = $\frac{11.625 - 0.225m^3}{0.0135}$ = $\frac{11.4}{0.0135}$ = 844.4 = 845	A1 M1 M1 M1 A1	
21.	 (i) True bearing of charo's from father's (ii) Compass bearing of fathers from Ben's (iii) Distance Ben's and fathers 7.5 x 10 = 75km (iv) Distance (total) by charo 2(100 + 75 + 80) = 510KM	 M1 A1 M1 A1	B1 Bens B1 church B1 Father B1 Complete diagram 360 – 40 = 320°
22.		B1 B1	Baseline xy Left side

	 a) Area A = ½ x 60 x 60 = 1800 B = ½ (60 + 100) x 200 = 2600 C = ½ (100 + 120) x 60 = 6600 D = ½ x 80 x 120 = 4800 E = ½ x 160 x 200 = 16000 F = 20 x 160 = 3200 G = ½ (120 + 160x 60 = 8400 H = ½ x 100 x 120 = 6000 72800 = $\frac{72800}{1000}$ = 7.28 ha c) 7.28 x 80,000 = sh.582400	B1 B1 M1 M1 A1 B1	Right side Complete diagram
23.	Let the number of suits be x and the cost per suit be y. xy = 57600 y = $\frac{57600}{x}$	M1	

	Umoja: No of suits (x + 4) Cost per suit is (y – 480) (x + 4) (y – 480) = 57600 (x + 4) ($\frac{57600}{X}$ – 480) = 57600 -480x2 – 1920 + 230400 = 0 X2 + 4x – 480 = 0 (x – 20)(x + 24) =0 X = 20 X = -24 No. of suits = 20 b) Cost per suit = $\frac{57600}{20}$ = sh.2880 c) Profit per suit = 720 $\frac{720 \times 100}{2880}$ = 20%	M1 M1 M1 M1 A1 M1 A1 M1 A1	
24.	a) $V= 2t^2 – 10t + 12$ $\frac{2t^2}{2} – \frac{10t}{2} + \frac{12}{2} = 0$ $t^2 – 5t + 6 = 0$ t=3 or t = 2 b) $\frac{ds}{dt} = 2t^2 – 10t + 12$ c) $\int 2t^2 + 10t + 12 \ dt$ When t = 0 s = 0 c = 0 $= {}^2/_3t^3 – st2 + 12t$ $= {}^2/3(3)^3 – 5(3)^2 + 12(3)$ 18 – 45 + 36 = 9m	M1 A1 M1 A1 M1 M1 A1	

18. b)



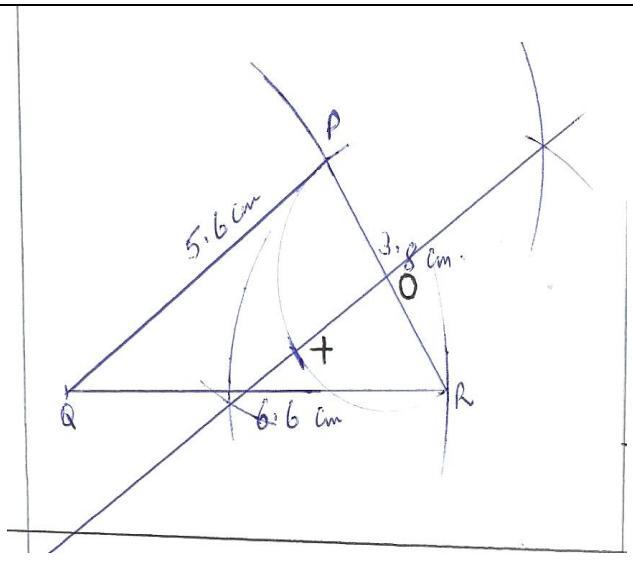
GATUNDU FORM 4 EVALUATION EXAM

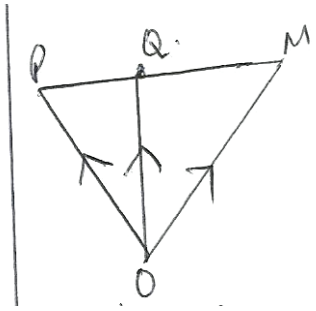
MATHEMATICS ALT A - PAPER 2
JULY/AUGUST 2015

MARKING SCHEME

SECTION I

QSTN.	WORKING	MARKS DISTR.	COMMENTS
1.	No. | Log 2 0.1324^2 5 Log 7 2.024×10^{-1} 0.2024 | 0.3010 0.3010 $\bar{1}.1219 \times 2 = \bar{2}.2438$ 2.5448 $\bar{0}.6990$ $\bar{1}.9270 +$ $\bar{0}.6260$ 2.5448 $\bar{0}.6260 -$ $\bar{3}.9188$ 3 Antilog $\bar{1}.3063$	M1 M1 M1 A1 4	All logs correct Correct subtraction of logs i.e numerator denominator Correct division by 3.
2.	$\sin(4x + 10)^o = \sin(90 - (x + 60)^o$ $4 \times 10^o = 90 - x - 60^o$ $4x + x = 20$ $5x = 20$ $x = 4^o$	M1 M1 A1 3	Correct relationship of complementary angles. Correct opening of brackets
3.	Amount borrowed = 8000 – 1000 = 7000 Installments = 840 x 15 = 12600 If r% is the rate per month Then $12600 = 7000\left(1 + {}^{r}/_{100}\right)^{15}$ $\left(1 + {}^{r}/_{100}\right)^{15} = \frac{12600}{7000}$ $= 1.8$ $1 + {}^{r}/_{100} = 15\ 1.8$ or $1.8^{1/15}$ $= 1.0399 = 1.04$ ${}^{r}/_{100} = 1.04 - 1$ $= 0.04$ $r = 4\%$	M1 M1 M1 A1 4	For both 7000 and 12600 If logs is used follow through. Allow the use of calculators.

4.	a=250; r = 2, n = $^{16}/_{2}$ + 1 = 9 n^{th} term = 250 x 28 = 64000	B1 M1 A1 3	Accept use of step by step method. 0 | 2 | 4 | 6 | 8 | 10 | 12 250 | 500 | 1000 | 2000 | 4000 | 8000 | 16000 14 | 16 32000 | 64000
5.	Let the transformation matrix T = a c b d $\begin{pmatrix} a & c \\ b & d \end{pmatrix} \begin{pmatrix} A & B & C & D \\ 1 & 3 & 3 & 1 \\ 0 & 0 & 2 & 2 \end{pmatrix} \begin{pmatrix} A^1 & B^1 & C^1 & D^1 \\ 1 & 3 & 7 & 5 \\ 0 & 0 & 2 & 2 \end{pmatrix}$ $\begin{pmatrix} a & 3a \\ c & 3c \end{pmatrix} \begin{pmatrix} 3a+2b \\ 3c+2d \end{pmatrix} \begin{pmatrix} a+2b \\ c+2d \end{pmatrix} = \begin{pmatrix} 1 & 3 & 7 & 5 \\ 0 & 0 & 2 & 2 \end{pmatrix}$ a = 1, c = 0 3(1) + 2b = 7 2b = 4 b = 2 2d = 2 d = 1 T.M = $\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$	M1 M1 A1 3	Solutions of All matrix's elements
6.	 	B1 B1 B1 3	Correct measurements and drawing of the ΔPQR. Correct bisecting of line PR Correct location of x. (i.e. by drawing a semi-curve centre at O)

7.	$\frac{3+5+7+9+11}{5} = 7$ Deviation (x-x): -4, -2, 0, 2, 4 $(x-x)^2$: 16, 4, 0, 4, 16 Variance = $\frac{\epsilon d^2}{F} = \frac{40}{5} = 8$ s.d $\sqrt{8}$ = 2.8284	M1 M1 A1 3	- finding the mean $\frac{\epsilon fx}{\epsilon f}$ - for squaring $(x - \bar{x})$
8.	 Using Ratio theorem OM = $\frac{-2}{1}\begin{pmatrix}1\\2\\3\end{pmatrix} + \frac{3}{1}\begin{pmatrix}4\\5\\-3\end{pmatrix}$ $= \begin{pmatrix}-2\\-4\\-6\end{pmatrix} + \begin{pmatrix}12\\15\\-9\end{pmatrix} = \begin{pmatrix}10\\11\\-15\end{pmatrix}$ Coordinates of m (10, 11, -15)	B1 B1 B1 3	Accept any valid method and award marks accordingly.
9.	Area of a sector = curve are of a cone. 60 x л x 12^2 = лr x 12 $^1/6$ x 12 = r Radius = 2cm h = $\sqrt{12^2 - 2^2}$	M1 M1	

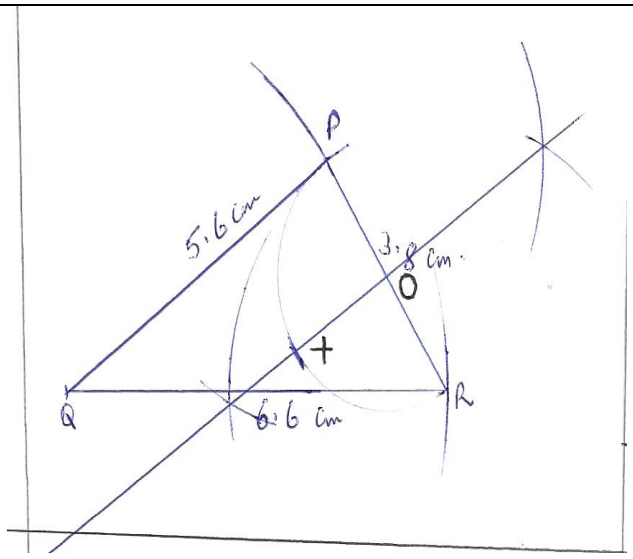
	$= \sqrt{140}$ = 11.83cm Volume = $^1/_3$ x $^{22}/_7$ x 2 x 2 x 11.83 = 49.57cm^3	 M1 4	 If л = 3.142; follow through
10.	Gradient $\frac{dy}{dx} = 3x^2 - 6x + 2$ Gradient = 3 $(3)^2$ - 6x 3 + 2 = 11 Gradient of the normal 1 to line $M_2 = \frac{-1}{11}$ $Y = 33 - 3(3)^2 + 3 \times 2 + 1$ Y = 7; (x, y) is (3, 7) Since $m_2 = \frac{-1}{11}$ $\frac{-1}{11} = \frac{y-7}{x-3}$ $y = \frac{-x}{11} + \frac{80}{11}$	M1 M1 A1 3	Correct differentiation Equating the two gradients
11.	Cos 135^o = - cos (180^o – 135^o) = - cos45^o = - $\frac{\sqrt{2}}{2}$ Sin 30^o = ½ Sin 135^o = sin (180^o- 135^o) = sin 450 = $\frac{\sqrt{2}}{2}$ $\frac{\text{Cos } 135^o - \sin 30^o}{\text{Sin } 135^o + \sin 30^o}$ = - $\frac{\sqrt{2}}{2} - \frac{1}{2}$ $\frac{\sqrt{2}}{2} + \frac{1}{2}$	 M1 M1 A1 3	 - correct ratios i.e. cos 135^o, sin 135^o, sin 30^o

	= -1		
12.	Mid point of AB = $\left(\frac{2+6}{2} , \frac{1+5}{2} \right)$ $= \left({}^{8}/_{2} , {}^{6}/_{2} \right)$ = (4, 3)	M1 A1 2	
13.	$X^2 + y^2 - 4x + {}^{5}/2y + 5 = 0$ $X^2 + y^2 - 4x + {}^{5}/2y = -5$ $X^2 - 4x + 4 + y^2 + {}^{5}/2y + {}^{25}/_{16} = -5 + 4 + {}^{25}/_{16}$ $(x-2)^2 + (y + \frac{5}{4})^2 = \frac{9}{16}$ h = 2 ; k = -1.25	 M1 M1 A1 3	Both values correct
14.	$H^2 = \frac{t}{q - y^2}$ $t = H^2q - H^2y^2$ $y^2 = \frac{H^2q - t}{H^2}$ $y = \pm \sqrt{\frac{H^2q - t}{H^2}}$	M1 M1 A1 3	Accept $\pm \sqrt{\frac{H^2q - t}{H}}$
15.	$\frac{1}{a-2} - \frac{1}{a+2}$ $= \frac{a+2 - 1(a-2)}{a^2-4}$ $= \frac{4}{a^2 - 4}$ Comparing with $\frac{c}{a^2-4}$ C = 4 b = 4	 M1 M1 A1	- Both c and b must be correct

		3	
16.	Yk + c where k and c are constants $3 = k + \frac{c}{4}$ $5 = k + c$ $2 = {}^{3}/_{4}c$; $c = {}^{8}/_{3} = 2\ {}^{2}/_{3}$ $k = {}^{7}/_{3} = 2\ {}^{1}/_{3}$ $k = 2\ {}^{1}/_{3}$, $C = 2\ {}^{2}/_{3}$ $y = {}^{7}/_{3} + \frac{8}{3x^2}$ When $x = 4$, $y = {}^{7}/_{3} + \frac{8}{3(4)^2}$ $Y = 2\ ½$	3 M1 M1 A1 3	Formation of the equation leading to finding the value of c and k. - Solving the two simultaneous equation correctly and getting values of unknown.
	SECTION II		
17.	a) b) Median mark the mark scored by the (½ x 100)th student from the graph 56±2 c) 27 students scored 40 marks and below. (i) Students who scored 41 marks and above = 100 – 27 = 73 Students who passed = $\frac{73}{100}$ x 100 (ii) Students who failed = 100 – 73	B1 B1 B1 B1 B1 B1	For all c.f that are correct otherwise B0.

Class	Frequency	Cumulative Freq. C.F
1 – 10	3	3
11 – 20	6	9
21 – 30	10	19
31 – 40	10	29
41 – 50	12	41
51 – 60	17	58
61 – 70	15	73
71 – 80	16	89
81 – 90	7	96
91 - 100	4	100

	= 27%	B1 10	

5.	Let the transformation matrix T = $\begin{pmatrix} a & c \\ b & d \end{pmatrix}$ $\begin{pmatrix} a & c \\ b & d \end{pmatrix} \begin{pmatrix} A & B & C & D \\ 1 & 3 & 3 & 1 \\ 0 & 0 & 2 & 2 \end{pmatrix} \begin{pmatrix} A^1 & B^1 & C^1 & D^1 \\ 1 & 3 & 7 & 5 \\ 0 & 0 & 2 & 2 \end{pmatrix}$ $\begin{pmatrix} a & 3a \\ c & 3c \end{pmatrix} \begin{pmatrix} 3a+2b \\ 3c+2d \end{pmatrix} \begin{pmatrix} a+2b \\ c+2d \end{pmatrix} = \begin{pmatrix} 1 & 3 & 7 & 5 \\ 0 & 0 & 2 & 2 \end{pmatrix}$ $a = 1,\ c = 0$ $3(1) + 2b = 7$ $2b = 4$ $b = 2$ $2d = 2$ $d = 1$ T.M = $\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$	M1 M1 A1 3	Solutions of All matrix's elements
6.	 	B1 B1 B1 3	Correct measurements and drawing of the ΔPQR. Correct bisecting of line PR Correct location of x. (i.e. by drawing a semi-curve centre at O)
7.	$\frac{3 + 5 + 7 + 9 + 11}{5} = 7$ 	Deviation (x-x)	-4	-2	0	2	4
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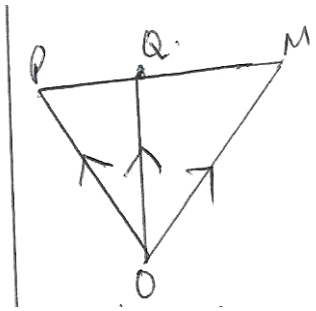
$(x-x)^2$	16	4	0	4	16 | Variance = $\frac{\epsilon d^2}{} = \frac{40}{} = 8$	M1 M1	- finding the mean $\frac{\epsilon fx}{\epsilon f}$ - for squaring $(x - \bar{x})$

	F 5 s.d $\sqrt{8}$ = 2.8284	A1 3	
8.	 Using Ratio theorem OM = $\underline{-2}$ $\begin{pmatrix}1\\2\\3\end{pmatrix}$ + 3 $\begin{pmatrix}4\\5\\-3\end{pmatrix}$ = $\begin{pmatrix}-2\\-4\\-6\end{pmatrix}$ + $\begin{pmatrix}12\\15\\-9\end{pmatrix}$ = $\begin{pmatrix}10\\11\\-15\end{pmatrix}$ Coordinates of m (10, 11, -15)	B1 B1 B1 3	Accept any valid method and award marks accordingly.
9.	Area of a sector = curve are of a cone. 61 x л x 12^2 = лr x 12 $^1/6$ x 12 = r Radius = 2cm h = $\sqrt{12^2 - 2^2}$ = $\sqrt{140}$ = 11.83cm Volume = $^1/_3$ x $^{22}/_7$ x 2 x 2 x 11.83 = 49.57cm^3	M1 M1 M1 4	If л = 3.142; follow through
10.	Gradient $\frac{dy}{dx}$ = $3x^2 - 6x + 2$	M1	Correct differentiation

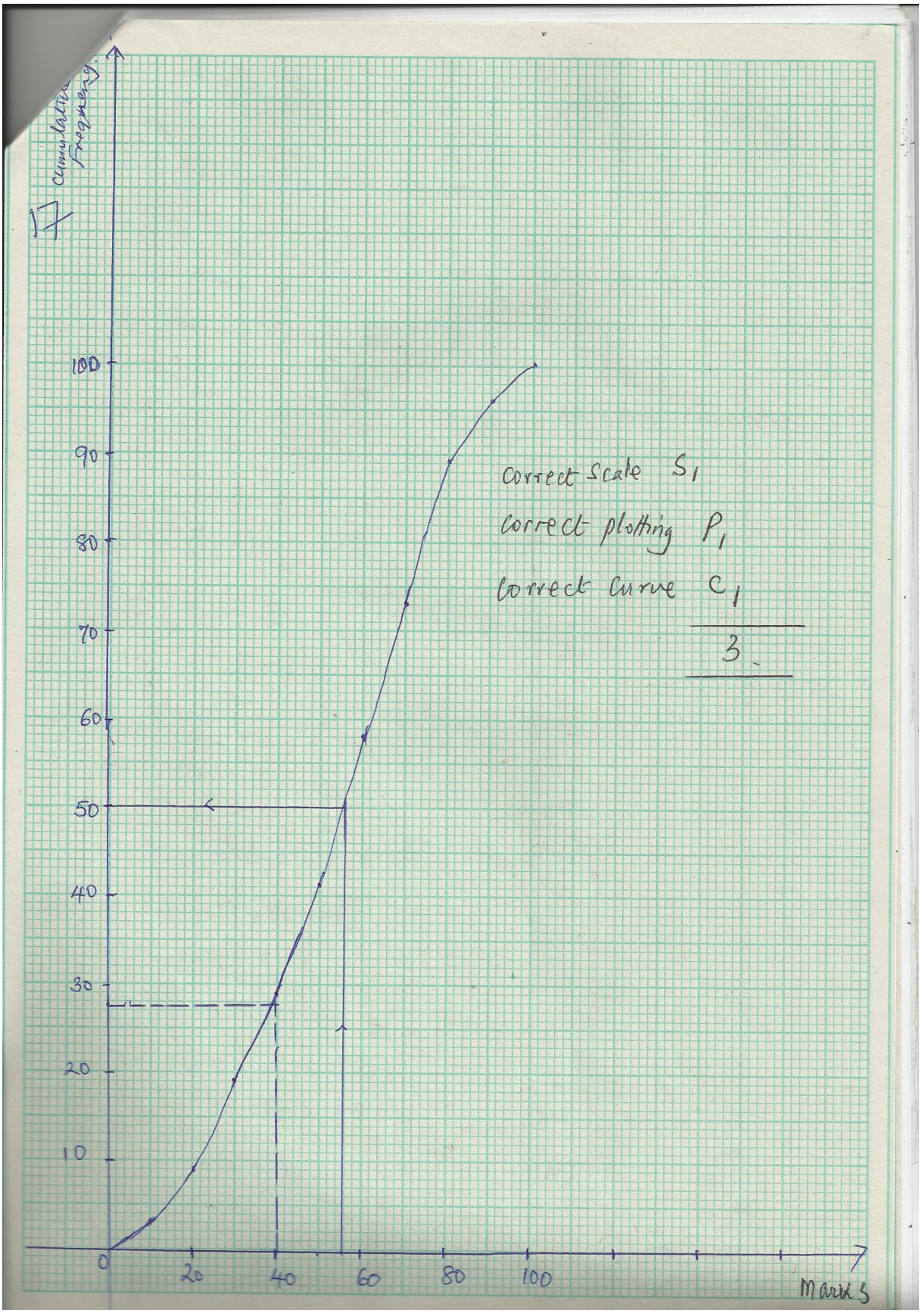
	Gradient = $3(3)^2 - 6x\ 3 + 2 = 11$ Gradient of the normal 1 to line $M_2 = \frac{-1}{11}$ $Y = 33 - 3(3)^2 + 3 \times 2 + 1$ $Y = 7$; (x, y) is (3, 7) Since $m_2 = \frac{-1}{11}$ $\frac{-1}{11} = \frac{y-7}{x-3}$ $y = \frac{-x}{11} + \frac{80}{11}$	M1 A1 3	Equating the two gradients
11.	$\cos 135^o = -\cos(180^o - 135^o)$ $= -\cos 45^o = -\frac{\sqrt{2}}{2}$ $\sin 30^o = ½$ $\sin 135^o = \sin(180^o - 135^o)$ $= \sin 450$ $= \frac{\sqrt{2}}{2}$ $\frac{\cos 135^o - \sin 30^o}{\sin 135^o + \sin 30^o}$ $= -\frac{\frac{\sqrt{2}}{2} - \frac{1}{2}}{\frac{\sqrt{2}}{2} + \frac{1}{2}}$ $= -1$	M1 M1 A1 3	- correct ratios i.e. cos 135°, sin 135°, sin 30°

12.	Mid point of AB = $\left(\frac{2+6}{2} , \frac{1+5}{2} \right)$ $= \left({}^{8}/_{2} , {}^{6}/_{2} \right)$ $= (4, 3)$	M1 A1 2	
13.	$X^2 + y^2 - 4x + {}^{5}/2y + 5 = 0$ $X^2 + y^2 - 4x + {}^{5}/2y = -5$ $X^2 - 4x + 4 + y^2 + {}^{5}/2y + {}^{25}/_{16} = -5 + 4 + {}^{25}/_{16}$ $(x - 2)^2 + (y + \frac{5}{4})^2 = \frac{9}{16}$ $h = 2$; $k = -1.25$	 M1 M1 A1 3	 Both values correct
14.	$H^2 = \frac{t}{q - y^2}$ $t = H^2q - H^2y^2$ $y^2 = \frac{H^2q - t}{H^2}$ $y = \pm \sqrt{\frac{H^2q - t}{H^2}}$	M1 M1 A1 3	 Accept $\pm \sqrt{\frac{H^2q - t}{H}}$
15.	$\frac{1}{a-2} - \frac{1}{a+2}$ $= \frac{a+2 - 1(a-2)}{a^2-4}$ $= \frac{4}{a^2 - 4}$ Comparing with $\frac{c}{a^2-4}$ $C = 4$ $b = 4$	 M1 M1 A1 3	 - Both c and b must be correct

16.	Yk + c where k and c are constants $3 = k + \frac{c}{4}$ $5 = k + c$ $2 = {}^{3}/_{4}c$; $c = {}^{8}/_{3} = 2\ {}^{2}/_{3}$ $k = {}^{7}/_{3} = 2\ {}^{1}/_{3}$ $k = 2\ {}^{1}/_{3}$, $C = 2\ {}^{2}/_{3}$ $y = {}^{7}/_{3} + \frac{8}{3x^2}$ When x = 4, $y = {}^{7}/_{3} + \frac{8}{3(4)^2}$ Y = 2 ½	3 M1 M1 A1 3	Formation of the equation leading to finding the value of c and k. - Solving the two simultaneous equation correctly and getting values of unknown.
	SECTION II		
17.	a) b) Median mark the mark scored by the (½ x 100)th student from the graph 56±2 c) 27 students scored 40 marks and below. (i) Students who scored 41 marks and above = 100 – 27 = 73 Students who passed = $\frac{73}{100}$ x 100 (ii) Students who failed = 100 – 73 = 27%	B1 B1 B1 B1 B1 B1 B1 10	For all c.f that are correct otherwise B0.

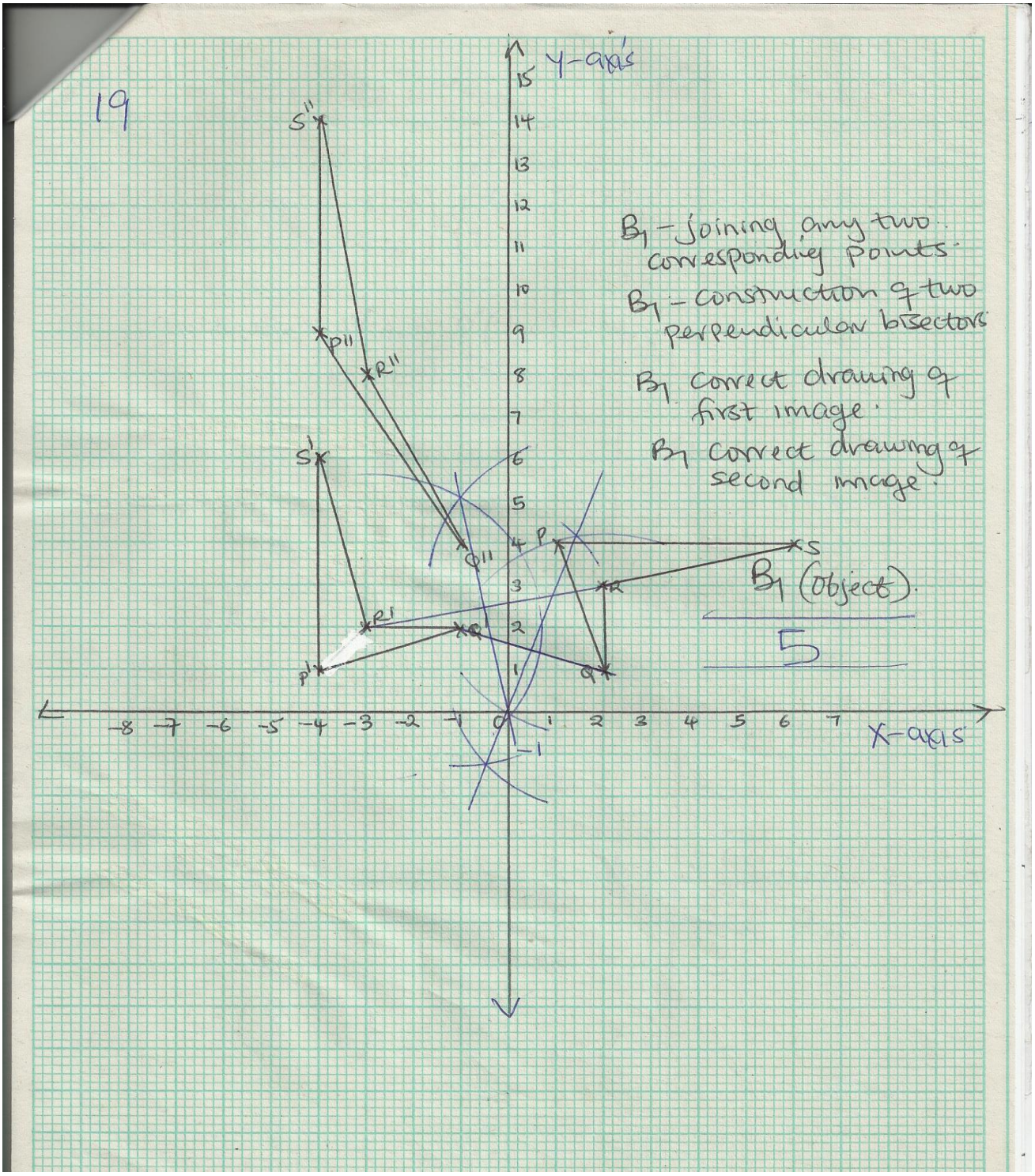
Class	Frequency	Cumulative Freq. C.F
1 – 10	3	3
11 – 20	6	9
21 – 30	10	19
31 – 40	10	29
41 – 50	12	41
51 – 60	17	58
61 – 70	15	73
71 – 80	16	89
81 – 90	7	96
91 - 100	4	100

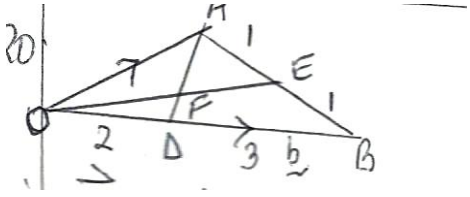
17


Cumulative frequency
100
90
80
70
60
50
40
30
20
10
0
20
40
60
80
100
Marks
correct scale S_1
correct plotting P_1
correct curve C_1
3

18.	In a G.P series; a term is given by ar n-1 2^{nd} term = ar 3^{rd} term = ar2 i) 2^{nd} term + 3^{rd} term = ar + ar2 = 6 ar(a+r) = 6 $ar^2 + ar^3 = -12$ ar(1+r) = 6 $ar^2(1+r)$ -12 $\frac{ar(1+r)}{ar^2(1+r)} = \frac{6}{-12}$ $\frac{1}{r} = \frac{-1}{2}$ r = -2 ii) oubsting: r = -2 in ar(1+r) = 6 -2a(1-2) = 6 2A = 6 = a = 3 b) $bm = n\{2a + (n-1)d\}$ Given sn = -19 ½ ; a = 16 ½ ; d=-3 $\frac{-39}{2} = \frac{n}{2}\{33 - 3(n-1)\}$ -39 = n(36-3n) 3n2 – 36n – 39 = 0 N2 – 12n – 13 = 0 (n-13) (n + 1) = 0 n =13 or n = -1 Number of term is 13	M1 M1 A1 M1 M1A1 M1 M1 M1 A1 10	Both equations For extracting the correct

19

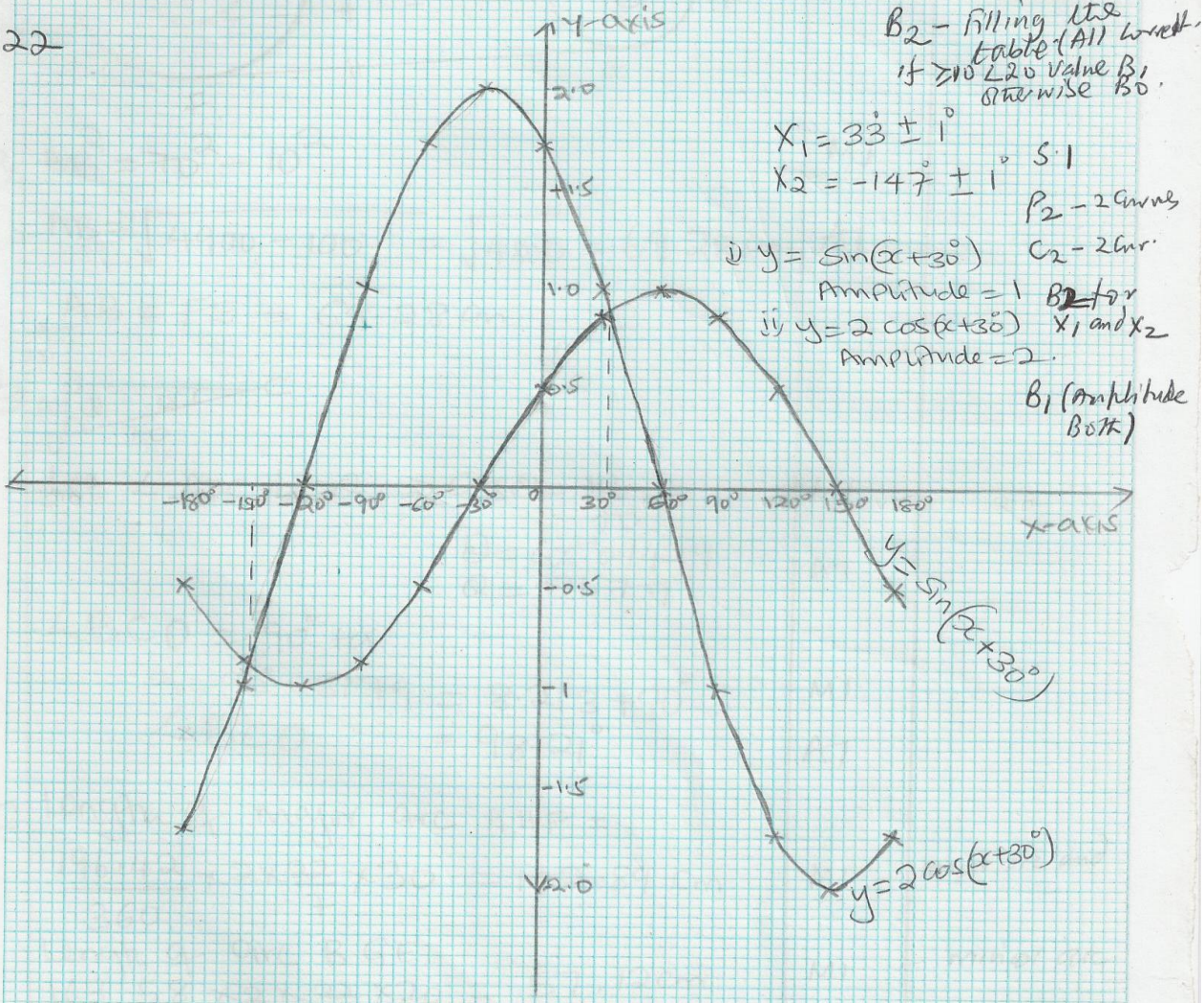

Y-axis
X-axis
S''
P''
R''
Q''
S'
P'
R'
Q'
P
S
R
Q
B1 – Joining any two corresponding points.
B1 – construction of two perpendicular bisectors
B1 correct drawing of first image.
B1 correct drawing of second image.
B1 (Object).
5

19. c)	$\begin{matrix} & P^1 & Q^1 & R^1 & S^1 \end{matrix}$ $\begin{pmatrix} 1 & 0 \\ -2 & 1 \end{pmatrix}\begin{pmatrix} -4 & -1 & -3 & -4 \\ 1 & 2 & 2 & 6 \end{pmatrix}$ $\begin{matrix} P^{11} & Q^{11} & R^{11} & S^{11} \end{matrix}$ $\begin{pmatrix} -4 & -1 & -3 & -4 \\ 9 & 4 & 8 & 14 \end{pmatrix}$	M1	
	Coordinates $P^1(-4\ 9)$: $Q^{11}(-1,4)$ $R^{11}(-3, 8)$; $S^{11}(-4, 14)$	A1	
	d) Let $T = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ $\begin{pmatrix} a & b \\ c & d \end{pmatrix}\begin{matrix} P & Q & R & S \end{matrix}\begin{pmatrix} 1 & 2 & 2 & 6 \\ 4 & 1 & 3 & 4 \end{pmatrix} = \begin{matrix} P^{11} & Q^{11} & R^{11} & S^{11} \end{matrix}\begin{pmatrix} -4 & -1 & -3 & -4 \\ 9 & 4 & 8 & 14 \end{pmatrix}$		
	$2(a + 4b = -4) = 2a + 8b = -8$ $2a + b = -1 \quad \underline{2a + b = -1}$ $7b = -7$ $a = 0$	M1	- Correct matrices multiplication
	$2(c + 4d = 9) = 2c + 8d = 18$ $2c + d = 4 \quad 2c + d = 4$ $7d = +14$ $c=1 \quad d=+2$	M1	- Correct solutions to simultaneous equation leading to finding the T.M
	$T = \begin{pmatrix} 0 & -1 \\ 1 & 2 \end{pmatrix}$	A1	
		10	
20.			
	a) (i) $OE = \frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{b}$	B1	
	$AD = -\mathbf{a} + {}^{2}/_{5}\mathbf{b}$	B1	
	b) $\mathbf{AF} = t\ \mathbf{AD}$		
	$AF = t(2/5b - a)$ $\mathbf{AF} = O\mathbf{A} + O\mathbf{F}$	B1	

	$= -\mathbf{a} + s(\frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{b})$ $= (\frac{1}{2}s - 1)\mathbf{a} + \frac{1}{2}s\mathbf{b}$ Equating $\frac{2}{5}t\mathbf{b} = t\mathbf{a} = (\frac{1}{2}s - 1)\mathbf{a} + \frac{1}{2}s\mathbf{b}$ $t = 1 - \frac{1}{2}s$ $\frac{2}{5}t = \frac{1}{2}s$ $t = 5s$ $5s = 1 - \frac{1}{2}s$ $= s = \frac{2}{11}$ $t = \frac{10}{11}$ c) OF = KOE $OF = S(\frac{1}{2}a + \frac{1}{2}b) = 2/11(\frac{1}{2}a + \frac{1}{2}b)$ $OE = \frac{1}{2}a + \frac{1}{2}b$ $2/11(\frac{1}{2}a + \frac{1}{2}b) = K(\frac{1}{2}a + \frac{1}{2}b)$ $K = \frac{2}{11}$ $O = 2/11\ OE$ O is common point O, F and E are collinear points.	B1 B1 B1 B1 B1 B1 B1 B1 10	For expressing AF in two different ways Equating the two vectors For solving Getting the values of s and t Identifying the common point Showing the three points are collinear.
21.	Angle difference = $110^o + 70^o = 180^o$ Distance = $\frac{\Theta}{360^o} \times 2 \times \pi \times 6370\cos 45$ $= \frac{1}{2} \times 2 \times 3.142 \times 6370 \cos 45$ $= 3.142 \times 6370 \times 0.7071$ $= 14152.28$km. b) Distance in nm = $60\alpha \cos\Theta$ $= 60 \times 180^o \times \cos 45^o$ $= 7636.68$nm. c)Speed = $\frac{\text{Distance in nm}}{\text{time in hours}}$ $= \frac{60 \times 90}{15}$ $= 360$ knots	 M1 M1 A1 M1M1 A1 M1 M1 M1 A1 10	is the finding $\cos 45^o$ For angle difference Multiplying 60*90 diving by 15

x°	-180°	-150°	-120°	-90°	-60°	-30°	0°	30°	60°	90°	120°	150°	180°
$y=\sin(x+30^\circ)$	-0.5	-0.87	-1	-0.87	-0.5	0	0.5	0.87	1	0.87	0.5	0	-0.5
$y=2\cos(x+30^\circ)$	-1.73	-1	0	1	1.73	2	1.73	1	0	-1	-1.73	-2	-1.73

Q22



B_2 - filling the table (All correct if $\geq 10 < 20$ value B_1 otherwise B_0.

$X_1 = 33^\circ \pm 1^\circ$ S1

$X_2 = -147^\circ \pm 1^\circ$ P_2 - 2 Curves

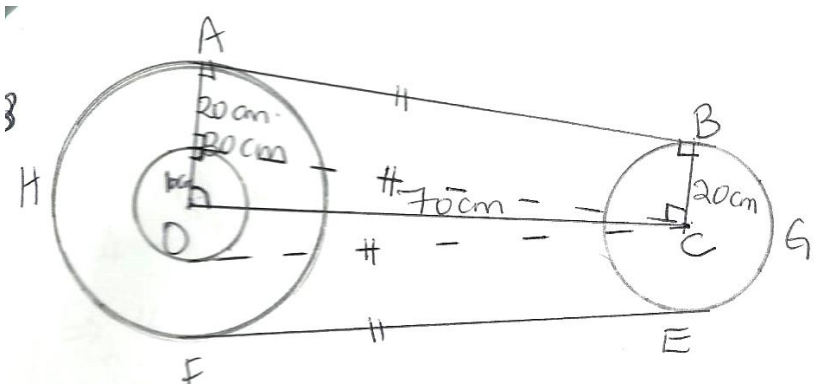
i) $y = \sin(x+30^\circ)$ C_2 - 2 Cur.

Amplitude = 1 B_2 for X_1 and X_2

ii) $y = 2\cos(x+30^\circ)$

Amplitude = 2. B_1 (Amplitude Both)

23.

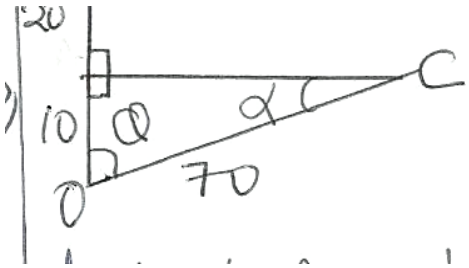


a) $AB^2 = 70^2 - 10^2$ — M1

$AB = \sqrt{4900 - 100} = \sqrt{4800} = 69.28cm$ — A1

$AB = FE = 69.28cm.$

b)



Let ‹ AOC be Q = Cos Q = $\frac{10}{70}$ — M1, A1

$Q = Cos^{-1} 0.1429$

$Q = 81.79^o$ — A1

‹BCD = $90^o + \alpha$ — M1

$A = 90^o - 8179 = 8.213 + 90^o$ — A1

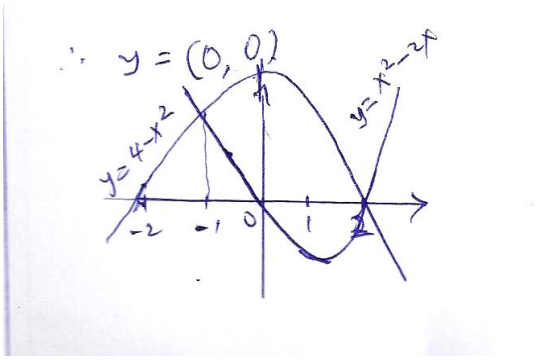
BCO $= 98.21^o$

b) Length of major arc AHF = — M1 Major arc and

$\frac{196.42}{360} \times 2 \times \frac{22}{7} \times 30 = 102.89cm$

Length of arc BGE — M1 Minor arc

$\frac{163.58}{360} \times 2 \times \frac{22}{7} \times 20 = 57.12cm$ — A1

	TOTAL LENGTH = (69.28 x 2) + 102.89 + 57.12 = 298.6cm	10	
24.	The two curves meet when		
a)	$4 - x^2 = x^2 - 2x$ $= 4 - x^2 - x^2 + 2x = 0$ $2x^2 - 2x - 4 = 0$ $x^2 - x - 2 = 0$ $(x - 2)(x + 1) = 0$ $x = -1$ or $x = +2$ (-1, 3) and (2, 0).	B1B1	- For the two correct points
b)	At the point where $y = 4 - x^2$ meet		
	(i) x-axis, $y = 0$ $0 = 4 - x^2$ $= x = \pm 2$	B1	
	(ii) At the point where the $y = 4 - x^2$ meets the y-axis $x = 0$. $y = 4 - (0)^2 = 4$ (0, 4)	B1	
c)	$Y = x^2 - 2x$ x-axis; y-axis; $y = 0$		
	$0 = x^2 - 2y$ $= x(x-2) = 0$ $x = 0$ or $x = 2$ (0,0) or (2,0)	B1B1	
	$Y = x^2 - 2x$; y-axis; $x = 0$		
d)		B1	For sketching

c)

$$\text{Area} = \int_{-1}^{+} \left\{ (4 - x^2) - (x^2 - 2x) \right\} dx \qquad \text{M1}$$

$$= \int_{}^{+2} (4 \times 2x - 2x^2)\ dx \qquad \text{M1}$$

$$= \left(4x + x^2 - {}^2/_3 x^3 \right)_{-1}^{+2} \qquad \text{A1}$$

$$(4 \times 2 + 2^2 - {}^2/_3 \times 2^3) - (-4 + 1 + {}^2/_3)$$

$$= 8 + 4 - 5^1/_3 + 4 - 1^2/_3$$

$$= 9$$

10