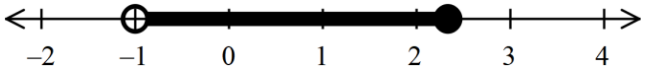
No	Workings	Marks	Comments
1.	Numerator ; $3\frac{1}{2}+\frac{10}{457}\left(\frac{6}{13}-\frac{4}{21}+\frac{11}{15}\right)$ $=\frac{7}{2}+\frac{10}{457}\left(\frac{457}{455}\right)$ $=\frac{7}{2}+\frac{2}{91}=\frac{641}{182}$ Deniminator; $\frac{1}{11}\left(\frac{121}{91}\right)-\frac{9}{91}$ $=\frac{11}{91}-\frac{9}{91}=\frac{2}{91}$ $N/D=\frac{641}{182}\div\frac{2}{91}=160\frac{1}{4}$ or 160.25	**M1** **M1** **A1**	✓Numerator ✓Denominator ✓CAO
	Total Marks	**3**	
2.	L.C.M $(9,15,21)=315$ minutes 315 minutes = 5 hours 15 minutes Time = 11 : 00 – 5 hours 15 minutes = 1745 Hours or 5 : 45 p.m.	**M1** **M1** **A1**	✓Follow through method used to find L.C.M ✓Subtracting the time ✓Correct time
	Total Marks	**3**	
3.	$x+10+3x+50=180$ $4x=120$ $x=30$ $\therefore$ Exterior angle = $(30+10)=40$ $n=\frac{360}{40}=9$ sides $S_n=180(9-2)$ $=1260^\circ$	**M1** **M1** **M1** **A1**	✓Equating sum to 180^o ✓ finding no. of sides ✓ Finding sum ✓
	Total Marks	**4**	
4.	(a) Solving the inequalities $-8<5x-3$ | $5x-3\le 2x+4$ $-5<5x$ | $3x\le 7$ $-1<x$ | $x\le 2\frac{1}{3}$ $-1<x\le 2\frac{1}{3}$  (b) Integral values = 0 , 1 , 2	**B1** **B1** **B1**	✓Splitting the inequalities ✓Combined inequality ✓number line correctly drawn ✓All Integral values stated

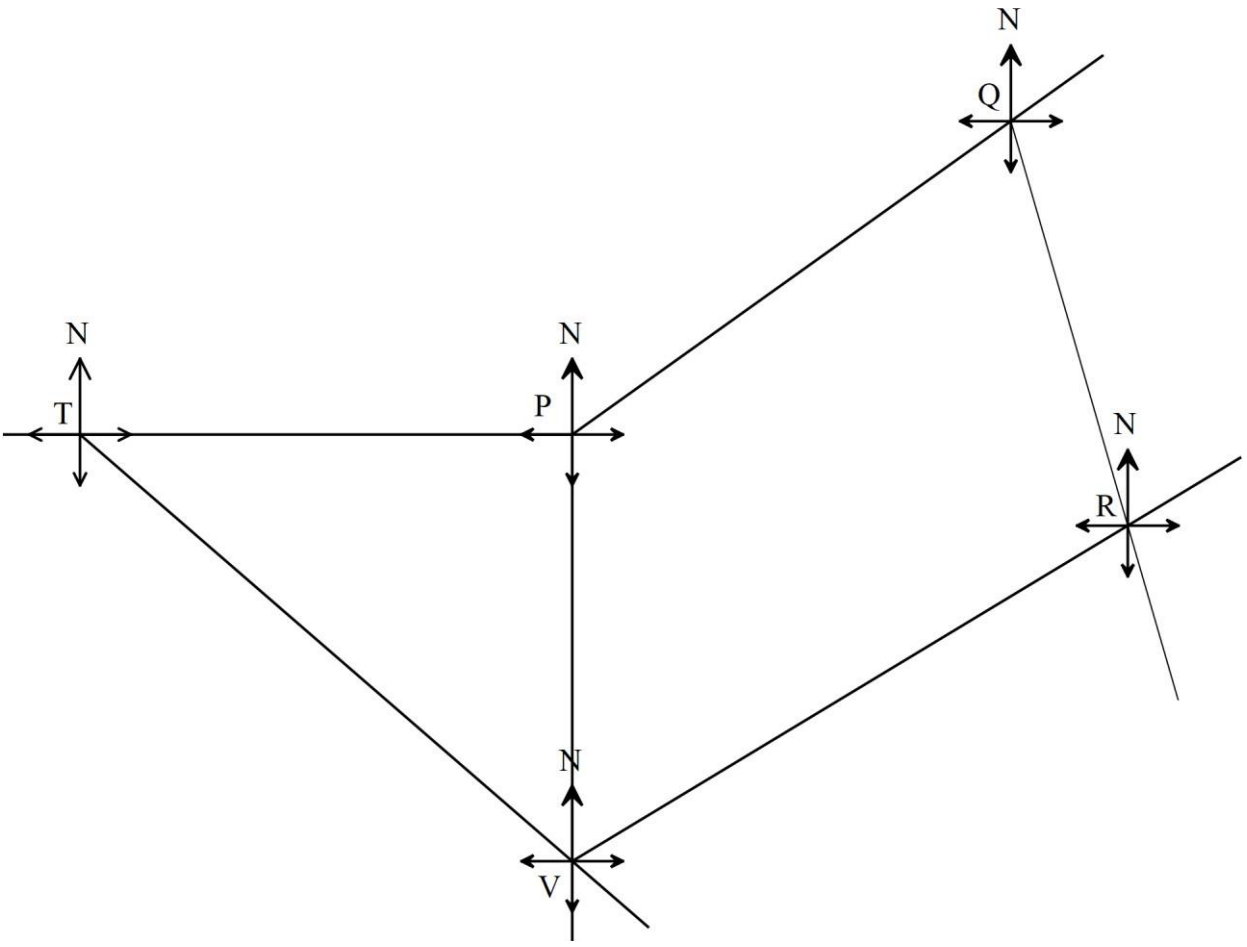
	Total Marks	**4**	
No	**Workings**	**Marks**	**Comments**
5.	$70\times145.30 = Kshs.1,017,100$ Balance = 1,017,100 − 426 380 = Kshs. 590 720 Amount received in UAE Dirhams; $= \frac{590720}{36.92}$ $=16,000$ UAE Dirhams.	**M1** **M1** **A1**	✓Exchanging to Kenyan currency ✓Exchanging balance into UAE Dirhams ✓CAO.
	Total Marks	**3**	
6.	Num; $9t^2 - 25a^2 = (3t+5a)(3t-5a)$ Den; $6t^2 + 19at + 15a^2$ $= 6t^2 + 10at + 9at + 15a^2$ $= 2t(3t+5a) + 3a(3t+5a)$ $= (3t+5a)(2t+3a)$ $\frac{Num}{Den} = \frac{\cancel{(3t+5a)}(3t-5a)}{\cancel{(3t+5a)}(2t+3a)}$ $= \frac{3t-5a}{2t+3a}$	**M1** **M1** **A1**	✓ Correct factorisation of numerator ✓Factorising denominator correctly ✓
	Total Marks	**4**	
7.	Let the cost of one beaker be *b* and that of one test – tube be *t* $4b + 3t = 475$ $2b + 5t = 325$ $2(4b + 3t = 475)$ $4(2b + 5t = 325)$ $8b + 6t = 950$ $\underline{8b + 20t = 1300}$ $-14t = -350$ $\Rightarrow t = Kshs.25,\ b = Kshs.100$	**M1** **M1** **A1**	✓Forming the two equations ✓ Follow through the method ✓Both values
	Total Marks	**3**	
8.	$5^{6y-15} \div 5^{2y+8} = 5^4$ $(6y-15) - (2y+8) = 4$ $6y - 15 - 2y - 8 = 4$ $4y = 27$ $y = 6.75$ or $6\frac{3}{4}$	**M1** **M1** **A1**	✓ Expressing to base 5 ✓ Equating powers ✓ Value of *y*
	Total Marks	**3**	

No	Workings	Marks	Comments
9.	$90+15+5=110$ minutes 110 mins = 1 hour 50 mins Kick off time = 4 : 30 - 1 : 50 = 6 : 20 p.m.	**M1** **A1**	✓ ✓Correct time
	Total Marks	**2**	
10.	Volume = $\frac{1}{2}\times\frac{22}{7}\times14^2\times18$ $=5544\text{ cm}^3$ Mass = 4.62×1000 = 4620 g Density = $\frac{\text{mass}}{\text{Volume}}$ Density = $\frac{4620}{5544}=0.8333\text{ g/cm}^3$	**M1** **M1** **A1**	✓Volume of cone ✓Finding Density ✓At least 4 s.f.
	Total Marks	**3**	
11.	$\mathbf{AB}=\begin{pmatrix}x\\-2\end{pmatrix}-\begin{pmatrix}-2\\10\end{pmatrix}=\begin{pmatrix}x+2\\-12\end{pmatrix}$ $(x+2)^2+(-12)^2=13^2$ $x^2+4x-21=0$ $x=\frac{-2\pm\sqrt{4^2-(4\times1\times-21)}}{2}$ $x=-7$ or 3	**M1** **M1** **M1** **A1**	✓Finding vector **AB** ✓Forming quadratic ✓ Solving quadratic ✓Values of x
	Total Marks	**3**	
12.	ABE ≡ ACD $\frac{AB}{AC}=\frac{BE}{CD}=\frac{AE}{AD}$ $\frac{6}{AC}=\frac{4}{9}$ $4AC=54$ AC = $\frac{54}{4}$ AC = 13.5 cm BC = 13.5 – 6 = 7.5 cm	**M1** **M1** **A1**	✓Identifying similar triangles and corresponding sides ✓ ✓
	Total Marks	**3**	

No	Workings	Marks	Comments
13.	<table><tr><td>*Marks*</td><td>*f*</td></tr><tr><td>10 – 14</td><td>5</td></tr><tr><td>15 – 24</td><td>16</td></tr><tr><td>25 – 29</td><td>4</td></tr><tr><td>30 – 44</td><td>15</td></tr></table>	**B1** **B2**	✓ All classes correct ✓ All correct 4 frequencies Award **B1** for at least two correct frequencies
	Total Marks	**3**	
14.	$3\left(5.584\times10^{-2}\right)^{-1}-\left(2.162\times10^{2}\right)^{\frac{1}{2}}$ $3\left(0.1791\times10^{2}\right)-\left(1.4704\times10^{1}\right)$ $\left(3\times17.91\right)-14.704$ 39.026	**B1** **B1** **B1**	✓ 0.1791 ✓ 14.704 ✓
	Total Marks	**3**	
15.	$2x+15+3x-25=90$ $5x=100$ $x=20$ $\sin x=\sin 60=\frac{\sqrt{3}}{2}$	**M1** **A1** **B1**	✓ Equating to 90^o ✓
	Total Marks	**3**	
16.	$a^2=66^2+34^2-2\times66\times34\cos96.7$ $a^2=6035.618$ $a=\sqrt{6035.618}$ $a=77.7\text{m}$	**M1** **M1** **A1**	✓ Substitution in formula ✓ square root ✓ to 1 decimal places
	Total Marks	**3**	

No	Workings	Marks	Comments
17	(a) (i) Equation of line L_1 Gradient = $\frac{-7-5}{6-4}=\frac{-12}{2}=-6$	**B1**	✓ Gradient
	$\therefore -6=\frac{y-5}{x-4}$	**M1**	✓ Equation
	$y-5=-6x+24$ $y=-6x+29$	**A1**	✓Correct format.
	(ii) x – intercept = $4\frac{5}{6}$	**B1**	✓
	y – intercept = 29	**B1**	✓
	(b) Equation of L_2 $\frac{1}{6}=\frac{y-7}{x+21}$	**M1**	✓
	$-x+6y=63$ or $x-6y=-63$	**A1**	✓
	(c) Intersection point $-x+6(-6x+29)=63$	**M1**	✓
	$-x-36x+174=63$ $-37x=-111$	**A1**	✓
	$x=3, y=11$ Point $(3,11)$	**B1**	✓
	Total Marks	**10**	
18	**(a) Maximum speed** $\left(\frac{130+60}{2}\right)h=2090$	**M1**	
	$h=22$ m/s	**A1**	
	Speed in km/h = $\frac{22}{10}\times 18=79.2$ km/h	**B1**	
	(b) Acceleration $\frac{22-0}{30}=\frac{11}{15}$ m/s	**M1A1**	
	(c) Distance in last 20 mins $\frac{1}{2}\times 11\times 20=110m$	**M1A1**	
	(d) Time to cover first half of the journey $330+32x=1045$	**M1**	
	$x=32.5$	**A1**	
	$30+32.5=62.5$ Seconds	**B1**	
	Total Marks	**10**	

No	Workings	Marks	Comments
19	**(a) Volume of water in the vessel**		
	$\frac{1}{3}\times\frac{22}{7}\times 21^2\times 30$	**M1**	✓ Substitution
	$=13{,}860\ \text{cm}^3$	**A1**	✓
	(b) Radius of new water surface		
	$\frac{36}{30}=\frac{x}{21}$	**M1**	✓
	$x=25.2cm$	**A1**	✓
	(c) Volume of metal sphere		
	$\frac{1}{3}\times\frac{22}{7}\times 25.2^2\times 36$	**M1**	✓ Substitution
	$=23950.08\ \text{cm}^3$		
	Volume = $23950.08 - 13\,860$	**M1**	✓ Subtraction
	$= 10\,090.08\ \text{cm}^3$	**A1**	✓
	(d) Radius of sphere		
	$\frac{4}{3}\times\frac{22}{7}\times r^3=10090.08$	**M1**	✓
	$r=\sqrt[3]{2407.86}$	**M1**	✓
	$r=13.40\ \text{cm}$	**A1**	
	Total Marks	**10**	
20	**(a) Inverse of P.**		
	$Det = 72-30=42$	**M1**	
	$P^{-1}=\frac{1}{42}\begin{pmatrix}9 & -5\\ -6 & 8\end{pmatrix}=\begin{pmatrix}\frac{3}{14} & -\frac{5}{42}\\ -\frac{1}{7} & \frac{4}{21}\end{pmatrix}$	**A1**	
	(b) Equations		
	$8T+5S=4400$	**B1**	
	$6T+9S=5400$	**B1**	
	(c) Solving the equations simultaneously		
	$\begin{pmatrix}\frac{3}{14} & -\frac{5}{42}\\ -\frac{1}{7} & \frac{4}{21}\end{pmatrix}\begin{pmatrix}8 & 5\\ 6 & 9\end{pmatrix}\begin{pmatrix}T\\ S\end{pmatrix}=\begin{pmatrix}\frac{3}{14} & -\frac{5}{42}\\ -\frac{1}{7} & \frac{4}{21}\end{pmatrix}\begin{pmatrix}4400\\ 5400\end{pmatrix}$	**A1**	
	$\begin{pmatrix}1 & 0\\ 0 & 1\end{pmatrix}\begin{pmatrix}T\\ S\end{pmatrix}=\begin{pmatrix}300\\ 400\end{pmatrix}$	**M1A1**	
	Price of one T - shirt = Kshs.300 and one short = Kshs.400	**M1** **A1**	
	(d) Percentage Increase	**B1**	
	$(5\times 300)+5(400+y)=3650$		
	$y=30$		
	Percentage increase = $\frac{30}{400}\times 100\%$		
	$=7.5\%$		
	Total Marks	**10**	



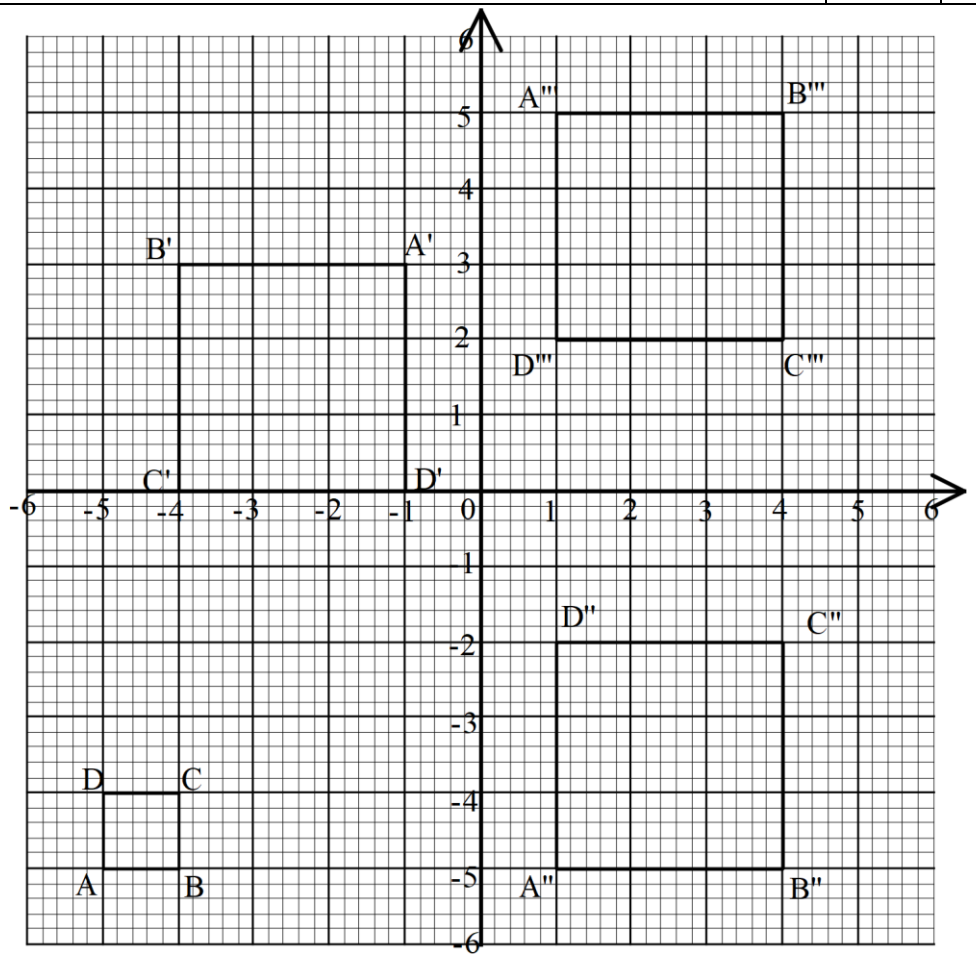
No	PWorkings	Marks	Comments
21.	(a) On the diagram;	**B1** **B1** **B1** **B1** **B1**	Point Q ✓ Point R ✓ Point T✓ Point V ✓ ✓Complete diagram
	(b) (i) 73 ± 1 km (ii) 202° OR S22°W $\pm 1^\circ$	**B1** **B1**	✓ ✓
	(c) Area PQRVT $\left(\frac{1}{2}\times 48\times 59\right)+\left(\frac{1}{2}\times 53\times 59\sin 125\right)+\left(\frac{1}{2}\times 58\times 73\sin 102\right)$ $= 4767.483 km^2$	**M1** **A1**	✓ Smooth Curve ✓
	Total Marks	**10**	

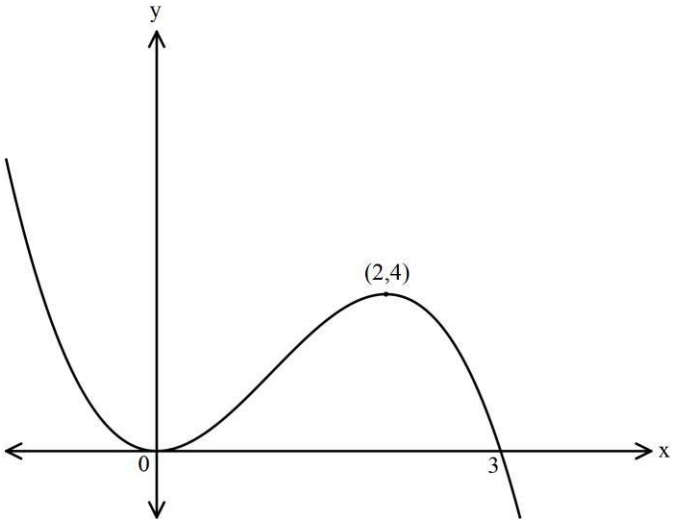
No	Workings	Marks	Comments
22	(a) Equating the equations; $2x+4=-2x^2+4x+16$ $2x^2-2x-12=0$ $x^2-x-6=0$ $(x+2)(x-3)=0$ $x=-2,3$ $\therefore$ Coordinates of A and B are $(-2,0)$ and $(3,10)$	**M1** **M1** **A1**	✓ Process of getting relative distance ✓ Time taken
	(b) Area using trapezoidal rule $Area=\frac{1}{2}(0+2(8+12+12+8))$ $=40$ square units	**M1** **M1** **A1** **M1**	✓Exact time ✓ ✓ ✓ ✓
	(c) Area using mid – ordinate rule $Area=1(4.5+10.5+12.5+10.5+4.5)$ $=42.5$ square units	**M1** **M1** **A1**	
	Total Marks	**10**	

x	-2	-1	0	1	2	3
y_1	0	10	16	18	16	10
y_2	0	2	4	6	8	10
y_1-y_2	0	8	12	12	8	0

x	-1.5	-0.5	0.5	1.5	2.5
y_1	5.5	13.5	17.5	17.5	13.5
y_2	1	3	5	7	9
y_1-y_2	4.5	10.5	12.5	10.5	4.5

No	Workings	Marks	Comments
23			
	(a) Enlargement	**B1**	Quad. ABCD
		B1	✓Using centre
		B1	✓ $A'B'C'D'$
		B1	✓ $A''B''C''D''$
	(b) Rotation	**B1**	✓ any 2 bisectors
	Centre $(0,-1)$	**B1**	✓Centre
	Angle = 180°	**B1**	✓Angle
	(c) Reflection in the line $y=0$	**B1**	✓
	(d) (i) $A'B'C'D'$ and $A'B'C'D'$	**B1**	✓
	(ii) $A''B''C''D''$ and $A''B''C''D''$	**B1**	✓
	Total Marks	**10**	



No	Workings	Marks	Comments
24.	(a) (i) $x^2(3-x)=0$	**M1**	
	$x=0$ or 3	**A1**	✓
	(ii) $y=0$	**B1**	
	(b) (i) **stationary points**		
	$y=3x^2-x^3$		
	$\frac{dy}{dx}=6x-3x^2$	**M1**	✓Differentiating
	$3x(2-x)=0$	**A1**	✓Both values
	$x=2$ or 0	**B1**	✓Coordinates
	$(0,0)$, $(2,4)$		
	(ii) **Nature of stationary points**		
	$(0,0)\frac{d^2y}{dx^2}=6$;Minimum point	**B1**	✓Follow through
	$(2,4)\frac{d^2y}{dx^2}=-6$; Maximum point	**B1**	✓
	(c) Sketch of the curve		
		**B1**	
		B1	
		B1	
	Total Marks	**10**	