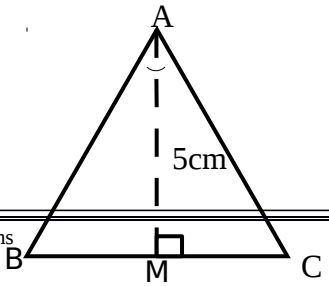
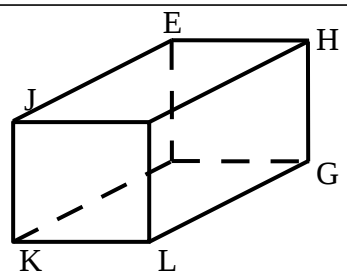
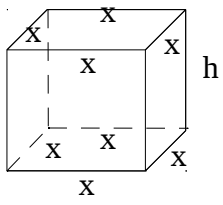
SCHOOL BASED FORM 4 EXAM JULY-AUGUST 2017

KENYA CERTIFICATE OF SECONDARY EDUCATION (K.C.S.E.)
121/1 MATHEMATICS
PAPER 1 MARKING SCHEME

No		MARKS	
1.	(a) $94344 - 36425 \div 5$ $= 94344 - 7285$ $= 87059$ (b) 7000	 A1 B1	
		02	
2.	Rhino - $\frac{1}{5}$ Zebras – ¾ $\frac{1}{5}+\frac{3}{4}=\frac{4+15}{20}$ $=\frac{19}{20}$ Zebras $\frac{2}{3}x\frac{1}{20}=\frac{1}{30}$ $\frac{1}{5}+\frac{3}{4}+\frac{1}{30}=\frac{12+45+2}{60}$ $=\frac{59}{60}$ Fraction of warthogs is $\frac{1}{60}$	M1 M1 A1	
		03	
3.	Length of the cube $\sqrt[3]{2744}$ = 14cm Diagonal of a face $=\sqrt{392}$ $=\sqrt{196\,x\,2}$ $= 14\sqrt{2}$cm	M1 M1 A1	
		03	
4.	No. | Log 24.36 | 1.3867 0.66547 | $\acute{1}.8231$ + 1.48^2 | 1.2098 0.1703 - x 2 0.3406 0.8692 3 1.9485 ◄ 0.2897 = 1.949	Logs M1 M1 ✓ Division by 3 A1	
		03	
5.			

	MC = 5 tan 20^0 = 1.81985cm BC = 3.6397cm Sin $20^0 = \frac{1.81985}{AC}$ Ac = $\frac{1.81985}{\sin 20^0}$ = $\frac{1.81985}{0.34202}$ = 5.321cm Length of the wire = 3.6397 + 2 x 5.321 = 14.3cm	M1 M1 A1	
		03	
6.	Mass of the liquid Density = $\frac{Mass}{Volume}$ 1.2 = $\frac{m}{300}$ = 360gm Total mass = 360 + 380 640gm	 M1 M1 A1	
		03	
7.	 Completed cuboid Use of dotted lines for the hidden edges	 B1 B1	
		02	
8.	2p = p $\left(1+\frac{r}{200}\right)^{10}$ = $\left(1+\frac{r}{200}\right)$ 1.0718 = $1+\frac{r}{200}$ 0.0718 = $\frac{r}{200}$ r = 0.0718 x 200 = 14.36%	M1 M1 Tenth root A1	
		03	
9.	(a) (2n – 40)90 = 40 $\left(\frac{360}{n}\right)$ 2.25n(2n – 4) = 360 $4.5n^2 – 9n – 360 = 0$ n^2- 2n – 80 = 0	M1 ✓ equations	

	$n^2 - 10n + 8n - 80 = 0$ $n(n-10) + 8(n - 10) = 0$ $\therefore n = 10$ (b) Decagon	✓ factorization A1 B1	
		03	

10.	(a) Class (a – b) | f | x = $\left(\frac{a+b}{2}\right)$ | fx 38 – 39 | 3 | 38.5 | 115.5 40-41 | 7 | 40.5 | 283.5 42-43 | 7 | 42.5 | 297.5 44-45 | 5 | 44.5 | 222.5 46-47 | 6 | 46.5 | 279 48-49 | 4 | 48.5 | 194 B1 | Σ=32 | | Σfx = 1392 | B1 | | B1		
	(b) $\acute{x} = \frac{1392}{32}$ $= 43.5$	B1 A1	
		04	
11.	(a) $q = 5\begin{pmatrix}-2\\-3\end{pmatrix} - 3\begin{pmatrix}1\\-2\end{pmatrix}$ $= \begin{pmatrix}-10 & -3\\-15 & +6\end{pmatrix}$ $= \begin{pmatrix}-13\\-9\end{pmatrix}$ (b) Translation $\begin{pmatrix}3\\2\end{pmatrix} - \begin{pmatrix}0\\-2\end{pmatrix}$ $¿\begin{pmatrix}3\\4\end{pmatrix}$	M1 A1 B1	
		03	
12.	$\frac{5(-5)^2-(2x-3)-\left(4x-\frac{1}{3}\right)}{\frac{1}{3}(-3)^2+2x-5}$ $= \frac{125+6+\frac{4}{3}}{\frac{1}{3}(9-10)}$ $= \frac{132\frac{1}{3}}{\frac{-1}{3}}$ $= \frac{397}{3}x - \frac{3}{1}$ $= -397$	M1 ✓ Substitution M1 A1	
		03	
13.			

	$8x + 4h = 36$ $h = \frac{36-8x}{4}$ $v = x^2 (9 - 2x)cm^2$	M1 M1 A1	
		03	
14.	(a) $\begin{pmatrix} 4 & 3 \\ 2 & -1 \end{pmatrix}$ $\Delta = -4 - 6$ $= -10$ Inverse $\frac{-1}{10}\begin{pmatrix} -1 & -3 \\ -2 & 4 \end{pmatrix}$ (b) $4x + 3y = 8$ $2x - y = 9$ $\frac{-1}{10}\begin{pmatrix} -1 & -3 \\ -2 & 4 \end{pmatrix}\begin{pmatrix} 4 & 3 \\ 2 & -1 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \frac{-1}{10}\begin{pmatrix} -1 & -3 \\ -2 & 4 \end{pmatrix}\begin{pmatrix} 8 \\ 9 \end{pmatrix}$ $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} ¿ \frac{1}{10}\begin{pmatrix} -35 \\ -1.8 \end{pmatrix}$ $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 3.5 \\ -1.8 \end{pmatrix}$ $\therefore x = 3.5, y = -1.8$	B1 M1 A1	M0 for post multiplication on the right hand side
		04	
15.	(a) $\frac{20-0}{10-0}$ m/s $= 2m/s^2$ (b) ½ x 10 x 20 + ½ x 5 (20 + 15)+5 x 15 + ½ x 10 x 15 $= 100 + 87.5 + 75 + 75$ $= 337.5m$	M1 A1 M1 A1	
		04	
16.	Area = ½ x 2 (11 + 27 + 2(3 + 3 + 11)n^2 $= 38 + 2(17)u^2$ $= 38 + 34\ u^2$ $= 72u^2$	M1 M1 A1	
	SECTION B	03	
17.	(a) Amount received = 12000 x 240 = KSh. 2,888,000 (b) (i) Sales = $\frac{125}{100} x 12000 x 240$ = 3,600,000 Decreased $\frac{90}{100} x 360,000$ = 3,240,000 % increase = $\frac{3,240,000-2,880,000}{2,880,000} x 100$ $= \frac{360000}{280000} x 100$ = 12.5% (ii) New price in 2003 $\frac{16}{15} x \frac{125}{100} x 12000$ KSh. 16000	M1 A1 M1 A1 M1 A1	

	(c) No. of sofa sets sold in the year 2003 $\frac{90}{100} x 240 = 216$ No. of sets sold in the year2003 = $\frac{Sales \in year\ 2003}{Price\ per\ sofa\ set}$ = $\frac{3240000}{16000}$ = 203 P = $\frac{216-202.5}{216}$ x 100 P = 6.25%	M1 M1 A1	
		10	

18.	(a) $\begin{pmatrix} 2 & 5 \\ 4 & 3 \end{pmatrix}$ Determinant = (2 x 3) – (4 x 5) = 6 – 20 = -14 Inverse = $\frac{-1}{14}\begin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix}$ Let L be the cost of hiring a lorry and Sh. b be that of hiring a bus (b) (i) 2L + 5b = 156000 4L + 3b = 137000 (ii) $\begin{bmatrix} 2 & 5 \\ 4 & 3 \end{bmatrix}\begin{bmatrix} L \\ b \end{bmatrix} = ¿ \begin{bmatrix} 156000 \\ 137000 \end{bmatrix}$ $-\frac{1}{14}\begin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix}\begin{bmatrix} 2 & 5 \\ 4 & 3 \end{bmatrix}\begin{bmatrix} l \\ b \end{bmatrix} = \frac{-1}{14}\begin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix}\begin{bmatrix} 156000 \\ 137000 \end{bmatrix}$ $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}\begin{bmatrix} l \\ b \end{bmatrix} = -\frac{1}{14}\begin{bmatrix} -217000 \\ -350000 \end{bmatrix}$ $\begin{bmatrix} l \\ b \end{bmatrix} = \begin{bmatrix} 15500 \\ 25000 \end{bmatrix}$ Lorry = 15500 Bus = 25000 (c) A singular matrix has a determinant = 0 $\begin{bmatrix} 2x-1 & 1 \\ x^2 & 1 \end{bmatrix}$ $(2x – 1) – x^2 = 0$ $2x – 1 – x^2 = 0$ $x^2 – 2x + 1 = 0$ p = 1 s = -2 f = -1, -1 $(x^2 – x) – (x + 1) = 0$ x(x-1) -1 (x -1) = 0 x = 1	M1 A1 M1 M1 M1 A1 M1 A1	M0 for post multiplication on the right hand side
		10	
19.	(a) (b) 4.1±0.1cm (d) Radius = 1.3 ± 0.1cm (e) Perpendicular line AM = 40cm	B1 ∠ of 300 B1 Δ ABC B1	

	Area of triangle = ½bh = ½ x 6 x 4 = 12cm^2 Area of circle = πr^2 = 3.142 x 1.3^2 = 5.310 Area = 12 – 5.310 = 6.690cm^2	M1 M1 A1	
		10	
20.	(a) a^2 = b^2 + c^2 – 2bcCos A a^2 = 6^2 + 8^2 – 2 x 6 x Cos 50 a^2 = 36 + 64 – 61.71 a^2 = 100 – 61.71 a = 6.188cm B = 6.19cm (b) $\frac{a}{\sin A}=\frac{b}{\sin B}=\frac{c}{\sin C}$ $\frac{6.188}{\sin 50}=\frac{6}{\sin B}$ Sin B = $\frac{6\sin 50}{6.188}$ B = 47.97^0 (c) a^2 = d^2 + c^2 – 2dCos A 2.82^2 = 6^2 + 7^2 – 2 x 6 x 7 x Cos A 7.9524 = 36 + 49 – 84Cos A 7.9524 = 85 – 84Cos A 84Cos A = 85 – 7.9524 Cos A = $\frac{77.0476}{84}$ A = 23.48^0 (d) Area of Δ ACD A = ½ ab sin C A = ½ x 7 x 6 c Sin 23.48 A = 21 Sin 23.48 A = 8.367cm^2 A = 8.37cm	 M1 M1 A1 M1 A1 M1 A1	
		10	
21.	(a) L ⇒ (-2, 3) (-1,6) Gradient = $\frac{6-3}{-1--2}=\frac{3}{-1+2}=\frac{3}{1}=3$ $\frac{y-3}{x--2}=3$ $\frac{y-3}{x+2}=\frac{3}{1}$ y – 3 = 3x + 6 y = 3x + 6 + 3 y = 3x + 9 (b)P ⇒m_1xm_2 = -1 3m_2 = -1 m_2 = -$\frac{1}{3}$ $\frac{y-6}{x--1}=\frac{-1}{3}$	 M1 A1 M1 A1	

	$\frac{y-6}{x+1}=\frac{-1}{3}$ 3(y – 6) = -x - 1 3y – 18 = -x - 1 3y = -x + 17 x + 3y = 17		
	(c) Q $\Rightarrow m_1 = m_2 = 3$ (1,2)	A1	
	$\frac{y-2}{x-1}=\frac{3}{1}$ y – 2 = 3x – 3 y = 3x – 3 + 2 y = 3x – 1	A1	
	At y – intercept, x = 0 y = 3x – 1 y = 3(0) – 1 y = -1 y – intercept (0,-1)		
	At x – intercept, y = 0 y = 3x – 1 0 = 3x – 1 $\frac{3x}{3}=\frac{1}{3}$ $x = \frac{1}{3}$ x – intercept $(\frac{1}{3}, 0¿$	B1	Accept alternative methods of solving simultaneous equations
	(d) Point of intersection P $\Rightarrow$ x + 3y = 17 y = -1 $-\frac{x}{3}+\frac{17}{3}$ ……(1) Q $\Rightarrow$ y = 3x – 1 …….. (ii) Equating (i) and (ii)	M1	
	$3x - 1 = \frac{-x}{3}+\frac{17}{3}$ $3x + \frac{x}{3}=\frac{17}{3}+1$ $\Rightarrow \frac{10}{3}x=\frac{20}{3}$ $x = \frac{20}{3}x\frac{3}{10}$ x = 2	M1 A1	
	(d) x = 2 y = 3x – 1 y = 3(2) – 1 y = 6 -1 y = 5 x = 2 y = 5 P (2,5)		
		10	

22.	A B C D A^I B^I C^I D^I (a) $\begin{bmatrix}0 & -1\\1 & 0\end{bmatrix}\begin{bmatrix}3 & 2 & 4 & 5\\1 & 4 & 3 & 1\end{bmatrix}=\begin{bmatrix}-1 & -4 & -3 & -1\\3 & 2 & 4 & 5\end{bmatrix}$ A^I B^I C^I D^I A^{II} B^{II} C^{II} D^{II} (b) $\begin{bmatrix}0 & 0\\1 & -1\end{bmatrix}\begin{bmatrix}-1 & -4 & 3 & -1\\3 & 2 & 4 & 5\end{bmatrix}=\begin{bmatrix}-1 & -4 & -3 & -1\\3 & 2 & 4 & 5\end{bmatrix}$ (c) $\begin{bmatrix}1 & 0\\0 & -1\end{bmatrix}\begin{bmatrix}0 & -1\\1 & 0\end{bmatrix}=\begin{bmatrix}0 & -1\\-1 & 0\end{bmatrix}$ Matrix = $\begin{bmatrix}0 & -1\\-1 & 0\end{bmatrix}$ Reflection along y = -x	B1 B1B1 A1 B1	
		10	
23.	(a) (i) Interval volume = 150cm x 80cm x 40cm = 480,000cm^3 External volume = 152cm x 82cm x 42cm = 523,488cm^3 Volume of the wood = 523,488 – 480,000 = 43,488 cm^3 (ii) Mass = Density x Volume = 0.6 x 43,488 = $\frac{26092.8g}{1000}$	M1 M1 A1 M1	

	= 26.0928kg = 26.1kg (Correct to 1 d.p) (b) Volume of 1 tin ⇒ V = $\pi r^2 h$ V = $\frac{22}{7} x 5 x 5 x 20$ V = $1571.4283\,cm^3$ No. of tins = $\frac{480{,}000}{1571.4286}$ ≅ 305 tins (ii) Total mass = Mass of the box + Total mass of the tins = $26.1 + \frac{(120 x 305)}{1000}$ = 62.7kg	A1 M1 M1	
		10	
24.	(a) (i) Stationary points of y = x3 – 3x + 2 $\frac{dy}{dx} = 3x^2 - 3$ $y = x^3 - 3x + 2$ At stationary points $\frac{dy}{dx} = 0$ ∴ $3x^2 - 3 = 0$ $\frac{3x^2}{3} = \frac{3}{3}$ $x^2 = 1$ $x = \pm 1$ When x = 1 $y = 1^3 - 3(1) + 2$ y = 1 – 3 + + 2 y = 0 (1,0) When x = -1 $y = (-1)^3 - 3(-1) + 2$ y = -1 + 3 + 2 y = 4 (-1,4) (ii) Nature of the stationary points (1,0) $\frac{dy}{dx} = 3x^2 - 3$ x 0 1 2 dy -3 0 9 dx - 0 + Minimum point (-1, 4) x -2 -1 0 dy 9 0 -3 dx - 0 + Maximum point	M1 M1 A1 A1 B1 B1 A1	

	(b) y – Intercept, x = 0 $y = x^3 – 3x + 2$ $y = 0^3 – 3(0) + 2$ $y = 2$ (0,2)		
	(c)	y intercept B1 Curve B1	
		10	