K.C.S.E. MATHEMATICS PAPER 121/1 2000

SOLUTION	MARKS	ALTERNATIVE METHODS
1. $\frac{28+18}{-2} - \frac{15-12}{3}$ $= -23 - 1$ $= -24$	M1 M1 A1 3 marks	Removal of each bracket Removal of denominators
2. $\frac{(3a+b)(a+b)}{(4a-b)(a+b)}$ $= \frac{3a+b}{4a-b}$	M1 M1 A1 3 marks	Numerator factorised Demoninator factorised
3. (a) $\angle BAE = \frac{540^\circ}{5} = 108^\circ$ (b) $\angle BED = 108^0 - 36^0 = 72^0$ (c) $\angle BNM = 90^0 - 36^0 = 54^0$	B1 B1 B1 3 marks	Award angle seen on diagram
4. (a) Modal class is 150 - 154 (b) Median $= 149.5 + \frac{7}{19} \times 5$ $= 151.34$ $= 151\frac{13}{38}$	B1 M1 A1 3 marks	Accept $\frac{25th - 26th}{2}$ $\frac{57}{2}$ 151.475
5. (a) $29 + \frac{28}{2} = 43cm^3$ (b) 43: $1075 \times 10^4 \times 10^6$ $1: 25 \times 10^8$ $1: 5\ 10^4 = 1: 50000$	B1 M1 A1 3 marks	Accept 45, 46, 48 a.s.f. follow through l.s.f.
6. $\frac{\sin\beta}{12} = \frac{\sin 30^\circ}{15}$ $\sin\beta = \frac{0.5 \times 12}{15} = 0.4$ $\beta = 23.58^\circ (23^\circ 35')$ $\alpha = 180^\circ - (30^\circ + 23.58^\circ)$ $= 126.42 \quad (126^\circ 25')$ Bearing of Z from X $180^\circ + 126.42^\circ = 306.42^\circ \quad (306^\circ .25')$ N53°25'W	M1 M1 A1 3 marks	After β getting = 23.50 $\theta = 53.58 = (30 + 23.58)$ $\alpha = 360 - 53.58$ $= 306.42$ $267.8cm^2$ when log used
7. Area of rectangle = $19.5 \times 16.5cm = 321.75cm^2$ Area of 4 triangles = $\frac{1}{2} \times 6 \times 4.5 \times 4 = 54cm^2$ Area of octagon = 321.75 - 54 = $267.75cm^2$	M1 M1 A1 3 marks	accept equivalent methods $267.8cm^2$ when log used

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8. Volume $= \frac{1}{3} \times 12 \times 9 \times 6$ $= 216cm^3$	M1 A1 2 marks	
9. Korir $\frac{1}{4}x$ Wangari $\frac{2}{5} \times \frac{3}{4}x$ or $\frac{3}{10}x$ Hassan $\frac{3}{2} \times \frac{1}{4}x$ or $\frac{3}{8}x$ Bank $x - \left\{\frac{1}{4}x - \frac{3}{10}x + \frac{3}{8}x\right\}$ $= \frac{3}{40}x$ $\frac{3}{8}x - \frac{3}{40}x = 60000$ $x = 200000$	M1 M1 M1 A1 4 marks	He can use number instead of unknown trials and errors accepted Korir who gave $= \frac{3}{10}x$ Hassan $= \frac{3}{8}x$ Bank $= \frac{3}{8}x - 60000$ $x = \frac{1}{4}x - \frac{3}{8}x + \frac{3}{8}x + \frac{3}{8}x$ $x = \frac{37}{40}x + \frac{3}{8} - 60000$
10. (a) $4p + 6b = 66$ $2p + 5b = 51$ $4p + 6b = 66$ $4p + 10b = 102$ $4b = 36$ $b = 9$ $p = 3$ (b) Let the number of pencils be x $3x + 9(x + 4) = 228$ $12x = 192$ $x = 16$	M1 M1 A1 M1 A1 5 marks	
11. Gradiant of a ⊥(perpepndicular) line $= 2$ Equation of the line $\frac{y-1}{x-2} = 2$ or $y = 2x - 3$	B1 B1 2 marks	
12. Distance covered $= 75 \times \frac{12}{60}$ $= 15$ km Distance covered by taxi $= \frac{x-15}{75} = \frac{x}{95}$ $x = \frac{95 \times 15}{20}$ $x = 71.25$	B1 M1 A1 3 marks	Alternative R.V = 95 - 75 $= 20$ M1 $\frac{15}{20} \times 95$ M1 D = 71.25 A1
13. $A = \frac{1}{2} \times 5 \times 5 \sin 120°$ $= \frac{1}{2} \times 5 \times 5 \times 0.866$ $= 10.825(10.82)$	M1 M1 A1 3 marks	Alternative $h = 5 \sin 60 = 5\frac{3}{2}$ M1 $A = \frac{1}{2} \times 5 \times 5\frac{3}{2}$ M1 $= \frac{25.3}{4}$ A1 3rd side = 8.66 then apply Hero's formula

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14. $x = \frac{P - \pi r}{2}$ Area of triangle $= \frac{1}{2}\left(\frac{P - \pi r}{2}\right)^2$ $= \frac{1}{8}(P - \pi r)^2$ Area of semi circle $= \frac{1}{2}\pi r^2$ Total area $= \frac{1}{2}\pi r^2 + \frac{1}{8}(P - \pi r)^2$	B1 B1 B1 3 marks	All numerical value for π
15. $4 - 2x < 4x - 9 \Rightarrow 13 < 6x$ $\Rightarrow \frac{13}{6} < x$ $4x - 9 < x + 11 \Rightarrow 3x < 20x$ $x < \frac{20}{3}$ Integral value of x = {3, 4, 5, 6}	B1 B1 B1 3 marks	
16. Equal share $= \frac{1}{4} \times \frac{12}{100} \times 46800 = 1404$ Remainder $= \frac{88}{100} \times 46800 = 4118$ Share in the ratio of contributions $= \frac{14}{40} \times 41184$ $= 14414.40$ Total share $= 1404 + 14414.40$ $= 15818.40$	B1 M1 A1 3 marks	
17. $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}\begin{pmatrix} A & B & C \\ 2 & 4 & 1 \\ 1 & 1 & 6 \end{pmatrix} = \begin{pmatrix} A' & B' & C' \\ 1 & 1 & 6 \\ -2 & -4 & -1 \end{pmatrix}$ Co-ordinates of image A '(1, -2), B '(1, -4) C '(6, -1)	M1 A1 B1 3 marks	Accept method of drawing
18. No | Log 1.23 | 0.0899 0.0089 | $\bar{3}.9494$ + 2.0393 1.8839 − 4.1554 ÷ 3 $\frac{\bar{6} + 2.1554}{3} = \bar{2}.7185$ Expression = 0.0523	M1 M1 M1 A1 4 marks	All logs correct correct attempt to add and subtract logs correct attempt to divide by 3

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19. Let $y = 5^x$ $y^2 - 6y + 5 = 0$ $(y - 5)(y - 1)$ $y = 5$ or $y = 1$ $5^1 = 5^x$ and $5^0 = 5^x$ $\Rightarrow x = 1$ or $x = 0$	M1 A1 M1 A1 4 marks	correct quadratic for both values At least one form quadratic for both values
21. (a) (i) $A = \frac{22}{7} \times 4.2 \times 4.2 = 55.44cm^2$ (ii) Let slanting length cone be be L $\frac{L-8}{L} = \frac{3.5}{4.2}$ $L = 48cm$ Curved area of frustum $= \frac{22}{7}(4.2 \times 48 - 3.5 \times 40)$ $= 193.6cm^2$ (iii) Hemispherical surface area $= \frac{1}{2} \times 4 \times \frac{22}{7} \times 3.5 \times 3.5$ $= 77cm^2$ (b) Ratio of area = 81.51:326.04 1:4 Ratio of lengths = 1:2 Radius of base = $\frac{4.2}{2}$ $= 2.1cm$	B1 M1 M1 A1 M1 A1 8 marks	3.142 used A = 55.42 cm $\frac{22}{7}(4Cos3.5)8 = 193.6$ Alternative $\frac{H}{36} \times \frac{22}{7} \times 4.2 \times 4.8$ $= 193.6$ $2 \times \frac{22}{7} \times 3.5 \times 3.5 + 2 \times \frac{22}{7} \times 4.2$ $= 77 + 110.00 = 187.88$ $187.88 + 193.6$
22. (a) Cost/ton/km = $\frac{24000}{28 \times 48}$ Kimani received $\frac{24000}{28 \times 48} \times 96 \times 49$ $= 84,000$ (b) Profit $= 84000 - \frac{96}{8} \times 3000$ $= 48,000$ (c) Achieng received $\frac{84}{28} \times 24,000 = 72,000$ Transport cost $72,000 \times \frac{100}{144} = 50,000$	M1 M1 A1 M1 A1 M1 M1, A1 8 marks	 $\frac{24,000 \times 48 \times 84}{28 \times 48} = 72,000$

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24.

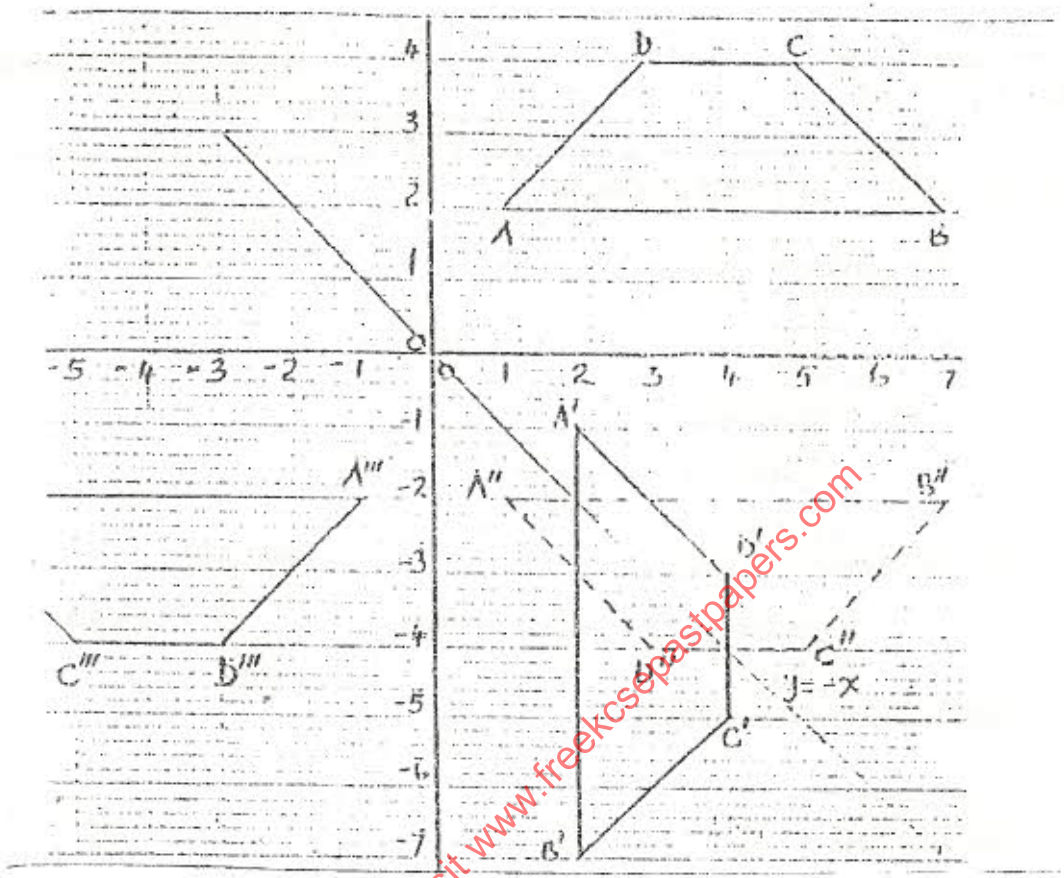

Image A′ B′ C′ D′	B1	
line $y = -x$ drawn	B1	May be implied
Image A″ B″ C″ D″	B1	
A″ (1, -2) B″ (7, -2) C″ (-5, -4) D″(-3,-4)	B1	
Image A‴ B‴ C‴ D‴	B1	
A‴ (-1,-2) B‴ (-7, -2) C‴ (-5,-4) D‴(-3,-4)	B1	
Half turn centre	B1	enlargement sf - 1
(0, 0)	B1	centre of enlargement (0, 0)
	8 marks	

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