K.C.S.E 2000 MATHEMATICS PAPER 121/2 MARKING SCHEME

SOLUTION	MARKS	ALTERNATIVE METHOD
1. Gradient of a 1 (perpendicular) line = 2 Equation of the line $\frac{y-1}{x-2} = 2$ or $y = 2x - 3$	B1 B 2	
2. Distance covered $= 15 \times {}^{12}/_{60}$ $= 15$ km distance covered by taxi $= \frac{x-15}{75} = \frac{x}{95}$ $x = \frac{95 \times 15}{20}$ $x = 71.25$	 B1 M1 A1	or R.V. = 95 - 75 = 20 A1 $\frac{15}{20} \times 95$ M1 D = 71.25 A1
3. $A = {}^1/_2 \times 5 \times 5 \sin 120°$ $= {}^1/_2 \times 5 \times 5 \times 0.866$ 10.825 (10.82)(3)	M1 M1 A1	Or $h = 5\sin 60 = 3{}^3/_3$ M1 $A = {}^1/_2 \times 5 \times 5\,{}^3/_2$ M1 $= \frac{25.3}{4}$ A1 or 3rd side = 8.66 M1 Then apply Hero's Formula A1
4. $x = \frac{p - \Pi r}{2}$ Area of triangle $= {}^1/_2 \left(\frac{P - \Pi r}{2}\right)^2$ $= {}^1/_8 (p - \Pi r)^2$ Area of semicircle $= {}^1/_2 \Pi r^3$ Total area $= {}^1/_2 \Pi r^2 + {}^1/_8 (p - \Pi r)^2$	B1 B1 B1 3	Allow numerical value for Π
5. (a) $V = \frac{ds}{dt} = 3t^2 - 5t + 2$ $a = \frac{dv}{dt} = 6t - 5$ b) $6t - 5 = 0 \Rightarrow t = 5/6$ $v = 3({}^5/_6)^2 - 5({}^5/_6) + 2$ $= \frac{25}{12} - \frac{25}{6} + 2$ $= \frac{1}{12}(-0.0833)$	 B1 M1 A1 3	

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6. $4 - 2x < 4x - 9 \Rightarrow 13 < 6x$ $\Rightarrow \frac{13}{6} < x$ $4x - 9 < x + 11 \Rightarrow 3x < 20$ $x < \frac{20}{3}$ Integral value of x $= \{3,4,5,6\}$	M1 B1 B1 3	
7. Equal share $= {}^{1}/_{4} \times {}^{12}/_{100} \times 46800$ $= 1404$ Remainder $= \frac{88}{100} \times 46800$ $= 4118$ Share in the ratio of contributions $\frac{14 \times 41184}{40}$ $= 14414.40$ Total share $= 1404 + 14414 + 40$ $= 15818.40$	B1 M1 A1 3	
8. $\text{Sin}^2 (x - 30)^\circ = {}^{1}/_{2} \times {}^{1}/_{2} = {}^{1}/_{4}$ $\text{Sin}(x - 30)^\circ = \pm 0.5$ $x - 30^\circ = 30^\circ, 150^\circ, -30^\circ, -150^\circ$ -210° $x\ 60^\circ, 180^\circ, 0^\circ, -120^\circ, -180^\circ$	M1 M1 A1 3	allow for any 4 angle given
9. $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix} \begin{bmatrix} 2 & 4 & 1 \\ 1 & 1 & 6 \end{bmatrix} = \begin{bmatrix} 1 & 1 & 6 \\ -2 & -4 & -1 \end{bmatrix}$ A B C $\quad$ A^1 B^1 C^1 Co-ordinates of image A1 (1, -2), B(1, -4), C1 (6,-1)	M1 B1 3	Accept method of drawing
10. $P(GGB) = {}^{7}/_{15} \times {}^{6}/_{14} \times {}^{8}/_{13}$ $P(GBG) = {}^{7}/_{15} \times {}^{8}/_{14} \times {}^{6}/_{13}$ $P(BGG) = {}^{8}/_{15} \times {}^{7}/_{14} \times {}^{6}/_{13}$ $P(2G + 1B) = ({}^{7}/_{15} \times {}^{6}/_{14} \times {}^{8}/_{13}) \times 3$ $= {}^{24}/_{65} (0.36\ldots)$	M1 M1 A1 3	

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11. No. | Log 1.23 | 0.0899 + 0.0089 | $\bar{3}.9494$ 2.0393 1.8839 4.1554 ÷ 3 $\bar{6} + \frac{2.1554}{3} = 2.7185$ Expression = 0.0523	M1 M1 M1 A1 4	All logs correct correct attempt to add and subtract logs correct attempt to divide by 3
12. Let $y = 5^x$ $y^2 - 6y + 5 = 0$ $(y - 5)(y - 1) = 0$ $y = 5$ or $y = 1$ $5^1 = 5^x$ and $5^0 = 5^x$ $\Rightarrow x = 1$ or $x = 0$	M1 A1 M1 A1 4	correct quadratic for both values at least one from quadratic for both values
13. $(1 + x)^5 = 1 + 5x + 10x^2 + 10x^3 + 5x^4 + x^5$ $(i = 0.04)5 = 1 + 5(0.04) + 10(0.04)^2 + 10(0.04)^3$ $+ 5(0.04)^4 + \ldots\ldots\ldots\ldots$ $= 1 + 0.2 + 0.016 + 0.00064 + 0.0000128$ $= 1.2166528$ $= 1.2167$ (4 d.p)	B1 M1 M1 A1 4	
14. a) 6. $xc = 4.8 \times 5$ $xc = \frac{4.8 \times 5}{6} = 4$ b) $BT^2 = (6 + 4 \div 8) \times 8$ $= 18 \times 8 = 144$ $BT = 12$	M1 A1 M1 A1 4	
15. $P^2 = \frac{xy}{z + x}$ $P^2Z + P^2x = xy$ $P^2Z = x(y - P^2)$ $x = \frac{P^2Z}{y - P^2}$	M1 M1 A1 4	Removal of denominator and expanding Removal of power $^1/_2$

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16.		
17. a) Const/ton/km = $\frac{2400}{28 \times 48}$ Kimani received $\frac{2400 \times 96 \times 49}{28 \times 48}$ = 84,000 b) Profit = $84,000 - \frac{96}{8} \times 3000$ = 48,000 c) Achieng received $\frac{84}{28} \times 2400 = 72,000$ Transport cost $= 72,000 \times \frac{100}{144}$ = 50,000	M1 M1 A1 M1 A1 M1 M1 A1 8	24,000 x 48 x 84 28 x 48 C.A.O
18. a) $^7/_2 (2a + 6d) = 175$ $= a + 3d = 25$ $a + 10d = 4 (a + d)$ $\Rightarrow a = 2d$ $2d + 3d = 25$ $d=5$ and $a=10$ b) $10 + (p-1)5 > 124$ $5p > 119$ $p > 119$	M1 M1 A1 M1 M1 M1 M1	Both values

SOLUTION	MARKS	ALTERNATIVE METHOD
21. a) $(2x + 3x^2)\,dx = x^2 + x^3 + c$	B2	Award B1 if constant omitted or one term or expression is not simplified
b) Area below x-axis $[(x^2 + x^3)]_{-\frac{2}{3}}^{2} = 0 - [(-\frac{2}{3})^2 + (-\frac{2}{3})^3]$ $= 12$ $= -(4/9 - 8/27) = -4/27$	M1	Allow when limits $^2/_3$ to 2
Area above x-axis $[x^2 + x^3]_0^2 = [4 + 8] - 0 = 12$ Total area $= 4/27 + 12 = 12\,4/27$	M1 A1	Adding absolute values (✓) Apply (✓) for numerical error or when one term in the integral
22.		For △ Mark 1) MR -2 Award △Highest
	B1	Angle 45o constructed
	B1	completion of ABC with <BAC abtuse
	B1	two l bisectors ✓l constructed or drawn (may be implied)
	B1	centre) identified and circle drawn
	B1	bisector of < OBC drawn
(✓)	B1	point D located
	B1	BO extended upto Circumference
Apply MR - 2 if acute (✓)		

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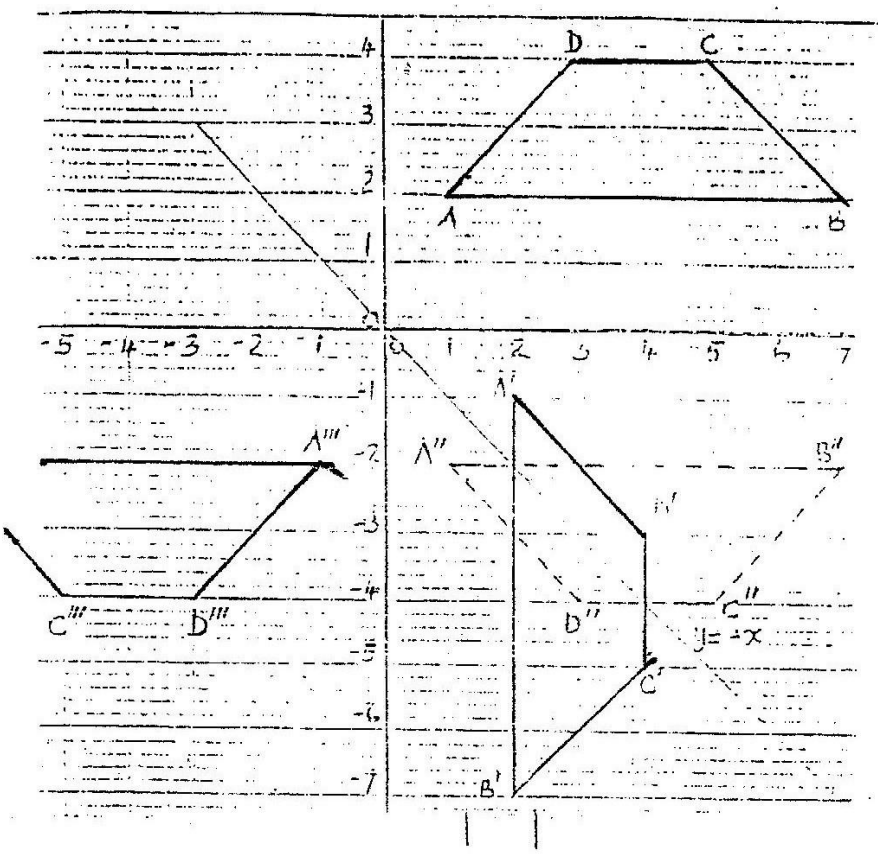
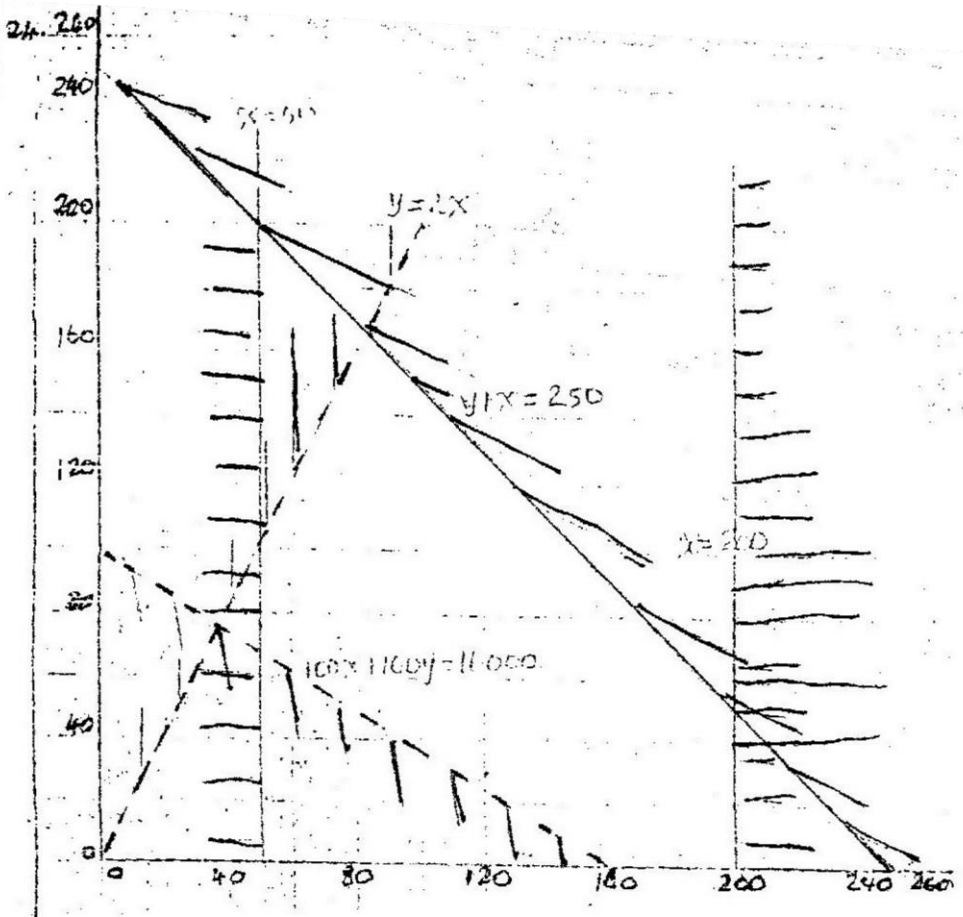


Image A' B' C' D'	B1	
Line y = -x drawn	B1	may be implied.
Image A" B" C"D"	B1	
2) B" (7, -2), C" (5,4) , D" (3,4)	B1	
Image A'"B'"C'"D'"	B1	
B'" (-7 , -2) C'" (-5, - 4) D'" (3, - 4)	B1	
Half term centre (0,0)	B1 B1	Enlargement s.f. 1 Centre of enlargement (0,0) Allow a single transformation if 2 turns



X x Y = 250		
100 x + 460y ≥ 16000	B2	Allow B1 for any three.
x < 200		
x > 50		
y = 2x		
x = 50 and x = 200 drawn and shading	B1	
y = 250 drawn and shading	B1	
y = 2x drawn and shading	B1	
Identification of best point	B1	
Ordinary seats = 84	B1	
Special seats = 160	B1	