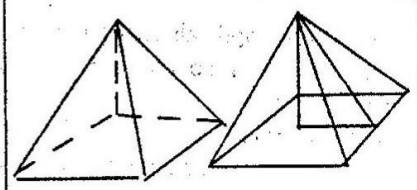
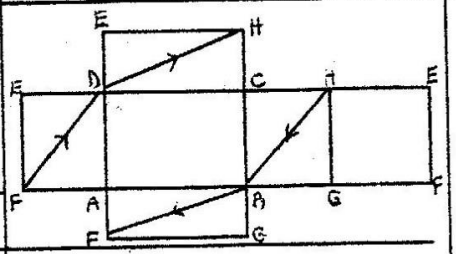
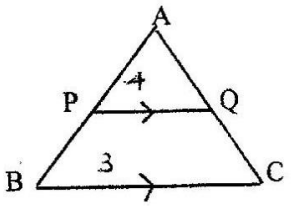
K.C.S.E 1997 MATHEMATICS PAPER 121/2 MARKING SCHEME

SOLUTION	MARKS	ALTERNATIVE METHOD
1. $\frac{19 \times 32}{20 \times 38}$ $= 0.8 = \frac{4}{5}$	M1	for ✓ removal of decimal points or 0.032 and 0.0038 stated in standard form.
2. Let number of ten shillings coins be t .: number of five shillings coins $= 2t$ Number of one shilling coins $= 21 - 3t$ Value = $10t + 2t \times 5 + (21 - 30 \times 1 = 72$ $= 17t = 51$ $t = 3$	 B1 B1 M1 A1	ALT. METHOD Let number of 5-sh coins be f Number of 10 sh. coins be $^1/_2$ f Number of 1-sh coins - 21 $1^1/_2$f 1/2fx 10 +5ft(21-11/2f)x1=72 17f = 102 f = 6 .: no of 10 sh coins =3 A1
3. No. of yen $\frac{30000}{0.5446}$ $= 55086$	M1 A1 2	Allow 55080 from tables
4.✓Const. of ⊥bisector of BC ✓Const of ⊥bisector of AC or AB Locus of P drawn	B1 B1 B1 3	
5. Area of the sector = $\frac{75^\circ}{360} \times \frac{22}{7} \times 14 \times 14$ $= 128.3$ cm Area of $\Delta = {}^1/_2 \times 14 \times 14 \sin 75^\circ$ $= {}^1/_2 \times 14 \times 14 \times 0.9659$ $= (6,5)$ $= 94.64$ cm Area of segment = 128-94.64 $= 33.66$ or (33.68)LM	ml ml ml A1 4	 simplified expression or equivalent Simplify on P Subtract at simplified numerical stage stage and at least one area is correctly obtained.

SOLUTION	MARKS	ALTERNATIVE METHOD
6. Labelled sketch of the pyramid (dimensions may be implied) $VN = 10^2 + 3^2 = 109$ $= 10.44$ cm	B1 M1 A1 3	
7. $\left(\frac{1}{3^3}\right)^m \times (3^4) - 1 = 3^5$ or $3^{-3m} \times 3^{-1} \times 3^{-4} = 35$ $= -3m - 4 = 5$ $m = -3$	ml ml A1	For equivalent in power of 3 at least one index Alternative method -inlog 27 -1x log 81 = log 243 -mx 1.4314.1.9085 = 23856 M1 -m = 4.2941 M1 1.4314 = -3.001 A1
8. 3.55 ± 0.05, 4.85 ± 0.05, 5.7, 6.3, 6.7 & 6.9 Area = 1/2x1(0+7+2(3.6=4.9+5.7+6.3+6.7+6.9) $= {}^1/_2$ x1 (7+68.20) = 37.6	B1 M1 M1 A1 A1 4	for any 4 middle ordinates interval of $^1/_2$ MR-2 Use of formular all dividual trapezia area for simplification of inner brackets in a trapezoidal rule Mid ordinate rule use MR-2
9. $(1-3x)^5 = 1+5(-3x)+10(-3x)^2 + 10(-3x)^3$ $= 1-15x + 90x^2 - 270x^3 + ...$ $=3x = 0.03$ or $x = 0.1$ $(0.97)5=1-15(0.01)+90(0.01)^2-270(0.0)$ $= 1-0.15+0.009-0.00027$ $= 0.85873$ = 0.8587 to 4 d.p.	M1 A1 B1 M1 A1 5	For complete expansion to the expansion accept only to x3 incase of any (condone) error or $1+5t-0.03)+10(0.03)^2+10(-0.03)^3$

SOLUTION	MARKS	ALTERNATIVE METHOD
10. Any/drawn and labelled net of a net of a cuboid (condone net of a cube ./path drawn All/directions (condone a net of cube award first B1. Diff net 12mm	B1 B1 B1 3	
11. (i) AQ : QC = 4:3 allow 8:6 (ii) QC = $\frac{3}{7}$ x 14 = 6 cm	B1 B1 2	
12. $\frac{\sqrt{14}(\sqrt{7}+\sqrt{2}) - \sqrt{14}(\sqrt{7}-\sqrt{2})}{(\sqrt{7}-\sqrt{2})(\sqrt{7}+\sqrt{2})}$ $= \frac{\sqrt{7}\sqrt{2} + \sqrt{2}\,7 - \sqrt{7}\sqrt{2} + 2\sqrt{7}}{7-2}$ $\frac{4\sqrt{7}}{5}$ $\therefore a = \frac{4}{5}$ b = 0	M1 M1 A1 A1 4	single term or write common 2 terms with common denominator expansion of both numerator & denominator
13. $\frac{48.4+56.25+50.3+49.0}{4}$ = 50.99 $\frac{56.25 + 50.3+49.0+45.6}{4}$ = 50.29 $\frac{50.3+49.0+45.6+57.65}{4}$ = 50.65	M1 M1 A1	for one moving average any expression for the other two moving average for 50.99, 50.29, 50.64

14. Let Onduso take x days
⇒ Mogaka takes x+5 days

$\therefore \frac{1}{x} + \frac{1}{x+5} = \frac{1}{6}$ — M1 or equivalent

$6(x+5)+6x = x(x+5)$ — M1 ✓ equivalent (removal of all denominators)

$x^2-7x-30=0$

$(x-10)(x+3)$ — M1

$x=10,-3$

$\therefore$ Onduso takes 10 days — A1 equivalent for factorization or use of formular.

4

15. Speed of slower athlete $= \frac{800}{108}$ — M1

$\therefore$ Distance $= \frac{800}{108} \times 4$

$= 29.63$ — A1

2

ALTE.METHOD

Slower speed $\frac{800}{108}$

Dist $800 - \frac{800 \times 104}{108}$

R.V $= \frac{800}{104} - \frac{800}{108}$

$= 0.2849$ $\therefore$ dis. $= 0.2849 \times 104 = 29.63$

16. (i) Area of Equi.$\Delta = \frac{1}{2} \times 6 \times 6 \sin 60^\circ$

$= \frac{1}{2} \times 6 \times 6 \times 0.8660$ — M1

$= 15.588 (15.59)$

X-section Area $= \frac{1}{2} \times 6 \times 6 \times 0.8660 \times 6$

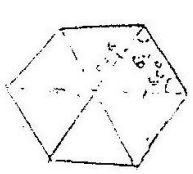
$= 15.59 \times 6$ — M1

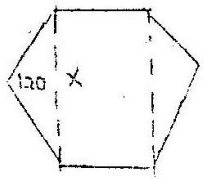
$= 93.54 (93.528)$ — A1

(ii) Vol. of prism $= 93.54 \times 30$ — M1

$= 2806.2 (2805.9)$ — A1

5





ALT. METHOD

Area of Isos $\Delta = \frac{1}{2} \times 6 \times 6 \times \sin 120^\circ$

$= \frac{1}{2} \times 6 \times 6 \times 0.8660$

$\frac{1}{2} \times 6 \times 5 \sin 30^\circ = 15.59 \Rightarrow X = 10.39$

X-Sec area $= 15.59 \times 2 + 6 \times 10.39$

$= 93.52$ A1

Vol $= 93.52 \times 30$ M1

$= 2805.6$ A1

5

SECTION II (48 MARKS)

17. (a) (i) Vol=135x0.15=20.25m^3 — B1 for evaluation

(ii) mass=2500x20.25

=50625kg(50630) — B1 (✓)

=mass of cement=$50625 \times \frac{1}{9}$ — M1

=5625kg(5625.56) — A1

(b) Bags of cement= $\frac{5625}{50}$ — M1

112.5

113 — A1 (✓)

(c) No. of lorries of sand $\frac{50625 \times 4}{7000 \quad 9}$ — M1

=3.214

≈ 4lorries. — A1 (✓)

8

18.

x	30	60	90	120	150	180	210	240	270	300	330	360
cosx	0.87		0	-0.5		-1.0		-0.5	0	0.5	0.87	1.0
2cos½x		1.73	1.41	1.0		0	0.52		1.41	1.73	1.93	

cosx ✓ row — B1 Allow 1d.p. Apply PA once

2cos½x row ✓ — B1 allow B1 for any 12 ✓

graph of cosx ✓

Graph of 2 cox½x ✓

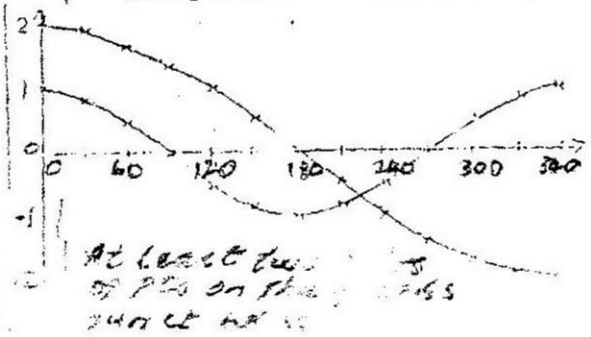
for any error in fitting table the graph drawn should have < that 2 points out) B1 ✓ — B1 (✓) all points must be correctly plotted using given scale. Apply Ow-1 if scale not used.

period =720° — B1

Amlitute =2 — B1

Enlargement of 2 about centre (0,0) — B1

8



19. $x+y \leq 500$ B1

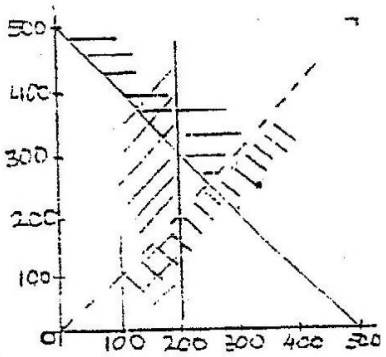
$y > x$ B1

$x \geq 200$ B1

(b) $x+y \leq 500$ drawn and shaded L.I(✓)

$y > x$ " " L.ii(✓)

broken line



broken line

(c) (i) No. enrolled in technical=249 B1

No " " " =251

(ii) max.profit

$249x2500+251x1000=873500$ B1

8

Allow √s when inequality symbols are wrongly applied

20. (a) $\angle QTS = 40^\circ$ B1

$\angle S$ in alt. segment B1

(b) $\angle QRS = 10^\circ$ B1

Reasons: $\angle SQT = 90^\circ$ on semi-circle

$\Rightarrow \angle TSQ = 50^\circ$ B1

$\therefore \angle QRS = 50-40$ ext $\angle$ of Δ

(c) $\angle QVT = 35^\circ$ B1

Reasons: $\angle QVT = \angle SQV$, alt $\angle$s B1

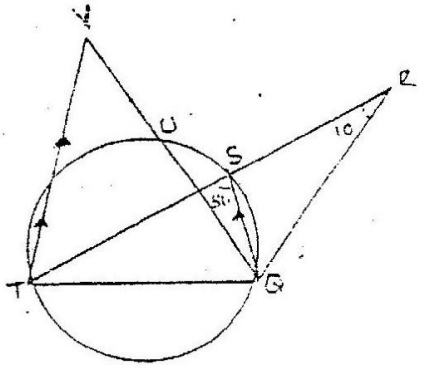
(d) $\angle UTV = 15^\circ$ B1

Reasons: $\angle QUT = \angle UTV + \angle QVT$

ext $\angle$ of Δ

$\therefore UTV = 50-35^\circ$ B1

8



21. (a) $V = k_1r^2 + k_2r^3$ B1 Must use different constants (or implied in the equation)

$k1+k2=54.6$

$4k1+8k2=226.8$ M1

$4k1+4k2=218.4$

$4k1+8k2=226.8$

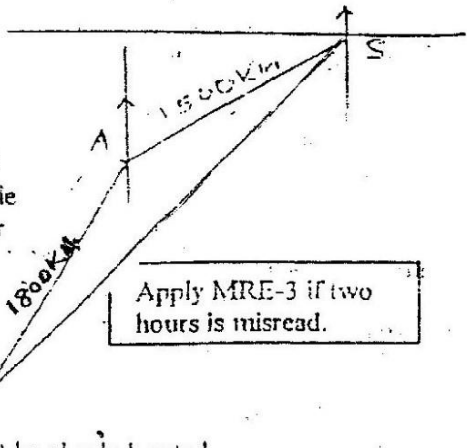
$-4k2=-8$ M_1

21. continuation $\Rightarrow K_2 = 2.1$ and $k_1 = 52.5$ $\therefore V = 52.5r^2 + 2.1r^3$	A1	
(b) $V = 52.5x4^2 + 2.1x4^3$ $= 52.5x16 + 2.1x64$ $= 840 + 134.4$ $= 974.4$	M1 A1	(✓) if error is formed in determining the constants)
(c) $52.5r^2 = 2.1r^3$ $(2.1r - 52.5)r^2 = 0$ $\Rightarrow r = 25$	M1 A1 8	(✓) condone division of both sides by r^2

22.

class	14.5-18.5	18.5-22.5	22.5-26.5	26.5-30.5	30.5-34.5	34.5-38.5	38.5-42.5
frequency	2	3	10	14	13	6	2
c.freq	2	5	15	29	42	48	50

Cummulative frequencies	B1	
(a) Linear scale used	S1	Must accomodate all data(allow reading of varied scale.
plotting of against upper class limit	P1	✓
Complete of cf curve drawn	C1	Allow curves from cf against mid-points lower class limits upper class limits boundaries.
(b) (I) median =29.5	B1	(✓) accept readings at cf= 25.0 0r 25½ within 1 small square
(ii) Reading at mass 25.28 =11 and 29. Probability= $\frac{29-11}{50}$ =0.8	B1 A1 8	(✓) Alloow the two Vs above for reading from cf curves.

3.	(a) Bearing of 060^0 ✓ drawn	B1	
	bearing of 210^0 ✓ drawn	B1	
	Distance on scale drawing representing 1500 km representing 1800 km	B1) B1)	either actual distance/scale is stated or or implied.
			Apply MRE-3 if two hours is misread.
	b (I) Actual distaance		
	$(16 \pm 0.1) \times 200$ or equivalent	M1	S or T must be clearly located
	$=3200$ km	A1	
	(ii) Bearing of T from S		
	$=224^0 \pm 1^0$	B1	(✓)
	(iii) Bearing of S from T		Apply ✓ if S or T is correctly located.
	$=044^0 \pm 1^0$	B1	(✓)

24.	(a) $a+b,\ a+8d,\ a+24d$	B1	All the 3 terms written. Allow the terms in the form $a+(n-1)d$
	(b) $\frac{a+8d}{a+2d} = \frac{a+24d}{a+8d}$	M1	
	$a^2+16ad+64d^2 = a^2+26ad+48d^2$		
	$16d^2 = 10ad$		
	$d(16d-10a) = 0$		
	$\Rightarrow d = \frac{5}{8}a$	M1	condone $16d=10a$
	$2(a+5d)+(a+6d) = 78$	M1	
	$3a+16d=78$		
	$3a+16\times\frac{5}{8}a = 78$	M1	for the formation of equ in one variable.
	$13a = 78$		
	$\Rightarrow a = 6$ $d = \frac{5}{8}\times 6 = 3.75$	A1	
	(ii) $S_9 = \frac{9}{2}\{2\times 6 + (9-1)\frac{15}{4}\}$	M1	
	$= \frac{9}{2}\times 42$		
	$= 189.$	A1	✓ Only from an error numerical either a list.
		8	