K.C.S.E 2008
MATHEMATICS P1 121/1
MARKING SCHEME

1. $\frac{-8 + (-5) \times (-8) - (-6)}{-3 + (-8) \div 2 \times 4}$

$\frac{-8 + 40 + 6}{-3 + -4 \times 4}$ M 1

$^{38}/_{-19}$

$=-2$ A1 (2)

2. $\frac{(3^3)^{2/3} \div 2^4}{(2^5) - {}^3/_5} = \frac{3^2 \div 2^4}{2^{-3}}$ M 1 or equivalent

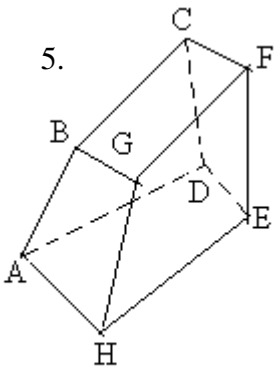
$= \frac{3^2}{2^4 \times 2^{-3}}$ M1 for $2^4 \times 2^{-3}$ or equivalent

$= {}^9/_2$ or 4.5 A1 (3) ${}^9/_2$ is not simplified

3. $\frac{a^4 - b^4}{a^3 - ab^2} = \frac{(a^2 + b^2)(a^2 - b^2)}{a(a^2 - b^2)}$ M1 Factorization of numerator
M1 Factorization of denominator

$= \frac{a^2 + b^2}{a}$ or $a + \frac{b^2}{a}$ A1 (3)

4. 23.50 + (7 h 15 min + 45 min + 5 h 40 min)
=1330h B1
=1.30 pm on Monday B1 (2)

5. 

CD parallel and equal to AB B1 For trapezoidal x sectional faces
GH parallel and equal to fit B1 for hidden lines dotted

Completion of sketch with
Hidden edges dotted B1 For 3 triangular faces (3)

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6. Sales Petrol $^1/_3$ x 900,000 } M1
Diesel $^2/_3$ x 900,000 }

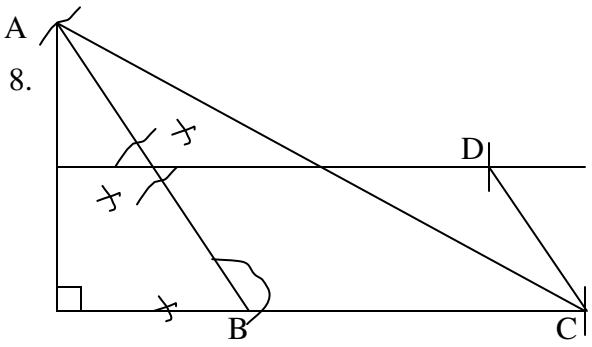
Profit $\frac{1}{3} \times \frac{900,000}{1000} \times 520 + \frac{2}{3} \times \frac{900,000}{1000} \times 480$ M1

= 15600 + 288000
= 444000 A1
3

7. Volume of liquid $= \frac{384}{0.6}$ M1

Height of liquid $= \frac{640}{X\ 3.2^2}$ M1
= 19.89 A1
3

8.



B1 $< 120^0$ completion
B1 Drop b from A to CB Produced
B1 (bisect height to determine E)
B 1 Determination of point D and completion of parallelogram
4

9. Volume of sphere = $^4/_3\ \pi$ x 4.2^3 M1

$\therefore$ Side of cube = $\sqrt[3]{^4/_3\ \pi \times 4.2^3}$ M1

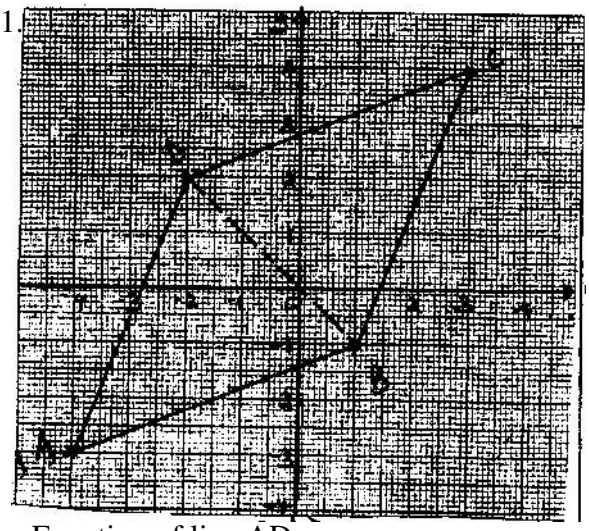
= 6.77 A1
3

10. Radius of circle $\frac{23.4}{1.8}$ M1 Are length r θ^c where θ is in radians
= 13 cm A1 $\Rightarrow$ 243 = r x 1.8

Area of sector = $\frac{1.8}{2\pi} \times \pi \times 13^2$ M1 $\therefore$ r = 24.3
A1 1.8

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152.1 cm^2 Follow through

11. 

B1 Plotting points A, B and C
B1 Location of point D (-2, 2)

Equation of line AD

$\frac{y - -3}{x - -4} = \frac{5}{3}$ M1 or $y-2 = {}^5/_2$

$y = {}^5/_2 x + 7$ A1

4

12. $AB = \begin{pmatrix} k & 4 \\ 3 & 2 \end{pmatrix} \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} = \begin{pmatrix} k + 12 & 2k + 16 \\ 3 + 6 & 6 + 8 \end{pmatrix}$ M1

$= \begin{pmatrix} k + 12 & 2k + 16 \\ 9 & 14 \end{pmatrix}$

Del AB = (k + 12) (14) – (2k + 16) (9) = 4 M1 If brackets missing wait for
$11k + 168 – 18k – 144 = 4$ $- 18 k – 144 + 14 k + 168 = 4$
$-4 k = -20$
$k = 5$ A1

3

13. Area of rectangular part = 2 x 5.2 x π x 18 M1
= 187. 2π
Area of circular parts = 2 x 5.2^2 x π M1
54.08 x
π (187.2 + 54.08) = 241. 28π A1

3

14. Log 0.096 = log (4^2 x 6 x $\underline{1}0^{-3}$) M1

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= 2 (0.6021) + 3.7782 M1
= 2.9824 A1
Or (-1. 0.76) 3

15. $2y = 5x + 8$
$y = {}^{5}/_{2}\, x + 4$
Grad of $L_1 = {}^{5}/_{2}$ B1
Grad of L_2 $\frac{0+4}{-5-5} = +\frac{4}{-10} = \frac{-2}{5}$ B1 If the gradient of L_1 and L_2 Are negative reciprocals of each other then L_1 L_2

${}^{5}/_{2} \times -{}^{2}/_{5} = -1$

$\therefore L_1$ and L_2 are 1 B1
3

16. $2 \cos 2\theta = 1$
$\cos 2\theta = ½$
$\therefore 2\theta = 60^0, 300^0, 420^0, 660^0$ B1 B1
$\theta = 30^0, 150^0, 210^0, 330^0$ B1 B1
4

17. Juma's earnings before increase
112% → 8400
100% → 8400 x $\frac{100}{112}$
= 7500
Akinyis earnings before increase
= ${}^{3}/_{5}$ x 7500 = 4500

Increase in Akinyis earnings
= 14,100 - 8 400 – 4 500
= 1200
% increase in Akinyis earnings
$\frac{1200}{4500} \times 100$
= $26\ {}^{2}/_{3}$

ALT
M1 112J= 8400 M1
A1 $J/A = \frac{5}{3} = A = \frac{3}{5} \times \frac{100}{112} \times 8400$
= 4500A1
M1 now 8400 + A = 14100
A = 5700 A1
Increase $\frac{(5700- 4500)}{4500} \times 100$ M
$= \frac{12}{45} \times 100 \times 26^{2}/_{3}$
A1
M1

(b) No of bags bought
= $\frac{14100}{1175}$
= 12 bags
Profit = (1762.50 – 1175) x 12
= 7050

M1 or equivalent
Sale price 1762.50 x 12
= 21150 M1

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Ratio: 5700:8400 = 19:28 M1 Ratio: 84: 57 = $\frac{57}{141}$ x 21150

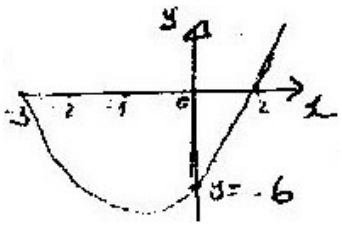
Profit for Akinyi = 7050 x $^{19}/_{47}$ = 2850

Total earning for Akinyi 5700 + 2850 A1 = 8550

= 8550

18. Trapezium rule

x	-1	-2	0	1
y	7	5	5	7



ALT

B1

x	y
-3	0
-2	4
-1	6
0	6
1	4
2	0

B1

y = 6

$y = x^2 + x - 6$

M1 A1

Are ½ x1 [(11 + 11) + 2 (7 + 5 + 5 + 7)]

= ½ (22 + 48) M1

= 35 A1

Are = 11 x 5 = 55 M1

= 55-35

= 20 (square unit) A1

A= ½ (0+2 (20)

M1

= 20A1

Mid ordinates

x	-2.5	-1.5	-0.5	0.5	1.5
y	8.75	5.75	4.75	5.75	8.75

AC = (8.75 + 5.75 + 4.75 + 5.75 + 8.75 x 1 B2

= 33.75 M1

A= 55 – 33.75 M1

21. 25

Difference = 21.25- 20

= 1.25 sq units A1

10

Alt Xm	Ym
-2.5	2.25
-1.5	6.25
-0.5	6.25
0.5	5.25
1.5	2.25

B2

A= 1 x 21.25 M1

= 21.25 A1

Difference

= 21.25 - 20

= 1.25 B1

19. (i) $\overrightarrow{BD} = q - p$ B1

(ii) $\overrightarrow{BC} = {}^{2}/_{3}(q - p)$ B1

(iii) $\overrightarrow{CD} = {}^{1}/_{3}(q - p)$ B1

(iv) $\overrightarrow{AC} = p + {}^{2}/_{3} q - {}^{2}/_{3} p$ M1

A1

$= {}^{1}/_{3} p + {}^{2}/_{3} q$

If ratio theorem used M1 will Be implied give M1 A1

(b) (i) $\overrightarrow{CE} = \overrightarrow{CD} + \overrightarrow{DE}$ M1

$= {}^{1}/_{3} q - {}^{1}/_{3} p + ½ p$

A1

$= {}^{1}/_{3} q + {}^{1}/_{6} p$

Ratio theorem could be used or equivalent

$\overrightarrow{AC} = k({}^{1}/_{3} q + {}^{1}/_{6} p)4$

${}^{1}/_{3} p + {}^{2}/_{3} q = {}^{1}/_{3} kq + {}^{1}/_{6} kp$ M1

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$^1/_6$ k = $^1/_3$ k = 2 A1

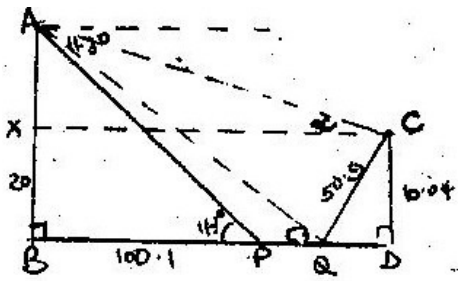
$\rightarrow$

(ii) AC = 2CE

AC: CE = 2.1 B1 With no vector sign used at ab

10

20. (a) Tan 11.3^0 = $\frac{20}{x}$ x = $\frac{20}{\text{Tan } 11.3^0}$ M1



= $\frac{20}{0.1998197}$ = 100.09022

= 100.1m A1

(b) PQ = $\frac{36 \times 1000}{60 \times 60} \times 5$ M1

= 50M

BQ = 100.1 + 50 = 150.1 M

Tan θ = $\frac{20}{150.1}$ = 0.133245 M1

θ= 7.5896

θ = 7.59^0

(c) (i) QD = 200 – 150.1 = 49.9 A1

CD= $\sqrt{50.9^2 - 49.9^2}$ = 10.03992 M1

= 10.04 m A1

(ii) AX = 20- 10.4 = 9.96 M1

Tan $\propto$ = $\frac{9.96}{200}$ = 0.0498

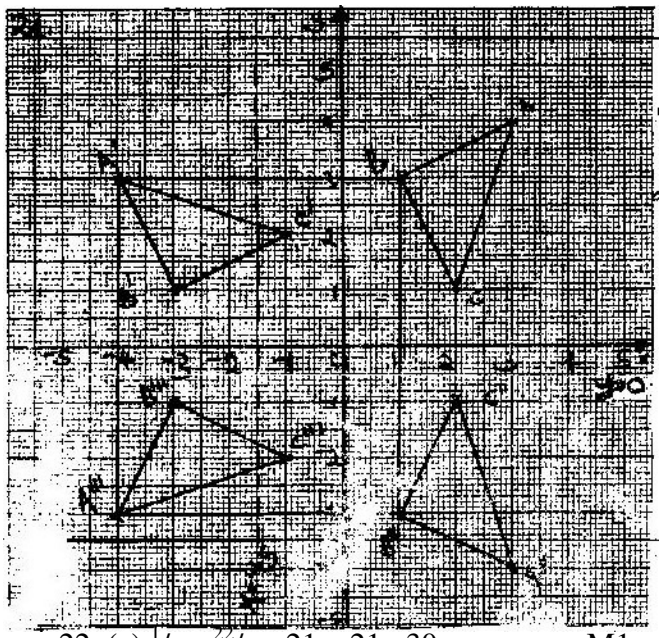
$\propto$ = 2.85097 M1

$\propto$ = 3^0 A1

10

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21.



(a) Δ $A^1B^1C^1$ √ 1y drawing — B2 Allow B1 for two vertices

(b) Δ A"B"C" √ 1y drawing — B2 or B1 above

(c) Δ A"'B"' C"'√ 1y drawing — B2 for B1 above

(d) Reflection in line — B2 B0 if B1 above

y= -x

x= 1..5 — B1

y = 0 — B1

10

22. (a) $^1/_3 \times {}^{22}/_7 \times 21 \times 21 \times 30$ M1

= 13860 A1 — 13858.22 if π = 3.142; 138544236 if π in the calculator used

(b) (i) $^8/_{21} = {}^{36}/_{30}$ M1

$r = \frac{360 \times 21}{30}$

= 25.2 A1

(ii) $^1/_3 \times {}^{22}/_7 \times 25.2 \times 25.2 \times 36$ M1 — Alt Ratio of height 30: 36 = 5:6; U.S.F = 125: 216; Volume of big cone = $\frac{216}{125} \times 13860$ = 23950

= 23950.08

= 23950.08 – 13860

= 10090. 08cm^3 M1

(ii) $^4/_3 \times {}^{22}/_7 \times 8^3 = 10090.08$ A1 — Vol of sphere = 10090.08 M_1A_1; 23950.08 – 13860 = 10090.08

$r^3 = \frac{10090.08 \times 21}{4 \times 22}$ M1 — ALT $^4/_3 \pi r^3 = 10090.08$ M1; $r^3 = 10090.08 \times ¾ \times {}^7/_{22}$

$r = \sqrt[3]{2407.86}$

= 13.40 cm M1 — $r^3 = 2407.8$ M1

A1 — r = 13.40 cm A1

10

23. Let the original number be n Original Contribution $\frac{2000\,000}{n}$ B1 For either $\frac{2000\,000}{n}$ or $\frac{2000\,000}{n-40}$

Amount per member after withdrawal of 40 = $\frac{2000\,000}{n-40}$

$\frac{2000\,000}{n-40} - \frac{2000\,000}{n} = 2500$ M1 For removal of denominator and expression

$2000\,000\,n - 2000\,000 + 8000\,000 = 2500\,(n-40)$ M1

$2000\,000\,n = 2500n^2 + 2000\,000\,n - 1000\,000 - 80{,}000{,}000$ M1

$n^2 - 40\,n - 3200 = 0$

$(n- 200)\,(n+ 160) = 0$

$n = 200$ A1

(b) New contribution $= \frac{55}{100} \times 2000\,000$ M1

Contribution per member

$= \frac{55}{100} \times 2000\,000 \times \frac{1}{160}$ M1

$= 6875$ M1

(c) Actual cash contribution by members M1

$\frac{55}{100} \times 2000\,000 \times \frac{19}{25} = 836{,}000$ A1

$= 836{,}000$ $\frac{M1}{10}$ or $6875 \times {}^{19}/_{25} \times 160$

24. (a) $\frac{ds}{dt} = 3t^2 - 12t + 9$ M1

$\frac{ds}{dt}(0.5) = 3(0.5)^2 - 12(0.5) + 9$ M1

$= 3.75$ A1

(b) $\frac{ds}{dt} \Rightarrow 0 \Rightarrow 3t^2 - 12t + 9 = 0$ M1

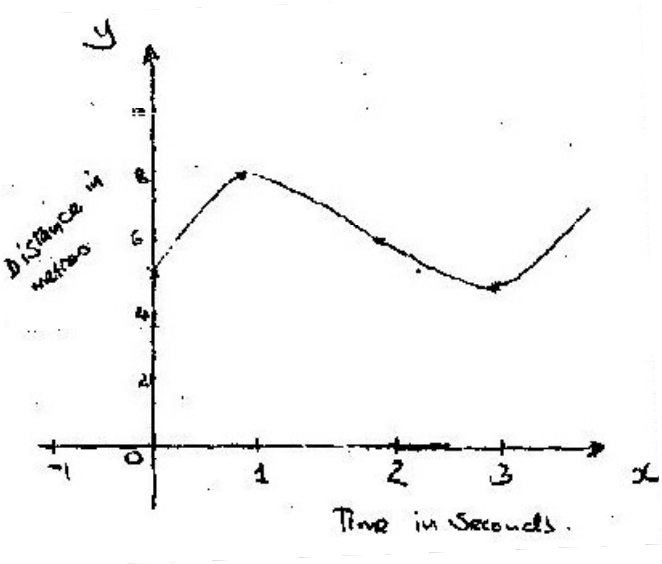
$t^2 - 4t + 3 = 0$

$(t-3)(t-1) = 0$ M1

$t = 3 \quad t = 1$ A1

When $t = 3$ $s = 3^3 - 6 \times 3^2 + 9 \times 3 + 5 = 5$

When $t = 1$ $s = 1^3 - 6 \times 1 + 9 \times 1 + 5 - 9$ } B1



B1 y intercept

B1 Turning points

B1 Curve through the three points

10