MATHEMATICS SCHEME K.C.S. E PAPER 2 2008

1.

No.	Log		
6.373	0. 8043	M1	All 3 logs correct
0. 6944	T. 8416 +		
	0. 6459		
$\sqrt{\quad}$ 0.004636	3.6661÷ 2	M1	2nd log and all operation
	2. 8331		(+,÷, -)
	1. 8128		
	↓		
	64.98	A1	
		3	

2. $q - n + q = 1 + rh$

$q - 1 = rh + htq$ M1 Grouping

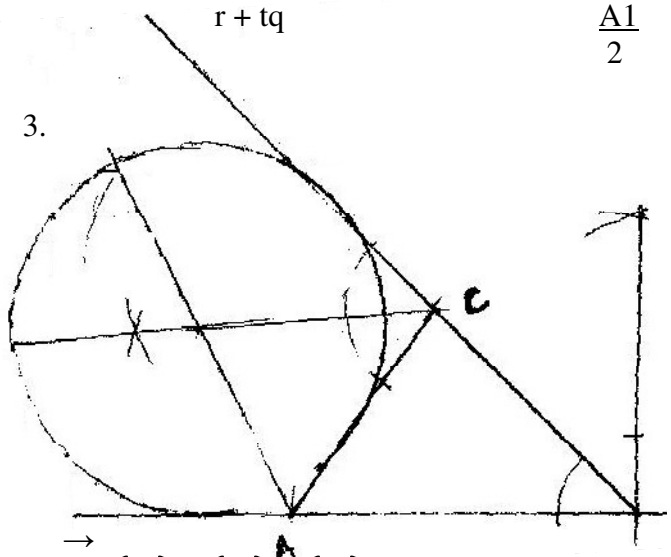
$q - 1 = h(r + tq)$

$h = q - 1$

$r + tq$ A1

2

3.



B1 Construction of 45^0 and completion of Δ

B1 Bisecting two angles to determine The centre

B1 Dropping a perpendicular from centre To a side and drawing the circle

03

4. $\overrightarrow{AB} = \begin{pmatrix} 8 \\ -6 \\ 6 \end{pmatrix} - \begin{pmatrix} 3 \\ -1 \\ -4 \end{pmatrix} = \begin{pmatrix} 5 \\ -5 \\ 10 \end{pmatrix}$ M1

Or $OP = {}^3/_5 \begin{pmatrix} 3 \\ -1 \\ 4 \end{pmatrix} + {}^2/_5 \begin{pmatrix} 8 \\ -6 \\ 6 \end{pmatrix}$ M1 M1

$OP = OA + AP$ Ratio theorem

$= \begin{pmatrix} 3 \\ -1 \\ -4 \end{pmatrix} + {}^2/_5 \begin{pmatrix} 5 \\ -5 \\ 10 \end{pmatrix}$ M1

$= \begin{pmatrix} 5 \\ -3 \\ 0 \end{pmatrix}$ A1

3

5. $0.05 \times 6 = 0.3$ M1

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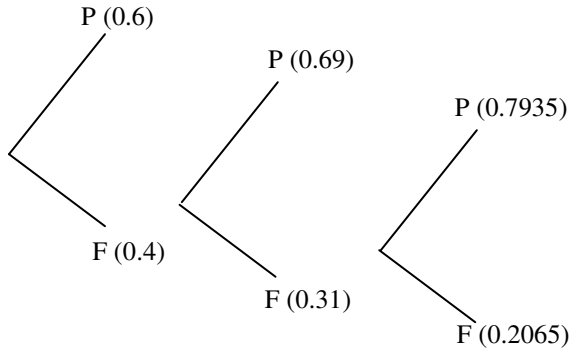
% error = $\frac{0.3}{50 \times 6} \times 100$ M1

= 0.1% A1

3

6.



P passing in 2nd attempt) 0.4 x 0.69 = 0.276 } M1 For either of the two

P passing in 3rd attempt 0.4 x 0.31 x 0.7935 }

Passing in 2nd or 3rd attempt

0.4 x 0.69 + 0.4 x 0.31 x 0.7935 M1 For adding the two probability

0.276 + 0. 098394 A1 Allow for (0.3 + 0.09)

= 0.374394 3 Accept 4 s.f.

7. (i) Distance = 500 x 9/4 = 1125 nm B 1

(ii) $\theta \times 60 \times 10553.4 = 1125$ M1

$\theta = \frac{1125}{60 \cos 53.4^0}$

$= 31.45^0$

Longitude of $\theta = 71.45^0$E A1 Allow without E

8. (a) $(10 + {}^2/_x)^5 = 10^5 + 10^{4/2}/x)^5 + 10^3({}^2/_x)^2 + 10^2({}^2/_x)^3 + 5.10\,({}^2/x)^4$ M1

$= 100000 + \frac{100000}{x} + \frac{40000}{x^2} + \frac{2000}{x^3} + \frac{800}{x^4} + \frac{32}{x^5}$ M1

(b) $(14^5) = (10 + {}^2/_x)^5$ ${}^2/_x = 4$ $x = {}^2/_4 = ½$

$= 100000 + \frac{100000}{½} + \frac{400000}{(½)^2} + \frac{2000}{(½)^3} + \frac{800}{(½)^4} + \frac{32}{(½)^5}$ M1 Give if any 4 terms in the expression are correct

$= 100000 + 200000 + 16000 + 64000 + 12800 + 1024$

$= 537824$ A1

4

9. Δ ADC and Δ BAC are similar

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$\frac{AC}{BC} = \frac{4}{3}$

Area scale factor = $(^4/_3)^2 = {}^{16}/_9$ M1 or equivalent

Area of Δ ADC = $^{16}/_9$ x 24 M1

$= 42\ ^2/_3\ cm^3$ A1 Accept 42.67 cm^2

3

10. Let $T = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix}\begin{pmatrix} 2 & 4 \\ 2 & 3 \end{pmatrix} = \begin{pmatrix} 2 & 4 \\ 8 & 15 \end{pmatrix}$$

$2a + 2b = 2$ $2c + 2d = 8$

$4a + 3b = 4$ $4c + 3d = 15$

$4a + 4b = 4$ $4c + 4d = 16$

$4a + 3b = 4$ $4c + 3d = 15$

$b = 0$ $d = 1$

$a = 1$ $c = 3$

$$\therefore T = \begin{pmatrix} 1 & 0 \\ 3 & 1 \end{pmatrix}$$

11. $x^2 + y^2 - 2x + 5y = {}^7/_4$ B1

$x^2 - 2x + 1 + y^2 + 5y + \frac{25}{4} = \frac{7}{4} + 1 + \frac{25}{4}$ B1

$(x-1)^2 + (y + {}^5/_2)^2 = 9$

Centre = (1 – 2 ½) B1

12. $\text{Log}\left(\frac{3y+2}{10}\right) = \log(y-4)$ M1 Single logs

$\frac{3y+2}{10} = y - 4$ M1 Dropping of logs

$3y + 2 = 10y - 40$

$7y = 42$ A1

$y = 6$ 3

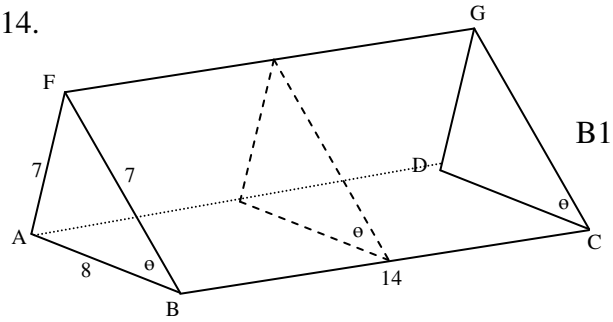
13. $\frac{\sqrt{3}}{1-\cos 30^0} = \frac{\sqrt{3}}{1-\sqrt{3}/2}$ B1 For $\cos 30^0 = \sqrt{3}/2$ in the expression

$= \frac{2\sqrt{3} - (2+\sqrt{3})}{(2\sqrt{3})(2+\sqrt{3})}$ M1 (Rationalization)

$= \frac{2\sqrt{3}(2+\sqrt{3})}{4-3}$ A1

$= 4\sqrt{3} + 6$ 3

14.



B1 Identifying the angle may be implied

$\text{Cos } \theta = {}^4/_7 = 0.5714286$ M1 or equivalent

$\theta = 55.1500954^0$ A1

$= 55.15^0$ 3

15. Distance traveled $= \left[\frac{9}{3}t^3 - \frac{4}{2}t^2 + t\right]_2^3$ M1 For integration

$(3 \times 3^3 - \frac{4}{2} \times 3^2 + 3) - (2 \times 2^3 - 2 \times 2^2 + 2)$ M1 Allow if two terms without units

$= 66 - 18$ A1

$= 48M$ 3

16. $2(1 - \text{Sin}^2 x)\text{Sin } x = 1$ M1 Subtraction

$2\sin^2 x + \sin x - 1 = 0$

$(2\sin x - 1)(\sin x + 1) = 0$ M1 factors

$\text{Sin } x = ½ \text{ or Sin } x$ A1 Both

$X = \frac{1}{6}\pi^c, \frac{5}{6}\pi^c, \frac{3}{2}\pi^c$ B1 allow if C is omitted

4

17. (a) $CP = 400 \times 30 + 350 \times 50$ M1

$= 29500$

$SP = \frac{120}{100} \times 29500$ M1

$= 35400$

1 Bag $= 35400 \div 80 =$ M1

$= \text{Ksh } 442.50$ A1

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(b) $\frac{400x + 350y}{x + y}$ M1

$\frac{400x + 350y}{x + y} = 383.50$

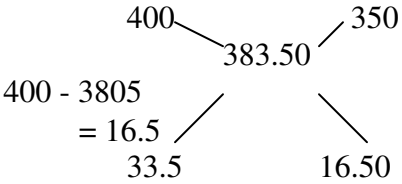
$400x + 350y = 383.5x + 383.5y$ M1

$\Rightarrow 16.5x = 33.5y$

$x: y = 33.5 : 16.5$

$67: 33$ A1

ALT M1



(c) $(^3/_8 + ^{67}/_{100}) : (^5/_8 + ^{33}/_{100})$ M1

$= 209: 191$ A1

10

18.(a) $p = \frac{kq}{r^2}$ B1 May be implied

$q = k\frac{(12)}{4}$ $k = 3$ M1

$p = \frac{3(15)}{5^2}$ $= 1.8$ M1

A1

(b) $q = \frac{pr^2}{3}$ B1 Lost if k is not substituted

(c) $q = 1.2\ p\ (0.9r)^2$ M1 } Allow if k is not substituted

$= 0.972\ \frac{pr^2}{3}$ M1 }

$\Delta q = 0.972\frac{pr^2}{3} - \frac{pr^2}{3}$

$= -0.028\ \frac{pr^2}{3}$ A1

$\% \Delta = (-0.028\frac{pr^2}{3} \div \frac{pr^3}{3}) \times 100$ M1 or $\frac{pr^2}{3} - 0.972\ \frac{pr^2}{3}$

$= 0.028pr^2$

$= -2.8\%$ A1 3

10

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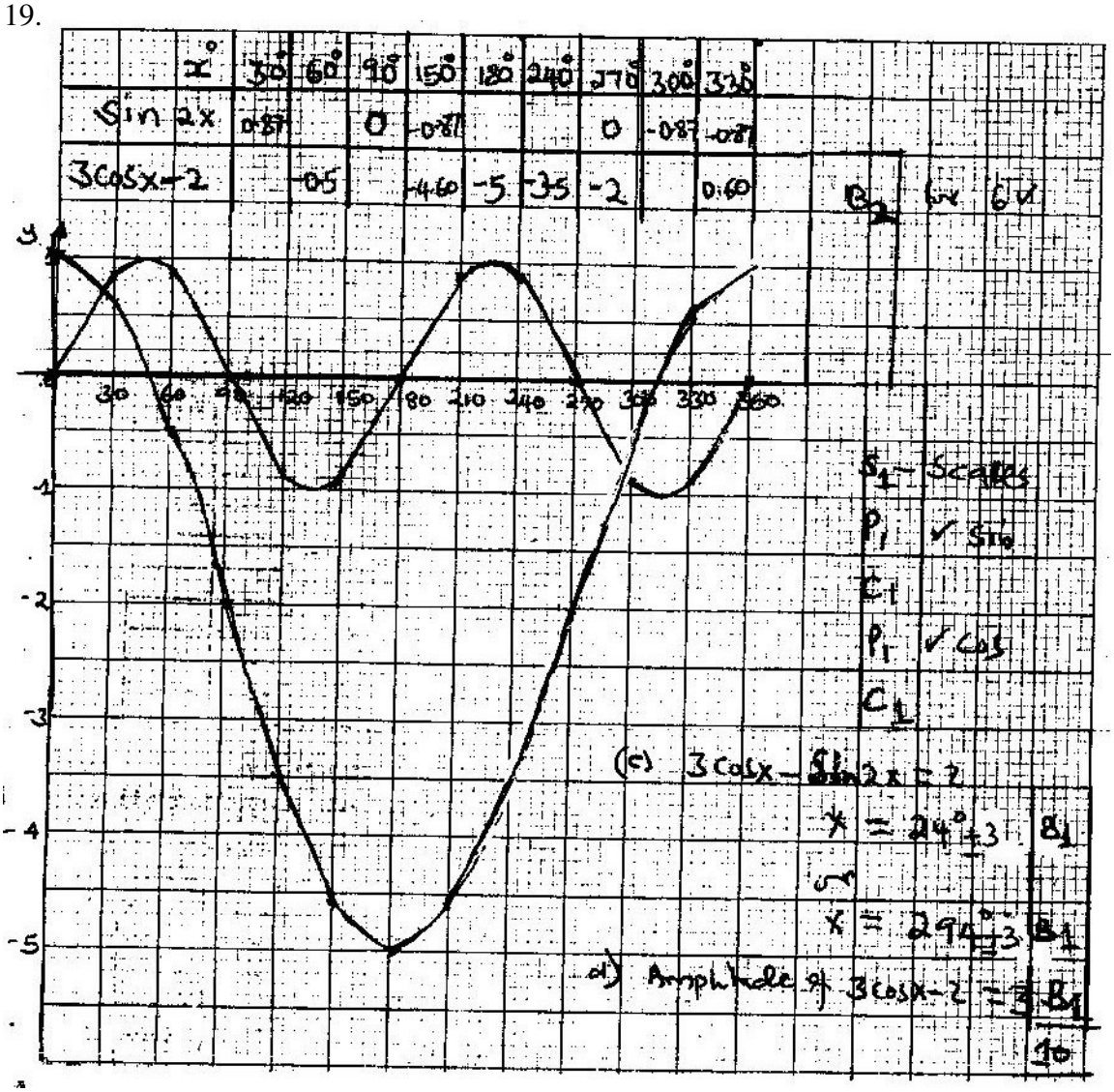
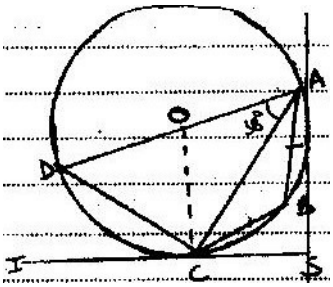
19.



20. (a) (i) $\angle ADC = 52^0$ or $\angle DCA = 38^0$ or $DCT = 38^0$ B1

$\angle ACS = 52^0$ B1



(ii) $\angle CBA = 128^0$ B1

$\angle BCA = 26^0$ B1

(b) (i) $AC = 20 \cos 38^0$ M1 or equivalent

$= 15.76$ cm A1

(ii) $AB = \frac{15.76}{\sin 26^0 \quad \sin 128^0}$ M1 AB subject

$AB = \frac{15.76 \sin 26^0}{\sin 128^0}$ M1 May or implied with Answer

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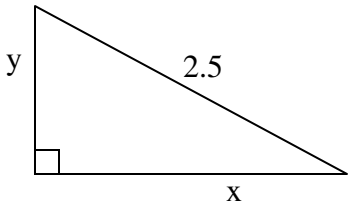
$= \frac{15.76 \times 0.4384}{0.7880}$ M1 4 s.f

$= 8.768$ cm A1

21. (a) B1 $2.5/ 90^0$ must be marked



(b) (i) $x^2 + y^2 = 2.5$ B1

$^{y}/_{2.4} = {}^{x}/_{3.2}$ B1

(ii) $y = \frac{3}{4} x$

$x^2 + (\frac{3}{4} x)^2 = 2.5^2$ M1 Are the subject

$16x^2 + 9x^2 = 6.25 \times 16$

$x^2 = \frac{6.25 \times 16}{25}$ M1 Substitution

$x = 2$ km A1

$y = \frac{3}{4} \times 2 = 1.5$ km B1

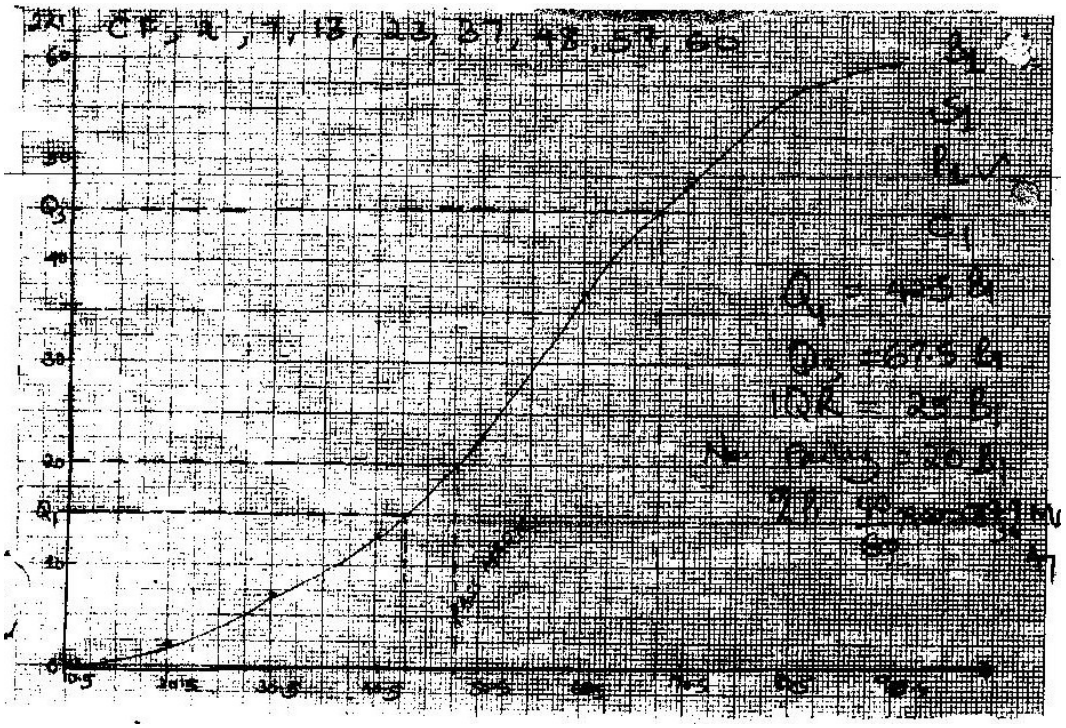
(iii) Time taken = $^{2}/_{32}$ or $^{1.5}/_{2.4}$ A1

M1

$= 0.625$ hours A1 or 37 ½ min or $^{5}/_{8}$ hrs

10

22.



23. (a) Internet = 10937 x $^{8}/_{100}$ x 2 — M1
= 17500

Amount = 109375 + 17500 — M1 — Summation
Kshs 126 875 — A1

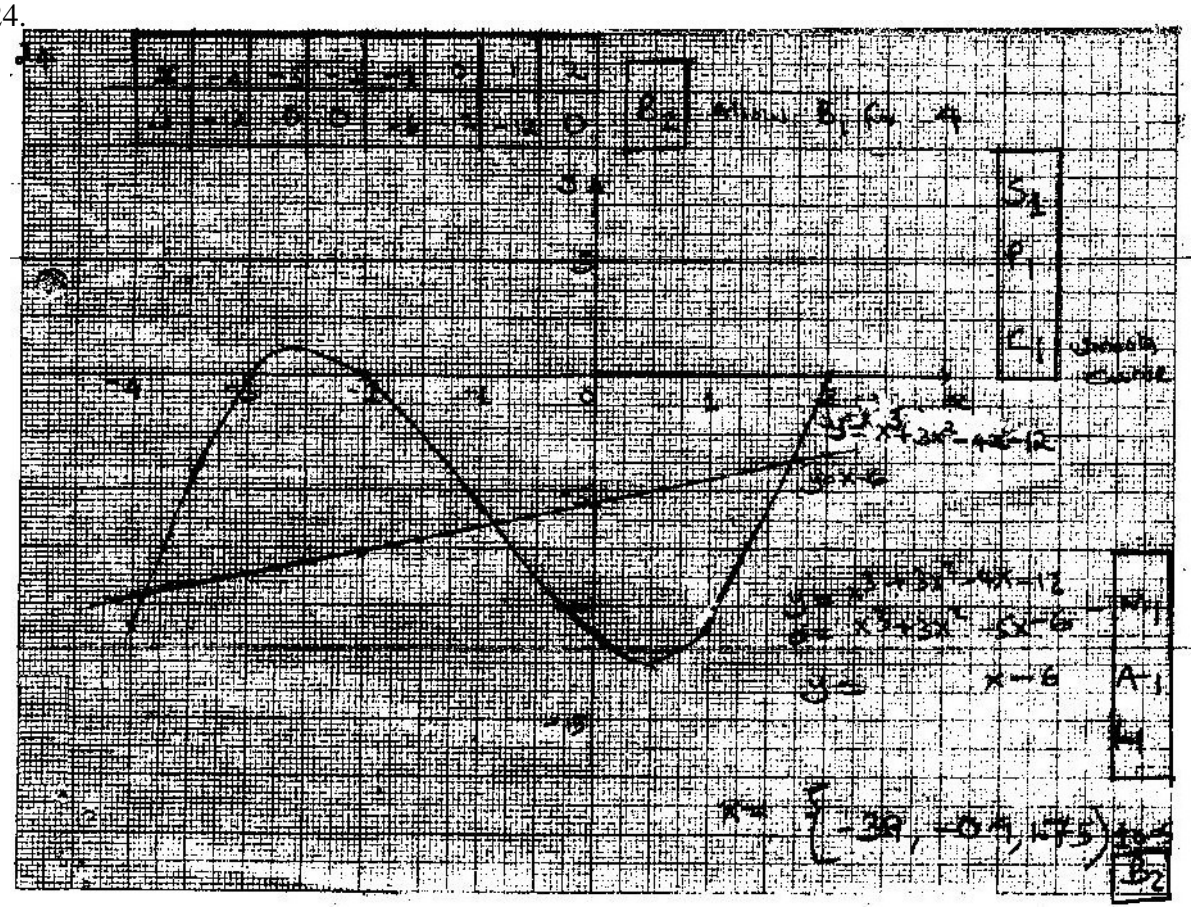
(b) (i) 1st yr value = $\frac{96}{100}$ x 126 875 — M1
Kshs 121 800 — A1

(ii) 4th year value = 121 800 $(1 + {}^{6}/_{100})^{9}$ — B1 — n = 9 been in formula
M1
= 205779 — A1

(c) % gain = $\frac{205779 - 126875}{126875}$ x 100 — M1 — Whole expression

= 62.19% — A1 — C.A.O

24.



MATHEMATICS PAPER 1
MARKING SCHEME - 2009

1	$\dfrac{\sqrt{5184}}{6\times -18 \div 9 + (5 - -3)}$		
	$= \dfrac{\sqrt{2^6 \times 3^4}}{6\times -18 \div 9 + 8}$		
	$= \dfrac{2^3 \times 3^2}{6\times -2 + 8}$	M1	✓ Method of $\sqrt{5184}$ without use of calc.
	$= \dfrac{72}{-4}$	M1	✓ order of operations
	$= -18$	A1	
		03	
2	$\dfrac{2\frac{1}{4} + \frac{3}{5} \div \frac{5}{6} \text{ of } 2\frac{2}{5}}{1\frac{7}{10}}$		
	$= \dfrac{2\frac{1}{4} + \frac{3}{5} \times \frac{6}{5} \times \frac{5}{12}}{1\frac{7}{10}}$		
	$= \dfrac{2\frac{1}{4} + \frac{3}{5} \times \frac{1}{2}}{1\frac{7}{10}}$		
	$= \left(2\frac{1}{4} + \frac{3}{10}\right) \div \frac{17}{10}$	M1	✓ order for operations of numerator
	$= \frac{51}{20} \times \frac{10}{17}$	M1	Multiplying by $\frac{10}{17}$
	$= \frac{3}{2}$ or $1\frac{1}{2}$	A1	
		03	
3	$x : y = 2 : 3 \Rightarrow \frac{x}{y} = \frac{2k}{3k}$ where k is a constant		Alt. 1
	$x = 2k \quad ; \quad y = 3k$	B1	$\frac{x}{y} = \frac{2}{3}$ M1
	Thus $(5x - 2y) : (x + y)$		$x = \frac{2}{3}y$ or $y = \frac{3}{2}x$ M1
	$[5(2k) - 2\times 3k] : (2k + 3k)$	M1	$\{5(\frac{2}{3})y - 2y\} : (\frac{2}{3}y + y)$
	$4k : 5k$		$4 : 5$ A1
	$\Rightarrow 4 : 5$	A1	Alt 2:
		03	$x = 2 \quad y = 3$ M1
			$\therefore 5(2) - 2(3) : 2 + 3$ M1
			$4 : 5$ A1

Q4 Distance covered by bus

$= 63 \times (10.45 - 8.15)$

$= 63 \times 2.5$

$= 157.5$

Speed of car $\frac{157.5}{1.75}$

$= 90$ km/h

Alt. 1.

M_1 Extra distance

$63 \times \frac{3}{4} = 47.25$

M_1 Relative speed

$x - 63$

M_1 $\frac{47.25}{x-63} = \frac{3}{4}$

A_1 $x = 90$

$\frac{63 \times 150}{105} = 90$ km/h

03

5 $64^{-\frac{1}{2}} \times 27000^{\frac{2}{3}}$

$2^{-4} \times 3^0 \times 5^2$

$= \frac{1}{\sqrt{64}} \times (\sqrt[3]{27000})^2$

$\frac{1}{16} \times 3^0 \times 25$

$= \frac{1}{8} \times 900 \times \frac{16}{25}$

$= 72$

M_1 Removal of -ve indices

M_1 Removal of roots.

A_1 Simplification

B_1

04

6 $AC = \sqrt{85^2 - 75^2} = \sqrt{1600}$

$= 40$

M_1

Area of quad. ABCD

$\frac{1}{2} \times 40 \times 75 + \sqrt{75(75-60)(75-50)(75-40}$

$= 1500 + \sqrt{984375}$

$= 1500 + 992$

$= 2492\ m^2$

$\simeq 0.25$ hec

M_1 Sum of both areas

A_1

B_1

04

7. Time between Monday 0545h and Friday 1945h

$= 4 \times 24 + 14$

$= 110$ h

M_1 Expression leading to 110hrs

Time lost $= 0.5 \times 110 = 55$ Min

Time shown in 12hour system

$1945 - 55 = 1850$ h

$= 6.50$ PM

M_1

A_1

03

8 $\dfrac{12x^2 + 4x - 6a^2}{9x^2 - 4a^2}$

$\dfrac{(4x + 3a)(3x - 2a)}{(3x + 2a)(3x - 2a)}$

$= \dfrac{4x + 3a}{3x + 2a}$

M1 √ Factorising numerator fully
M1 " denominator √ly
A1
03

9 $y = -\frac{2}{5}x + 2$

gradient $= -\frac{2}{5}$

$\dfrac{k - 5}{3 - -2} = -\dfrac{2}{5}$

$k - 5 = -2$

$\Rightarrow k = 3$

$5y + 2x = 10$

B1 $5(5) + 2(-2) = 21$

M1 $5k + 6 = 21$

(k,3) $5k = 15$

$k = 3$

A1
03

10 let exterior ∠ = ∠at the centre) be x

$\therefore 6.5x + x = 180$

$7.5x = 180$

$x = 24°$

$\therefore$ No. of sides $= \dfrac{360}{24}$

$= 15$ sides

Alt. 1.

M1 let the no. of sides = n

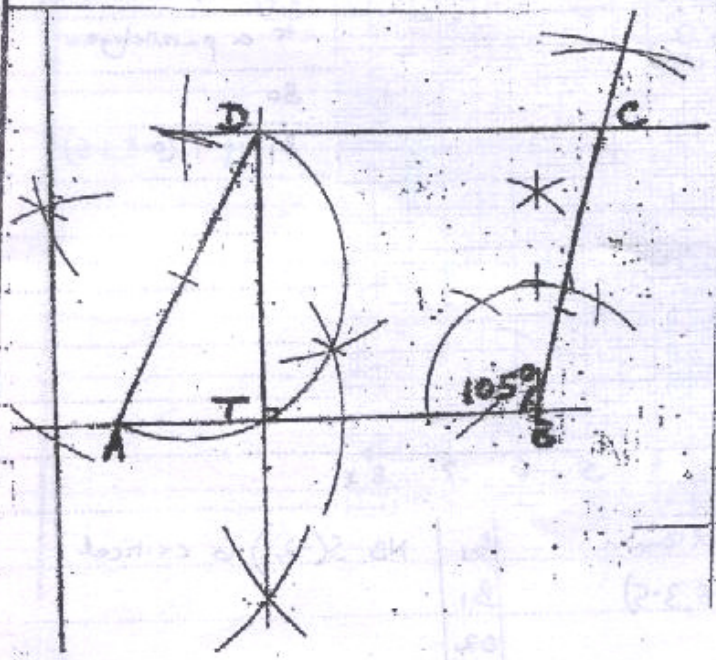
$\dfrac{360}{n} \times 6.5 + \dfrac{360}{n} = 180$ M1 M1

M1 $180n = 2700$

A1 $n = 15$ A1

03

11



- construction of 105° B1
- fixing point C and constructing line parallel to AB through C B1
- completion of trapezium ABCD B1
- location of point T from D only if any above B above lost B1

04

12. let angle between ground and wire be $\theta°$

$\therefore \theta + \frac{1}{3}\theta = 90$

$\Rightarrow \theta = 90 \times \frac{3}{4} = 67.5$ — B_1 or $22.5°$

let the wire be x cm in length

$\therefore \cos 67.5 = 6/x$

$x = \frac{6}{\cos 67.5} = \frac{6}{0.38268343}$ — M_1

$= 15.68$m or 1568cm — A_1

03

13. $\sin(3x+30) = \sin 60°$ — B_1 for $60°$

$\sin(3x+30) = \sin 120°$ — B_1 for $120°$

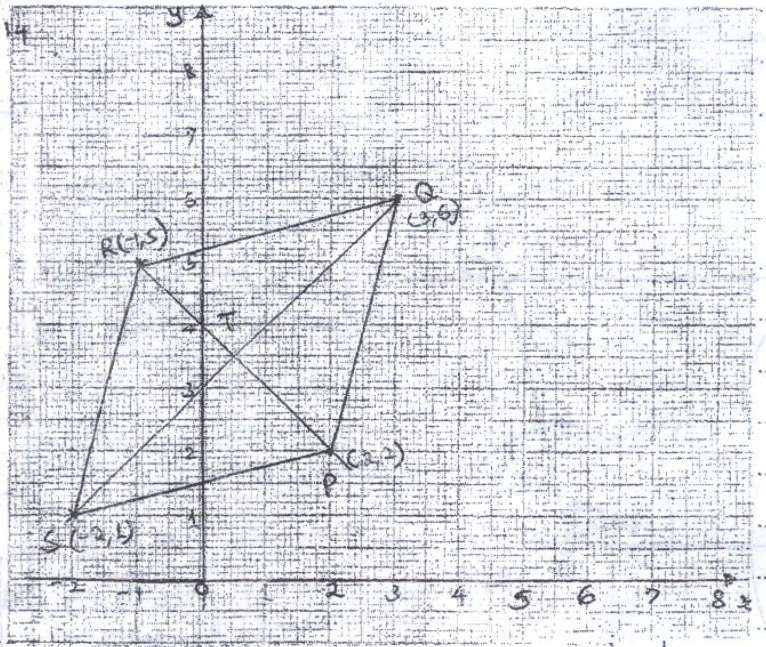
$3x + 30 = 60$

$3x + 30 = 120$

$x = 10°$, $x = 30°$ — B_1 for $10°$, B_1 for $30°$

04

14.



Different scales on x and y axis leads to a parallelogram.

B_0

B_1 if T(0.5, 3.5)

(a) Rhombus PQRS Vly drawn — B_1 NB S(-2,1) is critical

(b) Co-ordinates of T(0.5, 3.5) — B_1

02

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15 Commission earned

$0.225 \times 0.2 \times 3800$

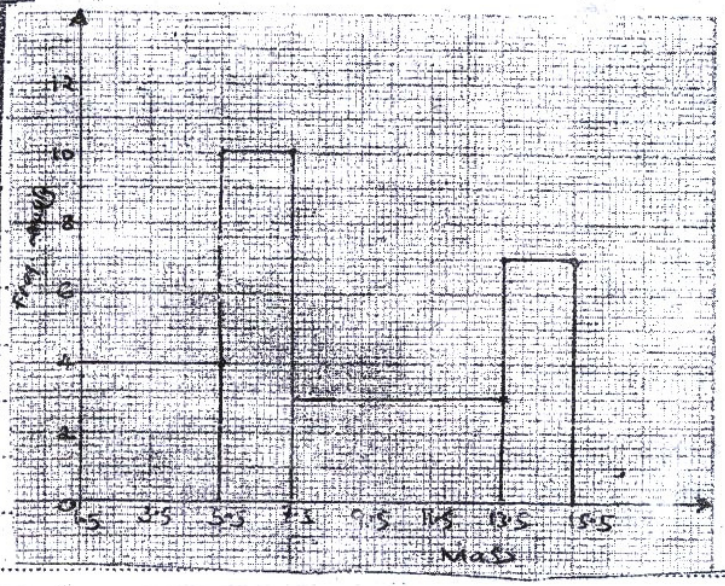
171

M1

A1

02

16



Frequency density = $\frac{\text{freq.}}{\text{C. Width}}$

1.5 – 5.5 ✓ bar B1

5.5 – 7.5 ✓ bar B1

7.5 – 13.5 bar B1

Check heights

Check heights

1.5 – 5.5 — 4 ✓

5.5 – 7.5 — 10 ✓

7.5 – 13.5 — 3 ✓

13.5 – 15.5 — 7 given.

17. a) $BC^2 = 6^2 + 8^2 - 2\times6\times8\times\cos 5°$ — M_1 If drawn to scale the line DB is not a straight line there are so many possibilities

$= 100 - 61.71$

$BC = \sqrt{38.2912} = 6.19$ — A_1

b) let $\angle ABC$ be $\beta°$

$\frac{\sin\beta}{6} = \frac{\sin 50°}{6.19}$; $\sin\beta = \frac{6\sin 50}{6.19}$ — M_1 Accept 48.16, 48.15

$\therefore \beta = 47.95°$ — M_1 47.94°, 47.96° depending on method used. A_1

c) let $\angle CAD$ be $\alpha°$

$2.82^2 = 7^2 + 6^2 - 2\times7\times6\cos\alpha$ — M_1

$\cos\alpha = \frac{49+36-7.9524}{84}$ — M_1

$\alpha = 23.48°$. — A_1 22.89 is possible

d) Area of $\triangle ACD = \frac{1}{2}\times7\times6\times\sin 23.48°$ — M_1 Heron's formula $s = 7.91$, $\sqrt{7.91\times1.42\times2.91\times5.10}$

$= 8.37\ cm^2$ — A_1

10

18. a) (i) Modal Class 60–69 — B_1

(ii) Class where Median mark lies

0–9	1
10–19	3
20–29	7
30–39	14
40–49	24
50–59	40 x
60–69	60
70–79	66
80–89	69
90–99	70

Median is 35 — B_1 for cf column or implied

Median class is 50–59 — B_1

class	Centres x	fd	d = x − 1
0–9	4.5	−49.9	−49.9
10–19	14.5	−79.8	−39.9
20–29	24.5	−119.6	−29.9
30–39	34.5	−139.3	−9.9
40–49	44.5	−99.0	−9.9
50–59	54.5	1.6	0.1
60–69	64.5	20.2	10.1
70–79	74.5	120.6	20.1
80–89	84.5	90.3	30.1
90–100	94.5	40.1	40.1

B_1 ✓ class centres

M_1 ✓ deviations

B_1 ✓ fd.

$\Sigma f = 70$ — B_1

$\Sigma fd = -33$ — A_1

Mean $= 54.4 - \frac{33}{70}$ — M_1

$= 53.93$ — A_1

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19 (c)(i) Original price $= \frac{16200}{x}$ B1

(ii) Price after discount $\frac{16200}{x+3}$ B1

(b)(i) $\frac{16200}{x} - 60 = \frac{16200}{x+3}$ M1 OR equivalent

$\Rightarrow (16200 - 60x)(x+3) = 16200x$ M1 Removal of denominators

$16200x + 48600 - 60x^2 - 180x = 16200x$

$60x^2 + 180x - 48600 = 0$ M1 For quadratic equation

$x^2 + 3x - 810 = 0$

$(x+30)(x-27) = 0$ M1 For factorization of quad. eqn.

$x = -30$ or $x = 27$

No. of calculators bought = 30 A1 C.A.O or avoids -ve sign

(c) Initial cost of calculators

$\frac{16200}{27} = 600$ M1

Discount offered as a percentage

$\frac{\frac{16200}{27} - \frac{16200}{30}}{600} \times 100$ M1

$= 10\%$ A1

10

20 (a)(i) $\overrightarrow{ON} = \frac{1}{2}\begin{pmatrix} -8 \\ 5 \end{pmatrix} = \begin{pmatrix} -4 \\ 2.5 \end{pmatrix}$

N is $(-4, 2.5)$ B1

$M = \left(\frac{-8+12}{2}, \frac{5-5}{2}\right)$ M1

M is $(2, 0)$ A1

(ii) $\overrightarrow{NM} = \begin{pmatrix} 6 \\ -2\frac{1}{2} \end{pmatrix}$ B1

$|NM| = \sqrt{6^2 + (2.5)^2}$ M1

$= 6.5$ A1

(b) $\overrightarrow{OB} = \begin{pmatrix} 12 \\ -5 \end{pmatrix}$, $\overrightarrow{NM} = \begin{pmatrix} 6 \\ -2\frac{1}{2} \end{pmatrix}$

$\therefore NM = \frac{1}{2}OB$ B1 Apply OW^{-1} If vector sign missing

(c) $\overrightarrow{OP} = \begin{pmatrix} 2 \\ 0 \end{pmatrix} + 2\begin{pmatrix} -6 \\ 2\frac{1}{2} \end{pmatrix} = \begin{pmatrix} -10 \\ 5 \end{pmatrix}$ M1

$OP' = \begin{pmatrix} -10 \\ 5 \end{pmatrix} + \begin{pmatrix} -5 \\ 8 \end{pmatrix} = \begin{pmatrix} -15 \\ 13 \end{pmatrix}$ M1

$\therefore P'$ is $(-15, 13)$ A1

10

Alt. 20 (a)(ii) $\overrightarrow{MN} = \begin{pmatrix} -6 \\ 2.5 \end{pmatrix}$ B1

$|\overrightarrow{MN}| = \sqrt{-6^2 + 2.5^2}$ M1

$= 6.5$ A1

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21 (a) Volume of water $\frac{6}{9+x} = \frac{2}{x}$ $x = 4.5$

$\therefore$ Vol $= \frac{1}{3} \times 3.142 (6^2 \times 13.5 - 2^2 \times 4.5)$

$= 508.94 - 18.25 = 490.09$

(b)(i) Volume of Sphere

Top radius $\frac{r}{14.5} = \frac{2}{4.5}$ $r = 6.44$

Volume $= \frac{1}{3} \times 3.142 (6.444^2 \times 14.5 - 6^2 \times 13.5)$

$= 121.6 \Rightarrow 121\frac{11}{15}$

(ii) $\frac{4}{3} \pi x^3 = 121.6$

$x^3 = 121.6 \times \frac{3}{4\pi}$

$x = 3.073$

Follow through

ALT 1:

M1 LSF 14.5 : 4.5

29 : 9

M1 VSF 24389 : 729

A1 $\frac{24389}{729} = \frac{V}{18.849}$ (M1)

(A1)

M1 $V = \frac{24389}{729} \times 18.849 = 630.619$

A1 Volume of marble

$= 630.619 - 508.938$ (M1)

M1 $= 121.681$ (A1)

b(i) M1 $V = \frac{1}{3} h (R^2 + Rr + r^2)$

M1 $= \frac{9}{3}(6^2 + 6 \times 2 + 2^2)$ (M1M1)

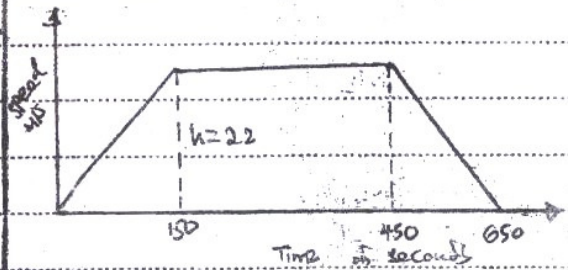
$= 156\frac{1}{3} = 490.088$ (A1)

A1 b(i) $\frac{1}{3} \times \frac{22}{7} (6.44^2 \times 14.5 - 6^2 \times 13.5)$

$= 630.79 - 509.14$

$= 121.65$

22



(a) $\frac{1}{2} \times 150h + \frac{1}{2} \times 200h + 300h = 10450$

M1 or equivalent.

$475h = 10450$

$h = 22$ M/S

A1

Max speed $= \frac{22 \times 60 \times 60}{1000} = 79.2$ km/h

B1 C.A.O

(b) Acceleration $\frac{22}{150}$ M/S

M1

$= \frac{11}{75}$

A1 or 0.1467 M/S^2

or 1900.8 km/h^2

(c) $\frac{1}{2} \times 100 \times 11$

M1

$= 550$

A1

(d) Time for half of journey

$\frac{1}{2} \times 22 (150 + t + t) = \frac{1}{2} \times 10450$

M1

$t = 162.5$

A1

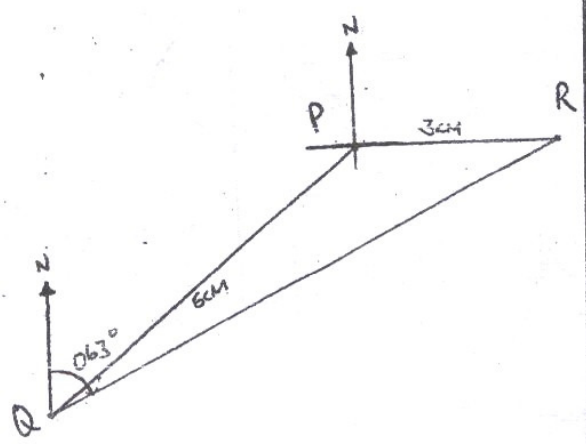
Total time $= 150 + 162.5$

$= 312.5$

B1

10

23



a) Direction and distance of Q from P	B_1	
- Direction and distance of R from P	B_1	
(i) Distance conversion		
8.5×40	M_1	8.5 ± 0.1 . $8.4 \times 40 = 336$, $8.6 \times 40 = 344$
$= 340$	A_1	
(ii) ✓ North line at Q	B_1	
bearing 063° stated	B_1	$\pm 1°$ N 62°E or N63°E or N64°E
(iii) Distance from the top of the post at Q to the tip of post at P		Follow through
$x = \frac{240}{\cos 9°}$ or $x \cos 9° = 240$	M_1	if calculation
$= 243\text{M}$	A_1	B_1 for calculated angle
		B_1 for angle in form of bearing.
(ii) Speed of bird		
$\frac{243 \times 60 \times 60}{1000 \times 18}$	M_1	$\frac{240}{\sin 81°} = x$
$= 48.6$ km/h	A_1	
	10	

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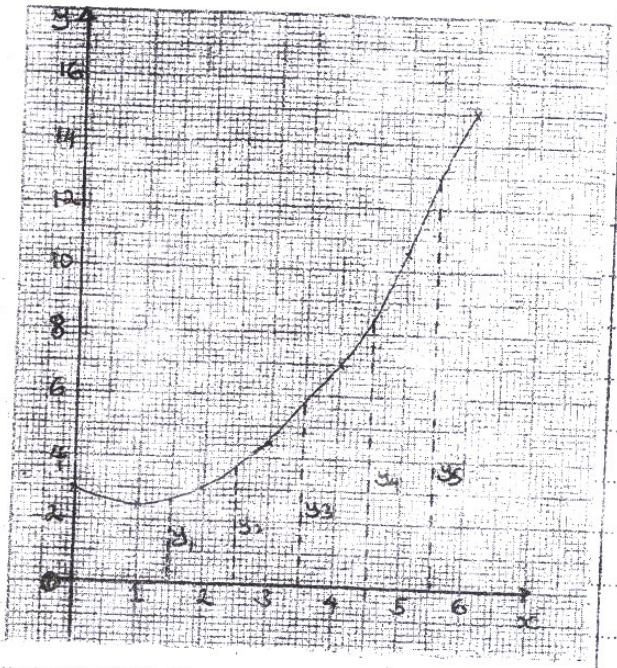
x	0	1	2	3	4	5	6
$y=\frac{1}{2}x^2-x+3$	3	$2\frac{1}{2}$	3	$4\frac{1}{2}$	7	$10\frac{1}{2}$	15

B1



P1 ✓✓ double line for at least 5 correct scores on table

C1 C.A.O

(b) When $y_1 \ldots y_5$ are read from the graph

B0

M0

A0

$y_1 = \frac{1}{2}\times 1.5^2 - 1.5 + 3 = 2.625$

$y_2 = \frac{1}{2}\times 2.5^2 - 2.5 + 3 = 3.625$

$y_3 = \frac{1}{2}\times 3.5^2 - 3.5 + 3 = 5.625$

$y_4 = \frac{1}{2}\times 4.5^2 - 4.5 + 3 = 8.625$

$y_5 = \frac{1}{2}\times 5.5^2 - 5.5 + 3 = 12.625$

B1 ✓ ordinates calculated

Approximate area $= 1(2.625+3.625+5.625+8.625+12.625)$ M1

$= 33.125$ square units A1

Area $= \int_1^6 (\frac{1}{2}x^2 - x + 3)\,dx = \left[\frac{x^3}{6} - \frac{x^2}{2} + 3x\right]_1^6$ M1

$= \left[\frac{6^3}{3} - \frac{6^2}{2} + 3\times 6\right] - \left[\frac{1^3}{6} - \frac{1^2}{2} + 3\right] = 33.3$ M1

% error $\frac{33.\dot{3} - 33.125}{33.3} \times 100 = 0.615\%$ M1 A1

$\frac{33\frac{1}{3} - 33\frac{1}{8}}{33\frac{1}{3}}$ A+00 $\% = 0.625\%$

151 10

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