KENYA NATIONAL EXAMINATION COUNCIL
REVISION MOCK EXAMS 2016
TOP NATIONAL SCHOOLS

ALLIANCE GIRLS HIGH SCHOOL

MATHEMATICS

PAPER 2

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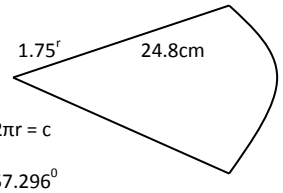
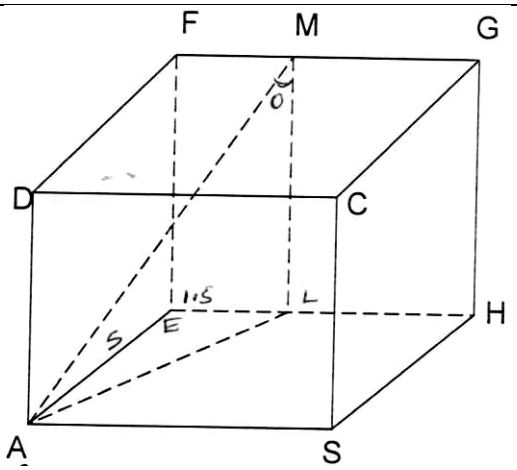
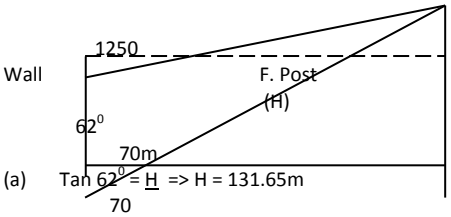
ALLJANCE GIRLS HIGH SCHOOL KCSE TRIAL AND PRACTICE EXAM 2016

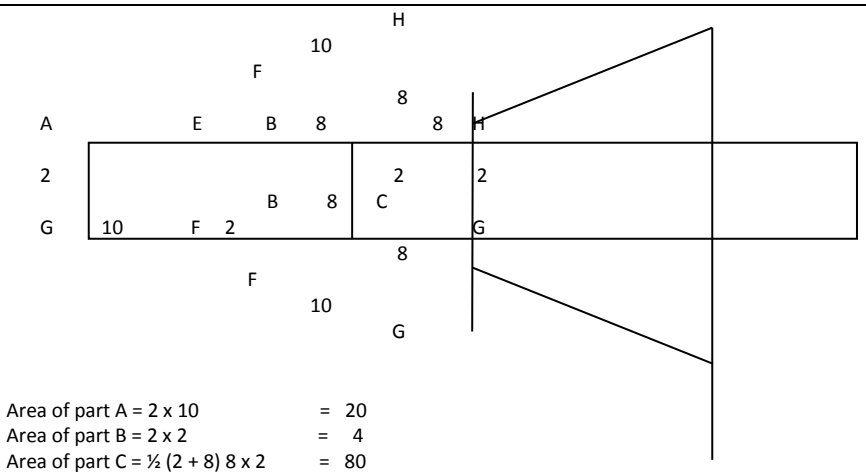
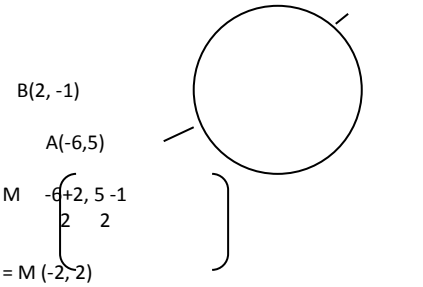
PAPER 2

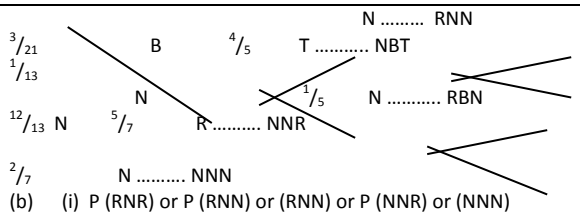
MARKING SCHEME

NO	WORKING	MARKS	COMMENTS
1	Log 559.3 = 2.7476 10 tan 3^0 = 10 x 0.0524 = 0.524 ⇨ 2.7476 + 0.5240 3.2716 $\frac{0.7493 \cos^2 16.3350}{3.2716}$ No. Std. form Log 0.7493 7.493×10^{-1} 1.8747 $Cos^2 16.335$ 2(1.982) 1.9642 + 1.8389 3.2716 3.2716×10^0 0.5148 - 1.3241 $\frac{-1 + 0.3241}{2}$ = 1.6621 $= 10^{-1} \times 4.593$ = 0.4593	M1 M1 M1 A1	✓Working out the denominators to get 3.2716 ✓For attempt to add and subtract correctly. ✓Division by 2 CAO
		04	
2	$\frac{1}{4}x^2 + \frac{1}{9}$ $\frac{1}{4} x^2 + k + \frac{1}{9}$ $a + 2ab + b^2$ $a^2 = \frac{1}{4} x$ $b^2 = \frac{1}{9}$ 2ab = k $2 \times \frac{1}{2} \times \frac{1}{3} = k$ $k = \frac{1}{3} x$	M1 A1	
		02	
3	$x^6, x^5\frac{-9}{x^2}, x^4\left(\frac{a^2}{x^2}\right), x^3\frac{-a^3}{x^2}, x^2\left(\frac{-a^4}{x^2}\right), x\frac{-a^5}{x^2}, \left(\frac{-a^6}{x^2}\right)x^2$ $1.x^6 - 6.x^5\frac{a}{x^2} + 15x^4\left(\frac{a^2}{x^2}\right) - 2x^3\frac{a^3}{x^2} + 15x^2\frac{a^4}{x^2} - 6x\frac{a^5}{x^2} + 1.\left(\frac{a^6}{x^2}\right)$ $x^6 - \frac{6ax^5}{x^2} + \frac{15x^4a^2}{x^4} - \frac{20x^3a^3}{x^6} + \frac{15x^2a^4}{x^8} - \frac{6xa^5}{x^{10}} + \frac{a^6}{x^{12}}$ $x^6 - 6ax^3 + 15a^2\frac{20a^3}{x^3} + \frac{15a^4 - 6a^5 x a^6}{x^6 \quad x^a \quad x^{12}}$ $15a^2 = 1215$ $a^2 = 81$ $a = \pm 9$	B1 M1 A1	For items and coefficients combined correctly Equating to 1215 C.A.O (± 9)
		03	
4	 $\frac{\theta}{360} = \frac{2\pi r}{c}$ $1^r = 57.296^0$ $1.75 - (1.75 \times 57.296^0)$ $= 100.268^0$ $\frac{100.26}{560} \times D \times \frac{22}{7} = 24.8$ 0.8754D = 24.8 $D = \frac{24.8}{0.874}$ D = 28.33cm	M1 A1	✓For substitution For diameter
		03	
5			

	 $AL^2 = AE^2 + EL^2$ $= 5^2 + (1.5)^2$ $= 27.5$ $= 5.240$ $AM = \sqrt{5.244^2 + 4^2}$ $= \sqrt{27.5 + 16}$ $= \sqrt{43.5}$ $= 6.5955$ $\cos\theta = \frac{4}{6.596}$ $= 0.6064$ $\theta = \cos^{-1} 0.6064 = 52.67^0$	M1 M1 A1	
		04	
6.	$(0.0054667)^{½} = (54.667 \times 10\text{-}4)^{½}$ $= 7.3939 \times 10^{-2}$ $= 0.073939$ $= \left(\frac{3}{0.043279}\right)$ $= 3 \times 0.2305 \times 100$ $= (69.15)^2$ $= (6.915 \times 10^1)^2$ $= 47.82 \times 10^2$ $= 4782$ ⇨ $0.073939 + 4782$ $= 4782.073989$ $= 4782.1$	M1 M1 A1	Use of table, to get square root. Getting reciprocals and squaring it using log tables. Giving answer to 5 significant figure.
		03	
7	$A = P(1 + \frac{r}{100})^n$ Period = 4 Rate = 4 $A = 1250000 (1 + \frac{4.5}{100})^8$ $= 1250000 (1.045)^8$ $= 1777625.766$ Half withdrawn Remaining 888812.883 $A = 888812.883 (1 + \frac{45}{100})^{10}$ $= 888812.883 (1.045)^{10}$ $= 1380299.229$ Interest in phase one $= (1777625.766$ Interest in phase two 1380299.229 – 888812.883 = 491486.346 Total interest (527625.776 + 4914863.436)	 M1 M1 M1	

	=1019112.112 ≈ 1019112	A1	
		03	
8	$16sm^2 x + 4 \cos x = 10$ $8sm^2 x + 2 \cos x = 5$ $8(1 - \cos^2 x) + 2 \cos x = 5$ $8 - 8 \cos^2 x = 2 \cos x = 5$ $-8 \cos^2 x + 2 \cos x + 3 = 0$ $8 \cos^2 x - 2 \cos x - 3 = 0$ Let $\cos x = y$ $8y^2 - 4y - 3 = 0$ $y = \frac{2 \pm \sqrt{(-2)^2 - 4 \times 8x - 3}}{16}$ $= \frac{2 \pm \sqrt{4 + 96}}{16}$ $= \frac{2 \pm 10}{16}$ $\cos x = \frac{12}{16} \Rightarrow \cos x = 0.75$ and $\cos x = \frac{-8}{16} \Rightarrow \cos x = \frac{-1}{2}$ $\cos x = -0.5$ – found in the 2nd and 3rd quadrant. For 3rd quadrant Acute angle = 60^0 Then $x - 180^0 = 60^0$ $x = 240^0$ $\tan 240^0 = 1.7321$	M1 M1 A1 B1	Accept use of sin
		04	
9	(a) $P = KL + \frac{B}{\sqrt{C}}$ K & B where K and B are constants $500 = 16K + \frac{B}{4}$ ..... (i) $800 = 25K + \frac{B}{5}$ ..... (ii) $K = \frac{2000}{61} = 32.79$ $B = -98.56$ $P = 32.79L - \frac{98.56}{\sqrt{C}}$ (b) $P = \frac{2000}{61}(81) - \frac{98.56}{\sqrt{81}}$ $= 1327.87 - 10.95$ $= 1,316.92$	 M1 A1 M1 A1	Attempt to find the constants.
		04	
10	 (a) $\tan 62^0 = \frac{H}{70} \Rightarrow H = 131.65m$ (b) $\tan 25^0 = \frac{x}{70}$ $\Rightarrow x = 70 \tan 25^0$ $= 32.64$ Therefore (wall) = 131.05 – 32.64 = 99.03m	B1 M1 A1	
		03	
11	$\log 135 = \log 3^3 x5$ $= 3 \log 3 + \log 5$ $= (1.583) + 2.322$ $= 7.071$	M1 A1	
		02	
12	Max. $Q = \frac{12.7}{7.1} = 1.7887$ Min. $Q = \frac{12.5}{7.3} = 1.7123$ Actual = $\frac{12.6}{} = 1.75$	M1	Both values

	7.2 A.E = ½ (1.7887 – 1.7123) = 0.0383 % Error = 0.0382 x 100 1.75 = 2.1829	M1 A1	
		03	
13	 Area of part A = 2 x 10 = 20 Area of part B = 2 x 2 = 4 Area of part C = ½ (2 + 8) 8 x 2 = 80 Area of part D = 8 X 2 = 16 Area of part E = 2 x 8 = 16 Total area = 136cm^3	B1 B1 M1 A1	✓Sketch ✓ Labelling
		04	
14	$9^{x+1} - 54 = 3^{2x+1}$ $(3^{2x})(3^2) - 54 = (3^{2x})(3^1)$ Let $3^{2x} = y$ $9y - 54 = 3y$ $6y = 54 = y = 9$ $3^{2x} = 3^2 => 2x = 2$ Therefore x = 1	M1 M1 A1	
		04	
15	 M $\left(\frac{-6+2}{2}, \frac{5-1}{2}\right)$ = M (-2, 2) MB = $\begin{pmatrix}2\\-1\end{pmatrix} - \begin{pmatrix}-2\\2\end{pmatrix} = \begin{pmatrix}4\\-3\end{pmatrix}$ MB = Radius = $\sqrt{4^2 + (-3)^2}$ = 5 $(x + 2)^2 + (y - 2)^2 = 5$ $x^2 + y^2 + 4x - 4y - 17 = 0$	B1 M1 A1	
		03	
16	$y + 2x + 1 = 0$ $x^2 + xy = -6$ $y = (-2 - 1)$ $x^2 + x(-2x - 1) = -6$ $-x^2 - x + 6 = 0$ $(x - 2)(x + 3) = 0$ x = 2 when y = -5 x = -3 when y = 5	 M1 M1 A1	
		04	
17	(a) Tree diagram $^4/_5$ T .....RBT B $^1/_5$ N .....RBN $^4/_{15}$ $^5/_7$ R ..... RNR $^{18}/_{21}$ R N $^1/_{15}$ $^2/_7$	 B1 B2	Labelling Indicating all probs



(b) (i) P (RNR) or P (RNN) or (RNN) or P (NNR) or (NNN)

$\frac{6}{7} \times \frac{11}{15} \times \frac{5}{15} + \frac{6}{7} \times \frac{1}{15} \times \frac{2}{7} + \frac{3}{7} \times \frac{12}{21} \times \frac{5}{13} + \frac{3}{7} \times \frac{12}{21} \times \frac{2}{13}$ M1

$= \frac{2}{49} + \frac{60}{637} + \frac{60}{637} + \frac{23}{637} = \frac{170}{637}$ M1 A1

(ii) P (RNR) or P(NNR)

$= \frac{6}{7} \times \frac{11}{15} \times \frac{5}{7} + \frac{3}{7} \times \frac{12}{21} \times \frac{5}{13}$ M1

$= \frac{86}{637}$ A1

(iii) P (R') = 1 – P (RNR + P (NNR)

$= 1 - \frac{86}{637}$ M1

$= \frac{557}{637}$ A1

10

18 Total tax = PAYE – Relief

= Ksh. 2172 + 1093 M1

= Ksh. 3265p.m

= Ksh. 39,180 p.a. A1

Tax (K£ p.a.)	Taxable income (K£p.a.)	
4512 x 2 (9024)	4,512	M1
4512 x 3 (13,536)	4,512	M1
4x = 16,620 (16,2620)	4,155	M1
	13,179	

Therefore taxable income = Ksh. 13,179 p.a M1

= Kshs. 21,965p.m. M1

Basic salary = Ksh. 21965 – (5000 + 2000) A1

= Ksh. 14,965p.m.

Total deductions = Ksh. 2172 + 320 + 4000

= Ksh. 6,492p.m.

Gross income = Ksh. 21965p.m.

Therefore Koech's net pay = Ksh. 21965 – 6492 M1

= Kshs. 15,473p.m. A1

10

19

(d) radius = 4.6 ± o.1 B1 Construction of pt C; Construction of ΔABC

Area = $\frac{120}{360} \times \frac{22}{7} \times 4.6 \times 4.6$ B1 Locating the centre; Bisecting <s

$= 22.17cm^2$ B1 Radius of circle construction.

Construction of angles 30^0.

B1 Centre of circle

B1 Locus L

B1

B1

B1

M1

A1

10

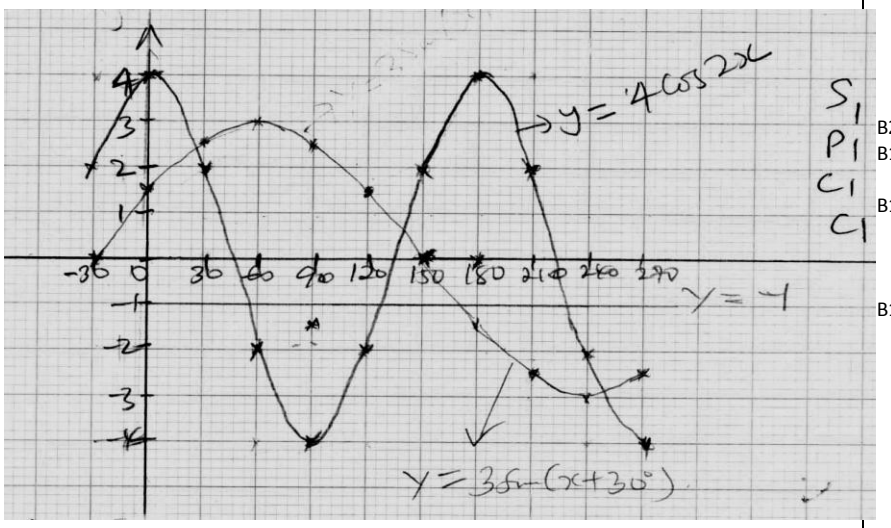
20

x	-30	0	30	60	90
+ cos 2x	2.0	4.0	2	**-2.0**	-4.0
3 sin (x+30)	0	1.5	2.6	3.0	**2.6**

B2 All 6

120	150	150	210	240	270
-2.0	**2.0**	-4.0	2.0	**-2.0**	-4
1.5	0	**-1.5**	-2.6	-3.0	-2.6

B1 At least 4

	 (c) (i) $x = 24^0, 138^0, 352^0 \pm 0.5$ (ii) $3 \sin (x + 30^0) = y$ $3 \sin (x + 30) = y \quad -y = y \quad x = 168 \pm 0.5$ (iii) $4 \cos 2x = y \qquad 2x = 360$ $x = 180^0$ Therefore period = 180^0✓	B2 B1 B1 B1	✓all ✓2
		10	
21	(a) $\frac{4800}{60} = 80^0$ $90 - 65 = 25^0$ $80 - 25 = 55^0$ $90 - 55 = 35^0$ $R = 35^0$	M1 M1 A1	
	(b) X (65^0N, 36^0E) Y (65^0N, 144^0W) Angle difference $144 + 36 = 180^0$ Small circle Therefore $180^0 \times 60^0 \cos 65^0$ = 4564.28nm Then: (65^0N, 144^0W) (35^0N, 144^0W) Angle difference $65 - 35 = 30^0$ Current circle $30 \times 60 = 1800$nm Total distance 4564.28 + 1800 = <u>6364.28nm</u> Direct route Angle difference = 80^0 Along a great circle (Longitude) Therefore $80 \times 60 = 4800$nm Route difference in distance 6364.28 – 4800 = <u>1564.28nm</u>	M1 M1 A1 A1 A1	
	(c) Route difference in distance = 1564.28nm Angle difference = $\frac{1564.28}{60} = 26.07^0$ ⇨ $35^0 + 26.07^0 = 61.07^0$ (61.07^0N, 144^0W)	M1 A1	
		10	
22	(a) $y = x^2 + 2$ $y = 10 - x^2$ $x^2 + 2 = 10 - x^2$		

$x^2 + x^2 = 10 - 2$

$2x^2 = 8$

$x^2 = 4$

$x = \pm 2$

$x = 2$

$y^2 = x + 2 \quad y = 10 - 2$

$y = 4 + 2$ or $y = 10 - 4$

$y = 6 \quad y = 6$

Q(2, 6) …….. A1

(b) $h = \frac{2 - 0}{8} = \frac{2}{8} = \frac{1}{4}$ or 0.25

For $y = 10 - x^2$

x	0.00	0.25	0.50	0.75	1.00	1.25	1.50	1.75
10	10	10	10	10	10	10	10	10
$-x^2$	0.00	-0.0625	-0.25	-0.5625	-1.00	-1.5625	-2.25	-3.0625
y	10.00	9.9375	9.75	9.4375	9	8.4375	7.75	6.9375

T2

9.96875 9.4375 9.59375 9.21875 8.71875 8.09375 7.34375 6.46875

= 0.25(9.96875+09.84375+9.59375+9.21875+8.71875+8.09375+7.34375+6.46875)

= 0.25 (69.25)

= 17.3125…….. A1

For $y = x^2 + 2$

X	0.00	0.25	0.50	0.75	1.00	1.25	1.50	1.75
x^2	0.00	0.0625	0.25	0.5625	1.00	1.5625	2.25	3.0625
2	2	2	2	2	2	2	2	2
y	2.00	2.0625	2.25	2.5625	3.00	3.5625	4.25	5.0625

T1

3.03125 2.15625 2.40625 2.78125 3.28125 3.90625 4.65625 5.53125

=0.25(3.08125+2.15625+2.40625+2.78125+3.28125 + 3.90625 + 4.65625+5.53125)

= 0.25 (27.75)

= 6.9375……. A1

Shaded region:

17.3125 – 6.9375

= 10.375 A1

(c) $y = 10 - x^2$

$\int_0^2 (10x - x^2)dx$ M1

$\left[10x - \frac{x^3}{3}\right]_0^2$

$\left(10(2) - \frac{(2)^3}{3}\right) - \left(10(0) - \frac{(0)^3}{3}\right)$ M1

(20 – 2.6667) – 0

17.3333 A1

10

23 (a) $p = kr^n$

$\log p = \log r^n + \log k$

$\log p = n \log r + \log k$ B1

(b)

p	1.2	1.5	2.0	2.5	3.5	4.5
r	1.58	2.25	3.39	4.74	7.86	11.5
Log p	0.792	0.1761	0.3010	0.3979	0.5441	0.6532
Log r	0.1987	0.3522	0.5302	0.6758	0.8954	1.0607

T2

n = the gradient

$n = \frac{0.3522 - 0.1987}{0.1761 - 0.0792} = \frac{0.1535}{0.0969} = 1.58$ M1 A1

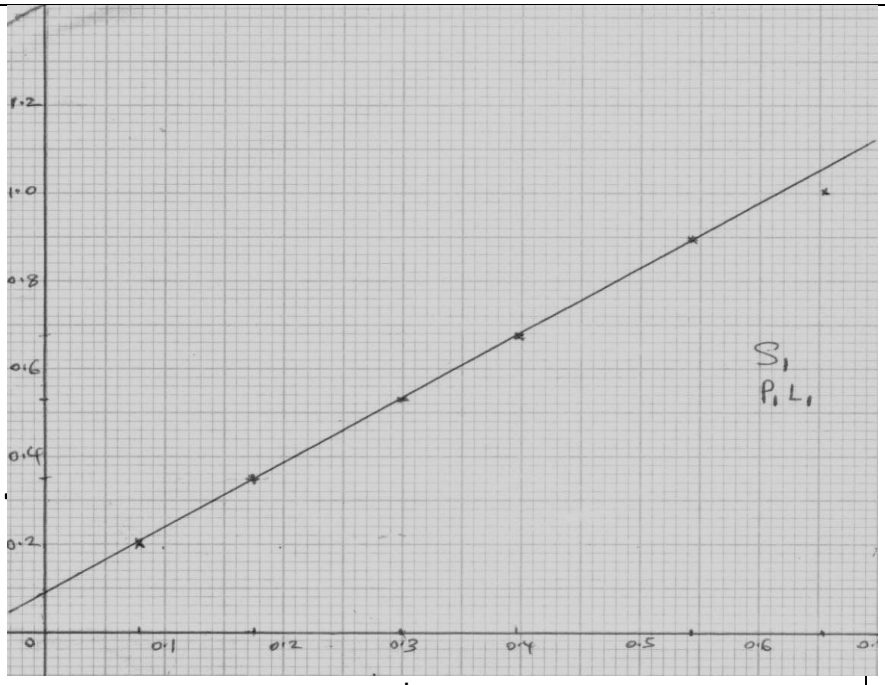
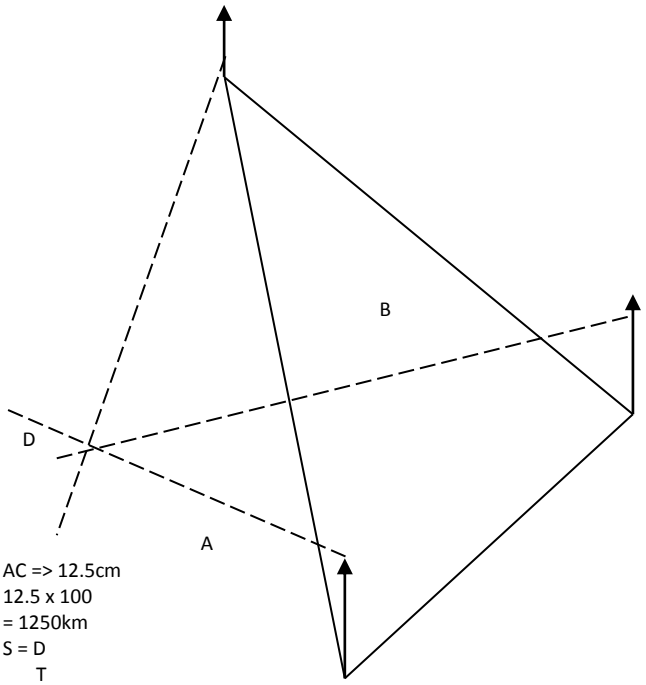
Log k = 0.9

No	Log
k	0.9
7.943	

k = 7.943 ……

(b) A1

A1

	 **Log p** (c) $P = 7.943r^{1.58}$		
		10	
24	Scale 1cm rep 100km  (a) AC => 12.5cm 12.5 x 100 = 1250km S = D T 200 = 1250 T T = 1250 = 6.25 200 = 6 hours 15 minutes (b) 149^0 (c) 8.3cm 8.3 x 100 = 830km	B3 B1 A1 M1 A1 B1 A1	For locating ABC For locating D For 1250km For correct substitution
		10	