TIGANIA SOUTH 2015

1. $\sqrt{}(4^2+-20^2) \div \sqrt{}(-1^2+5^2)$ m1

$=\sqrt{\frac{416}{26}}$ m1

=4 A1

2. $(7.32X1O^{-1})^3=392.2x10^{-}3$ M1

=.3922+4.402

$=\frac{1}{2x}$ =4.7942 M1

2x=.2086

X=.104 A1

3. $\frac{(3x-2a)(4x+3a)}{(3x+2a)(3x-2a)}$ M2

$=\frac{4x+3a}{3x+2a}$ A1

4. a) 2357 A1

b) 2000+300+50+7 M1A1

5. y-x=4

Y+x=14 M1

Y=4+x

4+x+x=14 M1

2x=10 thus x=5 and y=9

=59 A1

6 $2000 \times 40 = 80{,}000 + 1200 = 92000$ B1

$\frac{100}{125} \times 92{,}000 = Ksh.73{,}600$ M1A1

7. $3\ (1 + x) < 5x - 11 < x + 45$

3 (1 + x) < - 11 < x + 45 = *2x < -14 M1*

3 + 3x < 5x – 11 = *x > 7*

5x – 11 < x + 45 = *4x < 56 M1*

x < 14 7 <x < 14

(8, 9, 10, 11, 12, 13) *A1*

8.

$$\left(\frac{7}{3}\left[\frac{2}{5}of1\frac{2}{3}-\frac{1}{2}\left(\frac{\frac{5}{3}-\frac{5}{2}}{\frac{1}{3}-\frac{19}{27}}\right)^{\frac{1}{2}}+\frac{2}{3}\right]\right)^{\frac{1}{2}}$$

$\left(\frac{7}{3}\left[\frac{2}{3}-\frac{1}{2}\left(-\frac{5}{6}\div-\frac{10}{27}\right)^{\frac{1}{2}}+\frac{2}{3}\right]\right)^{\frac{1}{2}}$ M1

$\left(\frac{7}{3}\left[\frac{2}{3}-\frac{1}{2}\left(\frac{9}{4}\right)^{\frac{1}{2}}+\frac{2}{3}\right]\right)^{\frac{1}{2}}$ M1

$\left(\frac{7}{3}\left[\frac{2}{3}-\frac{3}{4}+\frac{2}{3}\right]\right)^{\frac{1}{2}}$

$\left(\frac{7}{3}\left[\frac{4}{3}-\frac{3}{4}\right]\right)^{\frac{1}{2}}$ M1

$\left(\frac{49}{36}\right)^{\frac{1}{2}}$

$\frac{7}{6}=1\frac{1}{6}$ Answer A1

9.

$$\frac{1000000}{91.80}=10{,}893.25$$

$$10{,}893.25-(190+4500)=6203.25$$

$$6203.25\times91.65=568{,}278.86$$

$$\frac{568{,}527.86}{103.93}=5{,}470.30$$

$$5470.30-2000=3{,}470.30$$ M1 M1 A1

10.

$$s = \frac{40+60+80}{2} = 90$$

$$area = \sqrt{90(90-40)(90-60)(90-80)}$$

$$area = \sqrt{1350000}$$

$$area = 1{,}161.9m^2$$

M1,M1,A1

11 . $4x + x = 180$ M1

$x = 36$

$\frac{360}{36} = n$ M1

$n = 10$ sides A1

12. l.s.f= $\frac{3}{5}$, v.s.f= $\frac{27}{125}$ M1

$\frac{8.1}{v} = \frac{27}{125}$ M1

V=37.5m^3 A1

13. Midpoint=(3,4) M1

Gradient of AC=3

Gradient of perpendicular line= $\frac{-1}{3}$ M1

$\frac{y-4}{x-3} = \frac{-1}{3}$

3y+x=5 A1

14 . $\frac{h}{60}$ =tan45,h=60tan45 M1

$\text{Tan}\theta = \frac{60 \tan 45}{240}$ M1

$\theta = 14.04^0$ A1

15.

$48 = 2^4 x3$ M1

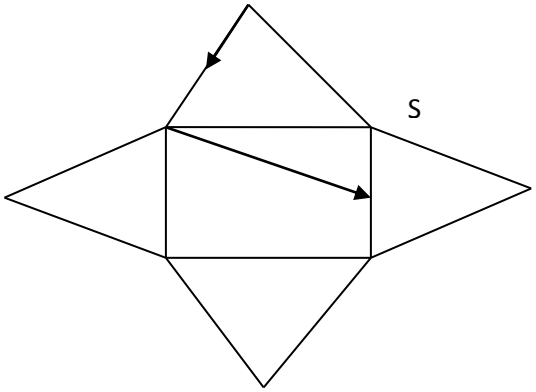
$72 = 2^3 x3^2$

$1008/2^4 x3^2 = 7$ M1

Least no is 7x3=21 A1

.

16.



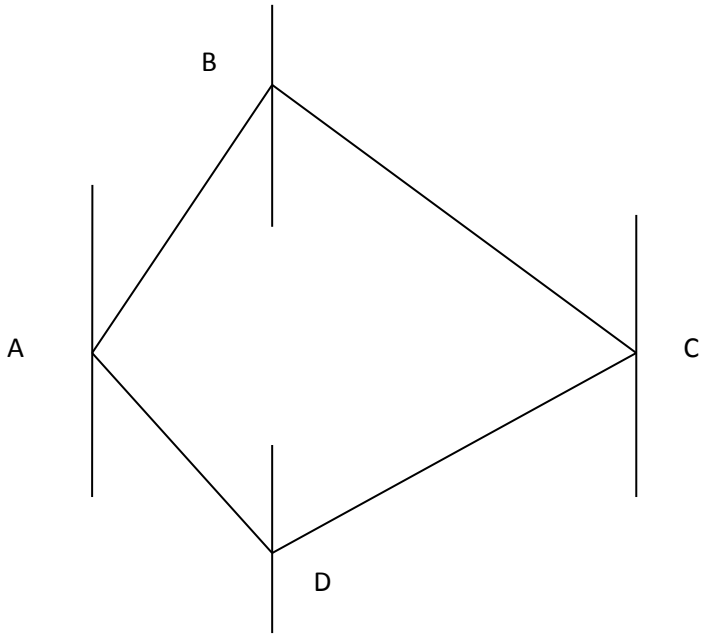
Correct labeling,equal dimensions shown,proper construction M3

Distance=$15+\sqrt{(144+16)}$

=27.649cm A1

SECTION B

17



Parallel lines passing A and B/1 mk

B located/1mk

C located/1mk

D located/1mk

b.Ship A from D N35W or 325^0 A1

ii)Ship D from C ,S55W or 235^0 A1

c)i) 441km A1

ii)755km A1

d)angle DAC=$6I^0$,angle BCD=67^0 ±2 M2

18.

a)i) capacity of the tank=2.4x2.8x3x1000

=20160L M1

Amount=20160-3600

=16560litres A1

ii) Time taken to fill = $\frac{16560}{0.5}$ M1

$\frac{16560}{0.5x60x60}$ M1

=9hr 12min A1

b) In 1hr,pipe A and B fill $\frac{1}{3}+\frac{1}{6}=\frac{1}{2}$ of the tank M1

in 1hr pipe C empties $\frac{1}{8}$ of the tank M1

the next hour all pipes open ,amount in tank increases by $\frac{1}{2}-\frac{1}{8}=\frac{3}{8}$ M1

time taken to fill the remaining half of the tank is $\frac{1}{2}x\frac{3}{8}=\frac{4}{3}hrs$ M1

total time=1+$\frac{4}{3}=2hrs20\min s$ A1

19.a)i) $\pi r^2=3.142x4.2^2=55.42cm^2$ M1A1

ii) πRL-πrl

L=x+8 M1

$\frac{4.2}{3.5}=\frac{8+x}{x}$ M1

X=40: 3.142x4.2x4.8-(3.142x3.5x40)

$=193.6cm^2$ A1

iii) hemisphere=$2\pi r^2$=2x3.142x3.5 M1

$=77cm^2$ A1

b) total area =55.44+193.6+77=326.04 M1

l.s.f^2=a.s.f

$$\frac{326.04}{81.51}=\sqrt{4}$$ M1

$$\frac{4.2}{2}=r$$

r=2.1cm A1

20. $\langle DON$ =20^0 angle at centre is twice angle at the circumference B1A1

ii)<DNQ=10^0 angle between chord and tangent is equal to angle in the alternate segment subtended by the same chord B1A1

iii)<ONA=60^0 base angles of an isosceles triangle B1A1

iv)<DBA=40^0 angle at the centre <AOD=80^0 is twice angle at the circumference. B1A1

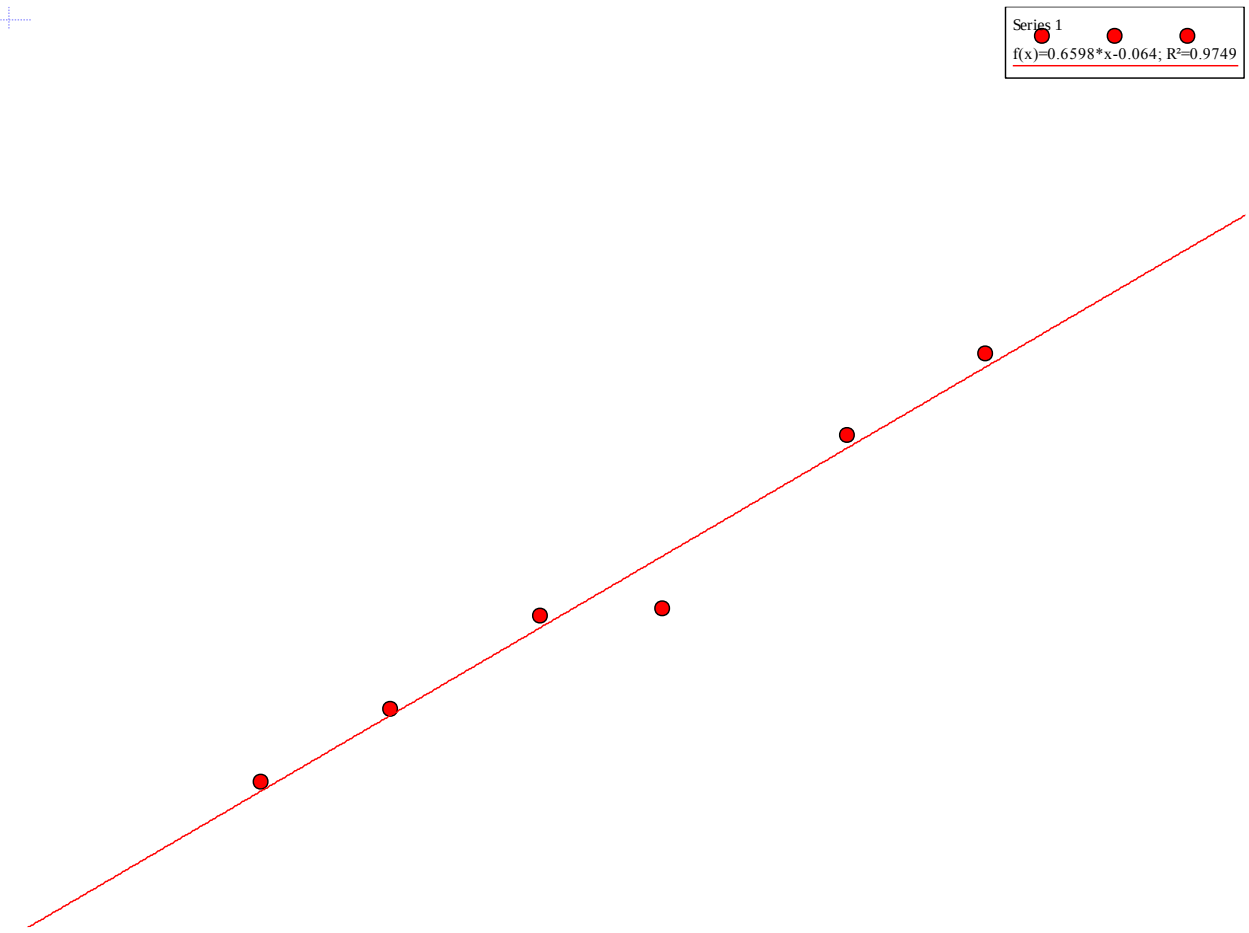
v)<ODN=80^0 base angles of an isosceles triangle. B1A1

21.a)logP=nlogQ+logk

b)

logP	0.0792	0.1761	0.3010	0.3118	0.5441	0.6532
logQ	0.1987	0.3522	0.5302	0.6758	0.8954	1.0607

T2



P1S1L1

c)logk=-0.06 A1

k=0.871.n=gradient=0.3585 MIA1

d) log3=0.4771

logQ=0.8 M1

Q=6.31 A1

22 $\frac{dh}{dt}$ =v=-6t²+3t+3, $\frac{dv}{dt}$ =a=-12t+3 at t=0,a=3m/s² M1A1

b)i) $\frac{dh}{dt}$ =0, -6t²+3t+3=0 M1

(2t+1)(t-1)=0,t=-$\frac{1}{2}$ or t=1 thus t=1s M1A1

ii) h=-2t^3+$\frac{3}{2}$ t^2+3t

at t=1,h=-2+$\frac{3}{2}$ +3 M1

=2.5 m M1A1

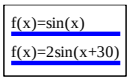
c) $\frac{dv}{dt} = a = -12t + 3 = 0$ M1

t=.25s

v=-6x0.25^2+3x0.25+3=3.375m/s A1

23.

X	0	30	90	120	150	180	210	240	270	300	330	360	
sinx	0	0.5	1	0.87	0.5	0	-0.5	-0.87	-1	-0.87	-0.5	0	
2sin(x+30)	1	1.74	1.74	1	0	-1	-1.74	-2	-1.74	-1	0	1	T2



P1C1S1B1

c) translation $\begin{pmatrix} -30 \\ 0 \end{pmatrix}$ then stretch parallel to y-axis stretch factor 2 B1A1

d) 132^0 and $312^0 \pm 2$ B2

24.A trailer moving at a speed of 80km/h is being overtaken by a car moving at 100km/h in a clear section of a road. Given that the bus is 21m long and the car is 4m long.

a) How much time in seconds) will elapse before the car can completely overtake the bus?

(3mks)

$r.s = 100 - 80 = 20km/h$ M1

$\Rightarrow \frac{20 \times 1000}{60 \times 60}$

$\Rightarrow \frac{50}{9} m/s$ M1

$time = \frac{total, dist}{r.s}$

$time = \frac{(4+21)}{50/9}$

$time = 4.5s$ A1

b) How much distance (in metres) will the car travel before it can completely overtake the bus? (2mks)

$dis\tan ce = time, taken, x, carsspped$

$dis\tan ce = 4.5 \times \frac{100 \times 1000}{60 \times 60}$

$\Rightarrow 125m$ A1M1

c) Given that as soon as the car completed overtaking the trailer, a bus heading towards the trailer and the car and moving at a speed of 90km/h became visible to the car driver. It took exactly 18 seconds for the car and the bus to completely by pass each other from the moment they first saw each other.

i. How far was the tail of the bus from the tail of the car at the instance they first saw each other given that the bus is 12 metres long? (3mks)

$rs = 90 + 100 = 190km/h \Rightarrow \frac{190 \times 1000}{60 \times 60} = \frac{475}{9} m/s$

$dis\tan ce = rs \times time \Rightarrow \frac{475}{9} \times 18$

$dis\tan ce = rs \times time = 950m$ A1M1M1

ii. How far a part was the trailer and the bus just immediately after the car and the bus had by passed each other? (2mks)

$= dis\tan ce, trailer \ \& \ car - length, bus$

$= \frac{50}{9} \times 18 - 12M1$

$= 88mA1$

PAPER 2 MARKING SCHEME TIGANIA SOUTH 2015

Paper 2

1

No	Std form	Log
45.23	$4.523\text{x}10^{1}$	1.6554
0.1122	$1.122\text{x}10^{-1}$	$\bar{1}.0500^{+}$
		0.7054
6394	$6.394\text{x}10^{3}$	3.8058^{-}
		$\bar{4}.8996$
		$=(\bar{4}.8996)\div 3$
		$=(\bar{6}+2.8996)\div 3$
	From antilog $9.258\text{x}10^{-2}$	$=\bar{2}.9665$

B1 M1 M1 A1

4

2

$4\theta+10+\theta+70=90$

$5\theta+80=90$

$5\theta=10$

$\theta=2^{o}$

3

3 a) Find the formulae connecting K and M K = a + cm, where a and c are constants

45 = a + 20c …….(i)
87 = a + 48c …….(ii)

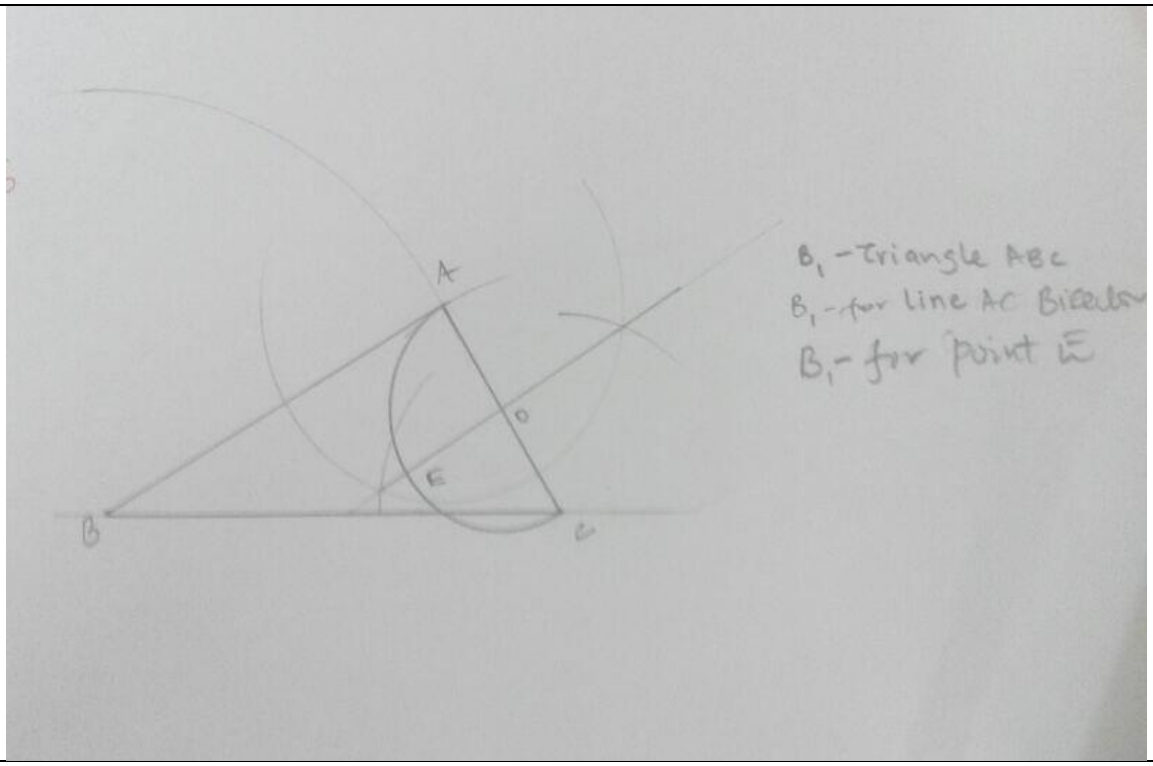
$$\frac{-42}{-28}=\frac{-28c}{-28}$$

$C = {}^{6}/_{4} = {}^{3}/_{2} = 1.5$

45 = a + 20 (1.5)
45 = a + 30
a = 15
Hence k = 15 = 1.5M

a) Find K when M = 36
C = 15 + 1.5 (36)

	= 15 + 54 = 69	
		3
4	(i) $(2x-1)^5 = (2x)^5(-1)^0 + 5(2x)^4(-1)^1 + 10(2x)^3(-1)^2 + 10(2x)^2(-1)^3 + 5(2x)^1(-1)^4 + 1(2x)^1(-1)^5$ $= 32x^5 - 80x^4 + 80x^3 - 40x^2 + 10x - 1$ $= -1 + 10x - 40x^2 + 80x^3 - 80x^4 + 32x^5$ (ii). $2x - 1 = -0.98$ $2x = 0.02$ $x = 0.01$ $(-0.98)^5 = -1 + 10(0.01) - 40(0.01)^2$ $= = -0.904$	B1 M1 A1

5	$\frac{dy}{dx} = 2x + 4$ $grad.at(1,2) is (2 \times 1 + 4)$ = 6 Grad of the normal = $-1/6$ $\frac{y-2}{x-1} = -1/6$ $y = \frac{13}{6} - 1/6\, x$	
		3
6		
7	$\cos 2(x+30) = \cos 60, \cos 300, \cos 420, \cos 660$ $2x + 60 = 60, 300, 420, 660$ $x = 0^0, 120^0, 180^0, 300^0$	B1 M1

		A1
		3
8	$AB=\begin{pmatrix}-2\\-1\\2\end{pmatrix}-\begin{pmatrix}2\\-3\\4\end{pmatrix}=\begin{pmatrix}-4\\2\\-2\end{pmatrix}$ M1 $AB=\sqrt{(-4)^2+2^2+(-2)^2}$ M1 = 4.90 (2dp) A1	
		3
9	a) Calculate the total amount paid on hire purchase (2mks) hire purchase price =Kshs (5000 + 15 x 1500) Kshs (5000 + 22,500) = Kshs 27,500 b) If the hire purchase payment is 20% than cash payment, find the cash price (2mks) if 20% = 27,500 100 % = $\frac{100\ x\ 27{,}500}{120}$ = Kshs 22, 916.60	
		3
10.	$10^2 = 7^2 + 8^2 - 2 \times 7 \times 8 \cos B$ $100 = 48 + 64 - 112 \cos B$ $100 - 1$ $13 = -112 \cos B$ $\cos B = 0.1161$ $B = 83.33^o$ → $\frac{10}{\sin 83.33^o} = 2R$ →	B1

	$\frac{5}{\text{Sin}83.33^o} = R$ $5.034 = R$ $R = 5$ cm	M1 A1
		3
11	Working area = 4.8 x 3.2 = 15.36 m^2 Max area = 4.85 x 3.25 = 15.7625 m^2 Min area = 4.75 x 3.15 = 14.9625 Absol error = $\frac{15.7625 - 14.9625}{2}$ $= \frac{0.8}{2}$ $= 0.4$ % error $= \left(\frac{0.4}{15.36} \times 100\right)$ $= 2.60417$	
		3
12	$\frac{\log 1296}{\log 216} = \frac{Log\ 6^4}{log 6^3}$ $\frac{4\log 6}{3\log 6} = \frac{4}{3}$	
		3
13.	$\frac{2}{\sqrt{5}+\sqrt{3}} - \frac{5}{\sqrt{7}-\sqrt{6}}$ $\frac{2}{\sqrt{5}+\sqrt{3}} \times \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}-\sqrt{3}} = \sqrt{5}-\sqrt{3}$ $\frac{5}{\sqrt{7}-\sqrt{6}} \times \frac{\sqrt{7}+\sqrt{6}}{\sqrt{7}+\sqrt{6}} = \frac{5\sqrt{7}+5\sqrt{5}}{2}$ $\sqrt{5}-\sqrt{3} - \frac{5\sqrt{7}+5\sqrt{5}}{2} = \frac{2\sqrt{5}-2\sqrt{3}-5\sqrt{7}+5\sqrt{5}}{2}$ $\frac{-3\sqrt{5}-2\sqrt{7}-5\sqrt{5}}{2}$	B1 either M1 A1

		3
14	$Log\ y = Log\ a + b \log\ x$ $\therefore \log\ a = 2 \Rightarrow a = 100$ $6b + 100 = 5 \Rightarrow b = 15\frac{5}{6}$	
		3
15	$2x^2 + 3x - 5 = 0$ $x^2 + 1.5x - 2.5 = 0$ $(x + 0.75)^2 = 2.5 + 0.75^2$ $\sqrt{(x + 0.75)^2} = \pm\sqrt{2.5 + 0.75^2}$ X+0.75 =±1.75 X= 1 0r x= -2.5	
		3
16.	y = x(x-1)(x+2) $y=x^3+x^2-2x$ integrate within limits 1,0 and -2 $\int_0^1 (x^3+x^2-2x)\,dx + \int_{-2}^0 (x^3+x^2-2x)\,dx$ $[\frac{x^4}{4} + \frac{x^3}{3} - x^2+c]$ for limits 1 and 0 = $-\frac{5}{12}$ $[\frac{x^4}{4} + \frac{x^3}{3} - x^2+c]$ for limits -2 and 0 = $2\frac{2}{3}$ Area= $2\frac{2}{3} - \frac{5}{12} = 2\frac{1}{4}$ sq. units	
		3

17	a) Taxable income = Ksh (8000 + 14000 + 3030 + 4640) = Ksh 39720 = £1986 Tax in the 1st £ 484 = £ 48.40 " " " 2nd £ 456 = £ 68.40 " " " 3rd £ 456 =£ 91.20 " " " 4th £ 456 = 114.00 " " " the last £ 134v = £ 40.20 Gross rate = £ 362.20 Relief sh $\frac{800}{20}$ x 3 + 1056 =sh 1176 PAYE = sh (362.20 x 20 - 1176) = sh 6068 b) i) Total deductions = sh (6068 + 400 + 4000 + 800 + 2/100 x 18000) = sh 11628 ii) Net pay = sh (1986 x 20) – 11628 = KSh 28092	
		10
18	a) Write down the co-ordinates of $A^1B^1C^1$ (3mks) $\begin{pmatrix} 3 & 1 \\ 4 & 0 \end{pmatrix} \begin{pmatrix} A & B & C \\ 1 & -2 & 4 \\ 4 & 0 & -2 \end{pmatrix}$ $\begin{matrix} A^1 & B^1 & C^1 \end{matrix}$ $\begin{pmatrix} 3\ x\ 1 + 1\ x\ 4 & 3x - 2 + 1\ x\ 0 & 3\ x\ 4 + 1x - 2 \\ 4\ x\ 1 + 0\ x\ 4 & 4x - 2 + 0\ x\ 0 & 4\ x\ 4 + 0\ x - 2 \end{pmatrix}$	

$$\begin{pmatrix} A^1 & B^1 & C^1 \\ 7 & -6 & 10 \\ 4 & -8 & 16 \end{pmatrix}$$

b)$A^{11}B^{11}C^{11}$ are the images of $A^1B^1C^1$ under a transformation represented by matrix

M = $\begin{pmatrix} 2 & -2 \\ 1 & 0 \end{pmatrix}$. Write down the co-ordinates of $A^{11}B^{11}C^{11}$. (3mks)

$$\begin{pmatrix} 2 & -2 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} A^1 & B^1 & C^1 \\ 7 & -6 & 10 \\ 4 & -8 & 16 \end{pmatrix}$$

$$\begin{pmatrix} 2\,x\,7 + -2\,x\,4 & 2x - 6 + -2x - 8 & 2\,x\,10 + -2\,x\,16 \\ 1\,x\,7 + 0\,x\,4 & 1x - 6 + 0x - 8 & 1\,x10 + 0\,x\,16 \end{pmatrix}$$

$$\begin{pmatrix} A^{11} & B^{11} & C^{11} \\ 6 & -28 & -12 \\ 7 & -6 & 10 \end{pmatrix}$$

c)A transformation N followed by M can be represented by a single transformation K.

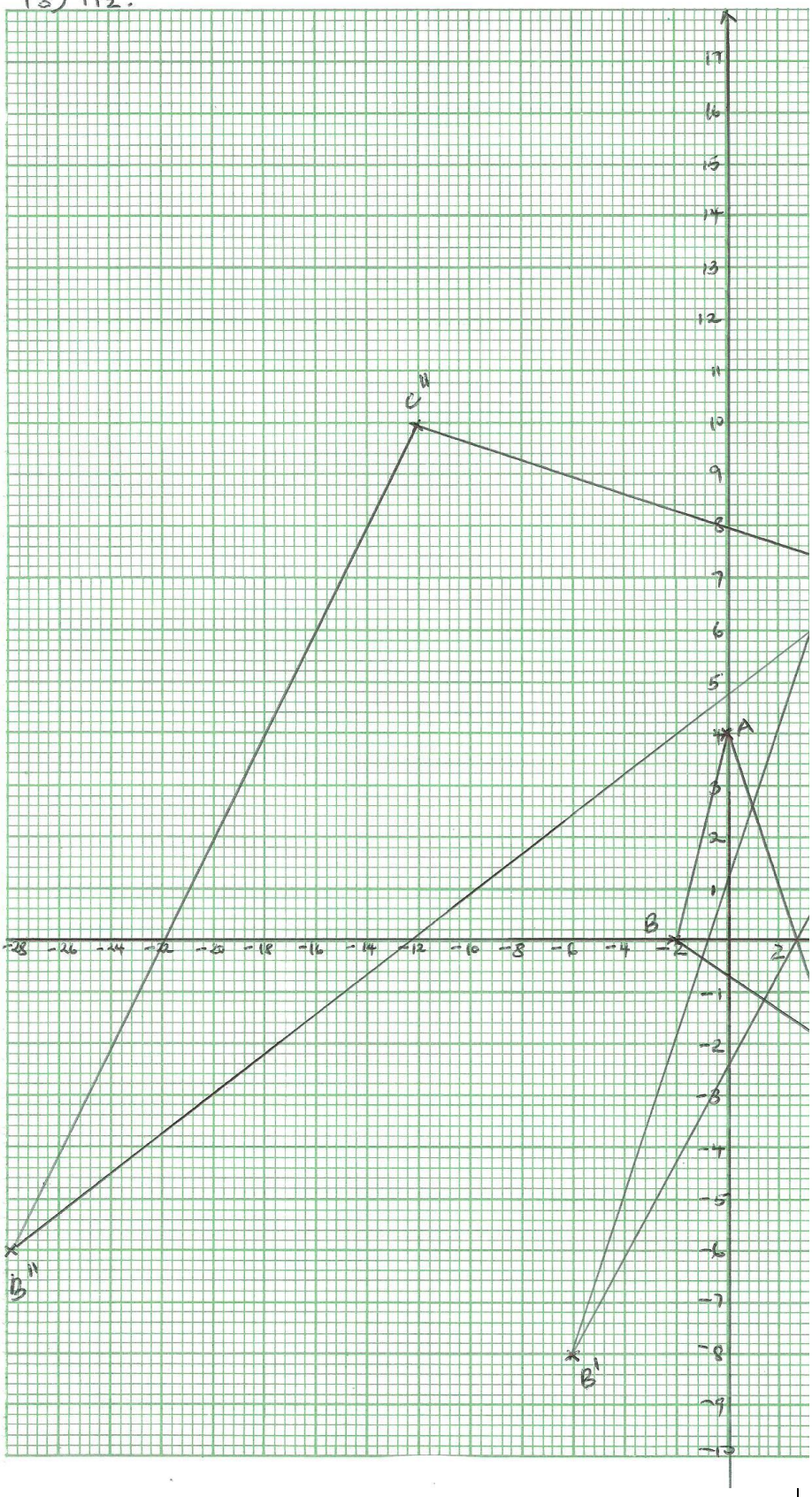
Determine the matrix K (4mks)

$$\begin{pmatrix} N \\ 3\ 1 \\ 4\ 0 \end{pmatrix} \begin{pmatrix} M \\ 2\ -2 \\ 1\ \ 0 \end{pmatrix}$$

$$= \begin{pmatrix} 3\,x\,2 + 1\,x\,1 & 3x - 2 + 1\,x\,0 \\ 4\,x\,2 + 0\,x\,1 & 4x - 2 + 0\,x\,0 \end{pmatrix}$$

K = $\begin{pmatrix} 7 & -6 \\ 8 & -8 \end{pmatrix}$

18) PP_2.



20

(a) $a + d = 8$

$a + 4d = 17$

$3d = a$ — B1

$d = 3$ — A1

$\therefore a = 5$ — A1

(b) $2^{nd} = 8$

$10^{th} = 5 + 9 \times 3 = 32$

$42^{nd} = 5 + 41 \times 3 = 128$

$\therefore$ GP is 8, 32, 128, - - - - — M1

$a = 8$

$r = 4$ — A1 (Both)

n^{th} term of G.P $= ar^{n-1}$

$\therefore 10^{th}$ term $= 8(4)^9$ — M1

$= 2097152$ — A1

(c) $S_n = \dfrac{a(r^n - 1)}{r - 1}$

$S_{10} = \dfrac{8(4^{10} - 1)}{4 - 1}$ — M1

$= \dfrac{8}{3} \times 1048575$ — M1

$= 2796200$ — A1

10

21

Total frequency= 127

a) P (5) = $^{56}/_{127}$

b) P less (than 6) – P (3 or 4 or 5)

P (3) + P (4) + P (5)

$^{15}/_{127} + {}^{32}/_{127} + {}^{56}/_{127}$

$= {}^{103}/_{127}$

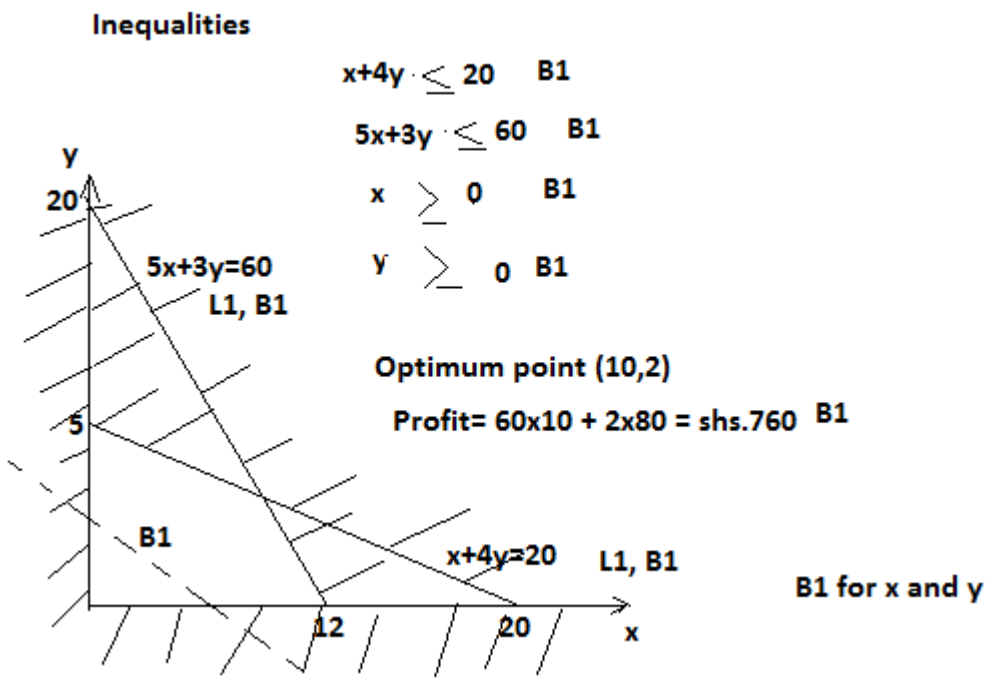
c) P (at most 4)

P (3 or 4)

$^{15}/_{127} + {}^{32}/_{127}$

$= {}^{47}/_{127}$

	d) P (at least 3) P (5 and above) P (5 or 6 or 7) P (5) + P (6) + P (7) $= {}^{56}/_{127} + {}^{19}/_{127} + {}^{5}/_{127} = {}^{80}/_{127}$ e) P (less than 7 more than 4) P (6) + P (5) $= {}^{19}/_{127} + {}^{56}/_{127}$ $= {}^{75}/_{127}$	
22(a)	XY = $\frac{180^o}{360^o}$ x 2 x 3.142 x 6370 Cos 45^o →	M1
	= 14152.42 km	A1
(b)	XY = 60 x 180 Cos 45^0 →	M1
	= 7636.75 nm →	A1
(c)	Angle XOY = 90^o Shortest distance XY = 60 x 90	
	= 5400 nm →	B1
	Speed = $\frac{5400}{15}$ →	M1
	= 360 knots →	A1
(d)	Longitude diff. = 180^o	
	Time diff. $\frac{180 \times 4}{60}$ →	M1
	= 12 hrs	
	Local time at X = 10.00 p.m + 12 hrs →	M1
	= 10.00 p.m on 11th April →	A1

23		
24	a) How is the stone 3 seconds later? (5mks) a = -10 v = $\int -10dt$ v = -10t + c 10 = -10(0) + c c = 10 v = -10 t + 10 s = $\int -10\ t + 10dt$ s = -5 t^2 + 10 t + c 80 = -5 (0) + 10 (0) + c 80 = c S = -5t^2 + 10 t + 80 S = -5 $(3)^2$ + 10(3) + 80 S = 65m b) What time does it hit the ground? (3mks)	

$O = -5t^2 + 10t + 80$

$t^2 - 2t - 16 = 0$

$t = \frac{2 \pm \sqrt{4+64}}{2} = \frac{2 \pm \sqrt{68}}{2} \quad \frac{2 + 8.246}{2} = 5.123$ secs

c) What is the velocity of the stone when it hits the ground? (2mks)

$V = -10(5.123) + 10$

$= -41.23$m/s