KENYA NATIONAL EXAMINATION COUNCIL
REVISION MOCK EXAMS 2016
TOP NATIONAL SCHOOLS

ALLIANCE BOYS HIGH ELDORET

MATHEMATICS

PAPER 1

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ALLIANCE BOYS HIGH SCHOOL KCSE TRIAL AND PRACTICE EXAM 2016

PAPER 1

MARKING SCHEME

Answer all the questions in this section in the spaces provided below each question

1. Evaluate - $\frac{4 \text{ of } (-4 + -15 \div 5) + - 3 - 4 \div 2)}{84 \div -7 + 3 - (-5)}$ (3 marks)

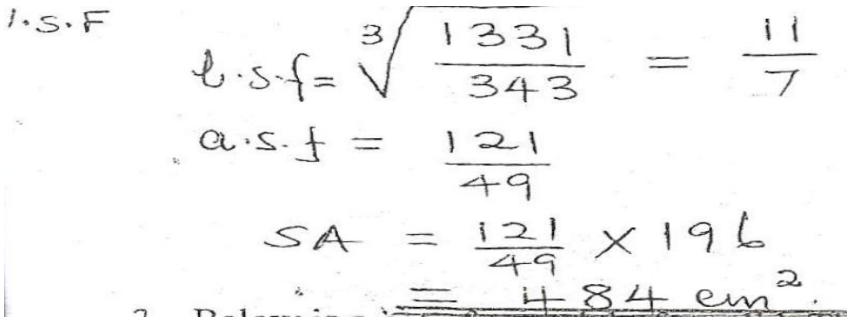
N = - 4 of 7 – 3-2
= -28 – 5
= - 33

D = - 12 +3 + 5
= - 4

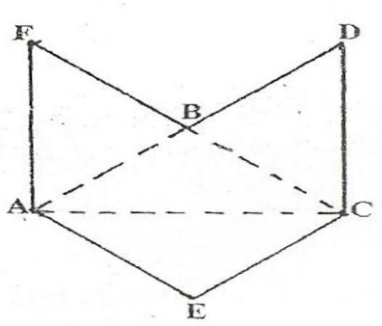
= $\frac{-33}{-4}$

= 8 ¼

2. The masses of two similar bars of soap are 343g and 1331g. If the surface area of the smaller bar is 196cm^2. Calculate the surface area of the larger bar. (3 marks)

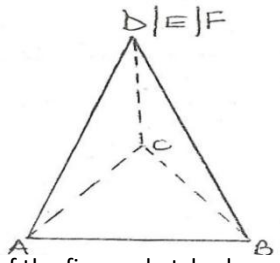


3. Below is a net of a model of a solid. The lengths AB = BC = AC = 6.0cm and lengths AF = FB = BD = CD = CE = AE = 8.0cm.



a) Sketch the solid of the net by taking ABC as the base and the height 5cm.

(3 marks)



b) State the name of the figure sketched: (1 mark)

A triangular based pyramid (Equipyramid)

4. Without using log tables or a calculator; solve (3marks)

$\frac{\log ¼ + \log 64}{\log 32 - \log 1/8}$

= $\frac{-2 \log 2 + 6 \log 2}{5 \log 2 + 3 \log 2}$

$= \frac{4 \log 2}{8 \log 2}$

$= ½$

5. The sum of interior angles of two regular polygons of sides; n and n + 2 are in the ratio 3:4. Calculate the sum of the interior angles of the polygon with n sides. (4 marks)

$\frac{(n-2)\,180}{n-(n+2)\,180} = ¾$

$\frac{n-2}{n} = ¾$

$4n - 8 - 3n = 0$

$n = 8$

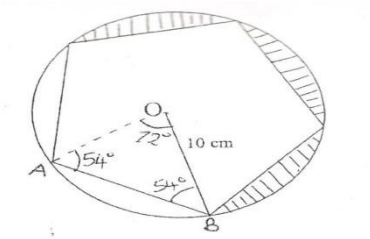
$(8-2)\,180 = 6 \times 180$

$= 10800$

6. A group of 10 soldiers set off with enough food to last 7 days. After 4 soldiers deserted. How many more days will the food last for the remaining soldiers? (3 marks)

Soldiers	*Days*	*3x10/6 = 5*
10	*3*	
6	*?*	
		5-3 = 2 more days

7. The diagram below, not drawn to scale, is a regular pentagon circumscribed in a circle of radius 10cm at centre O



Find

(a) The length of any side of the pentagon (2 marks)

$\frac{AB}{\sin 72^0} = \frac{10}{\sin 54^0}$

$AB = \frac{10 \sin 72^0}{\sin 54^0}$

$= 11.75570505$

$\approx 11.76cm$

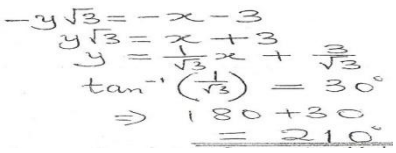
(b) The area of the shaded region (2 marks)

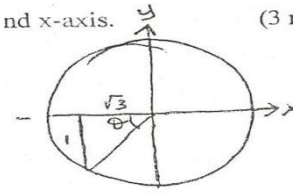
$A = (\frac{72}{360} \times 3.142 \times 100 - ½ \times 100 \sin 72) \times 3$

$= (62.84 - 47.55\ 282581)^3$

$= 45.\ 86152257cm^2 \approx 45.86cm^2$

8. A line whose gradient is positive is drawn on the Cartesian plane and its equation is $x - y\sqrt{3} = -3$. Calculate the angle formed between the lien and x-axis. (3 marks)





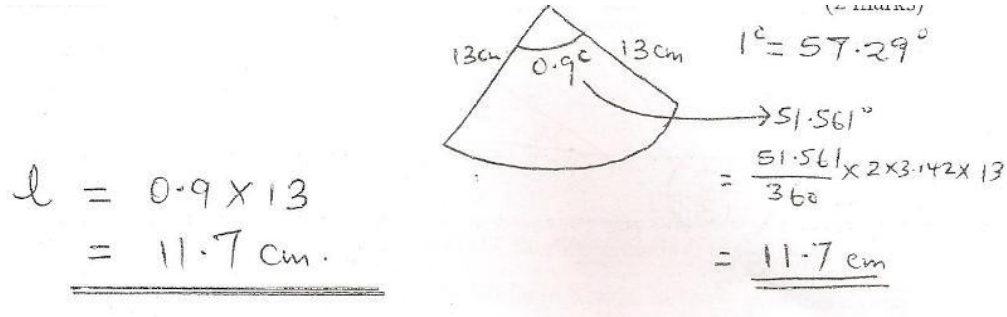
9. Find all the integral values of x which satisfy the inequality (3 marks)

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

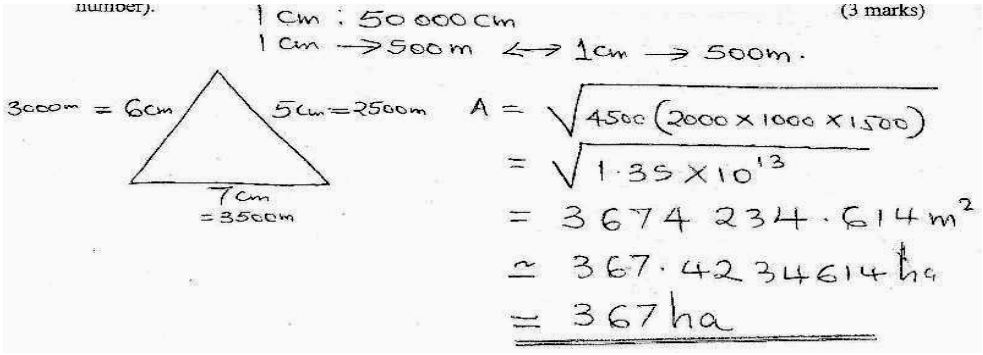
$3(1 + x) < -11 < x + 45$	=	$2x < -14$
$3 + 3x < 5x - 11$	=	$x > 7$
$5x - 11 < x + 45$	=	$4x < 56$
		$x < 14$

7 <x < 14
(8, 9, 10, 11, 12, 13)

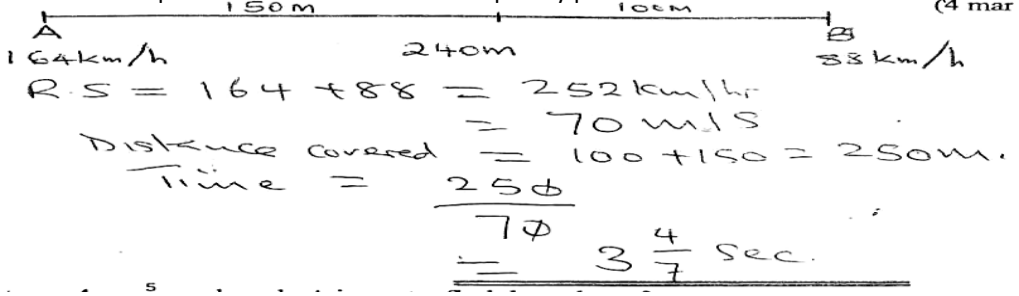
10. An arc subtends an angle of 0.9 radians at the centre of a circle whose radius is 13cm. Find the length of the arc. (2 marks)



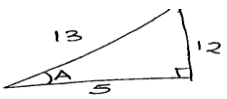
11. The scale of a map is given as 1:50,000. Find the actual area in hectares of a region represented by a triangle of sides 6cm by 7cm (Give your answer to the nearest whole number). (3 marks)



12. Two passenger trains A and B, 240m apart are travelling at 164kmh and 88km/h respectively towards each other on a straight railway line. Train A is 150 metres long, while B is 100 metres long. Determine the time in seconds that elapses before the two trains completely pass each other. (4 marks)



13. Given that cos A = 5/13 and angle A is acute, find the value of (3 marks)
2 tan A + 3 sin A.



$2\left(\frac{12}{5}\right) + 3\left(\frac{12}{13}\right)$
$\frac{24}{5} + \frac{36}{13}$
$= \frac{492}{65}$
$= 7\frac{37}{65}$

14 Given that $4x^2 - 32x - 20 + k$ is a perfect square, find k. (3 marks)

$k = \frac{b^2}{4a}$
$= \frac{1024}{4 \times 4}$
$= 64$

15. A watch which looses a half-minute every hour was set to read the correct time at 0545h on Monday. Determine the time, in the 12 hour system, the watch will show on the following Friday at 1945h. (3 marks)

Time diff = 1945h Fr - 054sh Monday
= 111 hrs
1 hr = ½ min
111 = 111 x ½ = 55.5 minutes
= 0.925 hrs
1945 – 0.925 hrs = 1944.075 hrs
≈ 7.44 p.m

16. Use the exchange rates below to answer this question.

	Buying	Selling
1 US dollar	63.00	63.20
1 UK £	125.30	125.95

A tourist arriving in Kenya from Britain had 9600 UK Sterling pounds (£). He converted the pounds to Kenya after his stay. If he was not charged any commission for this last transaction, calculate to the nearest US dollars, the amount he received. (3 marks)

9600 x 125.30 = kshs 1202800

Given = kshs 1142 660

Spent = ¾ x 1142660

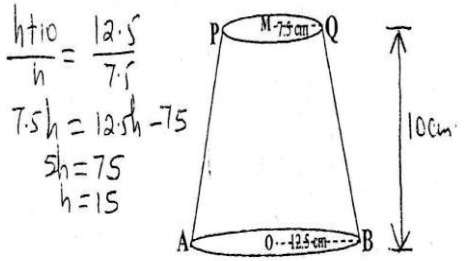
= ksh 856995

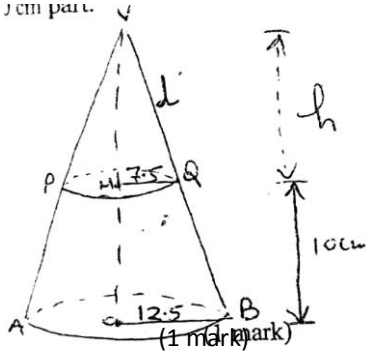
Back to US $ = 285665 / 63.20
= 4520.015823 dollars

≈ $ 4520

SECTION II (50 MARKS)
Answer only Five questions from this Section

17. PQCB shows a frustum of a cone. The radius of the top and bottom circular parts of the frustum are 7.5cm and 12.5cm respectively, centres M and O are 10cm part.





a) Calculate the slant length QB of the frustum correct to d.p. (1 mark)

$\frac{25}{l} = \frac{12.5}{7.5}$

$12.5l = 187.5 \Rightarrow l = 15$

$QB = 25 - 15 = 10\text{cm}$

e) Calculate the volume of frustum (5 marks)

$$\frac{1}{3}\pi\left(R^2H - r^2h\right) = \frac{1}{3} \times 3.142 \left(12.5^2 \times 25 - 7.5^2 \times 15\right)$$
$$= \frac{1}{3} \times 3.142 \left(3062.5\right)$$
$$= 3207.458333\ cm^3$$

f) If the frustum is of solid metal and is melted down and recast into a solid cylinder having a radius of 10.5cm, calculate.

(i) The height of cylinder correct to 3 d.p. (3 marks)

$3.142 \times 10.5^2 h = 3207.458333$

$h = \frac{3207.458333}{3.142 \times 10.5^2}$

$= 9.259259259$

$\approx \underline{9.259cm}$

(ii) The surface area of the cylinder (2 marks)

$SA = 2 \times 3.142 \times 10.5\ (10.5 + 9.259259259)$

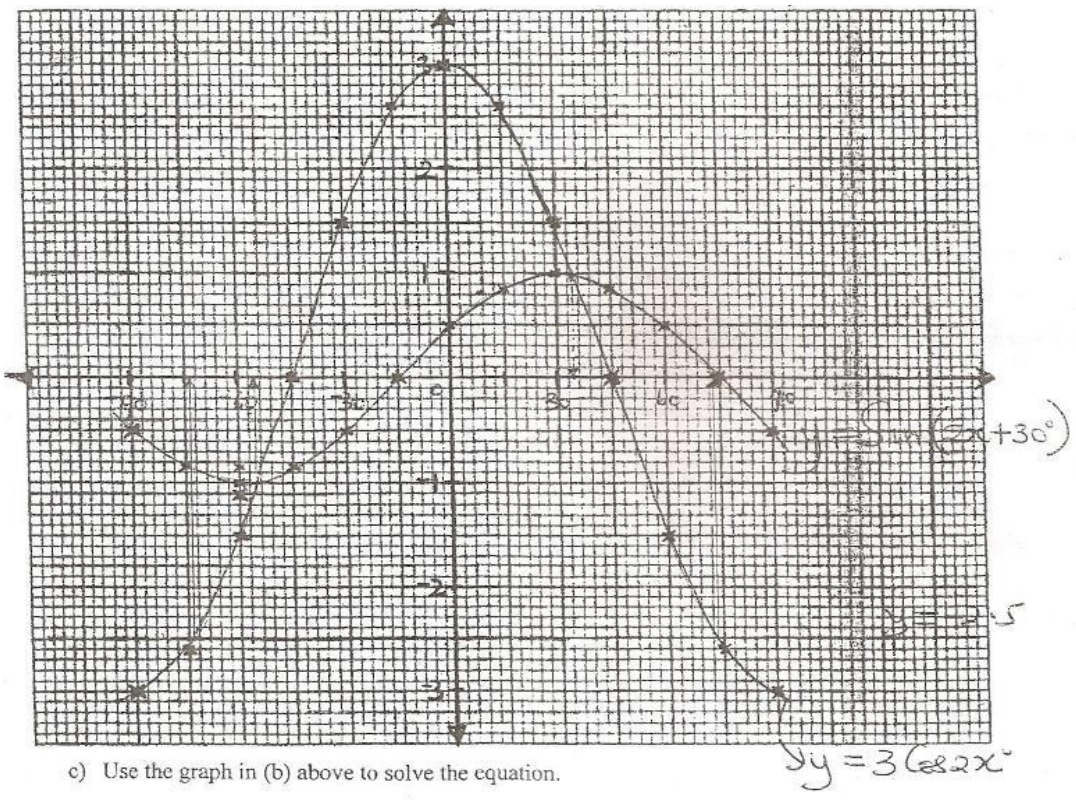
$= 1303.755444$

$\approx 1303.75cm^2$

18. a) Complete the table below giving your values correct to 2 decimal places. (2 marks)

x^0	-90^0	-75^0	-60^0	-45^0	-30^0	-15^0	0^0	15^0	30^0	45^0	60^0	75^0	90^0
$3\cos 2x^0$	-3	-2.6^0	-1.50	0	1.50	2.60	3	2.60	1.50	0	-1.50	-2.60	-3
$\sin(2x+30^0)$	-0.5	-0.87	-1	-0.87	-0.50	0	0.5	0.87	1	0.87	0.87	0	-0.5

b) On the grid provided draw, on the same axes the graph of y = 3 cos 2x0 and y = sin (2x + 30^0) for interval $-90^0 \leq x \leq 90^0$. Take the scale: 1cm represent 15^0 on x-axis and 2cm to represent 1 unit on the y-axis. (4 marks)



c) Use the graph in (b) above to solve the equation.

(c) Use the graph in (b) above to solve the equation.

(i) $3\cos 2x = \sin(2x + 30)$ (2 marks)

x = -55.50, 34.5

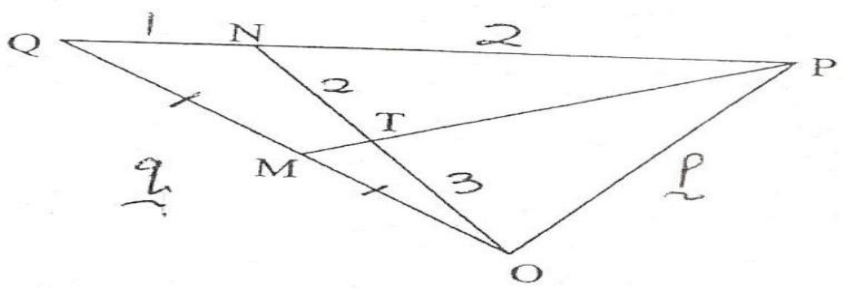
(ii) $6\cos 2x + 5 = 0$ (2 marks)

$6\cos 2x = -5$

$2 \quad 2$

$3\cos 2x = -2.5$

19. The diagram below shows a triangle OPQ in which QN:NP = 1:2, OT:TN = 3:2 and M is the midpoint of OQ.



b) Given that OP = p and OP = q, Express the following vectors in terms of p and q

i) PQ $-\underset{\sim}{p} + \underset{\sim}{q}$ (1 mark)

ii) ON $\underset{\sim}{p} + \frac{2}{3}(-\underset{\sim}{p} + \underset{\sim}{q})$ $\frac{1}{3}\underset{\sim}{p} + \frac{2}{3}\underset{\sim}{q}$. (2 marks)

iii) PT $= -\underset{\sim}{p} + \frac{3}{5}(\frac{1}{3}\underset{\sim}{p} + \frac{2}{3}\underset{\sim}{q})$ $= -\frac{4}{5}\underset{\sim}{p} + \frac{2}{5}\underset{\sim}{q}$ (2 marks)

vii) PM $= -\underset{\sim}{p} + \frac{1}{2}\underset{\sim}{q}$ (1 mark)

b) (i) Show that point P, T and M are collinear (3 marks)

$PT = k\,PM$

$-\frac{4}{5}\underset{\sim}{p} + \frac{2}{5}\underset{\sim}{q} = -k\underset{\sim}{p} + \frac{1}{2}k\underset{\sim}{q}$.

$k = \frac{4}{5}, \quad \frac{1}{2}k = \frac{2}{5} \Rightarrow k = \frac{4}{5}$

P is common and $PT = \frac{4}{5}PM$

$\therefore$ P, T and M are Collinear.

ii) Determine the ratio MT: TP (1 mark)

PT: TM = 4:1

MT: TP = 1:4

20. The displacement s meters of a particle moving a long a straight line after 1 second is given by

$S = 6t - \frac{t^3}{3} - \frac{t^2}{2}$ (3 marks)

(a) Find its initial *(at t = 0)*

$V = 6\text{-}t^2 - t$

$a = 2t - 1$

$\underline{at\ t = 0,\ a = -1m/s^2}$

(b) Calculate:

(i) The time when particle was momentarily at rest *(at v = 0)* (3 marks

at v = 0

$6 - t^2 - t = 0 = t2 + t - 6 = 0$

$(t - 2)(t + 3) = 0$

$t = 2 \text{ or } -3$

$= t = 2 \text{ seconds}$

(ii) Its displacement by the time it comes to rest momentarily (2 marks)

$$S = 6(2) - \frac{2^3}{3} - \frac{2^2}{2}$$

$$= 12 - \frac{8}{3} - 2$$

$$= \frac{22}{3}$$

$$= 7\ 1/3\ m$$

h) Calculate the maximum speed attained *(at a = 0)* (2 marks)

$-2t - 1 = 0$

$-2t = 1$

$T = -1/2 \text{ sec}$

$V = 6 - (-1/2)^2 - (-1/2)$

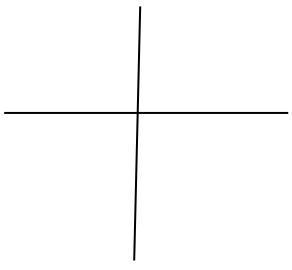
$= 6 - ¼ + ½$

$= 25/4$

$= 6\ ¼\ m/s$

21. Three ports A, B and C are situated in such a way that port A is 140km on a compass bearing of N65^{0}E from port B. Port C is 200km on a compass bearing of S32^{0}E from A. A ship S is docked in the sea, 86km on a bearing of 190^0 from port B.

(a) Using a scale of 1cm to represent 20km, draw a diagram to show the position of ports A, B, C and ship S. (4 marks)



(b) Using your diagram find

(i) The distance between the ship and the port A (1 mark)

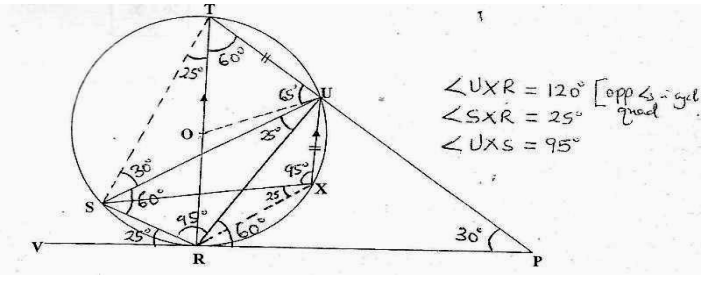
(ii) The bearing of the ship from port C (1 mark)

(iii) The distance from B to C (1 mark)

(iv) Find how far C is south of A (2 marks)

(v) Compass bearing of S from A (1 mark)

22. In the figure below, O is the centre of the circle TOR is the diameter and PRV is tangent to the circle at R.



Given that <SUR = 25^0, <URP = 60^0, TU = UX is parallel to the diameter; giving reasons calculate;

f) <TOU = *180 – 60 – 60 = $\underline{60^0}$ (angle sum of a = 180)* (2 marks)

Or 300^0 for reflex

g) <XUP =*MRTU = $\underline{60^0}$ (angles on a transversal are equal (alt).* (2 marks)

h) <STR = *<SUR = $\underline{25^0}$(angles in same segment and equal)* (2 marks)

i) Reflex <SXU = $360^0 - 95^0$

= $\underline{265^0}$ (2 marks)

k) <RPU

< RUP = 180 – 90 = 90^0 (angles on straight line add upto 180^0)

<RPU = 180 – 90 (angle sum of a = 180^0) (2 marks)

23. At an agricultural Research Centre, the length of a sample of 50 maize cobs were measured and recorded as shown in the frequency distribution table below.

f.d	3.0000	4.00	5.500	4.5	1.00
u.c.119.5	11.5	13.5	15.5	19.5	26.5
Length	10-11	12-13	14-15	16 – 19	20.26
No. of Labs	6	8	11	18	7

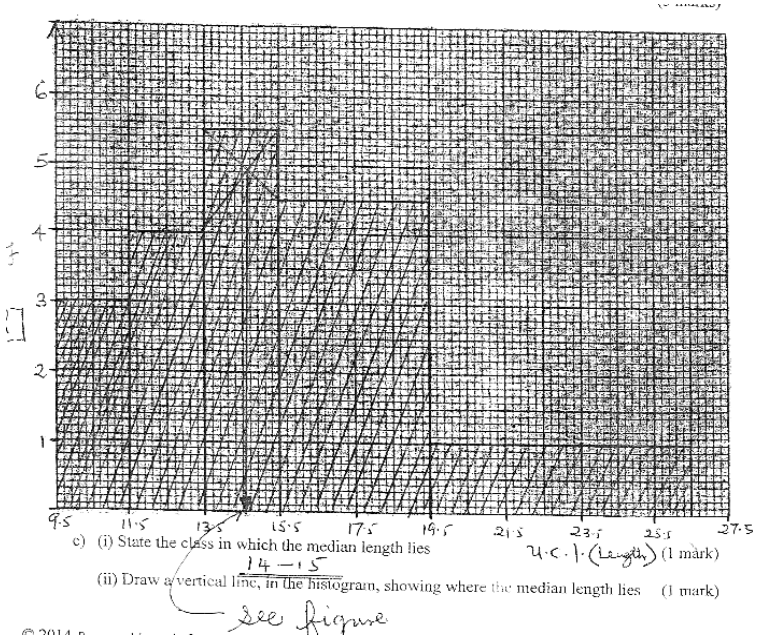
a) Calculate the mean (3 marks)

$X = \frac{(10.5x6) + 12.5x8) + (14.5x11) + (17.5x18) + (23x7)}{50}$

$= \frac{798.5}{50}$

$= \underline{15.97}$

e) Draw a histogram to represent the above information (5 marks)



c) (i) State the class in which the median length lies U.C.I. (Length) (1 mark)

14 – 15

(ii) Draw a vertical line, in the histogram, showing where the median length lies (1 mark)

See figure

24. A youth group decided to raise Ksh.480,000 to buy a piece of land costing Kshs.80,000 per hectare. Before the actual payment was made, four of the members pulled out and each of those remaining had to pay an additional Kshs.20,000.

a) If the original number of the group members was x, write down;

b) An expression of how much each was to contribute originally. (1 mark)

$\frac{480,000}{x}$

c) An expression of how the remaining members were to contribute after the four pulled out. (1 mark)

$\frac{480,000}{x-4}$

d) Determine the numbers who actually contributed towards the purchase of the land. (5 marks)

$$\frac{480,000}{x-4} - \frac{480,000}{x} = 20,000$$

$$\frac{480,000x - 48,000(x-4)}{x^2 - 4x} = 2,000$$

$$480,000x - 480,000x + 1920,000 = 20,000x^2 - 80,000x$$

$$20,000x^2 - 80,000x - 1920,000 = 0$$

$$x = \frac{8 \pm \sqrt{1600}}{4}$$

$$= \frac{8 + 40}{4} = 12 \text{ or } -8$$

$$x = 12$$

$$\text{Actual no} = 12 - 4 = 8 \text{ members}$$

f) Calculate the ration of the supposed original contribution to the new contribution. (1 mark)

$$40000 : 6000$$

$$= 2 : 3$$

g) If the land was sub-divided equally, find the size of land each member got. (2 marks)

$$480000 = 6ha$$

$$80000 = 6/8$$

$$= 0.75ha \text{ each}$$