120 copies

MARKING SCHEME
Alice mungu

8.15
2.30
10.45

GATITU GIRLS SECONDARY SCHOOL

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FORM 3 END OF TERM ONE MATHEMATICS EXAMINATION

ATTEMPT ALL QUESTIONS IN SECTION A AND ANY FIVE IN SECTION B

SECTION A

1. Without using mathematical tables or calculators evaluate this, leaving your answer in prime factor form. (3mks)

$$\frac{(2^2 \times 3 \times 5)^3}{\sqrt[3]{540 \times 50}}$$

$$\frac{2^6 \times 3^3 \times 5^3}{5 \times 10^2 \times 9^2 \times 6}$$

$$\frac{2^6 \times 3^3 \times 5^3}{10^2 \times 3^3 \times 2 \times 5}$$

$$\frac{2^6 \times 3^3 \times 5^3}{5^3 \times 3^3 \times 2^3}$$

$$\frac{2^6 \times 3^3 \times 5^3}{5 \times 3 \times 2}$$

$$= 2^5 \times 3^2 \times 5^2$$

2. Ali is eight times older than Musa who is thirty years younger than Juma. Five years ago the sum of al their ages was ninety five years. Find the age of Ali when Juma was born. (4mks)

$$M = x$$
$$A = 8x$$
$$J = x + 30$$
$$x + 8x + 8x + 30 + 15 = 95$$
$$10x = 95 - 45$$
$$10x = 50$$
$$10x = 80$$

$$x = 4.7$$
$$36.75\ yrs.$$

$$x = 8$$
$$38$$

3. The sum of the interior angles of two polygons is 1620°. Given than one polygon is one side less than the other, find the number of sides each polygon has. (3mks)

$$(2n-4)90 + (2(n-1)-4)90 = 1620$$
$$(2n-4)90 + (2n-2-4)90 = 1620$$
$$(2n-4) + (2n-6)90 = 1620$$
$$2n-4 + 2n-6 = 18$$

$$4n = 28$$
$$n = 7$$
$$6$$

4. Given points P (-4, 2) and Q (6,-2), obtain the equation of the perpendicular bisector and hence the coordinate of its Y intercept. (4mks)

$$\frac{-2-2}{6--4} = \frac{-4}{10}$$

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

$$\left(\frac{-4+6}{2}\right)\left(\frac{-2+2}{2}\right)$$

$$(1, 0)$$

$$\frac{y-0}{x-1} = \frac{5}{2}$$

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

$$x = 0$$

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

$$(0, -2.5)$$

5. Solve the equation. (2mks)

   i. $8^x + 2^{3x} + 3 = 35$

$$2^{3x} + 2^{3x} = 32$$

$$2\left(2^{3x}\right) = 2^5$$

$$2^{3x} = 2^4$$

$$3x = 4$$

$$x = \frac{4}{3}$$

   ii. $3(3^{2x}) - 28(3^x) + 9 = 0$ (3mks)

   let $3^x = y$.

$$3y^2 - 28y + 9 = 0$$

$$3y^2 - 27y - y + 9 = 0$$

$$3y(y-9) - 1(y-9) = 0$$

$$(3y-1)(y-9) = 0$$

$$y = \frac{1}{3}$$
or
$$y = 9$$

$$3^x = \frac{1}{3}$$

$$3^x = 3^{-1}$$

or $3^x = 3^2$

$$x = -1$$
or
$$x = 2$$

6. Find the integral values of X given that: (2mks)
   6-4x<6x-12≤4x-2

$$6 - 4x < 6x - 12$$

$$18 \leq 10x$$

$$10x \geq 18$$

$$x \geq 1.8$$

$$6x - 12 \leq 4x - 2$$

$$2x \leq 10$$

$$x \leq 5$$

$$1.8 \leq x \leq 5$$

$$2, 3, 4, 5$$

7. A commercial bank buys and sells foreign exchange using the rates shown below;

	Buying rate	Selling rate
1 US $	Ksh 83.25	ksh 84.05

An American tourist arrived in the country with US $ 8175 and exchanged 80% of the cash to local currency. While in the country, he spent ksh 443,595 and bought US $ with the remaining amount. Determine the USA dollars he had as he left the country. (4mks)

$$\frac{80}{100} \times 8175 =$$
$$6540$$

$$6540 \times 83.25 =$$
$$Ksh 544,455$$

$$544,455$$
$$-443,595$$
$$Ksh 98,860$$

$$\frac{98860}{84.05}$$
$$= 1,176.2$$
$$+ 1635$$

$$2,811.2$$

8. Solve for X in the equation: 0≤X≤360° (3mks)

Sin X= 0.8071

$$x = 53.8°, 126.2°$$

9. Simplify the expression. (3mks)

$$\frac{6x^3-10x^2y-24xy}{36x^3-64xy^2}$$

$$\frac{x(6x^2-10xy-24y)}{x(36x^2-64y^2)}$$

$$\frac{2x(3x^2-5xy-12y)}{x(6x+8y)(6x-8y)}$$

$$\frac{2x(3x^2-8xy+3xy-12y)}{x(6x+8y)(6x-8y)}$$

$$\frac{2x\{2x(x-4y)3y(x-4y)}{2x(2x+3y)(x-4y)}$$

$$\frac{2x(2x+3y)(x-4y)}{x(6x+8y)(6x-8y)}$$

10. Calculate the amount earned when shs 50,000 is deposited for 1½ years at 12½% p.a. (3mks)

$$\frac{50,000 \times 1.5 \times 12.5}{100}$$

$$= 9,375$$
$$+ \ 50,000$$
$$\text{Sh } \underline{59,375}$$

$$50,000\left(1 + \frac{12.5}{100}\right)^{1.5}$$
$$50,000(1.125)^{1.5}$$
$$\text{Sh } \underline{59,662.10}$$

11. Find the value of x in the equation
$6^x = 15$ (3mks)

$$x \log 6 = \log 15$$
$$x = \frac{\log 15}{\log 6}$$

$$x = \frac{1.1761}{0.7782}$$

$$x = 1.5113$$

$$\therefore x = \underline{1.51}$$

12. Rationalize leaving your answer in surd form. (4mks)

$$\frac{1}{\sqrt{17} - 2\sqrt{5}} - \frac{1}{\sqrt{17} + 2\sqrt{5}}$$

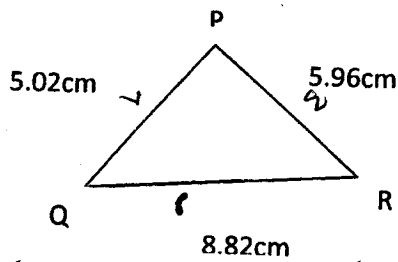$$\frac{1(\sqrt{17} + 2\sqrt{5}) - 1(\sqrt{17} - 2\sqrt{5})}{17 - 4 \times 5}$$

$$\frac{\sqrt{17} + 2\sqrt{5} - \sqrt{17} + 2\sqrt{5}}{17 - 20}$$

$$\frac{4\sqrt{5}}{-3}$$

$$= -\frac{4\sqrt{5}}{3}$$

13. Solve the triangle below.

P

5.02cm   5.96cm

Q   R

8.82cm

$$(8.82)^2 = (5.02)^2 + (5.96)^2 - 2 \times 5.02 \times 5.96 \cos P$$

$$77.79 = 25.2 + 35.52 - 59.8384 \cos P$$

$$17.07 = -59.8384 \cos P$$

$$-0.2853 = \cos P$$

$$= 106.6°$$

$$\frac{8.82}{\sin 106.6} = \frac{5.96}{\sin Q}$$

$$\sin Q = \frac{5.96 \sin 106.6}{8.82}$$

$$\sin Q = \frac{5.7116}{8.82}$$

$$\sin Q = 0.6476$$

$$Q = 40.4°$$

$$\begin{array}{r} 106.6 \\ + 40.4 \\ \hline 147.0 \end{array}$$

$$\begin{array}{r} 180 \\ -147 \\ \hline 33° \end{array}$$

14. Given $a = 2.7°c$ and $c = 9.8°c$ taken to the nearest $0.1°c$, find the relative error in the quotient $a \div c$.

2.75   2.65

9.85   9.75

Max $\frac{2.75}{9.75} = 0.2821$

Min $\frac{2.65}{9.85} = 0.2690$

15. Solve $3x^2 + x + 4 = 0$

$3x^2 - 3x + 4$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\frac{-1 \pm \sqrt{1 - 48}}{6}$$

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16. Add the missing term to the expression _+2x +1 to make it a perfect square. (3mks)

$$\left(\frac{b}{2}\right)^2 = ac$$

$$\left(\frac{2}{2}\right)^2 = a$$

$$1^2 = a$$

$$\underline{x^2 + 2x + 1}$$

SECTION B

17. Three business partners Joy, David and Johnny contributed shs 300,000, 500,000 and 200,000 respectively and bought a matatu. They agreed that one quarter of the profit would be saved for emergencies each month, one fifth of the remainder would be used for buying spare parts and repairs. The rest would be shared among the three partners in the ratio of their contributions. During the last month of June, the matatu realized a profit of shs 247,300

a. Calculate how much was saved for emergency that month. (2mks)

$$\frac{1}{4} \times 247,300$$

$$\underline{sh\ 61,825}$$

b. How much was used for repairs and buying spare parts. (2mks)

$$\frac{1}{5} \times \frac{3}{4} = \frac{3}{20}$$

$$\frac{3}{20} \times 247,300$$

$$= 37,095/=$$

FORM 3 MATHEMATICS

c. How much did each of them realize that month? (6mks)

$3\cancel{00},\cancel{000} : 5\cancel{00},\cancel{000} : 2\cancel{00},\cancel{000}$

$3 : 5 : 2$

J D S.

$\dfrac{3}{10} \times 247,30\cancel{0}$
$= 74,190$

$\dfrac{5}{10} \times 247,30\cancel{0}$

Sh $123,650$

$\dfrac{2}{10} \times 247,30\cancel{0}$
-4

$\begin{array}{r} 247,300 \\ -\ 98,920 \\ \hline 148,380 \end{array}$

$\dfrac{3}{10} \times 148,38\cancel{0} = 44,514$

$\dfrac{5}{10} \times 148,38\cancel{0} \quad 74,190$

$\dfrac{2}{10} \times 148,38\cancel{0} \quad 29,676$

18. The distance between Nanyuki and Nakuru town is 260km. A bus departs from Nanyuki at 10:55a.m heading to Nakuru at 60km/h. At 11:25a.m a lorry leaves Nakuru towards Nanyuki at 55km/h. Determine:

a. How far from Nakuru the bus will be when the lorry starts the journey. (2mks)

260 km.

N 10.55 60 km/h.   N 11.25 55 km/h.
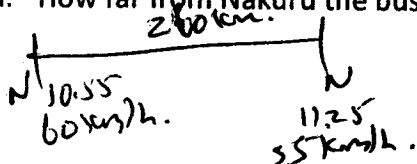
$6\cancel{0} \times \dfrac{1}{2} \quad 30$ km.

$260 - 30$
$= 230$ km

b. How far from Nanyuki the bus and the lorry will meet. (4mks)

$D = 230$ km

R.S = 115

$T = \dfrac{230}{115} \quad 2$ hrs.

$2 \times 60 + 30$
$120 + 30$
$= 150$ km.

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c. At what time will the bus meet the lorry in 12hr clock system? (1mk)

$$11.25$$
$$\underline{\quad 2 \quad}$$
$$13.25$$

$$1.25\,P.M$$

d. After meeting the bus, the lorry experiences a tire puncture that takes 45 minutes to fix. Find the time difference between the arrival of the bus and the lorry to the nearest minute. (3mks)

$$\frac{260}{60}$$

$$4.33$$
$$4hrs\ 20min.$$

$$10.55$$
$$\underline{4.20}$$
$$15.15$$
$$\underline{-.12}$$
$$3.15$$

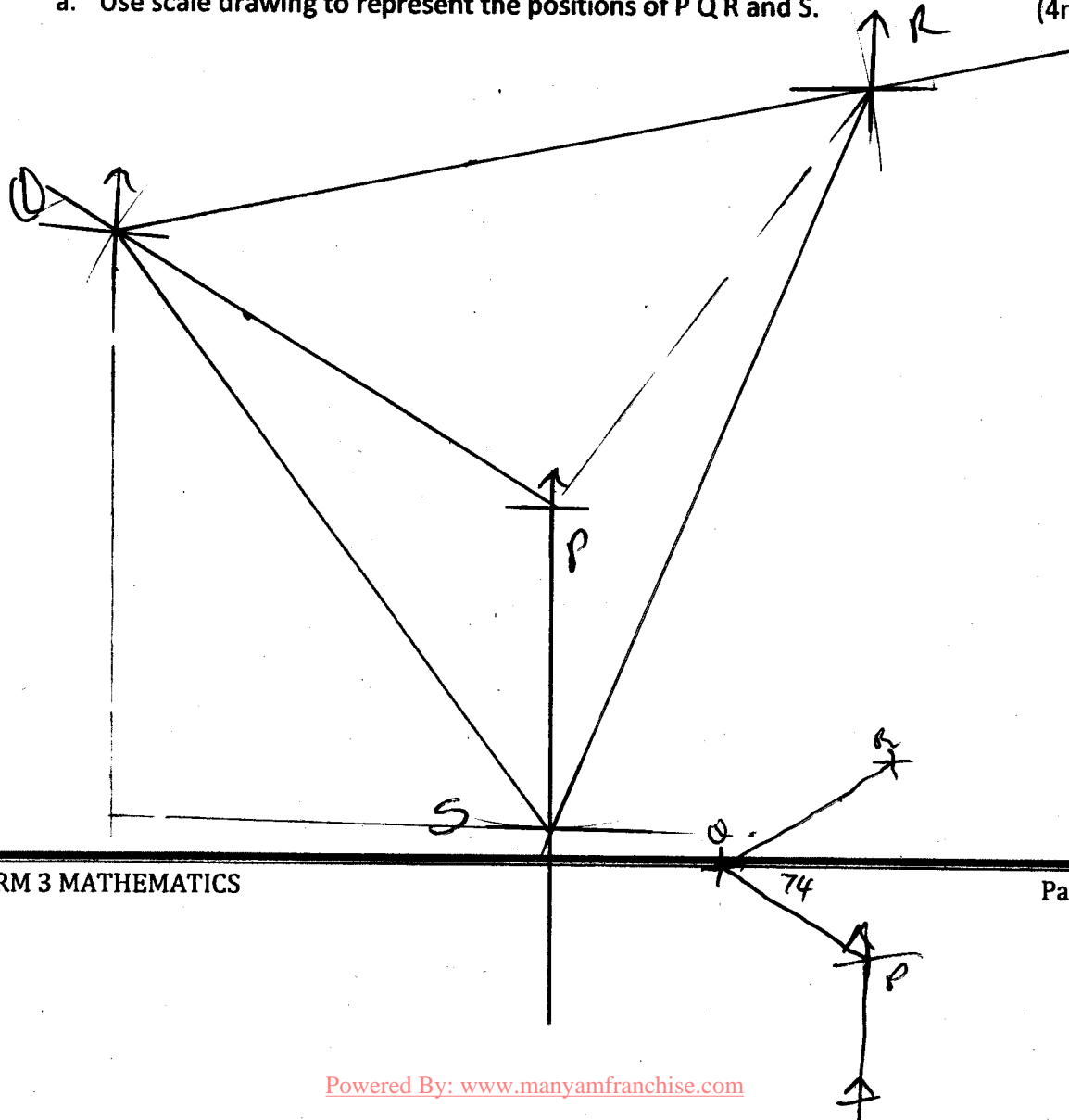$$\frac{260}{55}$$

$$4hrs\ 44min.$$
$$11.25$$
$$\underline{4\ 44}$$
$$16.09$$
$$4.09\,P.M$$

$$54m.$$

19. Points P, Q, R, and S are positions in a map whose scale is 1:1,000,000. Q is 74km on a bearing of 300° from P and point R is 110km on a bearing of 075° from Q. Given that S is 46km south of P:

a. Use scale drawing to represent the positions of P Q R and S. (4mks)

b. Using the diagram in "a" above find the distance RS in kilometers and the bearing of S from R.   (3mks)

23^0

11.5 KM

115 KM

c. Determine the shortest distance in km between points Q and S.   (2mks)

8.3×10   83 KM

d. Find the distance on the map between points P and R.   (1mk)

75 KM

20. Given that the equation of a quadratic curve $y=x^2+5x-3$

a. (i) Complete the table below for the function $y=x^2+5x-3$ for $-6\leq x\leq 1$ (2mks)

X	-6	-5	-4	-3	-2	-1	0	1
y	3	-3	-7	-9	-9	-7	-3	3

(ii) Draw the graph of $y=x^2+5x-3$ for $-6 \leq x \leq 1$ (3mks)

b. Use the graph to solve the functions;

(i) $x^2+5x-1=0$ (2mks)

$$y = x^2+5x-3$$
$$0 = x^2+5x-1$$
$$\overline{\hspace{2cm}}$$
$$y = -2$$
$$x = 0.4$$
$$\text{or}$$
$$x = -5.3$$

(ii) $x^2+4x=3$ (2mks)

$$y = x^2+5x-3$$
$$0 = x^2+4x-3$$
$$\overline{\hspace{2cm}}$$
$$y = x$$
$$x = 0.9$$
$$\text{or}$$
$$x = -3.6$$

c. Find the solution of $x^2+5x=3$ graphically. (2mks)

$$y = x^2+5x-3$$
$$0 = x^2+5x-3$$
$$\overline{\hspace{2cm}}$$
$$y = 0$$
$$x = 0.5$$
$$\text{or}$$
$$x = -5.5$$

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$y = x^2 + 5x - 3$

$y = x$

$y = -2$

The histogram shows bars with the following heights across the class boundaries:

- 39.5 to 43.5: height 5
- 43.5 to 47.5: height 4
- 47.5 to 51.5: height 5
- 51.5 to 55.5: height 3
- 55.5 to 59.5: height 6
- 59.5 to 63.5: height 2

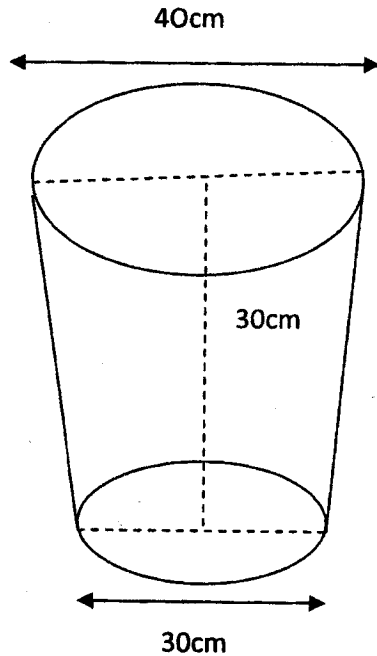Y-axis values: 1, 2, 3, 4, 5, 6
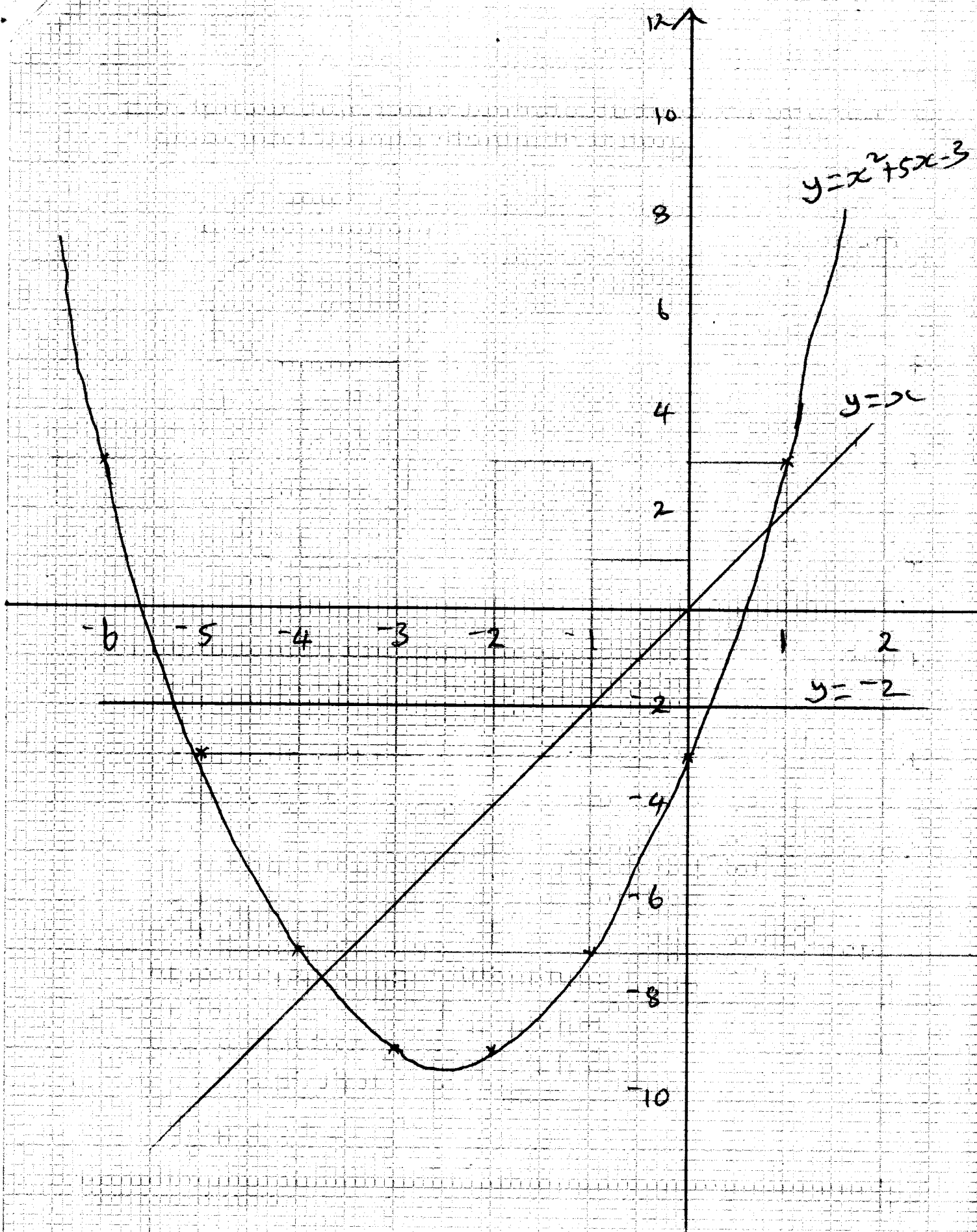
X-axis values: 39.5, 43.5, 47.5, 51.5, 55.5, 59.5, 63.5

21. The figure below shows a bucket of depth 30cm used to fill a cylindrical tank of radius 1.2m and height 1.35m which is initially three fifth full of water.

40cm

30cm

30cm

(i) Calculate the capacity of the bucket in litres. (5mks)

$$\frac{20}{15} = \frac{30+x}{x}$$

$$20x = 450 + 15x$$

$$5x = 450$$

$$x = 90$$

$$\frac{1}{3} \times 3.142 \times (20)^2 \times 120$$

$$5,092.3 \ cm^3$$

$$= 50,272$$

$$\frac{1}{3} \times 3.142 \times (15)^2 \times 90$$

$$21,208.5$$

$$\begin{array}{r} 50,272 \\ - \ 21,208.5 \\ \hline 29,063.5 \ cm^2 \end{array}$$

$$\overline{1000}$$

$$= 29.064 \ \text{litres}$$

(ii) The volume of water required to fill the tank in litres. (2mks)

$$v = \pi r^2 h$$

$$3.142 \times 1.2 \times 1.35$$

$$= 5.09 \ M^3$$

$$\frac{2}{5} \times 5.09 =$$

2.036M²

2036 L.

(iii) Calculate the number of buckets that must be drawn to fill the tank. (3mks)

$$\frac{2036}{29.064} =$$

$$\underline{70}$$

22. The following are masses of 25 students in form 3 class;

49	51	50	60	55
45	56	51	58	59
44	42	59	50	62
46	43	57	56	52
43	41	40	54	44

a) Using the classes 40-43, 44-47.....
   Prepare a frequency distribution table . (4mks)

Class	x	y	
40-43	41.5	5	207.5
44-47	45.5	4	182.0
48-51	49.5	5	247.5
52-55	53.5	3	160.5
56-59	57.5	6	345
60-63	61.5	2	123

$$\sum f = 25 \quad \sum fx = 1265.5$$

b) Estimate the median class. (3mks)

$$47.5 + \left(\frac{4}{5} \times 4\right)$$
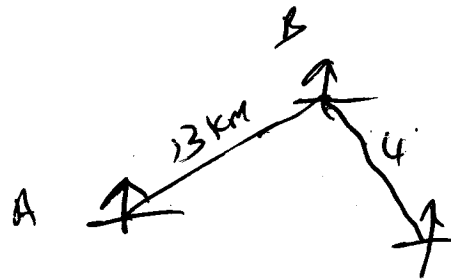
$$47.5 + \frac{16}{5}$$

$$47.5 + 3.2$$
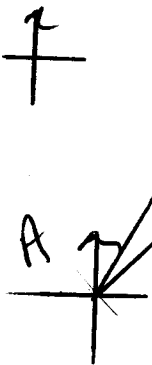
$$\underline{50.7}$$

c) Draw a histogram for the data. (3mks)

23. Three villages A B and C are such that B is 13 km on a bearing of 030° from A. C is 4km on a bearing of 120° from B.
   (i) Using a scale of 1cm to represent 0.8km draw a diagram to show the relative positions of the villages A B and C. (5mks)

(ii) Find the distance and bearing of village A from C. (3cm)

45° 14.2KM

(iii) A straight main road runs from village A to village C. Find the length of the shortest path from village B to main road. (2mks)

3.7 KM