

SECTION A (40 marks)

Answer ALL questions in this section.

1. Solve the equation:

$$\log_3[4x+4] - \log_3[3x+7] = 1$$

(4 marks)

2. Evaluate $\left(3\frac{3}{4} \times 7\frac{1}{5}\right) - 2\frac{5}{9}$.

(4 marks)

3. Calculate the compound interest on Ksh 20,000 for 3 years at 10% per annum.

(4 marks)

4. Given that $A = \begin{bmatrix} 0 & 2 \\ 3 & 8 \end{bmatrix}$ and $B = \begin{bmatrix} -7 & 2 \\ 6 & 3 \end{bmatrix}$.

Find (i) AB

(ii) $A+B$

(4 marks)

5. Table 1 shows the distribution of the diameter of bolts produced by a lathe machine.

Table 1

Diameter	0-10	10-20	20-30	30-40	40-50
No. of bolts	2	7	11	6	3

- Determine the mode of the distribution.

(4 marks)

6. Determine the sum of the first 20 terms of the series

$$2+4+6+8+10+12+14+16+18+20+22+24+26+28+30+32+34+36+38+40$$

(4 marks)

7. Express the recurring decimal $0.5\overline{7}$ as a fraction.

(4 marks)

8. Convert (i) 23_{10} to binary.

(2 marks)

(ii) 101011_2 to decimal.

(2 marks)

9. Determine the L.C.M. of the numbers 24, 25 and 30.

(4 marks)

10. Solve the equation $4^x = 68$

(4 marks)

1503/103
MATHEMATICS 1
June/July 2017
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL
CRAFT CERTIFICATE IN AUTOMOTIVE ENGINEERING
MODULE 1
MATHEMATICS 1

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Answer booklet;

Mathematical tables;

Scientific calculator.

This paper consists of TWO sections: A and B.

Answer ALL questions in section A and any THREE questions from section B.

Maximum marks for each part of a question are as indicated.

Candidates should answer all questions in English.

This paper consists of 4 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

- (a) Mechanics A, B and C were paid Ksh. 5600 for a pump-heating job. A and B received $\frac{2}{3}$ and $\frac{1}{4}$ respectively of the total amount. The balance was paid to C.

Calculate the

- fraction of C's share;
 - amount each of them received. (5 marks)
- (b) The fifth and the eleventh terms of an arithmetical progression are 19 and 43 respectively. Determine the
- 20th term; (6 marks)
 - sum of the first 16 terms. (3 marks)

- (c) The first term of a geometric progression is 10 while the sixth term is 27. Determine the tenth term of the progression.

$$a = 10 \quad a_6 = 27 \quad \frac{a_6}{a} = \frac{27}{10} = r^5 \quad r = \sqrt[5]{\frac{27}{10}} \quad r = 1.2$$

- (d) Table 3 shows the marks obtained by 30 attractive engineering students in a mathematics test.

Table 3

77	96	85	84	68
83	75	75	74	76
82	97	65	68	77
72	90	94	85	81
57	73	88	90	67
76	65	86	93	62

$$\frac{a_6}{a} = \frac{27}{10} = r^5$$

$$r = 1.2$$

$$a_{10} = 10 \times 1.2^9$$

- Arrange this data in a frequency table taking the classes as 50 - 59, 60 - 69
- hence calculate the mean mark.

(8 marks)

- (e) Table 4 gives the lengths of 25 screws produced by a machine in a factory.

Table 4

Length (cm)	0 - 9	10 - 19	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69
No. of screws	2	3	5	4	3	2	1

Use the data in table 4 to calculate the

- 4th decile;
- 60th percentile;
- upper quartile.

(12 marks)

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SECTION II (60 marks)

Answer any **THREE** questions from this section.

11. (a) Simplify the expression

$$2^{\frac{\log_4 125 - \frac{1}{2} \log_2 25}{3 \log_2 5 + \log_2 625}}$$

(5 marks)

- (b) Table 2 shows the number of vehicles arriving for service in a petrol station in 40 weeks.

Table 2

No. of weeks	0 - 3	3 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40
No. of cars	3	4	5	6	7	5	4	5

Calculate the:

- (i) mean = $\frac{200}{40} = 5$
 (ii) median = $\frac{41}{2} = 20.5$
 (iii) standard deviation

(15 marks)

12. (a) Given the matrices $A = \begin{bmatrix} 3 & 2 \\ 4 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 \\ 3 & 3 \end{bmatrix}$.

Determine (i) $A + B$

(ii) $(AB)^T$

(6 marks)

- (b) Two forces F_1 and F_2 in newtons acting on a mechanical system satisfy the equations:

$$F_1 + 11F_2 = 7$$

$$2F_1 + 5F_2 = 12$$

Use the inverse matrix method to solve the equations.

(8 marks)

- (c) Solve

$$\frac{x}{2} - \frac{1}{5} + \left[1 \frac{1}{4} + \frac{3}{4} \right] = \frac{2}{5}$$

$$5(x + 3y = 7)$$

$$3(2x + 5y = 12)$$

(6 marks)

$$5x + 15y = 35$$

$$6x + 15y = 36$$

$$\frac{-15x^3 - 1}{10 + 3y = 7}$$