

QUESTION ONE (30MKS)

- (a). Find the coefficient of x^{10} in the expansion $(2x - 3)^{14}$ [2mks]

Evaluate [4mks]

i. $256^{\frac{1}{4}}$

ii. $\log_2 64$

- (b). Simplify by rationalizing the denominator [2mks]

$$\frac{2\sqrt{3}}{7 - \sqrt{5}}$$

- (c). Given that $\log_5 2 = 0.4307$, $\log_5 3 = 0.6826$ and $\log_5 7 = 1.2091$

Evaluate [4mks]

(i). $\log_5 24$

(ii). $\log_5 \frac{63}{6}$

- (d). Given the sequence 5, 16, 27, 38, 49,..... [4mks]

(i). Find the twenty-third term

(ii). Find the sum of the first 150 terms

- (e). Solve the simultaneous inequation below. [3mks]

$$3x - 1 > -4$$

$$2x + 1 \leq 7$$

- f). Solve $x^2 - 3x - 18 = 0$ by using completely the square method [3mks]

- g). Solve the following simultaneous equations [3mks]

$$2x - y + 3 = 0$$

$$3x + 2y - 1 = 0$$

(h). Show that $\binom{4}{2} + \binom{4}{1} = \binom{5}{2}$ [3mks]

(i). Simplify completely $\frac{\cos\alpha}{1+\sin\alpha} + \tan\alpha$ [3mks]

QUESTION TWO (20MKS)

a). Show that $2x^3 + x^2 - 13x + 6$ is divisible by $x - 2$ and hence find the other factors of the expression. [3mks]

b). Prove that $\frac{1-\cos 2\theta + \sin 2\theta}{1+\cos 2\theta - \sin 2\theta} = \tan\theta$ [3mks]

c). Solve the following trigonometric equations:

$$12\cos^2\theta + \sin\theta = 1 \quad 0 \leq \theta \leq 360 \quad [3mks]$$

$$3\sin x + 4\cos x = 1 \quad -180 \leq x \leq 180 \quad [3mks]$$

d). If $\tan A = \frac{3}{4}$ and $\operatorname{cosec} B = \frac{17}{8}$ where A is acute angle and B an obtuse angle, calculate, without using mathematical tables or calculators, the value of [3mks]

$$\frac{3\sin A + 2\cos A}{\sec B}$$

e). Expand and simplify $(1 + \sqrt{2})^4$ hence use your expansion to express $(1 + \sqrt{2})^4 - (1 - \sqrt{2})^4$ as a single term. [3mks]

f). Solve the equation $\log_2(4x + 10) - \log_2(x + 1) = \log_2 8$ [2mks]

QUESTION THREE (20MKS)

a). Find the value of a in the expression $x^3 - 3x^2 + ax + 5$ has remainder 17 when divided by $x - 3$ [3mks]

- b). Find the first term of the expression of $\left(2 - \frac{1}{8}x\right)^{10}$ in ascending powers of x , and by putting $x = \frac{1}{10}$, find the result to show that $1.9875^{10} = 961\frac{4}{5}$

[3mks]

- c). Factorize the quadratic equation $2u^2 - 11u + 5 = 0$ hence solve the equation

[3mks]

$$2(2^{2x}) - 11(2^x) + 5 = 0$$

- d). In arithmetic progression, the thirteenth term is 27 and the seventh term is three times the second term. Find the first term, the common difference and the sum of the first ten terms.

[3mks]

- e). An even number, greater than 30000, is to be formed from the digits 0, 1, 2, 3, 5 and 7. How many ways such a number can be formed, if repetition is not allowed.

[2mks]

- f). A committee of seven persons is to be chosen from a group of eight women and five men. In how many of these committees will the men constitute a majority?

[3mks]

- g). A small business sells Kshs.10000 worth of goods during its first year. The owner of the business has set a goal of increasing annual sales by kshs.7500 each year for nine years. Assuming that this goal is met, find the total sales the first 10 years this business is in operation.

[3mks]

QUESTION FOUR (20MKS)

In a survey the masses of 50 apples were noted and recorded in the following table. Each value was given to the nearest gram.

86	101	114	118	87	92	93	116
105	102	97	93	101	111	96	117
100	106	118	101	107	96	101	102
104	92	99	107	98	105	103	100

103 108 92 109 95 100 103 110
113 99 106 116 101 105 86 88
108 92

- i. Construct a frequency distribution, using equal class intervals of width 5g and taking the first intervals as 85-89. [6mks]
Use the table to :
- ii. Find the mean [3mks]
iii. Standard deviation [4mks]
- Estimate:
- iv. Median [3mks]
v. Interquartile range [4mks]

QUESTION FIVE (20MKS)

- a). A box of chocolates contains 8 milk chocolates and 4 plain chocolates. A chocoholic eats three chocolates. Calculate the probability that:
- i. All three are milk chocolates [2mks]
ii. Exactly one is plain chocolate [2mks]
- b). A bag contains five black balls and seven white balls. Another bag contains four blacks and eight white balls. A ball is picked at random; Use a tree diagram to, find the probability that [6mks]
- i. Both are red
ii. They are of different colour
iii. They are of the same colour
- (c). An investor wishes to invest sh. 2 million in a financial institution at 2% p.a compound interest. Determine which of the following investment choices should the investor select for investing his fund.
- i. When compounding annually [2mks]

- ii. When compounding semi annually [2mks]
- iii. When compounding quarterly [2mks]

d). Mr. Ngeny borrowed Kshs. 560,000 from a bank to buy a piece of land. He was required to repay the loan with simple interest for a period of 48 months. The repayment amounted to Kshs 21000 per month. Calculate

- i. the interest paid to the bank [2mks]
- ii. the rate of simple interest [2mks]