5 (a) (i) Convert octal number 465_8 to its *hexadecimal* equivalent. (3 marks)

(ii) Evaluate $352.125_{16} + 58.375_{16}$ (2 marks)

(b) Given that:

$$A = \begin{pmatrix} 1 & 1 & 3 \\ 4 & -1 & 5 \end{pmatrix} \quad B = \begin{pmatrix} 2 & 1 \\ 0 & 1 \\ -3 & -1 \end{pmatrix} \text{ and } \quad C = \begin{pmatrix} 1 & 2 \\ 3 & -4 \end{pmatrix}$$

Prove that;

(AB)C = A (BC) (7 marks)

(c) Determine the binomial expansion for the expression $(q + p)^6$ (3 marks)

(d) Table 4 shows the values of x_i and y_i. Use it to answer the question that follows.

x_i	9	10	11	12	13	14
y_i	5.0	5.4	6.0	6.8	7.5	8.1

Table 4

Construct a *backward difference* table. (5 marks)

6. (a) (i) Evaluate the following mathematical expression;

$^{20}C_4 \times {}^{20}P_4$ (2 marks)

(ii) Differentiate between a *histogram* and a *bar graph* as used in modelling. (4 marks)

(b) The perimeter of a rectangular garden is 100 metres and its area is 616 square metres. Determine the length and the width of the garden. (6 marks)

(c) Given the Boolean equation $Y = A\overline{B} + \overline{B}C$ draw a truth table to find the value of Y. (4 marks)

(d) Differentiate between the terms a *measurement error* and a *rounding error* as applied in statistics. (4 marks)

7. (a) (i) List **two** assumptions in each of the following:

I. linear interpolation; (1 mark)

II. linear extrapolation. (1 mark)

(ii) Describe the *EXCLUSIVE – OR* gate as used in logic gates. (2 marks)

(b) (i) Kihoto Self Help Group comprises of seven men and five women. The chairman wants to choose a committee consisting of three men and two women. Determine the number of ways the chairman would use to constitute the committee (3marks)

(ii) Manguo Factory Ltd has a hundred employees whose salaries are distributed as follows.

Salary (Ksh)	No. of employees
below 3000	20
3000 – 6000	35
6000 – 9000	30
9000 – 12000	15

Draw a histogram to represent the salary distribution of the employees. (4 marks)

(e) The inventory of furniture at each outlet of a three- store chain is given by the following matrix.

$$F=\begin{pmatrix} 9 & 12 \\ 15 & 4 \\ 7 & 0 \end{pmatrix}$$

The rows denote the different stores and the columns the classes of the furniture. The cost of the furniture is given by vector $P=\begin{pmatrix}700 & 1200\end{pmatrix}^T$.

Determine:

(i) the total cost of furniture for each class of furniture; (2 marks)

(ii) the total cost of furniture in each outlet. (3 marks)

(d) Given that $X = \begin{pmatrix} 1 & 2 & 3 \\ 4 & -5 & 6 \end{pmatrix}$ and $Y = \begin{pmatrix} 7 & 8 \\ 0 & -9 \end{pmatrix}$;

Show that $(XY)^T = Y^T X^T$ (4 marks)

8. (a) (i) Describe the fundamental *union rule* as applied in finite sets. (2 marks)

(ii) Distinguish between *combinations* and *permutations* as applied in statistics. (4 marks)

(b) Given that a couple has two children, find the probability that both children are girls if it is known that:

(i) at least one of the children is a girl; (2 marks)

(ii) the older child is a girl. (2 marks)

(c) QRS factory manufactures vehicle parts where the probability of producing a good part is 0.8 and that of producing a faulty part is 0.2. Determine the probability of getting 10 good parts in a sample of 12. (5marks)

(d) (i) Find the value of $\frac{1}{13}$ truncated to four decimal places. (1 mark)

(ii) A farmer sold farm produce from the farm worth Kshs. 687,500 but had estimated the sales to be Kshs. 700,000. Determine:

I. absolute error; (2 marks)

II. relative error. (2 marks)