

**AHMES SECONDARY SCHOOL**  
**FORM THREE HOLIDAY PACKAGE DECEMBER 2021**  
**BASIC MATHEMATICS**

**COORDINATE GEOMETRY**

1. Find the equations of two lines through point  $(-2, 5)$ , one parallel and the other perpendicular, to the line  $3x - y = 8$ .
2. Find the equation of a line joining point  $(2, -5)$  and the mid-point of line AB, where  $A(5,8)$  and  $(7, -2)$ .
3. Find the equation of a line which is a perpendicular bisector of a line segment joining points  $(5, -8)$  and  $(3, -4)$ .
4. Determine the coordinates of the point  $P(x,y)$  on the y-axis such that the line joining it to the point  $(3,-1)$  forms a right angle with the line through the points  $(3,-1)$  and  $(-5,-5)$ .

**THE EARTH AS SPHERE**

5. An aeroplane from point A ( $10^{\circ}\text{S}$ ,  $28^{\circ}\text{E}$ ) flies 1200km due North to point B and then 1500km due West to point C. What are the locations of the points B and C?
6. A ship from port A ( $5^{\circ}\text{S}$ ,  $20^{\circ}\text{W}$ ) sails to port B ( $5^{\circ}\text{S}$ ,  $12^{\circ}\text{E}$ ) and finally to port C ( $35^{\circ}\text{N}$ ,  $12^{\circ}\text{E}$ ). What is the total distance for the whole journey?
7. The locations of the towns A and B are ( $25^{\circ}\text{N}$ ,  $15^{\circ}\text{E}$ ) and ( $25^{\circ}\text{N}$ ,  $34^{\circ}\text{E}$ ) respectively. Find the distance between A and B along the small circle in both km and nm.
8. Three towns, P, Q, and R are on the small latitude,  $20^{\circ}\text{N}$  with Town Q at longitude  $10^{\circ}\text{E}$  between Towns P and R. Find the longitudes of P and R if the distance between P and Q is 1482km and that between Q and R is 926 km.
9. A ship sails from Pemba ( $4.5^{\circ}\text{S}$ ,  $39.5^{\circ}\text{E}$ ) to Dar es Salaam ( $7.5^{\circ}\text{S}$ ,  $39.5^{\circ}\text{E}$ ). If it leaves Pemba at 11: 30 am and arrived in Dar es Salaam at 13:30 pm, use  $\pi = \frac{22}{7}$  and Radius of the Earth (R) = 6370 km to find the speed of the ship in km/h.
10. A ship sails due North from point A ( $0^{\circ}$ ,  $50^{\circ}\text{E}$ ) to point B at the speed of 800km/hr. If it leaves A at 08:45 am and arrived in B at 10:45 p.m. Find the position of point B ( $\pi = \frac{22}{7}$  and RE = 6370km).
11. Two places P and Q both on the parallel of latitude  $26^{\circ}\text{N}$  differ in longitudes by  $40^{\circ}$ . Find the distance between them along their parallel of latitude.
12. A ship sails northward from Dar es Salaam ( $7^{\circ}\text{S}$ ,  $39^{\circ}\text{E}$ ) to Tanga ( $5^{\circ}\text{S}$ ,  $39^{\circ}\text{E}$ ) at an average speed of 12 knots. If it leaves Dar es Salaam at 12:00 noon, when will it arrive at Tanga?
13. A plane is flying along latitude  $60^{\circ}\text{N}$  at 400 km/h. how long will it take to travel from point A (longitude  $34^{\circ}42'\text{N}$ ) to point B (longitude  $34^{\circ}42'\text{N}$ ). (Use Radius of the Earth = 6400km,  $\pi = 3.142$ ). (6.28 hours or 6 hours 16 minutes and 48 seconds)
14. A ship is steaming due to north at 25 Knot, is at position latitude  $10^{\circ}15'\text{N}$ , longitude  $50^{\circ}\text{W}$  at 6:00 am on May 21. Find the position of the ship at 12:00 noon on may 23. (1 knot = 1 nautical mile per hour)

15. How long will it take for plane travelling at 650km/h to travel between two points A (45°N, 33°E) to point B (45°N, 67°W) Use Radius of the Earth = 6400km,  $\pi = 3.142$ . (12 hours)

### STATISTICS

1. The following data represent the marks scored by 36 students at Tupendane Secondary School in mathematics examination.  
51, 83, 89, 74, 68, 63, 80, 50, 55, 62, 65, 74, 71, 85, 70, 61, 64, 50, 61, 83, 68, 70, 74, 70, 60, 66, 73, 75, 68, 58, 72, 64, 71, 76, 71.

- Prepare a frequency distribution table representing the data using class marks 52, 57, 62, etc.
  - Calculate the mode (write your answer in one decimal place)
  - Draw a cumulative frequency curve (Ogive) and use it to estimate the median score.
2. The scores of a Mathematics test taken by 60 students were recorded as hereunder:

30	56	21	49	58	22	38	50	20
25	34	48	33	20	34	30	51	63
25	50	36	29	21	61	33	21	52
26	28	45	36	26	60	42	35	54
43	24	30	27	56	35	32	57	
41	56	41	30	36	53	63	31	
34	58	34	59	26	30	27	26	

- Prepare the frequency distribution table for the data by using the intervals 20 – 24, 25 – 29, etc.
  - Calculate the mean by using assumed mean method.
  - Calculate the median of the data.
  - Draw a histogram and use it to estimate the mode for the data.
3. The heights of some plants grown in a laboratory were recorded after 5 weeks. The results are shown in the following table:

Height (cm)	Class mark (x)	Frequency (f)
	13	4
	18	8
	23	20
	28	21
	33	12
	38	3

- Prepare the frequency distribution table (use modal height = 26 cm)
- Draw a cumulative frequency curve for the data.
- Estimate the median from the graph.

### MATRICES

1. Given matrix  $A = \begin{pmatrix} 2 & 1 \\ 3 & 0 \end{pmatrix}$  and  $B = \begin{pmatrix} -2 & 4 \\ 1 & -3 \end{pmatrix}$ , compute:
- $(A + B)^2$
  - $A^2 + 2AB + B^2$
  - Hence, show that  $(A + B)^2 \neq A^2 + 2AB + B^2$
2. Given matrix  $A = \begin{pmatrix} 5 & 3 \\ 3 & 2 \end{pmatrix}$  and  $B = \begin{pmatrix} -1 & -2 \\ 3 & 5 \end{pmatrix}$ ,
- Find:  $AB, A^{-1}, B^{-1}$
  - Hence, show that  $(AB)^{-1} = A^{-1}B^{-1}$

- 3.
4. Find the matrix  $A \begin{pmatrix} 1 & 0 \\ -1 & 3 \end{pmatrix} = \begin{pmatrix} -1 & -3 \\ 3 & 6 \end{pmatrix}$
5. Find x, y and z from:  $\begin{pmatrix} x & 5 \\ 2 & 4 \end{pmatrix} + \begin{pmatrix} 2+y & z \\ 4-z & x \end{pmatrix} = \begin{pmatrix} 8 & 5 \\ 6 & 3 \end{pmatrix}$
6. Given matrix  $M = \begin{pmatrix} -5 & 8 \\ -3 & 4 \end{pmatrix}$ . Compute (a)  $(M^{-1})^2$  (b)  $(M^2)^{-1}$
7. Find the value of a and b, if  $\begin{pmatrix} a & -3 \\ 7 & 2 \end{pmatrix} \begin{pmatrix} 3 \\ b \end{pmatrix} = \begin{pmatrix} 5 \\ -9 \end{pmatrix}$
8. (a) Given matrix  $A = \begin{bmatrix} 1 & y \\ x & 5 \end{bmatrix}$  and Matrix  $B = \begin{bmatrix} -5 & 3 \\ 2 & -1 \end{bmatrix}$ . Find the value of x and y where matrix B is an inverse of matrix A.
9. (a) For what value (s) of t will the matrix  $\begin{pmatrix} 6t & 1 \\ t+3 & t-1 \end{pmatrix}$  be singular?  
 (b) If  $Q = \begin{pmatrix} k & -4 \\ 3 & -2 \end{pmatrix}$ , find the value of k given:  $|Q| = 5$
10. (a) Find the value of "K" if matrix  $\begin{bmatrix} 2(k+1) & k \\ 4k-3 & 3+k \end{bmatrix}$  is singular matrix.
11. Use the inverse matrix method to solve the following system of equations  $\begin{cases} 2x + 3y = 12 \\ y - 3x = -7 \end{cases}$
12. Find the inverse of the matrix :  $\begin{pmatrix} 5 & -2 \\ -1 & 1 \end{pmatrix}$  and hence solve the equation  $\begin{cases} 5x - 2y = -2 \\ -x + y = -15 \end{cases}$   
 Solve for x and y by using the determinant method if,  $x + 3y - 6 = 0$  and  $3x - y = 8$ .

### FUNCTIONS

1. Given the function  $f(x) = 2x^2 - x - 6$ . find the:
  - a. Axis of symmetry of  $f(x)$
  - b. Turning point of  $f(x)$
  - c. Maximum or minimum value of  $f(x)$
  - d. The domain and range of  $f(x)$
  - e. The x and y intercepts of  $f(x)$
2. The function  $f(x)$  is defined as follows:
 
$$f(x) = \begin{cases} 1 & \text{if } x \leq 0 \\ x^2 + 1 & \text{if } 0 < x \leq 2 \\ 5 & \text{if } x \geq 2 \end{cases}$$
  - a. Sketch the graph of  $f(x)$
  - b. Use the graph to determine the domain and range of  $f(x)$
  - c. Find  $f(-3)$ ,  $f(1.5)$  and  $f(7.5)$
3. If  $f(x) = x^2 - 4$ . Determine
  - a. Domain and range of  $f(x)$
  - b.  $f^{-1}(x)$
  - c. Calculate the x and y intercept of  $y = x^2 - 4x + 3$