

**MERRYLAND HIGH SCHOOL – ENTEBBE**  
**S5 TERM 2020 HOLIDAY BREAK**  
**MATHEMATICS P1**  
**Pure maths**

**INSTRUCTIONS:**  
**Answer ALL questions**

1. Solve the following equations:
  - a)  $4x - 5(2x) + 4 = 0$
  - b)  $2 - 5e^{-x} + 5e^{-2x} = 0$
  - c)  $x^{\frac{4}{3}} + 16x^{\frac{-4}{3}} = 17$
  - d)  $x^2 + 2x = 34 + \frac{35}{x^2 + 2x}$
  - e)  $\sqrt{2-x} + \sqrt{3+x} = 3$
  - f)  $3^{2(x+1)} - 10^{(3^x)} + 1 = 0$
2. If  $x^2 + x + b = 0$  and  $x^2 + ax + b = 0$  have a common root, show that;  
 $(b-1)^2 = (a-1)(1-ab)$
3. Solve the following pairs of simultaneous equations
  - a)  $x^2 + y^2 - 6x + 4y - 13 = 0$   
 $x^2 + y^2 - 10x + 10y - 15 = 0$
  - b)  $4x^2 + 25y^2 = 100$   
 $xy = 4$
  - c)  $\log x - 2 \log y = \log 2$   
 $x - 5y + 2 = 0$
4. a) If  $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = k$ , show that;  
 $\frac{a+c+e}{b+d+f} = k$ 
  - b) Hence solve the simultaneous equations.
5. Express the following in surd form and rationalize the denominators.
  - a)  $\frac{1+\tan 30^\circ}{1-\tan 30^\circ}$
  - b)  $\frac{1}{(1-\sin 45^\circ)} 2$
6. Solve the following equations for;  
 $0^\circ \leq \theta \leq 360^\circ$ 
  - a)  $2 \cos^2 \theta + 3 \cos \theta + 1 = 0$
  - b)  $3 \cos \theta + 2 \sec \theta + 7 = 0$
  - c)  $3 - 3 \cos \theta = 2 \sin^2 \theta$
  - d)  $2 \tan^2 \theta + \sec \theta = 1$
  - e)  $3 \sin^2 \theta - \sin \theta \cos \theta - 4 \cos^2 \theta = 0$
  - f)  $2 \sin x = \cos (x + 60^\circ)$
6. Prove the following identities;
  - a)  $\tan \theta + \cot \theta = \frac{1}{\sin \theta \cos \theta}$
  - b)  $\sec \theta + \operatorname{cosec} \theta \cot \theta = \sec \theta \operatorname{cosec}^2 \theta$
  - c)  $\sin (A+B) + \sin (A-B) = 2 \sin A \cos B$
  - d)  $2 \tan^2 \theta + \sec \theta = 1$
  - e)  $3 \sin^2 \theta - \sin \theta \cos \theta - 4 \cos^2 \theta = 0$
  - f)  $2 \sin x = \cos (x + 60^\circ)$
7. Prove the following identities
  - a)  $\tan \theta + \cot \theta = \frac{1}{\sin \theta \cos \theta}$
  - b)  $\sec \theta + \operatorname{cosec} \theta \cot \theta = \sec \theta \operatorname{cosec}^2 \theta$
  - c)  $\sin (A + B) = 2 \sin A \cos B$ .
  - d)  $\sqrt{\frac{1-\cos 2x}{1+\cos 2x}} = \tan x$
8. Given that  $\log_2 x + 2 \log_4 y = 4$ . Show that  $xy = 1.6$ . Hence solve the simultaneous equations:  
 $\log_{10} x + y = 1$   
 $\log_2 x + 2 \log_4 y = 4$

**END**

**MERRYLAND HIGH SCHOOL – ENTEBBE**  
**S5 TERM 2020 HOLIDAY BREAK**  
**MATHEMATICS P2**

**INSTRUCTIONS:**

**Answer ALL questions.**

1. The table below shows the marks obtained by 200 students in an examination marked out of 100%

Marks (%)	Number of candidates
10 – 19	18
20 – 29	34
30 – 39	58
40 – 49	42
50 – 59	24
60 – 69	10
70 – 79	6
80 – 89	8

- (a) Calculate the;
- (i) mean mark
  - (ii) modal mark
- (b) Draw a cumulative frequency curve for the data. Hence estimate the lowest mark for a distinction one if the top 5% of the candidates qualify for the distinction.
2. Find the resultant of two vectors of magnitude 5 units, direction  $32^\circ$ , and a vector of magnitude 8 units, direction  $55^\circ$ .
3. For a set of 20 numbers,  $\sum x = 300$  and  $\sum x^2 = 5500$ . For a second set of 30 numbers,  $\sum x = 480$  and  $\sum x^2 = 9600$ . Find the mean and standard deviation of the combined set of 50 numbers.
4. The mean of numbers; 3, 6, 7, a, 14 is 8. Find the standard deviation of the set of numbers.
5. A class performed an experiment to estimate the diameter of a circular object. A sample of five students had the following results in centimeters; 3.12, 3.16, 2.94, 3.33 and 3.00. determine the sample;
- (i) mean
  - (ii) standard deviation.

6. (a) Find the value of A if  $A\mathbf{i} + 2\mathbf{j} - \mathbf{k}$  and  $5\mathbf{i} + A\mathbf{j} - \mathbf{k}$  are perpendicular vectors.  
 (b) Find the angle between a force of 6N and a force of 5N given that their resultant has magnitude 9N.

7. The table below shows the income of 40 factory workers in millions of shillings per annum.

1.0	1.1	1.0	1.2	5.4	1.6	2.0	2.5
2.1	2.2	1.3	1.7	1.8	2.4	3.0	2.2
2.7	3.5	4.0	4.4	3.9	5.0	5.4	5.3
4.4	3.7	3.6	3.9	5.2	5.1	5.7	1.5
1.6	1.9	3.4	4.3	2.6	3.8	5.3	4.0

- a) Form frequency distribution table with class intervals of 0.5 million shillings starting with the lowest limit of 1 million shillings.
- b) Calculate the;
- mean income
  - standard deviation
- c) Draw an Ogive to represent the above data and use it to estimate the median income.
8. The table below shows the amount of money (in thousand of shillings) that was paid out as allowances to participants during a certain workshop.

Amount (sh '000s)	No. of participants
110 – 114	13
115 – 119	20
120 – 129	32
130 – 134	17
135 – 144	16
145 – 159	12

- (a) Find the mean, mode and median and standard deviation.  
 (b) Obtain the interquartile range  
 (c) Find the 40<sup>th</sup> and 60<sup>th</sup> percentile range

9. The table below shows marks obtained by 20 students in a math test marked out of 20

Marks	10	11	12	13	14	15	16	17	18	19
No. of students	1	2	2	2	2	4	2	1	2	1

Using assumed mean of 15, find the mean mode median and standard deviation.

10. Given the following set of values

2, 1, 3, 4, 5, 6, 7, 8, 9, 10, 3, 4, 6, 7, 6, 8, 9, 6, 3, 2

- (a) Form a frequency distribution table of ungrouped data
- (b) Use your table to obtain the: mean, Mode, median,
- (c) Find the standard deviation and interquartile range.

11. A bag contains five balls each bearing one of the numbers 1, 2, 3, 4, 5. A ball is drawn from the bag, its number noted and replaced. This was done 50 times in all and the table below shows the resulting frequency distribution.

Number	1	2	3	4	5
Frequency	x	11	y	8	9

If the mean is 2.7, determine the values of x and y.

12. Find the angle between the following pairs of vectors

- (i)  $5\mathbf{i} + \mathbf{j} - 2\mathbf{k}$  and  $4\mathbf{i} + 3\mathbf{j} - 8\mathbf{k}$
- (ii)  $-4\mathbf{i} + 2\mathbf{j} - 4\mathbf{k}$  and  $2\mathbf{i} - \mathbf{j} + 2\mathbf{k}$

13. If  $\mathbf{a} = \begin{pmatrix} 2 \\ 7 \\ 7 \end{pmatrix}$ ,  $\mathbf{b} = \begin{pmatrix} 6 \\ -3 \\ 2 \end{pmatrix}$ ,  $\mathbf{c} = \begin{pmatrix} 0 \\ -4 \\ -3 \end{pmatrix}$

- (i) Find the resultant of a and b
- (ii) find  $|\mathbf{a} + \mathbf{b} + \mathbf{c}|$
- (iii) Obtain the value of  $|\mathbf{a} + 3\mathbf{b} - 2\mathbf{c}|$ .

14. The table below shows delivery charges by DAKS courier.

Mass in (g)	200	400	600
Charges (sh)	700	1200	3000

Using linear interpolation or extrapolation, find the;

- a) Mass of a parcel whose delivery charge is shs. 3500
- b) Delivery charge of a parcel weighing 352g

15. Use the trapezium rule with 7 ordinates to estimate  $\int_0^3 \frac{1}{1+x} dx$  correct to 3dp.

**END**