

PAPER 2**SECTION 1 (50 MARKS)****Answer ALL questions in the spaces provided**

1. Evaluate without using tables or calculator.

(3mks) *BND*

$$\left[\frac{4}{11} \right]^2 \text{ of } \left[\frac{3}{5} - \frac{1}{20} \right]$$

$$(1^{4/5} + 1^{2/5}) \div (1^{1/5} + 9^{9/10})$$

2. Using a calculator, simplify

(2mks) *BND*

$$\frac{1.32 \times 1.62 + 2.64 \times 1.19}{0.66 \times 7.27 - 0.66 \times 2.27}$$

3. Use matrix method to determine the co-ordinates of the point of intersection of the two lines. (3mks) *BND*

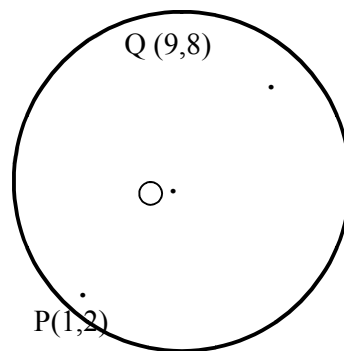
$$3x - 2y = 13 \quad , \quad 2y + x + 1 = 0$$

4. Solve for x,

(3mks) *BND*

$$[\log_2 x]^2 + \log_2 8 = \log_2 x^4$$

5. P and Q are the points on the ends of the diameter of the circle below.

a) Write down in terms of x and y the equation of the circle in the form ;
 $ax^2 + by^2 + x + y + c = 0$

(2mks) *BND*

b) Find the equation of the tangent at Q in the form $ax + by + c = 0$.

(2mks) *BND*

6. a) Expand $\left(a - \sqrt{5}\right)^5$ (2mks) *BND*

b) Use your expansion to evaluate $\left(a - \sqrt{5}\right)^5$ when $a = -2$ and $\sqrt{5} = 2.2361$ giving your answer to 5 significant figures. (2mks) *BND*

7. Simplify the expression. (4mks) *BND*

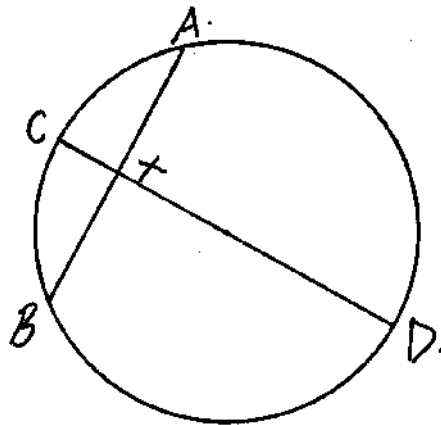
$$\frac{2x^2 - 3xy - 2y^2}{4x^2 - y^2} \div \frac{2x + y}{2x - y}$$

8. The cost per kg of two brands of tea x and y are shs. 60 and shs. 80. The two brands are mixed and sold at a profit of 20% above the cost. If 1 kg mixture was sold at shs. 78, determine the ratio in which the two brands were mixed. (3mks) *BND*
9. Make P the subject of the formular. (3mks) *BND*

$$YP - X + \frac{Q}{P} = O$$

10. A farmer wishes to enclose a rectangular nursery against a long straight wall. He has 40m of fencing wire. What is the largest area he can fence using the wire. (3mks) *BND*

11. In the figure below, not drawn to scale, $AX = 3\text{cm}$, $XB = 3\text{cm}$ and $\angle CXB = 90^\circ$. Given that the circle has a radius of 4.5cm. Calculate the length CD. (2mks) *BND*



12. Given that $\mathbf{OA} = 3\mathbf{i} + 2\mathbf{j} - 4\mathbf{k}$ and $\mathbf{OB} = 4\mathbf{i} + 5\mathbf{j} - 2\mathbf{k}$. P divides AB externally in the ratio 3: -2. Determine the position vector of P in terms of \mathbf{i} , \mathbf{j} and \mathbf{k} . (3mks) *BND*

13. Find the sum of the first six terms of the progression given;

$$\log 2x + \log 4x + \log 8x + \log 16x + \dots$$

leaving your answer in the form $a \log bx^2$ where a and b are integers. (3mks) *BND*

14. A varies as B and inversely as the square root of C. When B is increased by 26%, C is reduced by 19%. Find the percentage change in the value of A. (4mks) *BND*

15. Solve the equation $4 - 4 \cos^2 x = 4 \sin x - 1$ for the range $0^\circ \leq x \leq 360^\circ$. (3mks) *BND*

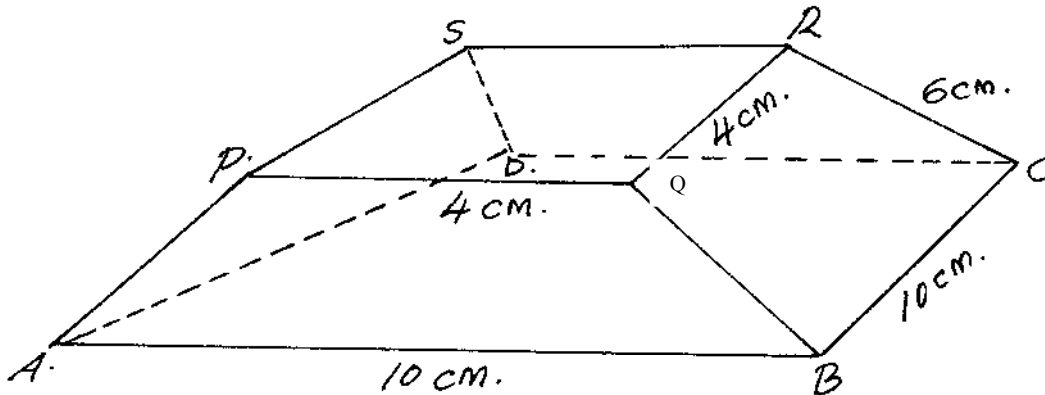
16. Given that $\tan \theta = x$, show that (3mks) *BND*

$$\frac{\cos \theta \sin^2 \theta + \cos^3 \theta}{\sin \theta} = \frac{1}{x}$$

SECTION II (50 MARKS)

Answer any FIVE questions

17. The velocity of a particle is given as $V = 12t - 2t^2$.
- determine the distance of the particle in terms of t if the distance is 6 metres. When $t = 1$ sec. (2mks) *BND*
 - determine the distance moved by the particle during the third second. (2mks) *BND*
 - calculate the maximum distance moved by the particle. (2mks) *BND*
 - determine the acceleration after 2 seconds. (2mks) *BND*
 - when is the velocity maximum? (2mks) *BND*
18. A jewellery room is guarded by three policemen X, Y, and Z. A thief on his way in has to pass X, Y and Z in that order. On his way out after stealing the jewellery has to pass Z, Y and X in that order. The probability of being caught by X is $\frac{1}{3}$, Y is $\frac{1}{5}$ and Z is $\frac{1}{4}$, on his way in and X is $\frac{5}{6}$, Y is $\frac{2}{5}$ and Z is $\frac{2}{3}$ on his way out. Find the probability that;
- the thief is caught by policeman Z. (4mks) *BND*
 - the thief is caught by Y on his way out. (1mk) *BND*
 - the jewellery is stolen and the thief escapes. (2mks) *BND*
 - the thief stole the jewellery but is caught on his way out. (3mks) *BND*
19. The diagram below shows a frustum of a square based pyramid. The base ABCD is a square of side 10cm. The top PQRS is a square of side 4cm and each of the slant edges are 6cm



- Calculate the height of the pyramid. (4mks) *BND*
 - A point X is $\frac{1}{4}$ of the height of the pyramid from the base. Calculate the angle that line AX makes with the base. (2mks) *BND*
 - Calculate the angle between planes PQRS and BCRQ. (4mks) *BND*
20. The masses of 50 loaves of bread were taken and recorded in the table below.

Mass	470	-	480	-	490 - 499	500 - 509	510 - 519	520 - 529	530	-
(gms)	479		489						539	

No. of loaves	1	3	11	21	8	4	2
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a) Using an assumed mean of 504.5, calculate the mean mass. (4mks) *BND*

b) Use the formula

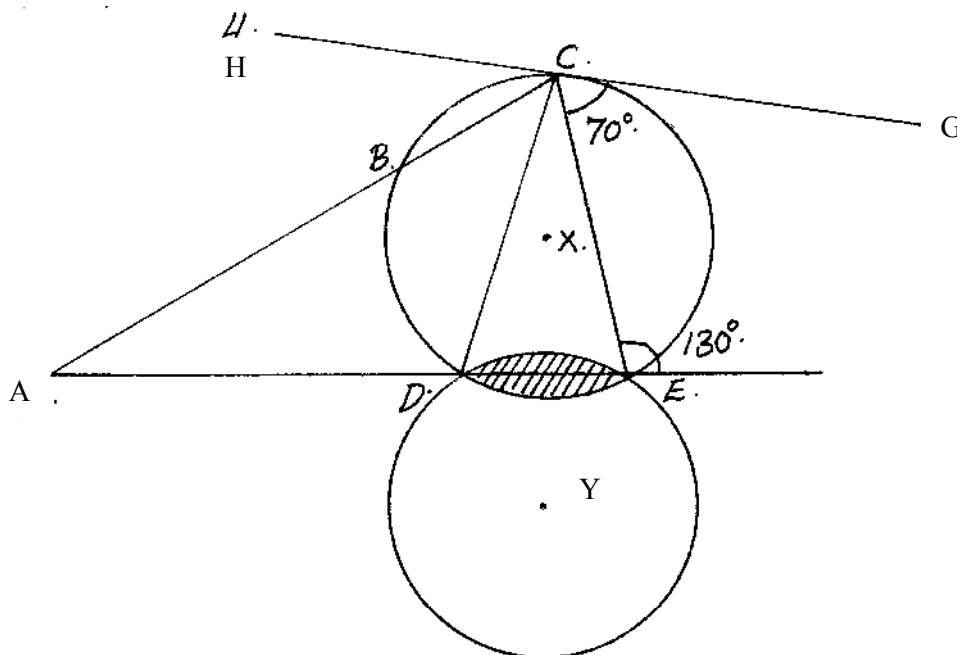
$$S^2 = C^2 \left\{ \frac{\sum d^2 f}{\sum f} - \left(\frac{\sum fd}{\sum f} \right)^2 \right\}$$

Where $d = \frac{x - a}{c}$, calculate the variance. (2mks) *BND*

c) Calculate the standard deviation. (3mks) *BND*

d) If 5 is added to each score and then divided by 3, write down the new standard deviation. (1mk) *BND*

21. The diagram below shows two intersecting circles with centers X and Y. HG is a tangent to the circle center X at C. $\angle GCE = 70^\circ$ and $\angle CEF = 130^\circ$. Given that CB = 5cm, BA = 4cm, AE = 12cm and radius DY = 6cm



a) Determine;

(i) Angle DXE (2mks) *BND*

(ii) Length DE (2mks) *BND*

b) Hence, calculate the area of the shaded region. (6mks) *BND*

22. a) Complete the table below for the graph of $y = \cos(4x - 60^\circ)$ for $0^\circ \leq x \leq 180^\circ$.

(2mks) *BND*

x	0	15	30	45	60	75	90	105	120	135	150	165	180
4x	0	60	120	180	240	300	360	420	480	540	600		
$4x - 60^\circ$	-60		60		180	240	300		420	480	540		
$y = \cos(4x - 60^\circ)$	0.5		0.5	-0.5	-1		0.5						

b) Using the scale of 1cm to represent 15° on the x - axis and 4cm to represent 1 unit on the y-axis, draw the graph of $y = \cos(4x - 60^\circ)$ for $0^\circ \leq x \leq 180^\circ$. (3mks) *BND*

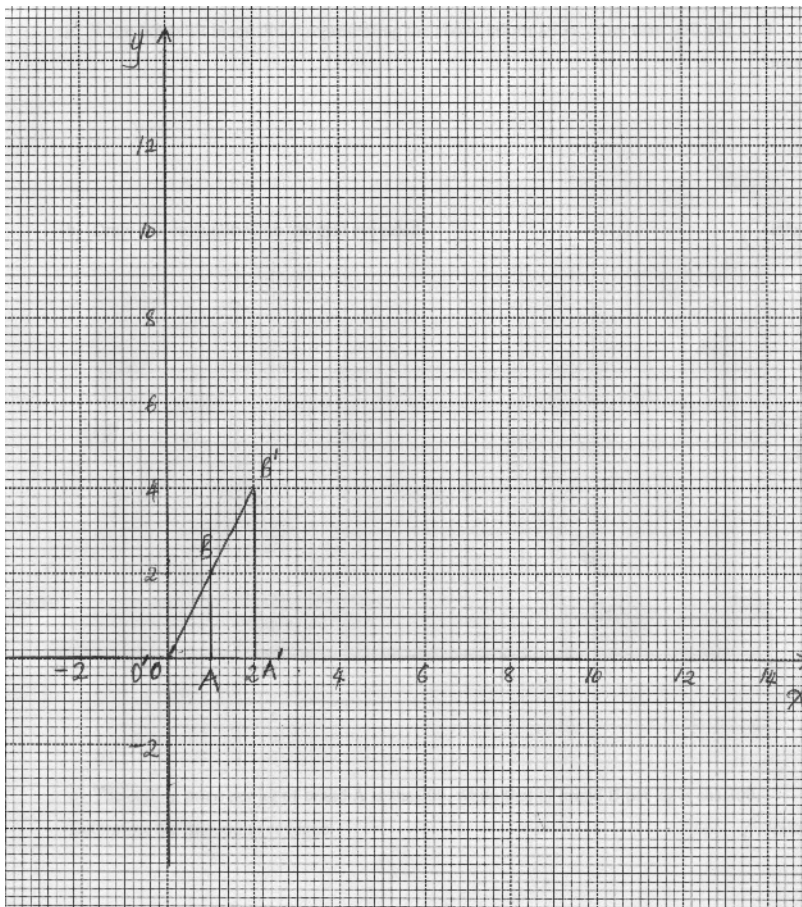
c) Use your graph to solve the equations.

(i) $1 + \cos(4x - 60^\circ) = 1$ (1mk) *BND*

(ii) $5 \cos(4x - 60^\circ) = 1$ (2mks) *BND*

d) State the period and the phase angle of the graph. (2mks) *BND*

23. The figure on the grid shows a triangular object OAB and its image $O^1A^1B^1$.



- a) Determine the matrix that transforms triangle OAB on to triangle O'A'B'. (3mks) *BND*
- b) (i) A transformation T whose matrix is $\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$ is applied on triangle O'A'B' to produce

triangle O¹¹A¹¹B¹¹. Find the coordinates of A¹¹ and B¹¹. (3mks) *BND*

(ii) Draw the image O¹¹A¹¹B¹¹ and describe the transformation T. (2mks) *BND*

24. To prepare two brands of coffee, A and B, a dealer uses 480kg of Robusta and 500kg of Arabica coffee. To prepare brand A, he uses 60% Robusta and 40% Arabica coffee. To prepare brand B he uses 50% Robusta and 50% Arabica coffee. The ratio of brand A to brand B does not exceed 3:5

- a) Write down all inequalities representing the above information, other than $y > 0$ and $x > 0$ (3mks) *BND*
- b) Draw the inequalities on the grid provided. (4mks) *BND*
- c) The selling price per kg of brand A is shs.200, while that of brand B per kg is shs.300. Determine the maximum revenue. (3mks) *BND*