

UCE MATHEMATICS PAPER ONE GUIDE QUESTIONS 2

F. CURVE SKETCHING

1. (a) For $-4 \leq x \leq 4$, draw the graphs of $y = 6 + x - 2x^2$ and $y = 5x$ Using 2cm: 1 unit horizontally and 2cm: 5 units vertically.

(b) Use your graph in (a) above to solve the simultaneous equations $y = 6 + x - 2x^2$ and $y = 5x$.

2. a) Draw on the same axes the graphs of $y = \cos x$, and $y = \sin x$ in the domain $-180^\circ \leq x \leq 180^\circ$. Use intervals of 30° and scale of 2cm: 30° , for horizontal axis and 2cm:0.5 on vertical axis.

b) Use your graph to solve the equations below.

(i) $4\sin x = 3$

(ii) $\sin x - \cos x = 0$

3. (a) (i) Draw a table for values y and x for the curve $y = 10 - x^2$. Use values of x from -4 to 4 .

(ii) Use your table to draw a graph of $y = 10 - x^2$

- (b) On the same axes, draw a graph of the line $y = 2x + 3$ (c)

Use your graph to solve the equation $x^2 + 2x - 7 = 0$

4. a) Copy and complete the table below:

x°	-180	-150	-120	-90	-60	-30	0	30	60	90	120	150	180
$y = 2\sin x^\circ$				-2.0			0			2.0			0
$y = 2\cos 2x^\circ$				-1.0			1.0			-1.0			1.0

b) On the same square paper, draw the graphs of $y = 2\sin x^\circ$ and $y = 2\cos 2x^\circ$

c) Use your graphs to solve the equation: $2\sin x^\circ - 2\cos 2x^\circ = 0$

5. a) On a squared paper, draw the graph of $y = 2x^2 - 49x$ for $0 \leq x \leq 3$.

b) On the same axes draw the line $y = 23x$.

c) Use your graph to solve the equation $x^2 - 23x + 60 = 0$

- 6.a) Copy and complete the table of values of x and y for the curve $y = x^2 - 8$ for $-5 \leq x \leq 5$.

x	-5	-4	-3	-2	-1	0	1	2	3	4	5
x^2											
-8											
y											

b). Use your table to draw a graph of $y = x^2 - 8$

c) On the same axes, draw the graph of line $y = 3x - 4$

d). Use your graphs to solve the equation $x^2 - 3x - 4 = 0$

7. (a). Copy and complete the table below in which $y = 12x^2$ for $-4 \leq x \leq 4$

X	-4	-3	-2	-1	0	1	2	3	4
X^2				1					
$Y = 12 - X^2$				11					

(a). Draw the graph of $y = 12 - x^2$ for $-4 \leq x \leq 4$

(b). Use your graph to solve the equation $12 - x^2 = 0$

(c). On the same axes, draw the graph of $y = 2x + 5$

(d). Use your graphs to solve the equation $x^2 + 2x - 7 = 0$

8. Copy and complete the table below;

X	-4	-3	-2	-1	0	1	2	3	4	5
6					6					6
$-x^2$	-4									
Y	-16						-4			

(a) On the same axes draw the graphs of $y = 6 + x - x^2$ and $y = 2 - 2x$.

(b) From your graphs find the values of x for which $6 + x - x^2 = 2 - 2x$. (c) Form a quadratic equation that satisfies the values in (b) above.

9. a) Copy and complete the table below for the graph of $y = 5 - 3x - 2x^2$

x	-3	-2	-1	0	1	2	3	4
$-2x^2$	-18		-2	0	2			-32
$5 + 3x$	-4		2	5		11	14	
y	-22			5		3		-15

b) Use the table in (a) above to draw the graph of $y = 5 - 3x - 2x^2$ for $-3 \leq x \leq 4$

c)

Use your graph to solve;

i) $5 - 3x - 2x^2 = 0$ ii) $x^2 - x - 2 = 0$

10. Draw the graph of the curve $x^2 - 2x + 1$ for $-3 \leq X \leq 3$.

Use your graph to find the solutions of the following equations

(i). $x^2 - 2x + 1 = 0$

(ii). $2x^2 - x - 6 = 0$

G. CONSTRUCTION

1. Using a ruler and a pair of compasses only

(a) Construct a triangle ABC such that $AB = 8\text{cm}$, $\angle ABC = 60^\circ$ and $\angle BAC = 75^\circ$. Measure the length BC. Hence calculate the area of the triangle ABC

(b) Construct a circum circle to the triangle ABC. Measure the radius of the circle.

2. a) Using a ruler and a pair of compasses only, construct a triangle ABC such that $AC = 9.6\text{cm}$, $BC = 4.8\text{cm}$ and the angles $BAC = 30^\circ$ and $ABC = 90^\circ$, D is a point on BC produced 2.7cm away from AB

- b) Construct a circle circumscribing triangle ACD such that it also passes through the point E. measure
- (i) Lengths AB and BE
 - (ii) Angle ADC
 - (iii) Radius of the circle
3. Using a ruler, pencil and a pair of compasses only;
- (i) Construct a triangle ABC, where $BC = 7.2\text{cm}$, $AC = 8.4\text{cm}$ and angle $ABC = 75^\circ$. Measure AB and angle ACB .
 - (ii) Draw a circle circumscribing triangle ABC, measure the radius of the circle.
4. Using a ruler and a pair of compasses and a pencil only;
- (i) Construct a triangle PQR in which $QR = 12\text{cm}$, $PQ = 8\text{cm}$ and $\angle PQR = 75^\circ$.
 - (ii) From P construct a perpendicular to QR to meet QR at S.
 - (iii) Construct the bisector of $\angle PRQ$ to meet PS at T
 - (iv) Measure and write down the length of QT.
5. a). Using a ruler, a pencil and a pair of compasses only:
- (i) Construct a triangle PQR in which $PQ = QR = 6.4\text{ cm}$ and angle $PQR = 105^\circ$. Measure and state the length of PR and Angle PRQ
 - (b) Construct a perpendicular line from point P to meet QR produced at N. Also locate points S on PN produced such that $PR = SR$.
 - (i). measure and state the length of PS
 - (ii). Draw an inscribed circle of the $\triangle PRS$ and hence state the radius of the circle.
6. Using a ruler, pencil and a pair of compasses only, construct
- (a). a triangle ABC in which $AB = 9.5\text{cm}$, $BC = 10.7\text{cm}$ and angle $BAC = 60^\circ$. Measure angle ACB.
 - (b) the perpendicular bisectors of AC and BC to meet at a point N.
 - (c). Hence draw a circumscribing circle to triangle ABC and measure the radius of the circle.
 - (d). Calculate the area of the circle (Take $\pi = 3.142$)
7. (a). On a squared paper, plot the points A (2, 3.5), B (6.5, 3.5) C (4.5, 6.5). Join them to form triangle ABC. (b) . Using a ruler and pair of compasses only, draw a circle that passes through A, B and C.
- (c). State the coordinates of the centre of the circle.
 - (d). Calculate the area of the minor segment cut off by the chord AC.
8. Using a ruler and pair of compasses only
- (a). Construct triangle PQR with $PQ = 4\text{cm}$, $PR = 10\text{cm}$ and $\angle QPR = 60^\circ$.
 - (b). Construct the circum circle of triangle PQR, measure and state its radius.
 - (c). Find a point S where the bisector of angle PQR meets the circle. Measure QS.

9. Using a ruler, a pencil and a pair of compasses only,
- Construct a triangle PQR with $\overline{PQ} = 8$ cm and $\overline{PR} = 12$ cm and angle PQR = 120° .
 - Draw a perpendicular from R onto \overline{PQ} produced meeting \overline{PQ} at S.
 - Draw a circle with centre T and radius ST where T is a point equidistant from S, P, and R. Hence calculate the circumference of the circle.

10. Construct without using a protractor triangle ABC so that BC = 10cm, $\angle ABC = 60^\circ$ and $\angle BCA = 45^\circ$

- On the diagram, measure length of AC
- Circumscribe triangle ABC
- Construct the locus of a set of points which are equidistant from A and B. Hence mark a point P such that $\angle APB = 45^\circ$ and AP = PB.

H. BEARING

- A plane flew from town A on a bearing of 050° to town B at a speed of 100 km h^{-1} for 5 hours. From B, the plane changed course and flew on a bearing of 110° to town C at a speed of 150 km h^{-1} for 4 hours.
 - Calculate the
 - Distance of town C from town A
 - Bearing of town C from town A
 - If the plane return from town C directly to town A at a speed of 200 km h^{-1} how long will it take?
- Town B is 55km from town A on a bearing of 050° . A third town C lies 75km due south of B. Given that town D lies on a bearing of 255° from C and 170° from A, make an accurate scale drawing to show the positions of the four towns. (Use a scale of 1cm to represent 10km)

From this find;

 - The distance of AD and DC in km (b) The distance and bearing of B from D
 - The bearing of C from A.
- A helicopter left Kampala at 0600 hours and flew on a bearing of 090° , at a velocity of 300 km per hour . It landed at Nairobi Airport at 0830 hours. At exactly 0900 hours, it left Nairobi Airport and flew on a bearing of 340° , at the same original velocity. It then landed at Kitgum Airstrip at 1200 hours. Using graphical construction and a scale of $1 \text{ cm} : 100 \text{ km}$, find the:
 - Distance of Kitgum from Kampala
 - Bearing of Kampala from Kitgum.
- The bearing of port K to port L is 053° while the bearing of M from H is 210° . Port N is due East of M and a distance of 60km. A part K to L and L to M is 58km and 72km respectively. Use a scale of 1cm to represent 10km, draw an accurate diagram to represent the four ports.
 - Find the shortest distance between K to N in km ii) Find the bearing of port N from K
- A plane moved from town P to town Q 370km away on a bearing of 305° . From Q, it altered its course to town R 430km away on a bearing of 240° . From town R, it then moved to town S 345km away on a bearing of 125° .

- Draw a sketch to show the flight of the plane.
- Using a scale of 1cm to represent 50km, draw an accurate diagram to show the path the plane took.
- Using the accurate diagram, calculate;

- (i) the shortest distance between town p and town s.
- (ii) the bearing of p from town s.
- (iii) the total time taken by the plane if it was travelling at a speed of 250km/hr to move from town p to town s if the plane stopped for refueling at town Q and R for 30 minutes each.

I. PROBABILITY THEORY

1. (a) In a certain S. 4 class, it was found out that only $\frac{5}{7}$ of the 210 students had done the holiday work.
 Determine the number of students who had not done the holiday work.
 - (b) A bag contains 5 red apples and 4 green apples. Kimala picks two apples one at a time from the bag with replacement after showing it to the friends. Draw a tree diagram to illustrate the above and use it to find the probability that the two apples picked are
 - (i) of the same colour
 - (ii) of different colours
2. a) Two dice are thrown together. Write down the possibility space. Hence find the probability that;
 - (i) both dice show up prime numbers
 - (ii) the sum of the two numbers shown is more than 8.
 b) an integer is chosen at random from 2,3,4,5,6,7,8,9 and 10. What is the probability that it is a factor of
 - (i) 120
 - (ii) 246
 (d) The following are the percentage marks obtained by ten pupils in a mathematics test. 12, 3, 39, 61, 40, 10, 28, 40, 15, 52. Find the probability of a pupil selected at random from this group having obtained a mark below the mean mark.
3. (a) Alice was given three numbers; 3, 1 and 5 to form three digit numbers. Write down the possible three digit numbers she formed. If a number is picked at random find the probability that it is less than the range of numbers formed.
 - (b) The probability of picking a white ball is $\frac{2}{5}$ a red ball is $\frac{1}{4}$ and there are seven green balls in that same bag. Find the number of;
 - (i) white
 - (ii) red balls in the bag.
4. A bag contains six mangoes, 5 apples and 4 pineapples. Three fruits were picked one at a time without replacement. Find the probability that,
 - (a) Both fruits are mangoes
 - (b) The first fruit is an apple
 - (c) The fruits picked are of the same colour

5. A bag contains 5 red balls, 3 blue balls and 2 yellow balls. A ball is drawn and not replaced. A second ball is drawn. Find the probability of drawing
- two red balls
 - one blue ball and one yellow ball,
 - two yellow balls,
 - two balls of the same colour.
6. A six sided die is thrown three times. Draw a tree diagram, showing at each branch the two events: 'six' and 'not six'. What is the probability of throwing a total of
- three sixes
 - no sixes
 - one six
 - at least one six.
7. A die has its faces marked 0, 1, 1, 1, 6, and 6. Two of these dice are thrown together and the total score is recorded. Draw a tree diagram.
- How many different totals are possible?
 - What is the probability of obtaining a total of 7?
8. A coin and a die are tossed. All the possible outcomes are shown in the table

		die					
		1	2	3	4	5	6
coin	H	H1	H2	H3	H4	H5	H6
	T	T1	T2	T3	T4	T5	T6

Find:

- $P(\text{a tail and even number})$
 - $P(\text{head})$
 - $P(1, 2 \text{ or } 3)$
 - $P(\text{head and } 6)$
 - $P(\text{head or } 6)$.
9. Two coins are tossed. Represent the possible outcomes on a probability tree and find the probability that
- both are heads
 - only one is a head
 - neither is a head.
10. There are 4 red and 6 yellow counters in a box. One is picked out and replaced, then a second is picked. Draw a probability tree to show all the possible outcomes and use it to find
- $P(\text{red})$
 - $P(2 \text{ yellow})$
 - $P(1 \text{ red, } 1 \text{ yellow})$.

11. The probability that it will rain in a certain part of the country on any one day is $\frac{1}{7}$. Use a probability tree to find

7

the probability that out of any two days

- (a) both will be dry
- (b) only one will be dry
- (c) it will rain on both days.

12. A fair, six-sided die is thrown. If event S is throwing a 6 and event N is throwing another number, draw a probability tree to show the possible outcomes of throwing the die twice. Find

- (a) $P(\text{two sixes})$
- (b) $P(\text{one six})$
- (c) $P(\text{no sixes})$

13. If two dice are thrown together, find the probability that:

- (a) they show the same number,
- (b) they show different numbers,
- (c) the sum of their numbers is 5.

14. Anne plays two games of table tennis against Betty. If the probability of Anne beating Betty in any one game of 4

table tennis is $\frac{1}{5}$, what is the probability of Betty:

- (a) winning both games,
- (b) winning the first game and losing the second one,
- (c) winning one of the two games.

15. In a super market, it was found that out of 100 apples in a box, 10 were bad and could not be sold. Three apples are picked at random from the box (replacing the previous one each time). What is the probability that:

- (a) all the three are good,
- (b) none of them is good,
- (c) 2 or 3 are bad.

16. If two dice are thrown together and their scores recorded as ordered pairs (1, 1), (1, 2), e.t.c, construct a table to show all the possible outcomes. Find the probability that they show:

- (a) the same number,
- (b) different numbers,
- (c) 2 as one of the numbers.

17. A bag contains red beads, blue beads and green beads. The probability that a bead drawn at random from the bag will be red is $\frac{3}{5}$ and that it will be blue is $\frac{3}{10}$. What will be the probability that it will be green?

If the bag contains a total of 100 beads, determine the number of beads of each colour.

18. In a shooting practice, two soldiers Ali and Ben fire shots alternatively at a target. Ali fires first. The probabilities of Ali and Ben hitting the target with any shot are $\frac{1}{3}$ and $\frac{2}{5}$ respectively. Using a tree diagram, or otherwise, find the probability that:
- they will both miss the target with their first shot,
 - Ben, in his second round, will be the first to hit the target,
 - Ben will hit the target at least once with his first three shots.
19. A family of three children can be represented by BGB, where B, G and B represents boy first, followed by a girl, followed by another boy. Write down all the eight possible codes fro a family of three children.
- Taking $P(B) = P(G) = \frac{1}{2}$, find the probability that a family of three children will contain:
- all three boys,
 - at least one girl,
 - at most one boy.
20. A bag consists of beads of which 5 are red, 7 are blue and 8 are yellow. Three beads are to be taken, at random. Calculate the probability that the beads will be:
- all yellow,
 - all three of the same colour
 - all three of different colour,
 - all three are not of the same colour.

J. ALGEBRA

1. a) (i) Make x the subject of formula.

$$\frac{7}{x} - \frac{z}{y} = \frac{y}{x y z}$$

- (ii) Find the value of x when $y = 2$ and $z = 5$.

- b) Matovu's present age is $\frac{1}{4}$ of his mother's age. In eight years' time, he will be $\frac{1}{3}$ of his mother's age then. How old is his mother?

2. (a) Jacob is now twice as old as his son. Twenty years ago, the product of their ages was 750. Determine the present age of Jacob and his son.

- (b). Given that $R = \sqrt{\frac{Mb^3}{t}}$ make b the subject of the formula. Hence find the value of b when $R=50$, $M=8$ and $t=0.4$.

3. The table below shows the rooms available each night and the charges at Zebra Hotel.

	Double room (for 2 people)	Single room (for 1 person)
--	----------------------------	----------------------------

Number of rooms available	78	42
Charges for each room	£83	£54

- a. Calculate the greatest number of people the hotel can accommodate each night.
 - b. On one particular night, 56 double rooms and 34 single rooms were occupied. Express the total number of rooms occupied as a percentage of the total number of rooms available in the hotel. Correct to two decimal places.
 - c. Express the number of people accommodated this night as a percentage of the greatest number the hotel can accommodate.
 - d. Calculate the total charge for the rooms occupied that night.
4. Consider a two – digit number PQ in base ten, the sum of whose digits is 8. When the order of the digits is reversed, the figure QP exceeds PQ by 36.
- (a) Form two suitable equations in P and Q .
 - (b) Use the equations in (a) above to find the values of the two – digit numbers PQ and QP .
5. A piece of wire 26cm long is cut into two parts. The first part is bent to form a square. The second part bent to form a rectangle having length x cm and width 3cm.
- (a) If the sum of the areas of the square and rectangle is B cm², show that

$$B = \frac{x^2}{4} - 2x + 25 \qquad [8\text{mks}]$$
 - (b) Given that $B = \frac{85}{4} \text{cm}^2$, solve the equation. Hence find the side of a square.

END

HUNT FOR QUESTIONS PLEASE SINCE THIS IS JUST A PORTION Compiled by NM