**UCE PRACTICE MATHEMATICS 2019**

1. Express 90 as a product of prime factors. Hence find the LCM of 90 and 105.
2. Solve the equation:
3. Express in the form , where and are constants.
4. Solve: .
5. A parallelogram has vertices at , and Use vector method to find the coordinates of .
6. Two cylindrical cans are mathematically similar. The larger can has a capacity of 1litre and the smaller can has a capacity of 440ml. calculate the diameter , of the smaller can, if the larger can has a diameter of 12 cm.
7. If and that , find the value of .
8. The average between a two-digit number and the number obtained by interchanging the digits is 55. If the difference between the two numbers is 18, find the difference between the two digits of the numbers.
9. Given that and , form an expression for
10. The simple interest on a certain sum of money for 3 years is Shs. 2,250 and the compound interest on the same sum of money at the same rate for 2 years is Shs. 1,530. Calculate the principle invested.
11. Pipe A takes 20 minutes to fill a tank and Pipe B takes 30 minutes to fill the same tank while Pipe C can empty the tank in 40 minutes. If the three pipes work together (simultaneously), find the time taken to fill the tank.
12. (a) Given the points and , find the position vector of **M**, the mid-point of .

(b) Given that , and , where *m* and *n* are scalars, find the values of *m* and *n* such that

1. 24 dogs are in a kennel. 12 of the dogs are black, 6 have short tails and 15 have long hair. One dog has a short tail, long hair and is black. Two of the dogs are black with short tails but have short hair. Other two dogs have short tails, long hair and are not black.
2. Represent the above information on a Venn diagram.
3. How many dogs are black with long hair and with long tails?
4. If a dog is picked at random from the Kennel, find the probability that it is not black but has a short tail.
5. (a) Given that , , and , find the values of a and b. Hence evaluate .

(b) If and , determine the values of , for which

(C) Given that and ,

(i) Form an expression for .

(ii) Hence find .

1. In the figure below, and .



1. Given that and , express the following vectors in terms of p and q as simply as possible:



(i) PQ (ii) PX (iii) OX (iv) VX

1. Also given that and , express ***h*** and ***k*** in terms of ***a***.
2. The diagram below shows a sandpit in the children’s play area. The shape of the sandpit is a sector of a circle of radius 2.25 m and a sector of angle 56o.



1. Calculate the area of the sandpit.
2. The sandpit is filled with sand to a depth of 0.3 m. Calculate the volume of sand in the sandpit.
3. Given that the sand is completely removed and transferred into a rectangular pit measuring 1.5 m by 1.2 m and fills the new sandpit, calculate the height of the new sandpit.
4. The figure below shows the structure for the roof of a house ABCDEF with a rectangular bottom ABCD. , , and the ridge above the base ABCD.

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Calculate the;

1. Length of BE and BF.
2. Angle between BF and the base ABCD.
3. Volume of air in the roof space.
4. (a) Express in the form , where a is an integer.

(b) An equilateral triangle has sides of length .

1. Show that the height of the triangle is , given that
2. Hence or otherwise find the area of the triangle in the form , where ***p*** and ***q*** are integers.
3. Matrices A and B are such that and . Find the matrix B.



The position vectors of points A and B relative to the origin are and respectively. The points P and Q are such that and . The point R lies on OA such that RQP is a straight line where and .

1. Express and in terms of **a** and **b**.
2. Express in terms of , **a** and **b**.
3. Express in terms , **a** and **b**.
4. Hence find the values of and .
5. The diagram below shows points A, B and C with position vectors **a**, **b** and **c** respectively relative to the origin. The point P lies on AB such that . The point Q lies on OC such that .



1. Express in terms of **a** and **b** and hence show that .
2. Find PQ in terms **a**, **b** and **c**.
3. Given that , find **c** in terms of **a** and **b**.



The diagram above shows a square ABCD of sides 16 cm. M is the mid-point of AB. The points E and F are on AD and BC respectively such that AE = BF = 6cm. EF is an arc of the circle with Centre M, such that angle .

1. Fine the value of , correct to the nearest degree.
2. Calculate the perimeter of the shaded region.
3. Calculate the area of the shaded region.
4. (a) Given that , find .

(b) Using your answer in (a) above, or otherwise, find the values of a, b, c and d such that .



(a) The diagram shows a triangle ABC in which angle . Sides AB and AC are and respectively. Find in the form , where **a** and **b** are integers.

(b) A number is selected at random from the set {1, 3, 5, 7, 9} and added to another number also selected at random from the set {2, 4, 6, 8, 10}.

1. Draw up a table showing all the possible sums.
2. Write down the least and most likely sums. Hence find their corresponding probabilities.
3. Calculate the probability that:
4. the sum is odd and prime.
5. the sum is divisible by three.
6. Using a ruler, a pencil and a pair of compasses only,
7. Construct a triangle BCK with angle , cm and cm.
8. Draw a circumcircle of triangle BCK and construct a perpendicular to line BC passing through point K to meet the circle at point D.
9. Measure the;
10. radius of the circle.
11. lengths KD and CD.
12. angles KBC and KDC
13. The cost Shs. C of making N copies of books is partly fixed and partly proportional to N. It takes Shs. 600,000 to make 50 copies and Shs. 1,080,000 to make 100 copies. Each book can be sold at Shs. 16,000 and a tax of 10% has to be paid on all sales.
14. Form an equation for the cost C and the number of book N.
15. Find the profit made when 200 copies are produced and sold.
16. If the profit must be more than Shs. 512,000, find the least number of books to be made.
17. (a) Two functions and are such that and . Solve for if .

(b) A function is such that for which .

1. Find h-1(*x*) and h‑1(2).
2. Find h2(*x*), giving your answer in its simplest form.
3. Find the value of *x* for which h(*x*) is meaningless.

10 *cm*

24 *cm*

**Q**

**P**

**A**

**B**

The diagram shows a circle, centre A, radius 10 cm intersecting a circle, centre B, radius 24 cm. The two circles intersect at points P and Q. The radii AP and AQ are tangents to the circle with centre B. The radii BP and BQ are tangents to the circle with centre A. Find the;

1. Size of angles PAQ and PBQ.
2. Perimeter of the shaded region.
3. Area of the shaded region.
4. A bag contains 60 tennis balls, some of which are white and others are blue. If the probability of drawing a white ball at random is , how many blue balls are in the bag.
5. A cyclist stars at 8:00 am and moves at a steady speed of 25 km/h to cover a distance of 105 km. at 9:00 am, a motorist takes off from the same place travelling at 50 km/h to reach the same destination. After 1 hour, the motorist stops for a rest of an hour, and then continues with his journey at the same speed.
6. Using a scale 4cm:1hr and 1cm:5km, draw the graphs to represent the two journeys.
7. Use your graph to find;
8. When and where the motorist first catches up with the cyclist.
9. When and where the motorist over takes the cyclist.
10. How far apart are the two men at 10:30 am.
11. The manager of a football club has 100,000 US dollars to spend on buying new players. He can buy defenders at 6,000 dollars each and forwards at 8,000 dollars each. There must be at least 6 of each sort. To cover for injuries, he must buy at least 13 players altogether. If ***x*** represents the number of defenders he buys and ***y*** the number of forwards;
12. In what ways can he buy players?
13. If the wages are 10,000 dollars per week for each defender and 20,000 dollars per week for each forward, what is the combination of players which has the lowest wage bill?
14. A shop keeper buys two types of cat food for his shop: Bruno at 0.4 US dollars a tin and Blaze at 0.6 US dollars a tin. He has 15 dollars available at decides to buy at least 30 tins altogether. He also decides that at one third of the tins should be Blaze. He buys x tins of Bruno and y tins of Blaze.
15. Write down three inequalities which correspond to the above conditions.
16. Illustrate these inequalities on a graph.
17. He makes a profit of 0.1 dollars a Tin on Bruno and a profit of 0.2 dollars a Tin on Blaze. Assuming he can sell all his stock, find how many tins of each type she should buy to maximize his profit and find that profit.
18. (a) The length of the sides of an equilateral triangle ABC is *2x* units.
19. Show with the help of the triangle that
20. Without using tables or calculator, find the value of

(b) Draw the graph of for .

1. (a) Draw the graph of for which .

(b) From your graph find the;

1. Range of the function.
2. Minimum value of y and the value of x at which this minimum value occurs.
3. Solution of the equation
4. Solution of the inequality
5. (a) Copy and complete the following table of values for the curve between and .

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **-4** | **-3** | **-2** | **-1** | **0** | **1** | **2** | **3** | **4** | **5** |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |

(b) Using the values in (a) above, draw the graph of for . (Use a scale of 1cm:1 unit on both axes).

(c) Use your graph to solve;

1. .
2. .

(d) From your graph, find the;

1. Range of the values of *x* for which .
2. Value of *x* for which .
3. The image of triangle and under a rotation is triangle , and .
4. Determine the centre and angle of rotation.
5. The triangle is then reflected in the line to give triangle . Use your graph to find the coordinates of and .