

29.3 MATHEMATICS (121)

29.3.1 Mathematics Alternative Paper 1 (121/1)

SECTION I (50 marks)

Answer **all** the question in this section in the spaces provided.

- 1 Without using a calculator evaluate,

$$\frac{-2(5+3) - 9 \div 3 + 5}{-3 \times -5 + -2 \times 4}.$$

(3 marks)

- 2 Kutu withdrew some money from a bank. He spent $\frac{3}{8}$ of the money to pay for Mutua's school fees and $\frac{2}{5}$ to pay for Tatu's school fees. If he remained with Ksh 12 330, calculate the amount of money he paid for Tatu's school fees. (4 marks)

- 3 A straight line l passes through the point $(3, -2)$ and is perpendicular to a line whose equation is $2y - 4x = 1$. Find the equation of l in the form $y = mx + c$, where m and c are constants. (3 marks)

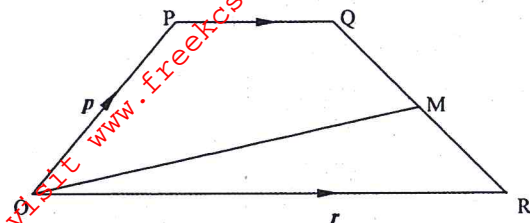
- 4 A bus left a petrol station at 9.20 a.m. and travelled at an average speed of 75 km/h to a town N. At 9.40 a.m. a taxi, travelling at an average speed of 95 km/h, left the same petrol station and followed the route of the bus. Determine the distance, from the petrol station, covered by the taxi at the time it caught up with the bus. (3 marks)

- 5 The sum of three consecutive odd integers is greater than 219. Determine the first three such integers. (3 marks)

- 6 A Kenyan company received US Dollars 100 000. The money was converted into Kenya shillings in a bank which buys and sells foreign currencies as follows:

	Buying (in Kenya shillings)	Selling (in Kenya shillings)
1 US Dollar	77.24	77.44
1 Sterling Pound	121.93	122.27

- (a) calculate the amount of money, in Kenya shillings, the company received. (2 marks)
- (b) The company exchanged the Kenya shillings calculated in (a) above, into sterling pounds to buy a car from Britain. Calculate the cost of the car to the nearest sterling pound. (2 marks)
- 7 In the figure below, OPQR is a trapezium in which PQ is parallel to OR and M is the mid-point of QR. $OP = p$, $OR = r$ and $PQ = \frac{1}{3}OR$.



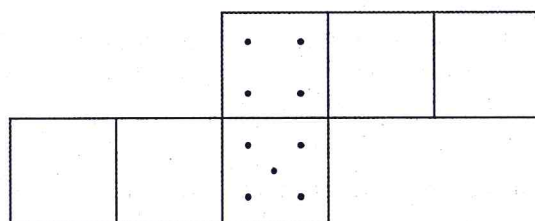
Find \overrightarrow{OM} in terms of \mathbf{p} and \mathbf{r} .

(3 marks)

- 8 Without using mathematical tables or a calculator, evaluate $27^{\frac{2}{3}} \times \left(\frac{81}{16}\right)^{-\frac{1}{4}}$.

(3 marks)

- 9 The figure below is a net of a cube with some dots on two faces.



Given that the number of dots on pairs of opposite faces add up to 7, fill in appropriate dots in each of the empty faces.

(2 marks)

- 10 Using a ruler and a pair of compasses only, construct a rhombus QRST in which angle $TQR = 60^\circ$ and $QS = 10$ cm.

(3 marks)

- 11 A fruit vendor bought 1948 oranges on a Thursday and sold 750 of them on the same day. On Friday, he sold 240 more oranges than on Thursday. On Saturday he bought 560 more oranges. Later that day, he sold all the oranges he had at a price of Ksh 8 each. Calculate the amount of money the vendor obtained from the sales of Saturday.

(4 marks)

- 12 Simplify the expression $\frac{x^2 + x - 4xy - 4y}{(x + 1)(4y^2 - xy)}$.

(3 marks)

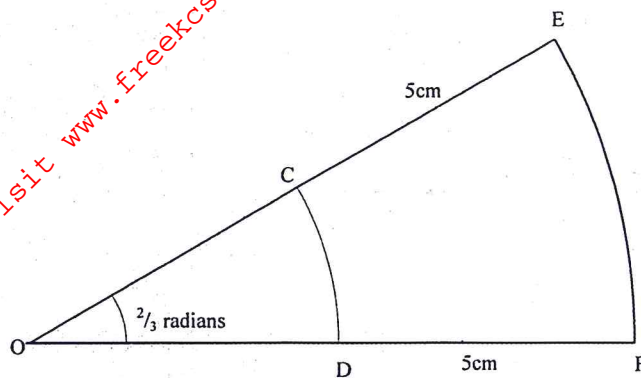
- 13 Given that 3θ is an acute angle and $\sin 3\theta = \cos 2\theta$, find the value of θ .

(3 marks)

- 14 A cylindrical solid whose radius and height are equal has a surface area of 154 cm^2 . Calculate its diameter, correct to 2 decimal places. (Take $\pi = 3.142$)

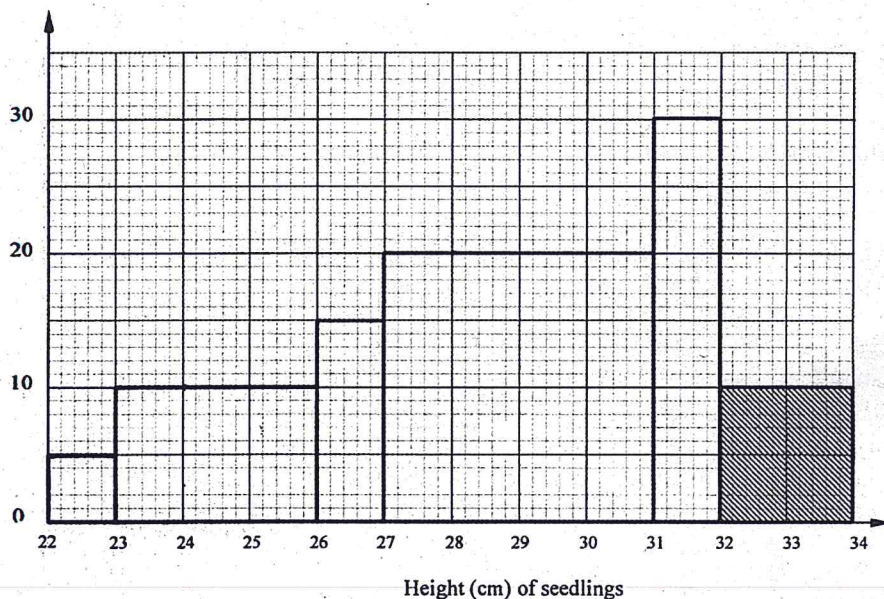
(3 marks)

- 15 The figure below shows two sectors in which CD and EF are arcs of concentric circles, centre O. Angle $COD = \frac{2}{3}$ radians and $CE = DF = 5$ cm.



If the perimeter of the shape CDFE is 24 cm, calculate the length of OC. (3 marks)

- 16 The histogram shown below represents the distribution of heights of seedlings of a certain plant.



The shaded area in the histogram represents 20 seedlings. Calculate the percentage number of seedlings with heights of at least 23 cm but less than 27 cm. (3 marks)

SECTION II (50 marks)

Answer only **five** questions in this section in the spaces provided.

- 17 A saleswoman is paid a commission of 2% on goods sold worth over Ksh 100 000. She is also paid a monthly salary of Ksh 12 000. In a certain month, she sold 360 handbags at Ksh 500 each.

(a) Calculate the saleswoman's earnings that month. (3 marks)

- (b) The following month, the saleswoman's monthly salary was increased by 10%. Her total earnings that month were Ksh 17 600.

Calculate:

- (i) the total amount of money received from the sales of handbags that month; (5 marks)
- (ii) the number of handbags sold that month. (2 marks)

- 18 A carpenter constructed a closed wooden box with internal measurements 1.5 metres long, 0.8 metres wide and 0.4 metres high. The wood used in constructing the box was 1.0 cm thick and had a density of 0.6 g/cm^3 .

- (a) Determine the:

- (i) volume, in cm^3 , of the wood used in constructing the box; (4 marks)
- (ii) mass of the box, in kilograms, correct to 1 decimal place. (2 marks)

- (b) Identical cylindrical tins of diameter 10 cm, height 20 cm with a mass of 120 g each were packed in the box.

Calculate the:

- (i) maximum number of tins that were packed; (2 marks)
- (ii) total mass of the box with the tins. (2 marks)

- 19 (a) Find A^{-1} , the inverse of matrix $A = \begin{pmatrix} 5 & 6 \\ 7 & 9 \end{pmatrix}$. (2 marks)

- (b) Okello bought 5 Physics books and 6 Mathematics books for a total of Ksh 2 440. Ali bought 7 Physics books and 9 Mathematics books for a total of Ksh 3 560.

- (i) Form a matrix equation to represent the above information. (1 mark)
- (ii) Use matrix method to find the price of a Physics book and that of a Mathematics book. (3 marks)

- (c) A school bought 36 Physics books and 50 Mathematics books. A discount of 5% was allowed on each Physics book whereas a discount of 8% was allowed on each Mathematics book. Calculate the percentage discount on the cost of all the books bought. (4 marks)

- 20 The boundaries PQ, QR, RS and SP of a ranch are straight lines such that: Q is 16 km on a bearing of 040° from P; R is directly south of Q and east of P and S is 12 km on a bearing of 120° from R.

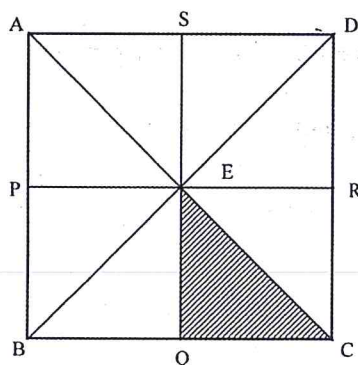
- (a) Using a scale of 1 cm to represent 2 km, show the above information in a scale drawing. (3 marks)

- (b) From the scale drawing determine:
- (i) the distance, in kilometres, of P from S; (2 marks)
 - (ii) the bearing of P from S. (2 marks)
- (c) Calculate the area of the ranch PQRS in square kilometres. (3 marks)

21 Motorbike A travels at 10 km/h faster than motorbike B whose speed is x km/h. Motorbike A takes $1\frac{1}{2}$ hours less than motorbike B to cover a 180 km journey.

- (a) Write an expression in terms of x for the time taken to cover the 180 km journey by:
- (i) motorbike A; (1 mark)
 - (ii) motorbike B. (1 mark)
- (b) Use the expressions in (a) above to determine the speed, in km/h, of motorbike A. (6 marks)
- (c) For a journey of 48 km, motorbike B starts 10 minutes ahead of motorbike A. Calculate, in minutes, the difference in the time of their arrival at the destination. (2 marks)

22 In the figure below, ABCD is a square. Points P, Q, R and S are the midpoints of AB, BC, CD and DA respectively.



- (a) Describe fully:
- (i) a reflection that maps triangle QCE onto triangle SDE; (1 mark)
 - (ii) an enlargement that maps triangle QCE onto triangle SAE; (2 marks)
 - (iii) a rotation that maps triangle QCE onto triangle SED. (3 marks)
- (b) The triangle ERC is reflected on the line BD. The image of ERC under the reflection is rotated clockwise through an angle of 90° about P. Determine the the images of R and C:
- (i) under the reflection; (2 marks)

(ii) after the two successive transformations.

(2 marks)

- 23 The frequency distribution table below represents the number of kilograms of meat sold in a butchery.

Mass in Kg	1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30	31 - 35
Frequency	2	3	6	8	3	2	1

(a) State the modal frequency

(1 mark)

(b) Calculate the mean mass.

(5 marks)

(c) Calculate the median mass.

(4 marks)

- 24 A rectangular box open at the top has a square base. The internal side of the base is x cm long and the total internal surface area of the box is 432 cm^2 .

(a) Express in terms of x :

(i) the internal height h , of the box;

(3 marks)

(ii) the internal volume V , of the box.

(1 mark)

(b) Find:

(i) the value of x for which the volume V is maximum;

(4 marks)

(ii) the maximum internal volume of the box.

(2 marks)