

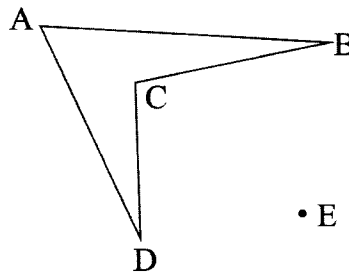
4.2 MATHEMATICS ALTERNATIVE B (122)

4.2.1 Mathematics Alt.B Paper 1 (122/1)

SECTION I (50 marks)

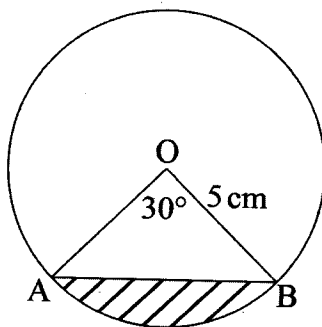
Answer *all* the questions from this section in the spaces provided.

1. Simplify the following expression $6q^2 - 11q - 6r - (2q - 3)^2$. (2 marks)
2. A boy cycled from town X to town Y at 10 km/h and he returned at 12 km/h. The total time taken was 1 hr 50 min. Find the distance between the two towns. (3 marks)
3. Given that $\cos(90^\circ - \alpha) = \frac{24}{25}$, find without using mathematical table the value of $\cos \alpha$ (2 marks)
4. Simplify $\left(\frac{33y^4 \times 9y^5}{11y^{12}}\right)^{\frac{1}{3}}$. (3 marks)
5. Evaluate $\sqrt[3]{\frac{9}{0.03746}} + 0.6042$, correct to 4 significant figures. (3 marks)
6. A line $y + 6x + c = 0$ passes through $(4, -2)$ and is perpendicular to the line $py + 4x - 10 = 0$. Determine the values of c and p . (4 marks)
7. Solve and state all the integral values of x which satisfy the inequality $3(1 + x) < 5x - 11 < x + 45$. (4 marks)
8. Construct the image of quadrilateral ABCD under an enlargement scale factor -2 , centre of enlargement E. (2 marks)

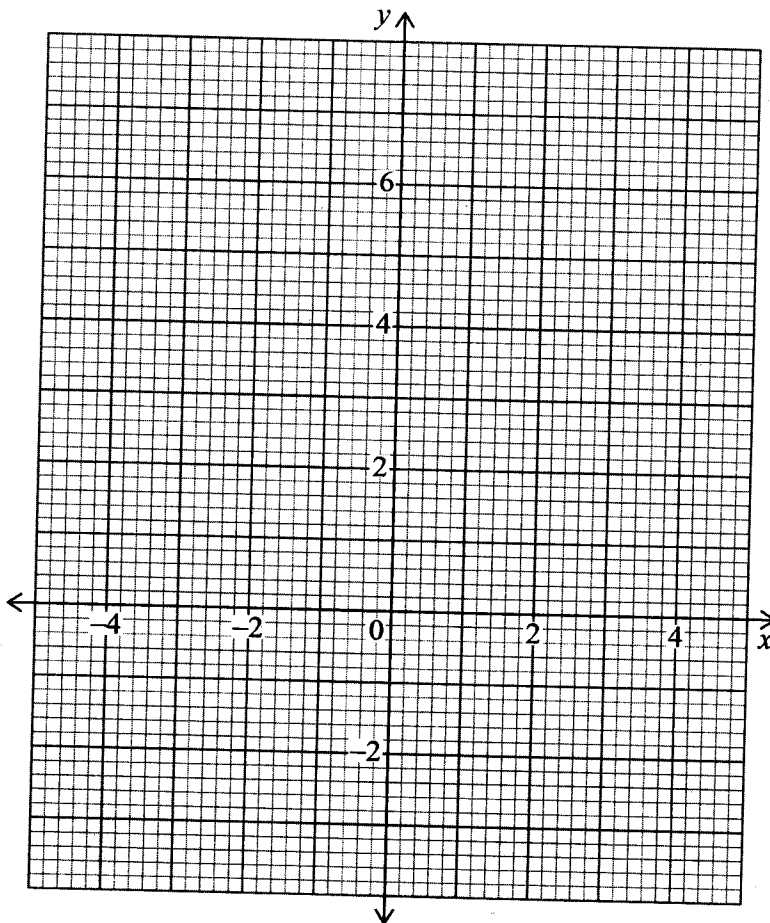


9. Given that $\frac{2y - 3x}{4x + y} = \frac{1}{7}$, find the ratio $x : y$. (3 marks)

10. The figure below, shows a circle centre O and chord AB subtends an angle of 30° at the centre with radius 5 cm. Calculate the area of the shaded minor segment. (4 marks)



11. By converting the recurring decimal part to a fraction, simplify completely the following expression
 $(0.\dot{3})(12 \times 8 \div 4 + 15)$. (3 marks)
12. Atieno, Njeri and Cheptoo are walking along a track and their strides are 54 cm, 72 cm and 60 cm respectively. Find the shortest distance they need to cover so as to be at the same point. (2 marks)
13. A parallelogram PQRS has vertices $P(a, b)$, $Q(-2, 5)$, $R(1, 1)$ and $S(x, y)$. The diagonals intersect at $T(-1, 1)$. Using the grid below, plot and state the coordinates of points P and S. (4 marks)



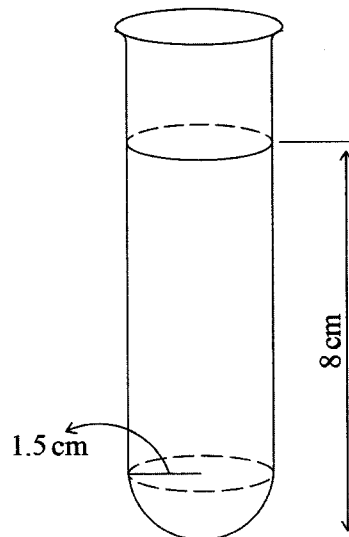
14. The sides of a triangle are in the ratio 3:5:6 and its perimeter is 56 cm. Use Hero's formula to find its area, correct to 4 significant figures. (4 marks)
15. A retailer sold an article at Ksh 550 after a discount of 20%.
- (a) Calculate the marked price of the article. (2 marks)
- (b) If the retailer was to make a profit of 10%. Calculate the price he was supposed to sell the article. (2 marks)
16. A helicopter flies from point A directly south to point B for 300 km. From B, it changes course and flies on a bearing of 270° for 400 km to point C. Calculate the distance of the helicopter from point C direct to point A. (3 marks)

SECTION II (50 marks)

Answer any five questions from this section in the spaces provided.

17. A straight line L passes through the point P(-3, 5) and its gradient is 1.
- (a) Determine:
- (i) the equation of the line L in the form $y = mx + c$ where m and c are constants; (2 marks)
- (ii) the value of x when $y = 4$ (2 marks)
- (b) The line L intersects with the x-axis at A and y-axis at B.
- Determine:
- (i) the coordinates of the x-intercept of line L at A; (2 marks)
- (ii) the coordinates of the y-intercept of line L at B. (2 marks)
- (c) On the grid provided, draw the straight line L and label points A and B. (2 marks)
18. A salesman gets a commission of 2% for sales up to Ksh 120 000, 3% for sales between Ksh 120 000 and Ksh 250 000. A commission of 5% was given for sales above Ksh 250 000.
- (a) A salesman made sales worth Ksh 290 000. Find his total commission. (3 marks)
- (b) If in a certain day his total commission was Ksh 11 300, find his total sales. (4 marks)
- (c) If he has a salary of Ksh 13 000 per month and his total earnings during a given month was Ksh 20 800, find his total sales for the month. (3 marks)

19. From a watch tower P on a hill, Q is 5 km on a bearing of 078° and a railway station R is 9 km away on a bearing of 200° .
- (a) Using a scale 1:100 000, show the relative positions of P, Q and R. (4 marks)
- (b) Find:
- (i) the bearing of Q from the railway station; (1 mark)
- (ii) the distance between R and Q; (2 marks)
- (iii) the shortest distance between P and the line RQ. (3 marks)
20. Adhiambo poured a liquid into a test tube which has a hemispherical base of inner radius 1.5 cm as shown in the figure below and she noted that the liquid is 8 cm high.
- (Take $\pi = 3.142$)



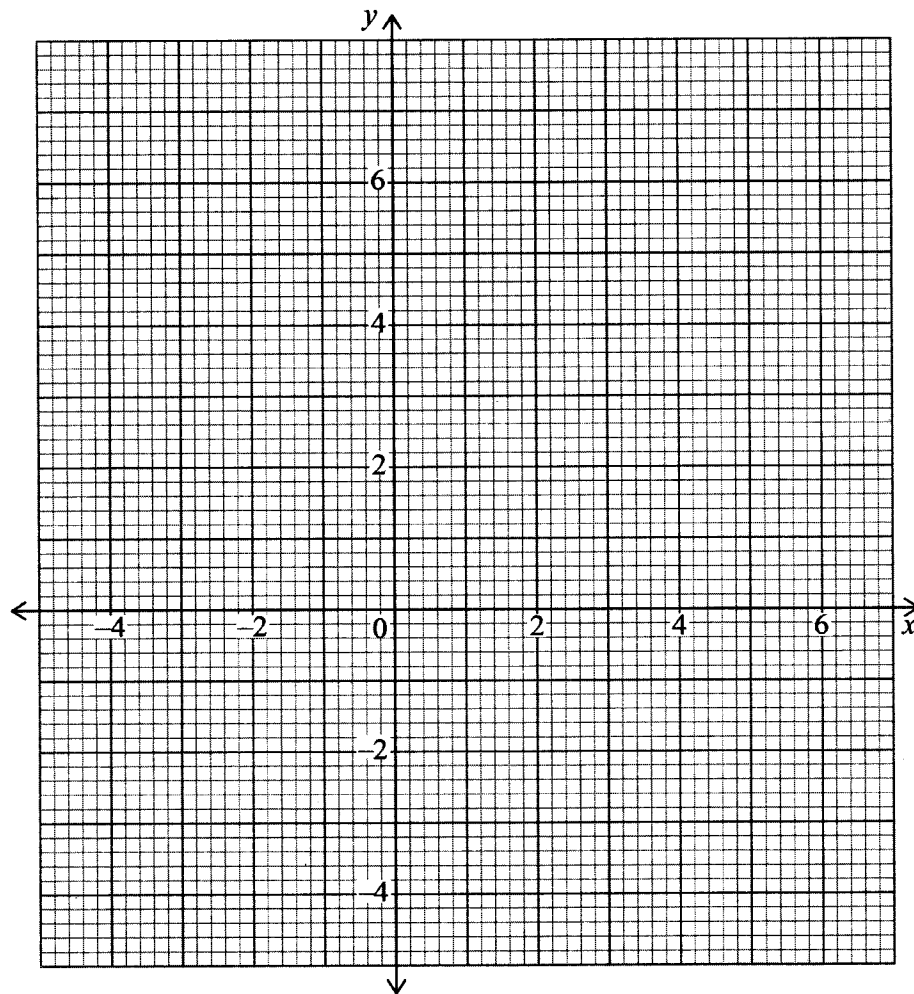
- (a) Calculate:
- (i) the surface area of the test tube in contact with the liquid; (3 marks)
- (ii) the volume of the liquid in the test tube, correct to 3 decimal places. (4 marks)
- (b) A spherical marble of radius 1 cm is dropped into the test tube containing the liquid. Calculate the new height of the liquid, correct to 2 significant figures. (3 marks)
21. (a) Agnes donated $16\frac{2}{3}\%$ of her maize produce to a charitable organisation. Janet donated 20% of her maize produce to the same charitable organisation. Their total donation was 15 200 kilograms. The following season, Agnes donated $12\frac{1}{2}\%$ of her maize produce to the same charitable organisation while Janet donated $8\frac{1}{3}\%$ of her maize produce to the same charitable organisation. Their total donation for the following season was 9 000 kilograms. Calculate the amount of maize produced by each of them, in tonnes. (6 marks)

(b) On the grid provided below, solve graphically the following simultaneous equations,

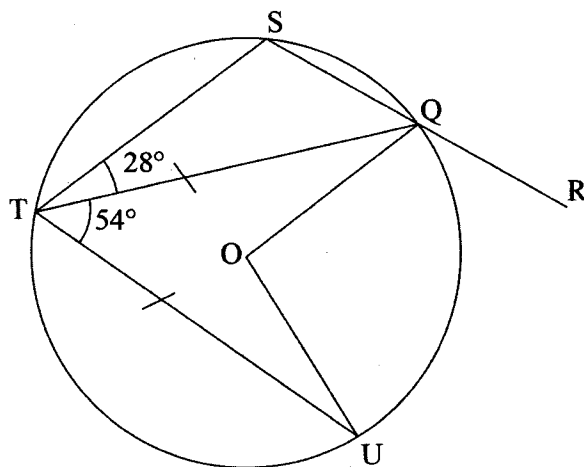
$$2x = y - 1$$

$$x - 2y = 4$$

(4 marks)



22. In the figure below, O is the centre of the circle and SQR is a straight line. Angle $STQ = 28^\circ$, angle $UTQ = 54^\circ$ and $UT = TQ$.



Giving reasons, determine the sizes of:

- | | | |
|-----|-------------------|-----------|
| (a) | angle TQU; | (2 marks) |
| (b) | angle TSQ; | (2 marks) |
| (c) | angle TQS; | (2 marks) |
| (d) | reflex angle UOQ; | (2 marks) |
| (e) | angle UQR. | (2 marks) |

23. Use a ruler and a pair of compasses only for all constructions in this question.

- | | | | |
|-----|------|---|-----------|
| (a) | (i) | Construct a triangle ABC in which $AB = 6$ cm, $AC = 5.3$ cm and $\angle BAC = 120^\circ$. | (3 marks) |
| | (ii) | Measure the length BC. | (1 mark) |
| (b) | | Bisect line AB and using A as the centre of a circle, construct a circle passing through the bisector on line AB. Calculate the area of the circle, correct to 4 significant figures. | (4 marks) |
| (c) | | Construct a perpendicular from C to meet BA produced at D. Measure CD. | (2 marks) |

24. Four businesswomen decided to buy a building. An agent was selling the building at Ksh3 800 000 on behalf of the owner, plus a facilitation fee of 10% on the value of the building to be paid by the buyers. The agreement was that the buyer would first pay a deposit of 55% of the total cost and the balance to be paid in one month's time.

(a) Find:

(i) the deposit paid; (3 marks)

(ii) the balance to be paid. (2 marks)

(b) The balance to be paid was contributed in the ratio 1:2:3:5 by the four businesswomen.

Calculate:

(i) the money contributed by the second highest contributor; (2 marks)

(ii) the difference between the money contributed by the highest and lowest contributors. (3 marks)