

### 3.4.1 MATHEMATICS ALTERNATIVE B (122)

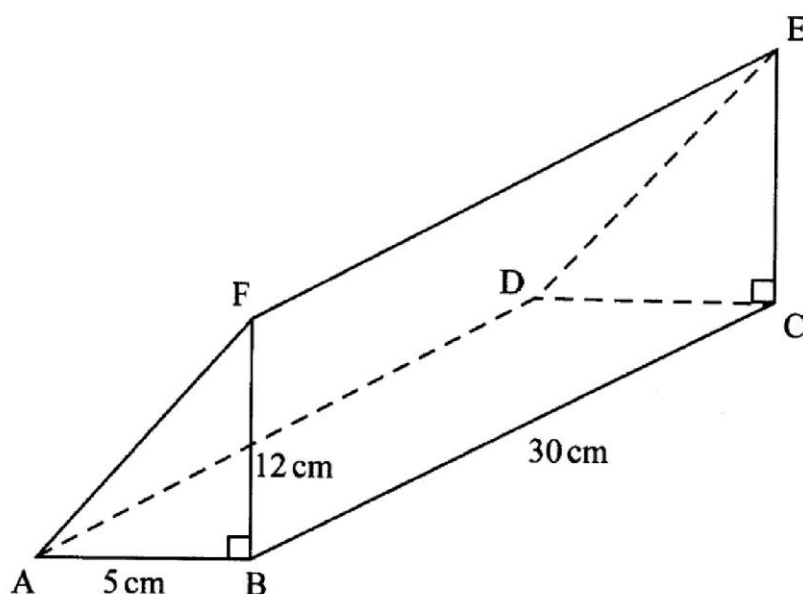
#### 3.4.1 Mathematics Alt.B Paper 1 (122/1)

#### SECTION I (50 marks)

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

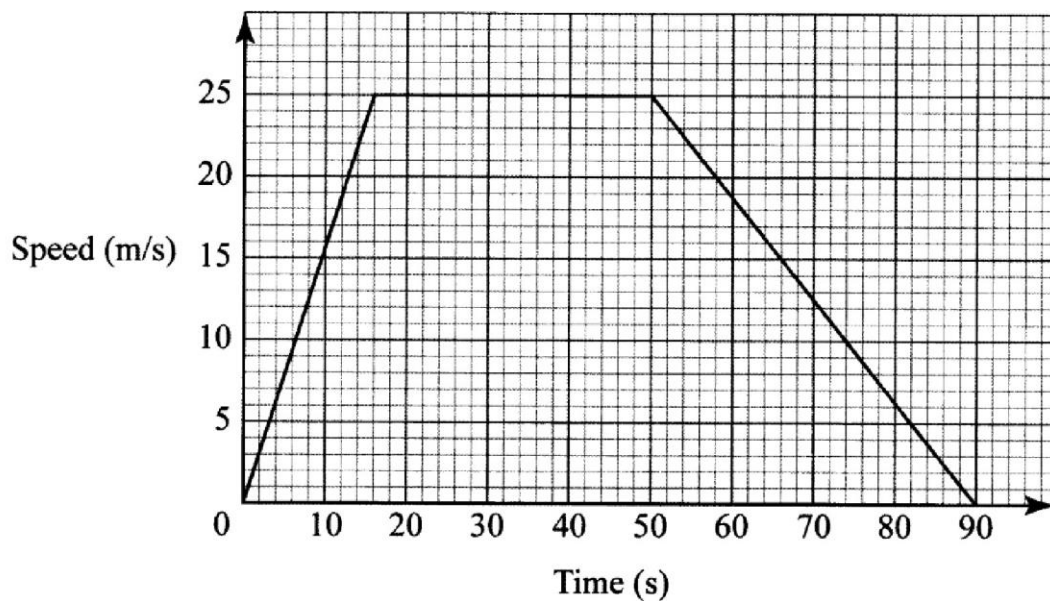
- 1 The population of a certain county was three hundred sixty eight thousand eight hundred and forty nine. Two reporters, A and B gave this figure correct to 3 significant figures and to the nearest hundreds respectively. Find the difference between the numbers given by the reporters. (2 marks)
- 2 A tailor had a ribbon which he intended to cut into equal lengths of either 28 cm, 16 cm or 40 cm. Determine:
- (a) the shortest length of ribbon that he would use to obtain an exact number of pieces; (2 marks)
- (b) the number of 16 cm pieces that can be obtained from the ribbon. (1 mark)
- 3 A metal bar with a cross-sectional area of  $44 \text{ cm}^2$  has a mass of 5.06 kg. The density of the bar is  $2.3 \text{ g/cm}^3$ . Calculate the length, in cm, of the bar. (3 marks)
- 4 Use logarithms, correct to 4 significant figures to evaluate:
- $$\sqrt[3]{\frac{0.04068 \times 35.72}{0.2799}} \quad (3 \text{ marks})$$
- 5 Given that  $A = x^2 + 2xh$ , find the positive value of  $x$  when  $A = 360$  and  $h = 13$ . (3 marks)
- 6 A rectangular field ABCD is such that  $AB = 90 \text{ m}$  and  $BC = 70 \text{ m}$ . A well, W in the field is located 30m from A and angle  $WAB = 45^\circ$ . A tree, T also in the field is located 40m from B and angle  $TBA = 40^\circ$ . Using a scale drawing:
- (a) Draw the field and show the positions of W and T; (3 marks)
- (b) find the distance, in metres, between the well and the tree. (1 mark)
- 7 A chord subtends an angle of  $60^\circ$  at the circumference of a circle of radius 3.5 cm. Determine the area of the minor segment correct to 4 significant figures. (Take  $\pi = \frac{22}{7}$ ) (4 marks)
- 8 Given the inequalities  $\frac{3}{2x-1} \geq 5$  and  $x > -4$ , find the integral values of  $x$  that satisfy the inequalities. (3 marks)
- 9 Kassam spent  $\frac{1}{5}$  of his monthly salary on house rent,  $\frac{3}{8}$  on loan repayment, Ksh 26 000 on domestic expenses and saved the rest. If he saved Ksh 8 000, calculate his monthly salary. (3 marks)

- 10 A line  $L_1$  passes through  $(3, -4)$  and is perpendicular to the line  $y = 3x - 2$ . Determine:
- (a) the equation of  $L_1$  in the form  $ax + by = c$  where  $a, b$  and  $c$  are constants. (3 marks)
- (b) the  $x$  intercept of line  $L_1$ . (1 mark)
- 11 The vertices of a triangle JKL are  $J(2,1)$ ,  $K(5,1)$  and  $L(3,3)$ . The triangle JKL is mapped onto  $J'K'L'$  by a rotation of  $+90^\circ$  about point  $(1, -1)$ . On the grid provided below, draw triangle JKL and its image  $J'K'L'$ . (3 marks)
- 12 Given that  $\cos 60^\circ = \frac{1}{2}$ , without using mathematical tables or a calculator, find:
- (a)  $\sin 60^\circ$  (2 marks)
- (b)  $\tan 30^\circ$  (1 mark)
- 13 A builder used square tiles of side 34.2 cm to cover a rectangular floor of length 307.8 cm and width 236.7 cm. Determine the number of whole square tiles that were fitted on the floor. (3 marks)
- 14 The figure below represents a triangular prism.  $AB = 5$  cm,  $BC = 30$  cm,  $BF = 12$  cm and angle ABF is a right angle.



- Calculate the surface area of the prism. (4 marks)
- 15 The volume of a hemisphere is  $41.2 \text{ cm}^3$ . Calculate, correct to one decimal place, the radius of the hemisphere. (2 marks)

- 16 The diagram below is a speed-time graph for a car that travelled between two stations in 90 seconds.



Calculate the average speed of the car correct to one decimal place. (3 marks)

### SECTION II (50 marks)

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

- 17 A businessman transported bags of rice using 2 lorries and 5 pickups. Each lorry made 4 trips carrying 132 bags per trip. 3 pickups made 7 trips each and the remaining pickups made 6 trips each. The pickups carried the same number of bags each per trip. The ratio of the number of bags transported by the lorries to that transported by the pickups was 8:3.
- (a) Calculate:
- the total number of bags transported; (3 marks)
  - the number of bags carried by a pickup per trip. (4 marks)
- (b) The cost per trip for each lorry was Ksh 5 000 and that of a pickup was Ksh 1 500. Calculate the total cost of transporting the rice. (3 marks)
- 18 A rectangular piece of land has a perimeter of 84 m. Its length is 12 m longer than its width.
- (a) If the width is  $x$  m:
- write an expression for the perimeter of the land; (1 mark)
  - find the ratio of the length to the width. (4 marks)
- (b) The piece of land was fenced with 4 strands of barbed wire allowing 30 cm for binding at each end of a strand. A space of 3 m on one side of the land was left for the gate.
- Determine the length of barbed wire that was used. (3 marks)
  - If the fencing poles were 3 m apart, determine the number of poles used. (2 marks)

19 The base of an open rectangular tank is 3 m by 2.5 m and its height is 4 m.

(a) Calculate:

(i) the capacity of the tank in litres. (3 marks)

(ii) the surface area in  $\text{m}^2$  of the tank. (2 marks)

(b) An open cylindrical tank has an equal capacity and same height as the rectangular tank in (a) above. Calculate, correct to one decimal place:

(i) the radius of the cylindrical tank; (3 marks)

(ii) the surface area in  $\text{m}^2$  of the tank. (2 marks)

20 (a) Using a ruler and a pair of compasses only, construct triangles ABC and ABD on opposite sides of line AB below, such that  $\angle DAB = \angle DBA = \angle ABC = \angle BAC = 60^\circ$ . (2 marks)



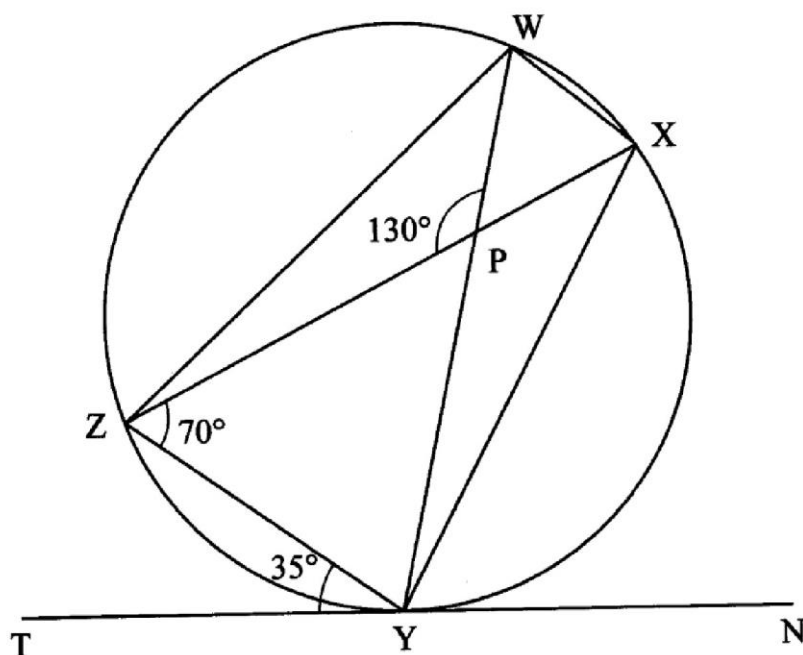
(b) (i) Name the quadrilateral AD BC. (1 mark)

(ii) State two properties of the quadrilateral. (2 marks)

(c) Construct a circle touching all the sides of the quadrilateral. (2 marks)

(d) Determine, correct to one decimal place, the area of the region enclosed by the quadrilateral but outside the circle. (3 marks)

21 In the figure below WXYZ is a cyclic quadrilateral and TYN is a tangent to the circle at Y. Angle TYZ =  $35^\circ$ , angle YZX =  $70^\circ$  and angle WPZ =  $130^\circ$ .



Giving reasons, find the size of:

- (a)  $\angle XYN$ ; (2 marks)
- (b)  $\angle ZYX$ ; (2 marks)
- (c)  $\angle ZXY$ ; (2 marks)
- (d)  $\angle ZWY$ ; (2 marks)
- (e)  $\angle WXZ$ . (2 marks)

**22** A salesman sold 300 bags of animal feeds to a retailer at Ksh 1 700 each. He was given a commission of 3% on 120 of the bags and 2% on the remaining bags. The salesman allowed a discount of 1.2% on  $\frac{3}{5}$  of the bags sold. This discount was deducted from his commission.

- (a) Calculate:
  - (i) the discount allowed; (2 marks)
  - (ii) the net commission the salesman got. (3 marks)
- (b) The retailer sold all the bags at Ksh 1 850 each and paid Ksh 3 000 for transport. Calculate the profit made by the retailer. (3 marks)
- (c) In addition, a value added tax (VAT) of 16% was charged on the profit made by the retailer. Calculate the amount of tax collected. (2 marks)

**23** A piece of wire is bent to form the sides of a rectangle whose length is 6 cm more than the width. The area of the rectangle formed is  $567 \text{ cm}^2$ .

- (a) Determine the length of the wire. (4 marks)
- (b) The same piece of wire could be bent to form a semi-circle. Determine the area that would be enclosed by the semi-circle, correct to one decimal place. (4 marks)
- (c) Express the area of the semi-circle as a percentage of the area of the rectangle, correct to 3 significant figures. (2 marks)

**24** A cattle ranch is in the shape of a parallelogram. The length of one side is 600 m and the other is 500 m. The smaller angle between the sides is  $30^\circ$ .

- (a) Calculate the area, in hectares, of the ranch. (3 marks)
- (b) A water point in the shape of a regular hexagon of side 10 m is built in the ranch. Calculate:
  - (i) the grazing area, in hectares, correct to 3 decimal places. (4 marks)
  - (ii) the number of cattle that can be kept in the ranch if one animal requires a grazing area of 0.625 ha. (3 marks)