3.4 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. Evaluate (2 marks)

$$\frac{^{-}9 \div {}^{+}3 + {}^{+}7 - {}^{-}4}{^{-}3 + {}^{+}2 \times {}^{+}6}.$$

2. Express 2744 as a product of its prime factors, hence evaluate $\sqrt[3]{2744}$. (3 marks)

3. Three athletes A, B and C decided to run round a field track. Athlete A completes a round in 12 minutes, B in 15 minutes and C in 20 minutes. If they all started at the same point at 8.00 a.m. find the time they will next be together again. (4 marks)

4. A fruit vendor sold $\frac{2}{5}$ of his fruits on day one and $\frac{2}{3}$ of the remainder on day two. He remained with 250 fruits. Determine the original number of fruits he started with on day one. (3 marks)

5. A young man rolled a circular ring of diameter 70 cm and covered a distance of 66 m. Find the number of times that the circular ring rolled. (Take $\pi = \frac{22}{7}$) (3 marks)

6. The lengths of two sides of a triangle are 5 cm and 8 cm. The perimeter of the triangle is 20 cm. Calculate the area of the triangle, correct to 4 significant figures. (3 marks)

7. Use logarithms to evaluate

$$\sqrt{\frac{37.32 \times 27.43}{6541}}.$$ (4 marks)

8. A line L_1 passes through (5, 3) and its gradient is 2. Another line L_2 is perpendicular to L_1 at the y-intercept of L_1. Find the equation of L_2 in the form $y = mx + c$. (4 marks)

9. The base of a rectangular tank measures 1.5 m by 2 m. Given that the capacity of the tank is 9 000 litres, determine the height of the tank. (3 marks)

10. The position of three points on a level ground are such that B is 50 metres directly east of A and C is 30 metres from B on a bearing of 330°.

(a) Using the scale 1 cm represents 10 m, show the relative positions of points A, B and C. (2 marks)

(b) Find the:

(i) distance from A to C; (1 mark)

(ii) bearing of C from A. (1 mark)

11. The sum of interior angles of a regular polygon is 900°.

(a) Find the number of sides of the polygon. (2 marks)

(b) Name the polygon. (1 mark)

12. In a retail shop, the price of a tray of eggs was increased by 40%. Two months later the new price was lowered by 40%. Given that the original price was Ksh 300, determine the price after the reduction. (3 marks)

13. Given that p = 2 and q = −2, find the value of

$$\frac{5p+4q+1}{q}.$$

(3 marks)

14. Given that $\cos 2x = \sin 4x$ and x is an acute angle, find the value of x. (2 marks)

15. The vertices of a triangle ABC are A(−2, 4), B(−2, 2) and C(−4, 1).

On the grid provided draw:

(a) triangle ABC; (1 mark)

(b) triangle A′B′C′, the image of triangle ABC, under a negative quarter turn (−90°) about the origin. (2 marks)

16. A car travels at 60 km/h for 45 minutes and a further 40 km in 30 minutes. Determine the average speed of the car in km/h. (3 marks)

SECTION II (50 marks)

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

17. A salesman earns a basic salary of Ksh 9 000 per month and a commission of 5% for sales above Ksh 150 000.

In a certain month his total earnings were Ksh 15 000.

(a) Calculate the total sales made in that month. (4 marks)

(b) The following month his salary was raised by 10% and his commission increased to 7.5%. The total sales that month was Ksh 378 000, calculate:

(i) the salesman's total earnings that month; (4 marks)

(ii) the salesman's percentage increase in earnings compared to the previous month. (2 marks)

18. (a) Solve the equation

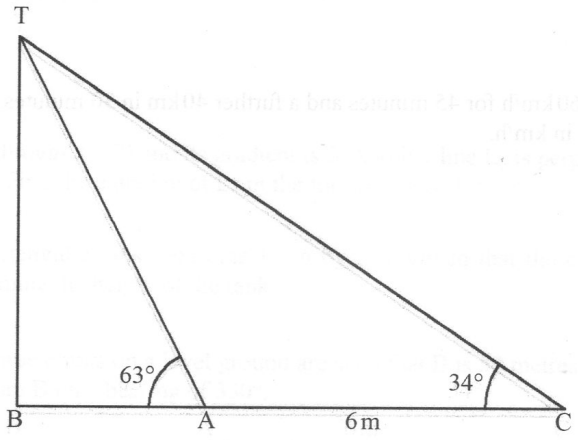
$$\frac{3r-2}{r} = \frac{1}{r^2}.$$ (3 marks)

(b) The length of a rectangular garden is $(5x+12)$ metres while its width is $(x-5)$ metres. The diagonal of the garden is $(6x-7)$ metres. Determine the:

(i) value of x; (5 marks)

(ii) dimensions of the garden. (2 marks)

19. The figure below represents an electrical pole, TB and two supporting cables TA and TC. The points B, A and C are on the same horizontal level. $\angle TAB = 63°$, $\angle TCB = 34°$ and AC = 6 metres.



Calculate, correct to 1 decimal place:

(a) the length BC; (5 marks)

(b) the height TB, of the electric pole; (2 marks)

(c) the total length of the cables TA and TC. (3 marks)

20. A container consists of a frustum mounted on a cylinder. The radius of the cylindrical part is 5 cm and its height 12 cm. The radius of the top part of the frustum is 2 cm and the height of the frustum is 6 cm.

Calculate, correct to 1 decimal place the:

(a) volume of the cylindrical part of the container; (2 marks)

(b) volume of the frustum part of the container; (4 marks)

(c) capacity of the container in litres. (4 marks)

21. (a) Using a ruler and a pair of compasses only:

(i) construct triangle ABC in which BC = 7 cm, $\angle ABC = 105°$ and $\angle ACB = 30°$. (3 marks)

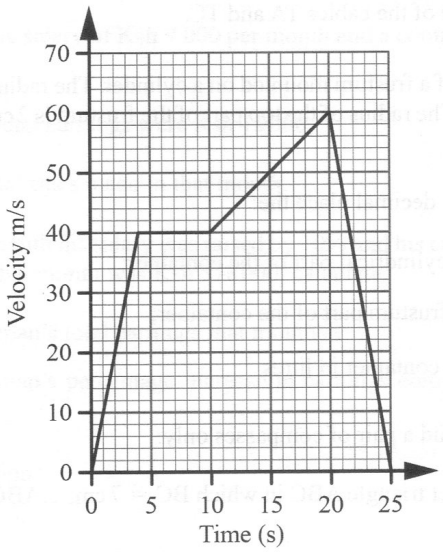
(ii) Drop a perpendicular from A to meet CB produced at T. (1 mark)

(iii) Measure angle TAB. (1 mark)

(iv) Measure TA. (1 mark)

(b) The triangle ABC represents a farm drawn to a scale of 1:50 000. Find the area of the farm in ares. (4 marks)

22. The figure below shows a velocity – time graph for a particle.



Use the graph to:

(a) find the velocity of the particle after 4 seconds; (1 mark)

(b) determine the distance travelled by the particle during the first 4 seconds; (2 marks)

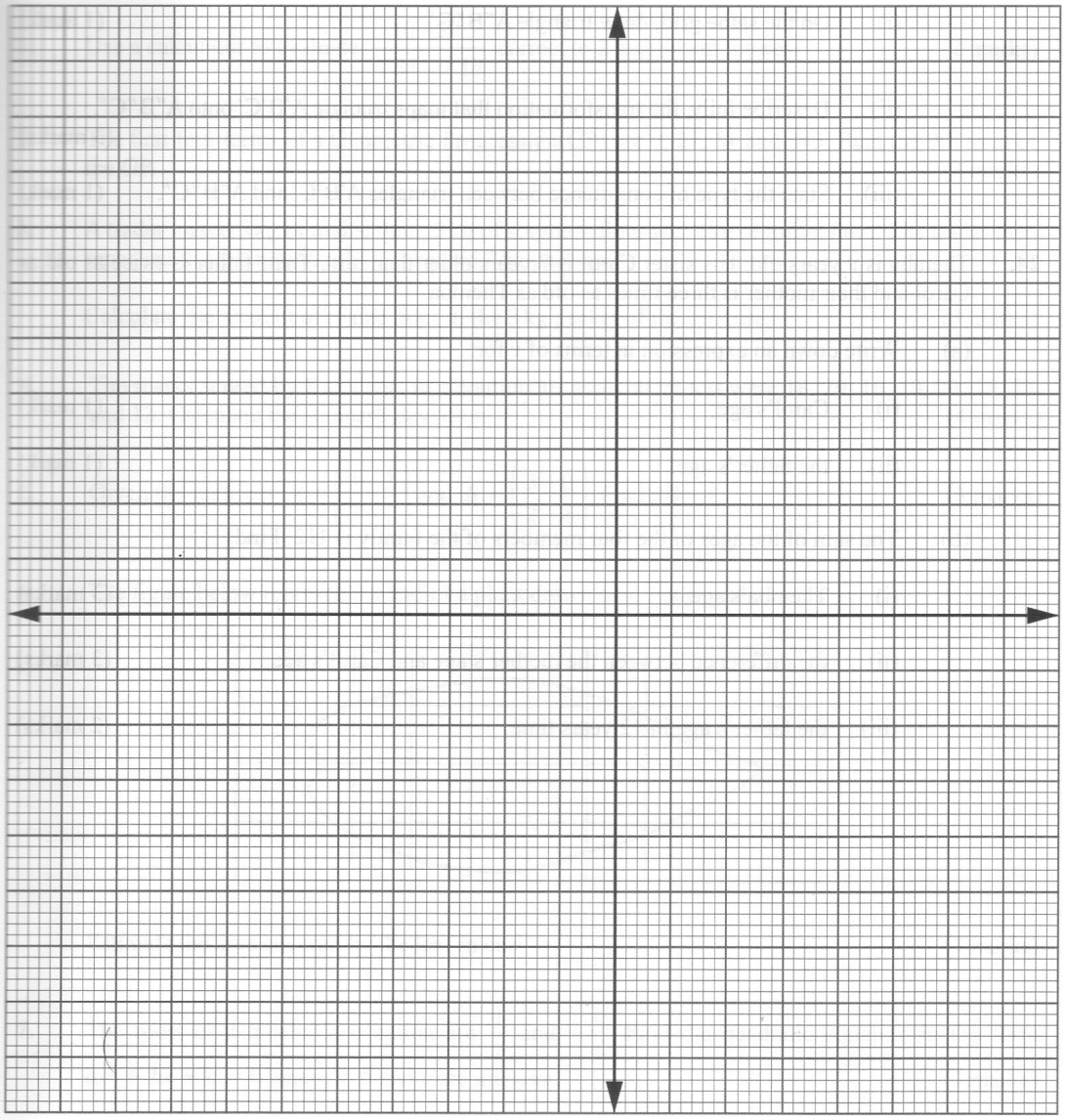
(c) calculate the acceleration of the particle between the 10th and 20th seconds; (2 marks)

(d) calculate the deceleration of the particle; (2 marks)

(e) calculate the average speed of the particle for the whole journey. (3 marks)

23. The vertices of a triangle ABC are A(1, 6), B(2, 3) and C(4, 3). The vertices of triangle A′B′C′ the image of triangle ABC under an enlargement are A′(1, 10), B′(3, 4) and C′(7, 4).

(a) On the grid provided draw triangle ABC and its image A′B′C′. (2 marks)



(b) Determine the centre and scale factor of the enlargement. (3 marks)

(c) Triangle A″B″C″ with vertices A″(−10, −1), B″(−4, −3) and C″(−4, −7) is the image of triangle A′B′C′ under a certain transformation.

(i) On the same grid, draw triangle A″B″C″. (1 mark)

(ii) Describe fully, the transformation that maps triangle A′B′C′ onto A″B″C″. (3 marks)

(iii) State the type of congruence between triangles A′B′C′ and A″B″C″. (1 mark)

24. Themba is y years old. His sister Carol is 7 years older than him. Their father is twice as old as Carol and their mother is three times as old as Themba.

(a) Write down an expression in terms of y for:

(i) Carol's age; (1 mark)

(ii) the father's age. (1 mark)

(b) The sum of the ages of the four members of the family is 112. Find:

(i) Themba's age; (3 marks)

(ii) the difference between the mother's age and Carol's age; (3 marks)

(iii) the father's age in 12 years time. (2 marks)