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. The sum of 3 133 792, 5 293 476, 7 672 598 and 4 257 348 is rounded off to the nearest 10 000. Find the difference between the actual sum and the rounded figure. (3 marks)

2. Express 1 728 as a product of its prime factors, hence find the cube root of 1 728. (3 marks)

3. Ngata's office is on the twenty second floor in a storey building. On a certain day, he walked up five floors from his office to another office. He then took a lift to the third floor. Calculate the number of floors he went through while in the lift. (2 marks)

4. Given that $2^{2x} = 1024$, find 3^x. (3 marks)

5. A metal dealer had a piece of wire which he intended to cut into pieces of 8 m, 15 m or 21 m. Determine the minimum length of the wire that would give an exact number of pieces of each length. (3 marks)

6. Three villages K, L and M are such that L is 53 km from K on a bearing of 295°. Village M is 75 km east of village L.

    (a) Using a scale of 1 cm to represent 10 km, draw a diagram to show the positions of villages K, L, and M. (2 marks)

    (b) Use the scale drawing to determine the bearing and distance of village M from K. (2 marks)

7. Use factor method to solve: (3 marks)

    $2x^2 = 3x + 9$

8. A straight line L passes through (–3,5) and is perpendicular to $2x + 3y = 6$. Find the equation of line L, in the form $ay + bx = c$. (3 marks)

9. Waswa boarded a bus that took off at 9.45 pm on a Sunday to visit his sister in Nairobi. The bus took 8 hours 20 minutes to arrive in Nairobi. After 10 minutes, he took a taxi that took 42 minutes to arrive at his sister's home. Find the day and time, in 24 hour system, when Waswa arrived at his sister's home. (3 marks)

10. Simplify the expression: (3 marks)

    $$\frac{x^2 + xy - 3x - 3y}{x^2 - 9}$$

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11. A cone of height of 8 cm has a slant length of 10 cm. Calculate the volume of the cone.
    (Take $\pi = 3.142$) (3 marks)

12. Use the grid provided below to solve the equations:

    $4y - 3x = 12$
    $2y + 3x = 24$. (4 marks)

13. Given that $\theta = \dfrac{2}{3}$, find $\tan \theta$ correct to 2 decimal places. (2 marks)

14. A cylindrical container of diameter 28 cm and height 45 cm is filled with milk. If the mass of the milk is 26.61 kg, calculate the density of the milk in g/cm³, correct to 2 decimal places.
    (3 marks)

15. Kantai had Ksh 81 000 which he changed to dollars at the rate of Ksh 101.25 per dollar. He later sold the dollars to a bank which bought 1 dollar for Ksh 102.56. Calculate the money gained in Kenya shillings. (4 marks)

16. A triangle ABC with vertices A(2,3), B(1,1) and C(4,0) is mapped onto triangle A′B′C′ by an enlargement scale factor 2, centre (−1,0).

    On the grid provided, draw:

    (a) triangle ABC; (1 mark)

    (b) triangle A′B′C′. (3 marks)

SECTION II (50 marks)

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

17. The Hire Purchase (H.P.) price of a sofa set was Ksh 54 000. A discount of 20% was allowed on the H.P. price if one bought it by cash.

    (a) Calculate the cash price. (2 marks)

    (b) Mugure bought the sofa set on H.P. terms and paid 10% of the H.P. price as deposit. She paid the remainder in 18 equal monthly instalments.

   (i) Calculate the amount paid as deposit. (2 marks)

        (ii) Calculate the monthly instalments. (2 marks)

    (c) Karigo bought an identical sofa set as Mugure. She opted for a longer repayment period than Mugure and paid a 10% deposit and a monthly instalment of Ksh 2 268. If the total H.P. price paid by Karigo was 12% more than that paid by Mugure, calculate Karigo's repayment period.

    (4 marks)

18. Mary can complete a task in 2 hours 10 minutes while Jane can complete the same task in 2 hours.

   (a) Determine the time both Mary and Jane would take to complete the task if they work together. (4 marks)

   (b) Mary and Jane embarked on the task and worked together for 30 minutes. They were then joined by Rachel and the three completed the remaining task in 20 minutes.

      (i) Find the proportion of work that was remaining before Rachel joined in. (2 marks)

      (ii) Calculate the fraction of work done by Rachel in the 20 minutes. (4 marks)

19. A rectangular plot of land measures $(3x+9)$ m by $(x-3)$ m and has an area of 648 m².

   (a) Write an equation for the area of the plot in the form , $ax^2 + bx + c = 0$. (2 marks)

   (b) Determine the dimensions of the plot. (4 marks)

   (c) Another similar plot has an area of 2 592 m². Find the dimensions of this plot. (4 marks)

20. In the figure below A,B,C and D are points on the circumference of the circle centre O. Line TDF is a tangent to the circle at D and AB produced meets the tangent at T. $\angle ACD = 34°$ and $\angle BAC = 25°$.
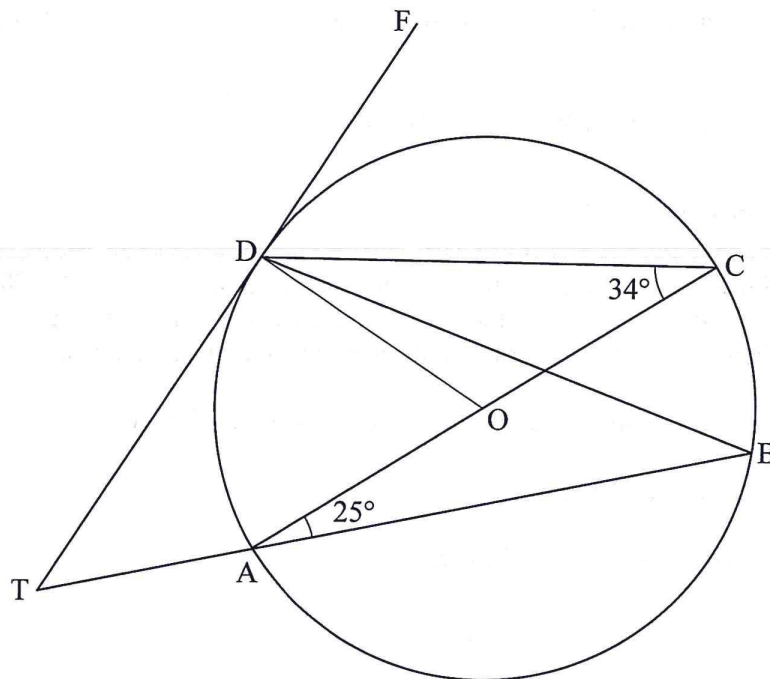
Giving reasons in each case, find the size of:

(a)   ∠AOD   (2 marks)

(b)   ∠BDC   (2 marks)

(c)   ∠ACB   (2 marks)

(d)   ∠FDC   (2 marks)

(e)   ∠ATD   (2 marks)

21.   The vertices of a triangle ABC are A(–3,2), B(–1,2) and C(–1,4).

(a)   On the grid provided, draw triangle ABC.   (1 mark)

(b)   Triangle ABC is reflected on line $y = x + 1$.

    (i)   Draw line $y = x + 1$.   (2 marks)

    (ii)   Draw triangle A′B′C′, the image of triangle ABC under reflection in the line $y = x + 1$.   (2 marks)

(c)   Draw triangle A″B″C″, the image of triangle A′B′C′ under a rotation of –90° about (0,0).   (2 marks)

(d)   Under a translation $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$, triangle A′B′C′ is mapped onto A‴B‴C‴.

    (i)   Find the coordinates of A‴B‴C‴.   (2 marks)

(b)   Draw triangle A‴B‴C‴.   (1 mark)

22.   A car started from rest and moved at a constant acceleration of 0.5 m/s² for 20 seconds. It maintained a constant velocity for the next 10 seconds before accelerating at 0.8 m/s² for 25 seconds. It then decelerated uniformly and came to rest after 15 seconds.

(a)   On the grid provided, draw the velocity – time graph for the car.   (4 marks)

(b)   Use the graph to determine:

    (i)   the deceleration of the car;   (2 marks)

    (ii)   the total distance covered by the car;   (2 marks)

    (iii) the average speed of the car, correct to 2 decimal places.   (2 marks)

23. The figure below represents a wooden model. The model consist of a frustrum part and a cylindrical part. The diameter of the cylindrical part is 18 cm and the height is 30 cm. The height of the frustrum part is 80 cm.
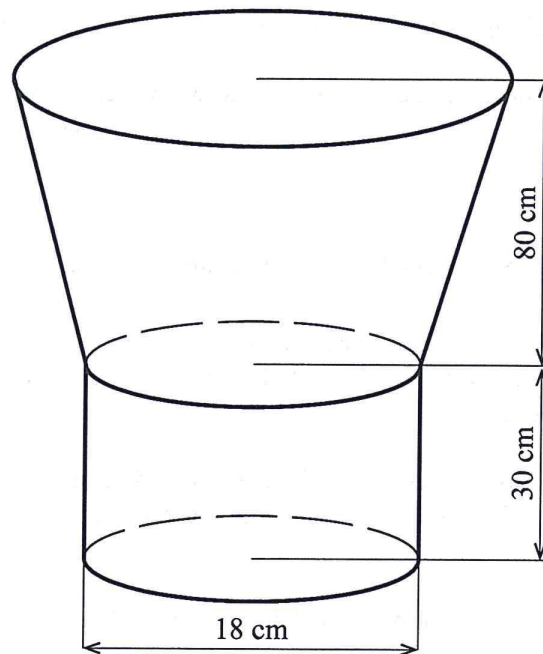
If the vertical height of the cone from which the frustum was cut was 120 cm, calculate:

(i)   the larger radius of the frustrum;   (2 marks)

(ii)   the slant height of the frustrum;   (4 marks)

(iii)   the surface area of the model.   (4 marks)

24. A cylindrical container of radius 14 cm has a capacity of 12.32 litres. (Take $\pi = \frac{22}{7}$)

(a)   Calculate the height of the container.   (3 marks)

(b)   The container was used to store juice. If the container was full of juice and some of it was used up to a level of 5 cm, calculate the amount, in litres, of juice used.
                                                                             (3 marks)

(c)   The remaining juice was packed into cylindrical bottles of radius 2 cm and height 8.4 cm. Calculate the number of bottles of juice obtained.   (4 marks)