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

SECTION I (50 marks)

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

1. Evaluate

$$\frac{^-8\times{}^+2+{}^-11}{^+18\div{}^-2\times{}^+3}$$

(2 marks)

2. During a prize-giving day in a school, there were four times as many students as parents. The number of girls was 84 more than the number of boys. If there were 630 girls, calculate the number of parents present. (3 marks)

3. Given that $3x + 5y = 300$ and $x + y = 78$, find the value of $10x + 15y$. (3 marks)

4. A group of families shared 96 packets of maize meal, 84 packets of wheat flour and 36 packets of sugar.

   Determine:

   (a) the greatest number of families that shared the foodstuffs equally; (2 marks)

   (b) the total number of packets of foodstuffs that each family received. (2 marks)

5. Express $\dfrac{128}{2^5 \div 2^8}$ in the simplest index form. (3 marks)

6. Line AB shown below is a side of a parallelogram ABCD in which AD = 6 cm and angle DAB = 30°.

A   B

   Using a pair of compasses and ruler only, complete the parallelogram ABCD. (3 marks)

7. An acute angle α is such that $\sin(4\alpha)° = \cos(\alpha+10)°$. Find:

   (a) the value of α; (2 marks)

   (b) $\sin \alpha$, correct to 3 decimal places. (1 mark)

8. Without using a calculator or mathematical tables, evaluate:

$$\frac{0.375 \div 0.06 - 4.2}{3.96 + 2.8 \times 0.05}$$
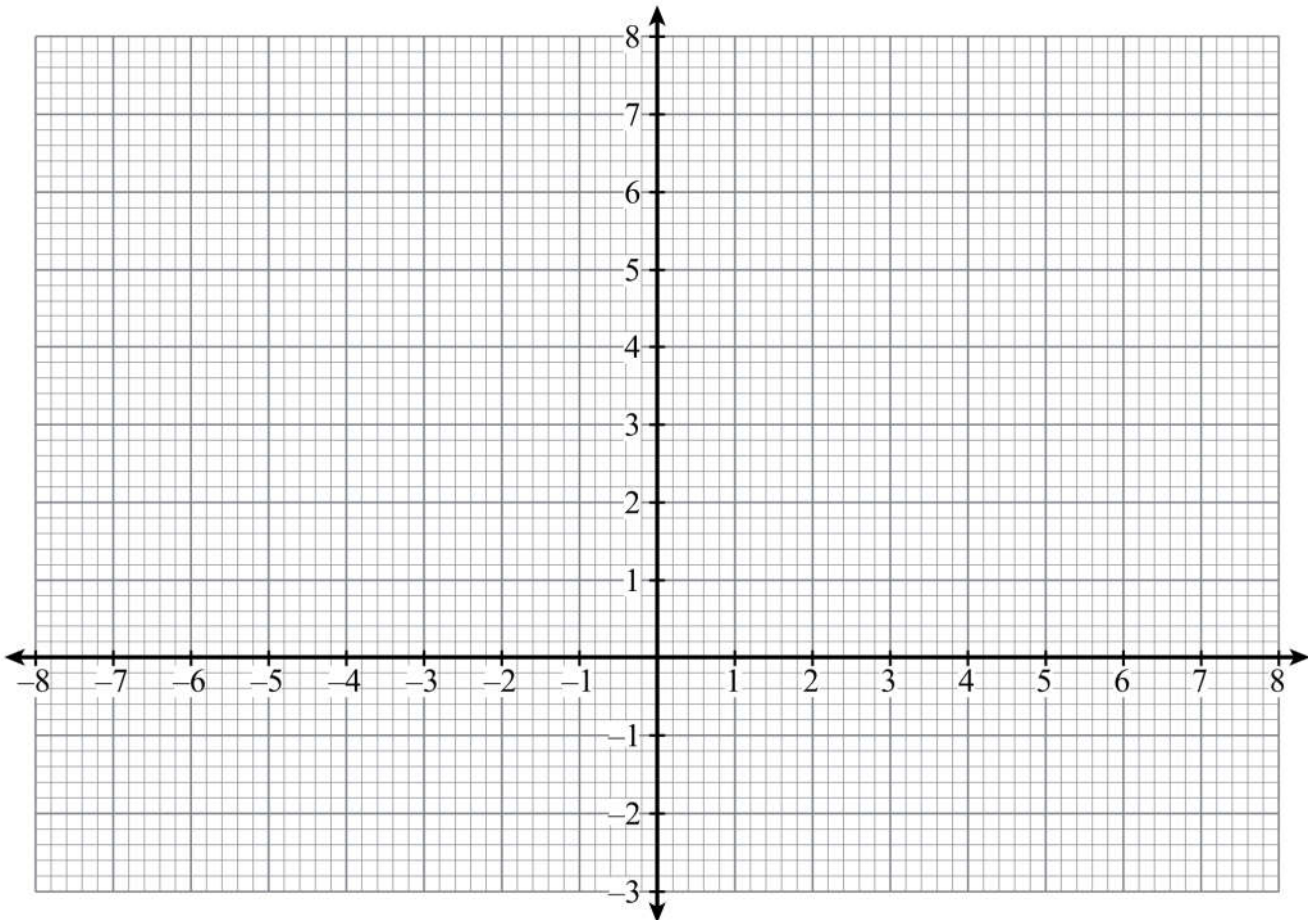
(3 marks)

9   Three children Awino, Buko and Chebet had two types of fruits each. Awino had twice as many mangoes as Buko while Buko had three times as many mangoes as Chebet. Also, Buko had three times as many oranges as Awino while Chebet had twice as many oranges as Awino. If Buko had x mangoes and y oranges, write a simplified expression to represent the total number of fruits the three children had. (3 marks)

10   A solid has a circular cross-section of radius 1.4 cm and a height of 4 cm.

    (a)   Name the solid. (1 mark)

    (b)   Draw an accurate net of the solid. (2 marks)

11   The tip of the minute hand of a clock moves through a distance of 17.6 cm between 3.00 pm and 3.12 pm. Find the length of the minute hand. (4 marks)

12   In the figure below, O is the centre of the circle. PQRS is a cyclic quadrilateral and RST is a straight line. Angle RPQ = 21° and angle TSP = 147°.
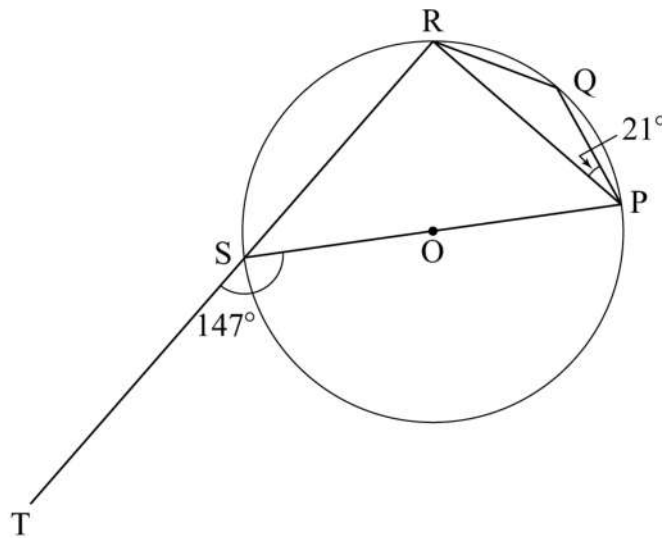
Calculate the size of angle SRQ. (3 marks)

13   Factorise $2x^2 + 6y - 3x - 4xy$. (2 marks)

14   The area of a rhombus is 34 cm². One of the interior angles is 30°. Calculate the length of a side of the rhombus to the nearest centimetre. (3 marks)

15 The vertices of a triangle are P($-3,1$), Q($1,3$) and R($4,2$). The vertices of its image under an enlargement are P′($-7,4$), Q′($1,8$) and R′($7,6$).

(a) On the grid provided, draw triangle PQR and its image. (2 marks)

(b) Determine the centre and scale factor of the enlargement. (2 marks)

16 A tumbler is in the shape of a frustum of a cone. The radii of the circular ends are 2.1 cm and 3.5 cm. The slant height of the tumbler is 5 cm. Calculate the area of the curved surface. (4 marks)

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

17   Keya, Limo and Mumo invested some money into a business. Keya contributed Ksh 30 000,
      Limo contributed Ksh 50 000 and Mumo contributed 25% of the total amount contributed by
      Keya and Limo.

      (a)   Calculate:

             (i)   the amount of money contributed by Mumo;   (2 marks)

             (ii)   the ratio in which Keya, Limo and Mumo made their contribution.   (2 marks)

      (b)   After one year, the business realised a profit of Ksh 25 000 which was shared by the
             partners in the ratio of their contributions. Find the amount of money Mumo got.
                                                                                        (2 marks)

      (c)   During the second year, Mumo added some more money to the business. The new ratio
             of their contributions was, Keya:Limo:Mumo = 3:5:7.

             Calculate:

             (i)   the total amount of money Mumo added to the business in the second year.
                                                                                        (2 marks)

             (ii)   Mumo's percentage contribution in the business by the end of the second year.
                                                                                        (2 marks)

18   The capacity of a cylindrical container is 1.54 litres. The height of the container is 10 cm.
      (Take $\pi = \dfrac{22}{7}$)

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

      (b)   Along each end of the curved surface, a ribbon of width 1.5 cm is fixed with an overlap
             of 2 cm.

             Calculate:

             (i)   the total length of the ribbon used;   (3 marks)

             (ii)   the surface area of the part of container covered by the ribbon.   (1 mark)

      (c)   Given that the container is open at one end, calculate the outer surface area of the
             container.   (3 marks)

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19   Figure ABCD below is a scale drawing of a piece of land in which AD represents 90 m. The square PQRS represents the homestead.
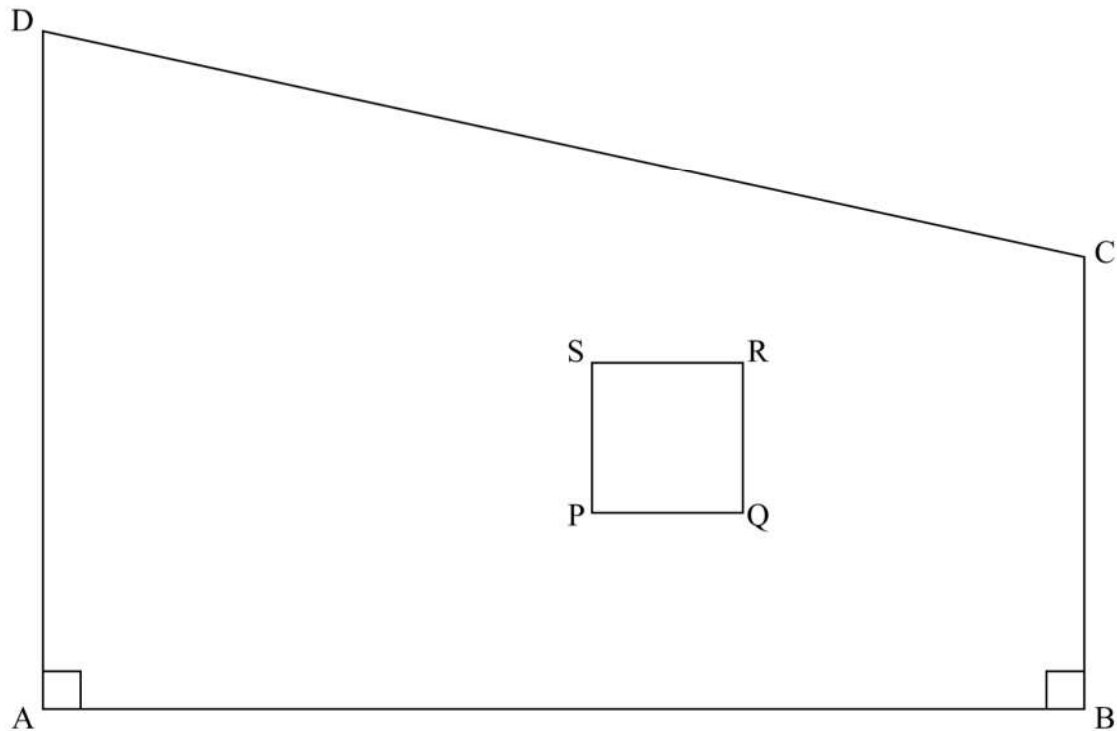
(a)   State, in ratio form, the scale used.   (2 marks)

(b)   Calculate:

(i)   the perimeter of the homestead in metres.   (2 marks)

(ii)   the area of the piece of land in hectares.   (3 marks)

(c)   On the scale drawing show the shortest distance from the centre of the homestead to side CD and hence determine the distance in metres.   (3 marks)

20   A line L_1 passes through points $(-3, -2)$ and $(6, 1)$.

(a)   Find the equation of L_1 in the form $y = mx + c$, where m and c are constants.   (3 marks)

(b)   A line L_2 is perpendicular to L_1 and passes through point $(-1, 2)$. Find the equation of L_2 in the form $ax + by + c = 0$, where a, b and c are constants.   (3 marks)

(c)   Another line L_3 is parallel to L_2 and passes through point $(1,1)$. Determine the co-ordinates of the x-intercept and the y-intercept of L_3.   (4 marks)

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21   Using a ruler and a pair of compasses only:

    (a)   Construct triangle PQR such that PQ = 6.5 cm, QR = 8 cm, and angle PQR = 75°.
                                                                                    (4 marks)

    (b)   On triangle PQR in part (a) above, construct:

        (i)   the perpendicular bisector of line RP to meet line RP at M and line RQ at N.
                                                                                    (1 mark)

        (ii)   the bisector of angle RPQ to meet line MN at O. Measure angle POM.   (2 marks)

        (iii)   a circle centre O and radius OM, to meet line RQ at X and Y. Measure chord XY
                and angle XOY.   (3 marks)

22   An athlete ran two laps around a 400 metre track. He ran the first lap in 64 seconds and then
      increased his speed in the second lap by 6%.

    (a)   Calculate his speed, in metres per second, during:

        (i)   the first lap;   (2 marks)

        (ii)   the second lap;   (2 marks)

    (b)   Calculate, to 2 decimal places:

        (i)   the total time taken to run the two laps;   (3 marks)

        (ii)   the average speed, in km/h, for the two laps.   (3 marks)

23   Kerubo bought 420 bananas at Ksh 20 for every 8 bananas. For every 70 bananas she bought,
      she was given one extra banana. She hired a cart for Ksh 50 to transport the bananas. During
      transportation 14 bananas got spoilt and the remaining ones were sold.

    (a)   Determine:

        (i)   the total amount of money that Kerubo spent;   (2 marks)

        (ii)   the number of bananas sold.   (1 mark)

    (b)   Kerubo made a 60% profit after selling some of the bananas at Ksh 30 for every 5 and
           the rest at Ksh 10 for every 3.

           Calculate:

        (i)   the number of bananas sold at Ksh 30 for every 5.   (4 marks)

        (ii)   the amount of money obtained from the bananas sold at Ksh 10 for every 3.

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24 **(a)** **(i)** On the grid provided, draw triangle RST such that R($-3,1$), S($-3,-4$) and T($2,-4$). (1 mark)

(ii) Determine the area of the triangle RST. (2 marks)

(b) On the same grid:

(i) plot point U such that RSTU is a square. State the coordinates of point U; (2 marks)

(ii) plot point V such that SV = 2SU and S, U and V lie on a straight line. State the coordinates of V. (2 marks)

(c) Calculate the area of RSTV. (3 marks)

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