

NOV 2023

BINDURA UNIVERSITY OF SCIENCE EDUCATION**DM005: GEOMETRY AND TRIGONOMETRICAL RATIOS.****Time: 3 hours**

Candidates may attempt ALL questions in Section A and at most TWO questions in Section B. Each question should start on fresh page.

SECTION A (40 marks)

A1. If M (-1;4) is the midpoint of the line segment AB, and the coordinates of A(3;6) are given, find the coordinates of the end point B. [7]

A2. Determine the equation of the straight line that passes through the points P(1;2) and Q (3;8) in the form $y = mx + c$ [8]

A3 A(-4;7), B(4;5), C(0;-1) and D(a; b) are vertices of a parallelogram ABCD.

- (i) Draw the parallelogram on graph paper. [3]
- (ii) Find the midpoint of the diagonal AC. [2]
- (iii) Use information that you have to find the coordinates of point D. [2]
- (iv) Determine the equation of the straight line that passes through point A and point B on the parallelogram in the form $y = mx + c$ [3]

A4. The points A(7;1), B(7;9) and C(1;9) are on the circumference of a circle.

- (a) Find an equation of a circle. [8]
- (b) Find an equation of the tangent to the circle at B. [7]

SECTION B (60 Marks)

Candidates may attempt TWO questions being careful to number them B5 to B7.

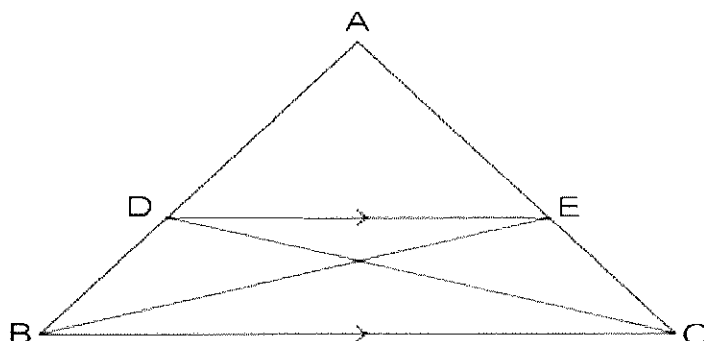
B5. (a) Show that $\frac{\sin(90^\circ + x) \cos x \tan(-x)}{\cos(180^\circ + x)} = \sin x$. [8]

- (b)** If $\sin 36^\circ = m$ and $\cos 24^\circ = n$ determine in terms of m and / or n
- (i) $\cos 36^\circ$, [5]
 - (ii) $\sin 12^\circ$. [5]

(c) Simplify $\frac{2 \cos 285^\circ \cos 15^\circ}{\cos(45^\circ - x) \cos x - \sin(45^\circ - x) \sin x}$. [12]

B6.(a) Calculate the value of $(\sin 3x - \cos 3x)^2$ if $\sin 6x = \frac{-2}{5}$. [6]

(b) In the diagram, $\triangle ABC$ has $DE \parallel BC$. Prove the theorem that states $\frac{AE}{EC} = \frac{AD}{DB}$.



[10]

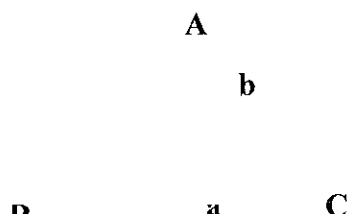
- (c). (i) Express $4\sin\theta - 3\cos\theta$ in the form $R\sin(\theta - \alpha)$, where $R > 0$ and $0^\circ < \alpha < 90^\circ$, stating the value of α correct to 2 decimal places.

[4]

Hence

- (ii) Solve the equation $4\sin\theta - 3\cos\theta = 2$,
giving all values of θ such that $0^\circ < \theta < 360^\circ$ [8]
- (iii) Write down the greatest value of $\frac{1}{4\sin\theta - 3\cos\theta + 6}$. [2]

B7(a). In a triangle, $\triangle ABC$, prove that $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ [8]



(b). Prove the identity. $(1 + \sin\theta)\left(\frac{1}{\cos\theta} - \tan\theta\right) \equiv \cos\theta$. [6]

(c). Find the coordinates of the points of intersection of the line $y + 2x = 9$

and the curve $y^2 = 6x + 1$.

[4]

(d). The line L_1 has the equation $2x + y = 8$. The line L_2 passes through the point $A(7, 4)$ and is perpendicular to L_1 .

(i) Find the equation of L_2 .

[6]

(ii) Given that the lines L_1 and L_2 intersect at the point B, find the length of AB.

[6]

END OF THE PAPER