

Total Questions: 8

Total Marks: 50

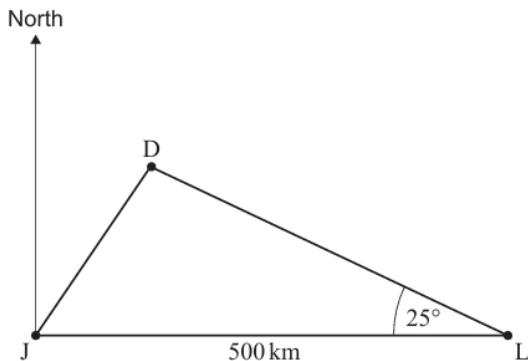
Question 1:

Calculator Allowed: Yes

1. [Maximum mark: 5]

The cities Lucknow (L), Jaipur (J) and Delhi (D) are represented in the following diagram. Lucknow lies 500 km directly east of Jaipur, and $\angle JLD = 25^\circ$.

diagram not to scale



The bearing of D from J is 034° .

- (a) Find $\angle JDL$. [2]
(b) Find the distance between Lucknow and Delhi. [3]

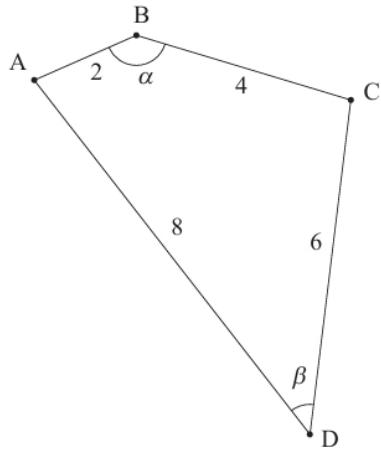
Question 2:

Calculator Allowed: Yes

9. [Maximum mark: 8]

Consider a quadrilateral ABCD such that $AB = 2$, $BC = 4$, $CD = 6$ and $DA = 8$, as shown in the following diagram. Let $\alpha = \hat{ABC}$ and $\beta = \hat{ADC}$.

diagram not to scale



- (a) (i) Find AC in terms of α .
(ii) Find AC in terms of β .
(iii) Hence or otherwise, find an expression for α in terms of β . [4]
- (b) Find the maximum area of the quadrilateral ABCD. [4]

Question 3:

Calculator Allowed: No

3. [Maximum mark: 7]

Consider the functions $f(x) = \sqrt{3} \sin x + \cos x$ where $0 \leq x \leq \pi$ and $g(x) = 2x$ where $x \in \mathbb{R}$.

- (a) Find $(f \circ g)(x)$. [2]
(b) Solve the equation $(f \circ g)(x) = 2 \cos 2x$ where $0 \leq x \leq \pi$. [5]

Question 4:

Calculator Allowed: No

[Maximum mark: 7]

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Solve the equation $\sin 2x - \cos 2x = 1 + \sin x - \cos x$ for $x \in [-\pi, \pi]$.

Question 5:

Calculator Allowed: Yes

[Maximum mark: 5]

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Let $f(x) = \tan(x + \pi) \cos\left(x - \frac{\pi}{2}\right)$ where $0 < x < \frac{\pi}{2}$.

Express $f(x)$ in terms of $\sin x$ and $\cos x$.

Question 6:

Calculator Allowed: Yes

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[Maximum mark: 6]

(a) Prove the identity $\frac{1 + \sin 2x}{\cos 2x} \equiv \frac{1 + \tan x}{1 - \tan x}$. [4]

(b) Solve the equation $\frac{1 + \sin 2x}{\cos 2x} = \sqrt{3}$ for $0 \leq x < 2\pi$. [2]

Question 7:

Calculator Allowed: No

5. [Maximum mark: 7]

Let $f(x) = \frac{\sin 3x}{\sin x} - \frac{\cos 3x}{\cos x}$.

(a) For what values of x does $f(x)$ not exist? [2 marks]

(b) Simplify the expression $\frac{\sin 3x}{\sin x} - \frac{\cos 3x}{\cos x}$. [5 marks]

Question 8:**Calculator Allowed: No****5.** [Maximum mark: 5]

(a) Sketch the graph of $y = \left| \cos\left(\frac{x}{4}\right) \right|$ for $0 \leq x \leq 8\pi$. [2]

(b) Solve $\left| \cos\left(\frac{x}{4}\right) \right| = \frac{1}{2}$ for $0 \leq x \leq 8\pi$. [3]