

## 2.3 Further Trigonometric Equations

### Question Paper

Course	Edexcel IAL Maths: Pure 3
Section	2. Trigonometry
Topic	2.3 Further Trigonometric Equations
Difficulty	Hard

**Time allowed:** 70

**Score:** /56

**Percentage:** /100

**Question 1**

Solve the equation  $\sec^2 2x = 1 + \tan 2x$  for  $0^\circ \leq x \leq 180^\circ$ .

**[4 marks]**

**Question 2**

Given that

$$\sin(2A^\circ - B^\circ) = \frac{\sqrt{6} + \sqrt{2}}{4}$$

and that

$$3A = 4B \text{ and } 60^\circ < B^\circ < A^\circ < 300^\circ$$

find the values of  $A$  and  $B$ .

**[4 marks]**

**Question 3**

Solve the equation

$$\frac{\cos x}{\operatorname{cosec} x} - \cot x = 0, \quad -2\pi \leq x \leq 2\pi$$

**[4 marks]**

**Question 4**

(a) Find the value of ...

(i)  $\arcsin\left(\sin \frac{7\pi}{6}\right)$ ,

(ii)  $\arccos\left(\cos\left(-\frac{2\pi}{3}\right)\right)$ .

**[3 marks]**

**Question 4**

(b) Briefly explain why  $\arctan(\tan \pi) \neq \pi$ .

**[2 marks]**

**Question 5**

(a) Show that  $6 \cos \theta - 8 \sin \theta$  can be written in the form  $R \cos(\theta + \alpha)$ , where  $R > 0$  and  $\alpha$  is an acute angle measured in radians.

**[3 marks]**

**Question 5**

(b) Hence, or otherwise, solve the equation  $3 \cos \theta - 4 \sin \theta - 2 = 0$ , for  $0 \leq \theta \leq 2\pi$ .  
Give your answers to three significant figures.

**[3 marks]**

**Question 5**

(c) Write down the minimum value of  $6 \cos \theta - 8 \sin \theta$  and the smallest positive value of  $\theta$  for which it occurs. Give your value of  $\theta$  to three significant figures.

**[2 marks]**

**Question 6**

Solve the equation

$$2 \cot^2 x = 8 - \operatorname{cosec} x, \quad -\pi \leq x \leq \pi$$

giving your answers to three significant figures where appropriate.

**[4 marks]**

**Question 7**

Solve the equation

$$8 \cos^4 \theta - 5 \cos 2\theta - 2 = 0 \quad 0 \leq \theta \leq \pi$$

State your answers as multiples of  $\pi$ .

**[5 marks]**

**Question 8**

(a) Write down the domain and range for the function

$$f(x) = \cos(\arcsin x)$$

**[2 marks]**

**Question 8**

(b) Solve the equation

$$2[f(x)]^2 - 3f(x) + 1 = 0$$

**[4 marks]**

**Question 9**

(a) Use a small angle approximation to estimate the positive solution to the equation

$$\sec 2\theta = 1.05$$

Give your answer to six decimal places.

**[3 marks]**

**Question 9**

(b) Solve the equation  $\sec 2\theta = 1.05$   $0 < \theta < \frac{\pi}{2}$ .

Give your answer to six decimal places.

**[3 marks]**

**Question 9**

(c) Find the percentage error, to two significant figures, in the approximation from part (a) compared to your answer in part (b).

**[2 marks]**

**Question 10**

Determine the values of the constant  $k$  for which the equation

$$\operatorname{cosec} \theta = k, \quad -\pi \leq \theta \leq 2\pi$$

- has
- (i) no real solutions,
  - (ii) 1 real solution,
  - (iii) 2 real solutions,
  - (iv) 4 real solutions

**[4 marks]**

**Question 11**

Solve the equation

$$\cot^2 \theta = 15 - 6\operatorname{cosec} \theta, \quad -180^\circ \leq \theta \leq 180^\circ$$

Give your answers to one decimal place where appropriate.

**[4 marks]**



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