

# Addition & Double Angle Formulae

## Difficulty: Easy

### Question Paper 1

Level	A Level
Subject	Maths Pure 3
Exam Board	CIE
Topic	Trigonometry
Sub-Topic	Addition & double angle formulae
Difficulty	Easy
Booklet	Question Paper 1

**Time allowed:** 48 minutes

**Score:** /34

**Percentage:** /100

**Grade Boundaries:**

A*	A	B	C	D	E
>90%	81%	70%	58%	46%	34%

## Question 1

Express the equation  $\tan(\theta + 45^\circ) - 2 \tan(\theta - 45^\circ) = 4$  as a quadratic equation in  $\tan \theta$ . Hence solve this equation for  $0^\circ \leq \theta \leq 180^\circ$ . [6]

## Question 2

(i) Show that the equation  $\tan(30^\circ + \theta) = 2 \tan(60^\circ - \theta)$  can be written in the form

$$\tan^2 \theta + (6\sqrt{3})\tan \theta - 5 = 0. \quad [4]$$

(ii) Hence, or otherwise, solve the equation

$$\tan(30^\circ + \theta) = 2 \tan(60^\circ - \theta),$$

for  $0^\circ \leq \theta \leq 180^\circ$ .

[3]

### Question 3

(i) Using the expansions of  $\cos(3x - x)$  and  $\cos(3x + x)$ , prove that

$$\frac{1}{2}(\cos 2x - \cos 4x) \equiv \sin 3x \sin x. \quad [3]$$

(ii) Hence show that

$$\int_{\frac{1}{6}\pi}^{\frac{1}{3}\pi} \sin 3x \sin x \, dx = \frac{1}{8}\sqrt{3}. \quad [3]$$

### Question 4

Solve the equation

$$\tan(45^\circ - x) = 2 \tan x,$$

giving all solutions in the interval  $0^\circ < x < 180^\circ$ . [5]

## Question 5

Solve the equation

$$\cos \theta + 4 \cos 2\theta = 3,$$

giving all solutions in the interval  $0^\circ \leq \theta \leq 180^\circ$ .

[5]

## Question 6

(i) Simplify  $\sin 2\alpha \sec \alpha$ .

[2]

(ii) Given that  $3 \cos 2\beta + 7 \cos \beta = 0$ , find the exact value of  $\cos \beta$ .

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[3]