

TRIGONOMETRIC EQUATIONS

AS Unit 1: Pure Mathematics A

WJEC past paper questions: 2010 – 2017

Total marks available 139 (approximately 2 hour 45 minutes)

1. a) Find all values of θ in the range $0^\circ \leq \theta \leq 360^\circ$ satisfying

$$3 - 7 \cos \theta = 6 \sin^2 \theta . \quad (5)$$

- b) Find all values of x in the range $0^\circ \leq x \leq 180^\circ$ satisfying

$$\tan(2x + 45^\circ) = 0.7 . \quad (3)$$

- c) Find all values of θ in the range $0^\circ \leq \theta \leq 360^\circ$ satisfying

$$4 \tan \theta \cos \theta + 1 = 0 . \quad (3)$$

(January 10)

2. a) Find all values of θ in the range $0^\circ \leq \theta \leq 360^\circ$ satisfying

$$12 \cos^2 \theta - 5 \sin \theta = 10 . \quad (6)$$

- b) Find all values of x in the range $0^\circ \leq x \leq 180^\circ$ satisfying

$$\tan(2x) = -1.6 . \quad (2)$$

- c) Find all values of ϕ in the range $0^\circ \leq \phi \leq 180^\circ$ satisfying

$$\tan \phi + 2 \sin \phi = 0 . \quad (4)$$

(Summer 10)

3. a) Find all values of θ between 0° and 360° satisfying

$$7 \sin^2 \theta + 1 = 3 \cos^2 \theta - \sin \theta . \quad (6)$$

- b) Find all values of x between 0° and 180° satisfying

$$\cos(2x + 25^\circ) = -0.454 . \quad (3)$$

(January 11)

4. a) Find all values of θ in the range $0^\circ \leq \theta \leq 360^\circ$ satisfying $\sin \theta + 12\cos^2 \theta = 6$. (6)

b) Find all values of x in the range $0^\circ \leq x \leq 180^\circ$ satisfying $\cos(2x - 35^\circ) = 0.891$. (3)

c) Find all values of ϕ in the range $0^\circ \leq \phi \leq 360^\circ$ satisfying $\sin \phi + \cos \phi = 0$. (3)

(Summer 11)

5. a) Find all values of θ in the range $0^\circ \leq \theta \leq 360^\circ$ satisfying $10 \sin^2 \theta + 7 \cos \theta = 5 \cos^2 \theta + 8$. (6)

b) Find all values of x in the range $0^\circ \leq x \leq 360^\circ$ satisfying $\sin(x - 50^\circ) = -0.682$. (3)

c) Without carrying out any calculations, explain why there are no values of ϕ which satisfy the equation

$\sin \phi + \cos \phi = 3$. (1)

(January 12)

6. a) Find all values of θ in the range $0^\circ \leq \theta \leq 360^\circ$ satisfying $10 \cos^2 \theta + 3 \cos \theta = 4 \sin^2 \theta - 2$. (6)

b) Find all values of x in the range $0^\circ \leq x \leq 180^\circ$ satisfying $\sin(3x - 21^\circ) = -0.809$. (3)

c) Find all values of ϕ in the range $0^\circ \leq \phi \leq 360^\circ$ satisfying $\cos \phi - 5 \sin \phi = 0$. (3)

(Summer 12)

7. a) Find all values of θ between 0° and 360° satisfying $7 \sin^2 \theta - \sin \theta = 3 \cos^2 \theta$. (6)

b) Find all values of x between 0° and 180° satisfying $\tan(3x - 20^\circ) = 1.28$. (4)

(January 13)

8. a) i) Show that the equation

$$6 \cos \theta + 5 \tan \theta = 0$$

may be rewritten in the form

$$6 \sin^2 \theta - 5 \sin \theta - 6 = 0 .$$

- ii) Hence find all the values of θ in the range $0^\circ \leq \theta \leq 360^\circ$ satisfying the equation

$$6 \cos \theta + 5 \tan \theta = 0 . \quad (7)$$

- b) Find all values of x in the range $0^\circ \leq x \leq 180^\circ$ satisfying

$$\cos(2x - 60^\circ) = 0.788 . \quad (3)$$

(Summer 13)

9. a) Find all values of θ in the range $0^\circ \leq \theta \leq 360^\circ$ satisfying

$$8 \cos^2 \theta - 7 \sin^2 \theta = 4 \cos \theta - 3 . \quad (6)$$

- b) The angles X , Y and Z are the three angles of a triangle. Given that $\tan X = -2.246$ and that $\tan(Y - Z) = 0.364$, find the values of X , Y and Z . Give each angle correct to the nearest degree. (4)

(January 14)

10. a) Find all values of θ in the range $0^\circ \leq \theta \leq 360^\circ$ satisfying

$$4 \cos^2 \theta + 1 = 4 \sin^2 \theta - 2 \cos \theta . \quad (6)$$

- b) The angle α satisfies

$$\sin(\alpha + 40^\circ) = \frac{1}{\sqrt{2}}$$

and $\sin(\alpha - 35^\circ) = \frac{\sqrt{3}}{2}$

Given that $0^\circ < \alpha < 180^\circ$, find the value of α . (3)

- c) Find all values of θ in the range $0^\circ \leq \theta \leq 360^\circ$ satisfying

$$\frac{7}{\cos \theta} - \frac{10}{\sin \theta} = 0 \quad (3)$$

(Summer 14)

11. a) Show that there is no angle θ which satisfies the equation

$$4 \cos^2 \theta - 2 \sin^2 \theta - \sin \theta + 8 = 0$$

giving a mathematical reason to explain how you came to your conclusion. (4)

- b) Find all values of x in the range $0^\circ \leq x \leq 180^\circ$ satisfying

$$\sin(2x - 75^\circ) = -0.515. \quad (3)$$

- c) Find all values of ϕ in the range $0^\circ \leq \phi \leq 180^\circ$ satisfying

$$4 \tan \phi + 7 \sin \phi = 0. \quad (4)$$

(Summer 15)

12. a) Find all values of θ in the range $0^\circ \leq \theta \leq 360^\circ$ satisfying

$$6 \sin^2 \theta + 1 = 2(\cos^2 \theta - \sin \theta). \quad (6)$$

- b) Find all values of x in the range $0^\circ \leq x \leq 180^\circ$ satisfying

$$\tan(3x - 57^\circ) = -0.81. \quad (4)$$

- c) Without carrying out any calculations, explain why there are no values of ϕ which satisfy the equation

$$2 \sin \phi + 4 \cos \phi = -7 \quad (1)$$

(Summer 16)

13. a) Find all values of θ in the range $0^\circ \leq \theta \leq 360^\circ$ satisfying

$$\sin^2 \theta + 6 \cos^2 \theta + 13 \sin \theta = 0. \quad (5)$$

- b) The angles A , B and C are the three angles of a triangle.

Given that $\cos A = -0.342$ and that $\tan(B - C) = 0.404$, find the values of A , B and C .

Give each angle correct to the nearest degree. (4)

(Summer 17)