Topic: TRIGONOMETRY Total marks: 43

1. Given that $sin\,A = -\frac{3}{5}, cos\,B = \frac{5}{6}$ and both angle A and angle B are in the same quadrant, find the exact value of

   (i) $cos(A - B)$ [3]

   (ii) $sin\frac{B}{2}$ [2]

2. (i) Prove the identity $cot\,x - sin\,2x = cot\,x\,cos\,2x$. [3]

   (ii) Hence, solve the equation $4\,cot\,x - 4\,sin\,2x = cos\,2x$ for $0 \leq x \leq \pi$ [4]

3. (i) Show that $sin(x - 30°) = -cos(x + 60°)$ [3]

   (iii) Hence, find the values of $x$between $0°$ and $360°$ for which $4\,sin(x - 30°) + cos(x + 60°) = 1$. [4]

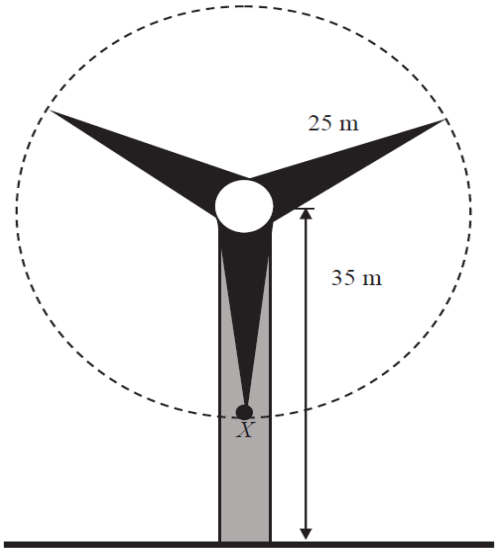
   (iii) Given that $sin(x - 30°) = \frac{1}{2}\left(\sqrt{3}\,sin\,x - cos\,x\right)$, use it to find the exact value of $sin\,15°$. [3]

4. (a) Factorise $a^3 + b^3$. [1]

   (b) Show that $\frac{sin^3\,x + cos^3\,x}{sin\,x + cos\,x} = 1 - \frac{sin\,2x}{2}$. [2]

   (c) Hence, solve the equation $\frac{sin^3\,x + cos^3\,x}{sin\,x + cos\,x} = 1 - sin^2\,2x$ for $0 \leq x \leq \pi$ [5]

5. The diagram shows a wind turbine with blade 25m in length. The centre of the wind turbine is 35m from the ground. The height, h m, of the tip of a particular blade above the ground t seconds after leaving X can be modelled by $h = a\,cos\,bt + c$, where c is a constant. The blades of the wind turbine rotate at a speed of 1 revolution for every 3π seconds.



(a)Find the values of a, b and c. [3]

(b) Hence, sketch the graph for $h = a\cos bt + c$ for $0 < t < 6\pi$. [2]

(c) Find how long it would take for the blade to first be 42m above the ground after leaving X. [3]

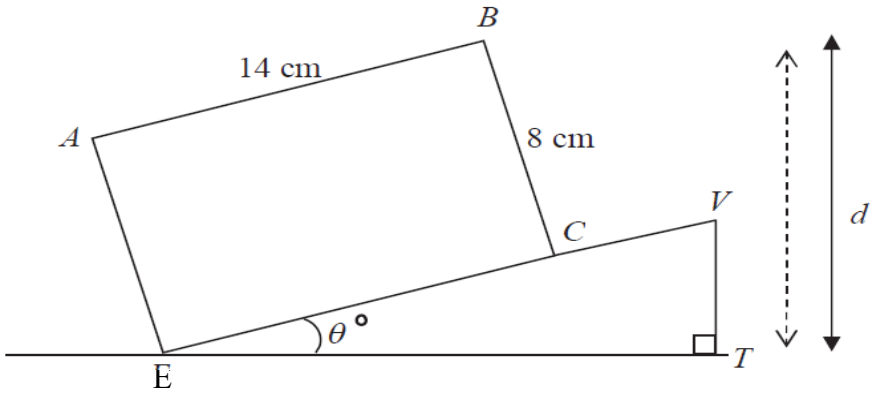
6. The diagram shows the front view of a rectangular block ABCE, with dimensions 14cm by 8cm, placed on a ramp, VE, tilted at an acute angle of $\theta°$ and angle $\angle VTE = 90°$. The ramp is placed on a horizontal surface ET and d is the perpendicular distance from B to ET.

(a) Show that $d = 14\sin\theta + 8\cos\theta$. [2]

(b) Express d in the form $R\sin(\theta + \alpha)$, where $R > 0$, and $0° \leq \alpha \leq 90°$. [3]

(c) State the maximum value of d and find the corresponding value of θ. [2]

(d) Find the smallest value of θ such that $d = 13$. [2]



Answer Key

1(i)	$\frac{20+3\sqrt{11}}{30}$
1(ii)	$\frac{\sqrt{3}}{6}$
2(i)	-
2(ii)	$\frac{\pi}{4}, \frac{3\pi}{4}, 1.33$
3(ii)	$49.5°, 190.5°$
3(iii)	$\frac{1}{4}(\sqrt{6}-\sqrt{2})$
4(a)	$(a+b)(a^2-ab+b^2)$
4(b)	-
4(c)	$0, \frac{\pi}{2}, \pi \quad or \quad \frac{\pi}{12}, \frac{5\pi}{12}$
5(a)	$a=-25, b=\frac{2}{3}, c=35$
5(b)	Graph
5(c)	$t = 2.78$ s
6(a)	-
6(b)	$d = 2\sqrt{65}\sin(\theta + 29.7°)$
6(c)	$2\sqrt{65}, 60.3°$
6(d)	$24.0°$