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Problem Solving Set A → Chapter 10

Bronze:

a) $2\sin x = 5\cos x$

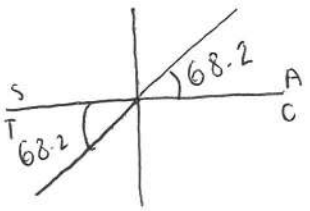
$\frac{\sin x}{\cos x} = \frac{5}{2}$

$\tan x = 5/2$

b) $\tan(\theta + 20°) = 5/2$ $\quad 20° \leq \theta + 20° \leq 380°$

$\theta + 20° = \tan^{-1}(5/2)$

$= 68.2$



$180 + 68.2 = 248.2$

$68.2°$ } principal
$248.2°$ } solutions

$68.2 - 20 = 48.2°$

$248.2 - 20 = 228.2°$

Silver:

$\frac{\sin 3x + 1}{1 - \sin 3x} = 2$ $\quad 0° \leq 3x \leq 540°$

$\sin 3x + 1 = 2(1 - \sin 3x)$

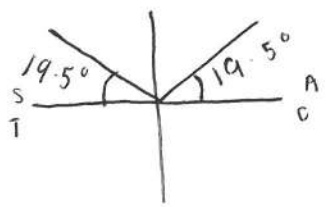
$\sin 3x + 1 = 2 - 2\sin 3x$

$3\sin 3x = 1$

$\sin 3x = 1/3$

$3x = \sin^{-1}(1/3)$

$= 19.5$



$180 - 19.5 = 160.5$

19.5 } principal
160.5 } solutions

$19.5 + 360 = 379.5$

$160.5 + 360 = 520.5$

$\frac{19.5}{3} = 6.5°$

$\frac{160.5}{3} = 53.5°$

$\frac{379.5}{3} = 126.5°$

$\frac{520.5}{3} = 183.5°$

Gold:

$-375 \leq 2x - 15 \leq 345$

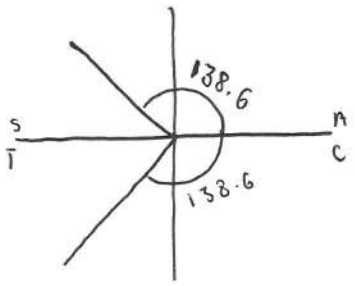
$4\cos(2x-15) + 3 = 0$

$4\cos(2x-15) = -3$

$\cos(2x-15) = -3/4$

$2x - 15 = \cos^{-1}(-3/4)$

$= 138.6$



$360 - 138.6$

$= 221.4$

138.6 } principal
221.4 } solutions

$138.6 - 360 = -221.4$

$221.4 - 360 = -138.6$

$\frac{138.6 + 15}{2} = 76.8$

$\frac{221.4 + 15}{2} = 118.2$

$\frac{-138.6 + 15}{2} = -61.8$

$\frac{-221.4 + 15}{2} = -103.2$

Problem Solving Set B → Chapter 10:

Bronze:

a) $\frac{3\sin^2 x + \cos^2 x}{\cos^2 x} = 5$

$\frac{3\sin^2 x}{\cos^2 x} + \frac{\cos^2 x}{\cos^2 x} = 5$

$3\tan^2 x + 1 = 5$

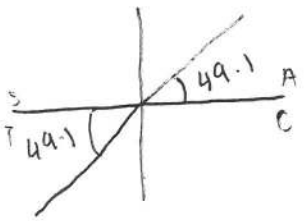
$3\tan^2 x = 4$

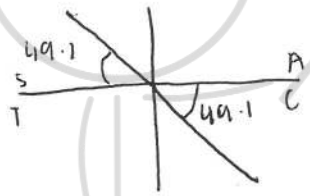
$\tan^2 x = 4/3$

b) $\tan x = \pm\sqrt{4/3}$ $\quad 0 \leq x < 360$

$x = \tan^{-1}(\sqrt{4/3})$ $\quad x = \tan^{-1}(-\sqrt{4/3})$

$= 49.1$ $\quad = -49.1$





$180 + 49.1 = 229.1$

49.1

229.1

$180 - 49.1 = 130.9$

$360 - 49.1 = 310.9$

130.9

310.9

Silver:

a) $4\cos^2 x + 9\sin x - 6 = 0$

$4(1 - \sin^2 x) + 9\sin x - 6 = 0$

$4 - 4\sin^2 x + 9\sin x - 6 = 0$

$-4\sin^2 x + 9\sin x - 2 = 0$ OR $4\sin^2 x - 9\sin x + 2 = 0$

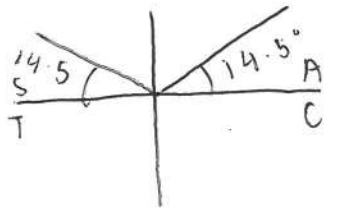
b) Using quadratic formula $0 \leq x < 720$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$ where $a = 4$, $b = -9$, $c = 2$

~~$\sin x = 2$~~ or $\sin x = 1/4$

$x = \sin^{-1}(1/4)$

$= 14.5$



$180 - 14.5 = 165.5$

14.5, 165.5 } principal solutions

$14.5 + 360 = 374.5$

$165.5 + 360 = 525.5$

Gold:

$5(\cos 3x - 1) = 3\sin 3x \tan 3x$

$5(\cos 3x - 1) = 3\sin 3x \left(\frac{\sin 3x}{\cos 3x}\right)$

$5(\cos 3x - 1) = \frac{3\sin^2 3x}{\cos 3x}$

$5\cos 3x - 5 = \frac{3\sin^2 3x}{\cos 3x}$

$\cos 3x(5\cos 3x - 5) = 3\sin^2 3x$

$5\cos^2 3x - 5\cos 3x = 3(1 - \cos^2 x)$

$5\cos^2 3x - 5\cos 3x = 3 - 3\cos^2 x$

$8\cos^2 3x - 5\cos 3x - 3 = 0$ $\quad 0 \leq 3x \leq 270$

Using quadratic formula: $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ where $a = 8$, $b = -5$, $c = -3$

$\cos 3x = 1$

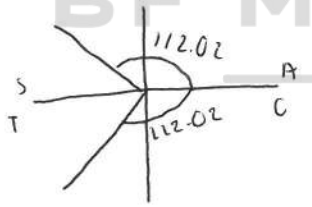
$3x = \cos^{-1}(1)$

$= 0$

$\cos 3x = -3/8$

$3x = \cos^{-1}(-3/8)$

$= 112.02$



$360 - 112.02$

$= 247.98$

112.02 } principal solutions
247.98 }

$112.02 \div 3 = 37.3$

$247.98 \div 3 = 82.7$