MATH 12

SOLUTIONS – SEC. 4.6 AND 6.2

4.6 – 29a) $pH = -\log[H^+] = -\log(5\times10^{-3}) = -[\log 5 + \log 10^{-3}] = -[\log 5 - 3]$

$= \boxed{3 - \log 5} \approx 2.3$

31 a) $pH = -\log[H^+] = 3.0$, so $\log[H^+] = -3.0$, $[H^+] = \boxed{10^{-3}\ M}$

b) $pH = -\log[H^+] = 6.5$, so $\log[H^+] = -6.5$, $[H^+] = 10^{-6.5} = \boxed{10^{.5}(10^{-7})\ M}$

$\approx 3.2\times10^{-7}\ M$

38 Northridge earthquake: $M_1 = 6.8$

Kobe earthquake: $M_2 = 7.2$

Since $M = \log\frac{I}{S}$, $10^M = \frac{I}{S}$ so $I = S(10^M)$;

and $\frac{I_2}{I_1} = \frac{\cancel{S}(10^{M_2})}{\cancel{S}(10^{M_1})} = 10^{M_2 - M_1} = \boxed{10^{.4}} \approx 2.5$ times more intense

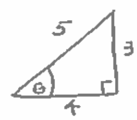
42 Power mower: $106\ dB = B_1$

Rock concert: $120\ dB = B_2$

Since $B = 10\log\frac{I}{I_0}$, $\frac{B}{10} = \log\frac{I}{I_0}$, $\frac{I}{I_0} = 10^{B/10}$, $I = I_0(10^{B/10})$

Then $\frac{I_2}{I_1} = \frac{\cancel{I_0}(10^{12})}{\cancel{I_0}(10^{10.6})} = \boxed{10^{1.4}} \approx 25$ times as intense

6.2 – 19 $\sin\theta = \frac{3}{5}$



$\cos\theta = \boxed{\frac{4}{5}}$ $\sec\theta = \frac{1}{\cos\theta} = \boxed{\frac{5}{4}}$ $\tan\theta = \boxed{\frac{3}{4}}$

$\csc\theta = \frac{1}{\sin\theta} = \boxed{\frac{5}{3}}$ $\cot\theta = \boxed{\frac{4}{3}} \leftarrow \frac{1}{\tan\theta}$

27 $\sin 30^\circ\cos 60^\circ + \sin 60^\circ\cos 30^\circ = \frac{1}{2}\cdot\frac{1}{2} + \frac{\sqrt{3}}{2}\cdot\frac{\sqrt{3}}{2} = \frac{1}{4} + \frac{3}{4} = \boxed{1}$

29 $(\cos 30^\circ)^2 - (\sin 30^\circ)^2 = \left(\frac{\sqrt{3}}{2}\right)^2 - \left(\frac{1}{2}\right)^2 = \frac{3}{4} - \frac{1}{4} = \frac{2}{4} = \boxed{\frac{1}{2}}$

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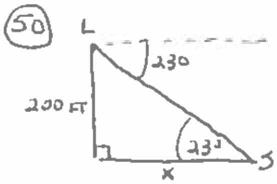

$\cot 23^\circ = \frac{x}{200}$, so $x = \boxed{200\cot 23^\circ}$ FT $\approx$ 471 FT

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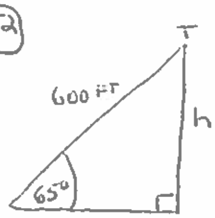
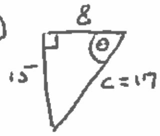


$\sin 65^\circ = \frac{h}{600}$, so $h = \boxed{600\sin 65^\circ}$ FT $\approx$ 544 FT

MATH 12 SOLUTIONS – SEC. 6.2

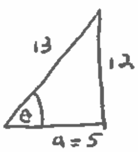
(6)



$c^2 = 8^2 + 15^2 = 64 + 225 = 289$, so $\underline{c} = \sqrt{289} = \underline{17}$

$$\boxed{\begin{array}{l} \sin\theta = \frac{15}{17} \\ \cos\theta = \frac{8}{17} \\ \tan\theta = \frac{15}{8} \end{array}} \qquad \boxed{\begin{array}{l} \csc\theta = \frac{17}{15} \\ \sec\theta = \frac{17}{8} \\ \cot\theta = \frac{8}{15} \end{array}}$$

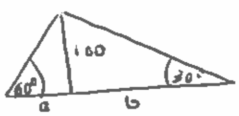
(24)



$a^2 + 12^2 = 13^2$, so $a^2 + 144 = 169$, $a^2 = 25$, $\underline{a = 5}$

$$\boxed{\begin{array}{ll} \sin\theta = \frac{12}{13} & \csc\theta = \frac{13}{12} \\ \cos\theta = \frac{5}{13} & \sec\theta = \frac{13}{5} \\ \tan\theta = \frac{12}{5} & \cot\theta = \frac{5}{12} \end{array}}$$

(41)

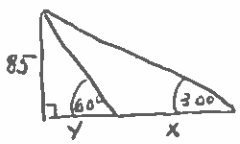


$x = a + b$ where $\cot 60° = \frac{a}{100}$, so $a = 100 \cot 60° = 100 \cdot \frac{\sqrt{3}}{3}$

and $\cot 30° = \frac{b}{100}$, so $b = 100 \cot 30° = 100\sqrt{3}$

Therefore $x = 100 \cdot \frac{\sqrt{3}}{3} + 100\sqrt{3} = 100\sqrt{3}\left(\frac{1}{3} + 1\right) = \frac{4}{3}(100\sqrt{3}) = \boxed{\frac{400\sqrt{3}}{3}} \approx \underline{230.9}$

(42)

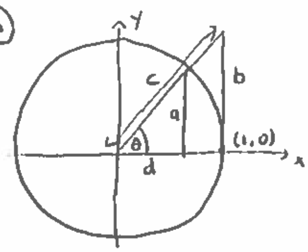


$\cot 60° = \frac{Y}{85}$, so $\underline{Y} = 85 \cot 60° = 85 \cdot \frac{\sqrt{3}}{3}$

$\cot 30° = \frac{X+Y}{85}$, so $\underline{X+Y} = 85 \cot 30° = 85\sqrt{3}$

Then $\underline{X} = (X+Y) - Y = 85\sqrt{3} - 85 \cdot \frac{\sqrt{3}}{3} = 85\sqrt{3}\left(1 - \frac{1}{3}\right) = \frac{2}{3}(85\sqrt{3}) = \boxed{\frac{170\sqrt{3}}{3}} \approx \underline{98.1}$

(46)



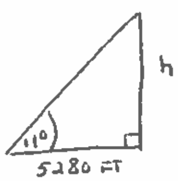
$\sin\theta = \frac{a}{1}$, so $\boxed{a = \sin\theta}$

$\cos\theta = \frac{d}{1}$, so $\boxed{d = \cos\theta}$

$\tan\theta = \frac{b}{1}$, so $\boxed{b = \tan\theta}$

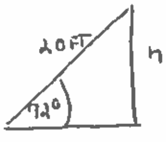
$\sec\theta = \frac{c}{1}$, so $\boxed{c = \sec\theta}$

(47)



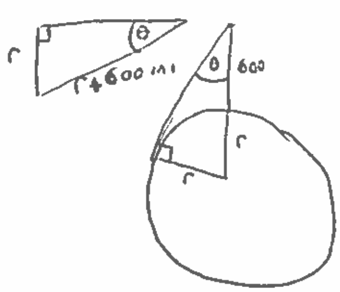
$\tan 11° = \frac{h}{5280}$, so $h = \underline{5280 \tan 11°}$ FT $\approx \underline{1026 \text{ FT}}$

(51)



$\sin 72° = \frac{h}{20}$, so $h = \underline{20 \sin 72°}$ FT $\approx \underline{19.0 \text{ FT}}$

(63)



$\underline{\sin\theta = \frac{r}{600 + r}}$, so $(600 + r)\sin\theta = r$,

$600 \sin\theta + r\sin\theta = r$,

$\underline{\theta = 60.276°}$

$600 \sin\theta = r - r\sin\theta = (1 - \sin\theta) r$

$r = \frac{600 \sin\theta}{1 - \sin\theta} \approx \underline{3960 \text{ mi}}$