Midpoint Formula

$$\left(\frac{x_2+x_1}{2}, \frac{y_2+y_1}{2}\right)$$

$$\frac{(x-h)^2}{b^2}+\frac{(y-k)^2}{a^2}=1$$

$$\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$$

Ellipse

$$c^2=a^2-b^2$$

Hyperbola

$$c^2=a^2+b^2$$

$$\frac{(y-k)^2}{a^2}-\frac{(x-h)^2}{b^2}=1$$

$$\frac{(x-h)^2}{a^2}-\frac{(y-k)^2}{b^2}=1$$

1

$$16x^2 + 9y^2 - 32x + 72y + 16 = 0$$
$$-16 \quad -16$$

$$16x^2 - 32x + \frac{9y^2}{9} + 72y = -16$$

$$16(1x^2 - 2x + \boxed{1}) + 9(1y^2 + 8y + \boxed{16}) = -16 + 16\boxed{1} + 9\boxed{16}$$

$$-16 + 16 + 144$$

$$\frac{16(x-1)^2}{144 \div 16} + \frac{9(y+4)^2}{144 \div 9} = \frac{144}{144}$$

$$\frac{(x-1)^2}{9} + \frac{(y+4)^2}{16} = 1$$

$b = 3$ $a = 4$

$c^2 = a^2 - b^2$

$c^2 = 16 - 9 = 7$ $c = \sqrt{7}$

center $(1, -4)$

vertices $(1, -4 \pm 4)$

co-v $(1 \pm 3, -4)$

foci $(1, -4 \pm \sqrt{7})$

$\frac{(x-h)^2}{b^2}+\frac{(y-k)^2}{a^2}=1$ Standard form

$\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$

2) ellipse

vertices $(-3,0)$, $(7,0)$

foci: $(0,0)$, $(4,0)$

center $\left(\frac{-3+7}{2}, \frac{0+0}{2}\right)$

$(2,0)$

$\frac{(x-2)^2}{25}+\frac{y^2}{21}=1$

$a=5$

$c=2$

$c^2=a^2-b^2$

$4=25-b^2$

$b^2=25-4$

$b^2=21$

center
ver
foci
asym

3. $9x^2-16y^2-18x-32y-151=0$

$+151 \quad +151$

$9x^2-18x-16y^2-32y=151$

$9(x^2-2x+\boxed{1})-16(y^2+2y+\boxed{1})=151+9\boxed{1}-16\boxed{1}$

$$\frac{9(x-1)^2}{144}-\frac{16(y+1)^2}{144}=\frac{144}{144}$$

$$\frac{(x-1)^2}{16}-\frac{(y+1)^2}{9}=1$$

$a=4$

$b=3$

$c^2=a^2+b^2$

$\sqrt{c^2}=\sqrt{16+9}=\sqrt{25}$

$c=5$

center $(1,-1)$

vert $(1\pm4,-1)$

foci $(1\pm5,-1)$

asy: $\pm\frac{b}{a}$ $\pm\frac{3}{4}x$

④ vertices $(-10,3)$, $(6,3)$ major axis is horizontal

foci $(-12,3)$, $(8,3)$

$$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$$

center $\left(\frac{-10+6}{2}, \frac{3+3}{2}\right)$

$(-2,3)$

$$\frac{(x+2)^2}{64} - \frac{(y-3)^2}{36} = 1$$

$a = 8$, $c = 10$

$c^2 = a^2 + b^2$

$100 = 64 + b^2$

$36 = b^2$

5 center $(0,0)$
major axis $= 120 = 2a$
focus $(1,0)$

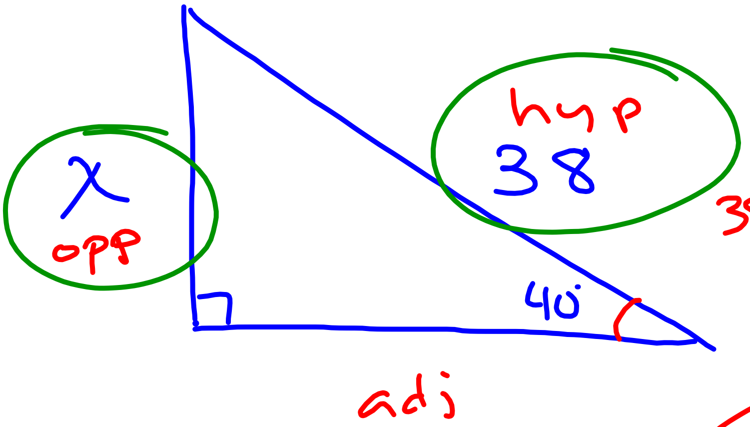
$c = 1$
$a = 60$

$$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$$

$$\frac{x^2}{3600} - \frac{y^2}{3599} = 1$$

$c^2 = a^2 - b^2$
$b^2 = a^2 - c^2$
$3600 - 1$
$b^2 = 3599$

6



SOH CAH TOA

$$38 \cdot \sin(40°) = \frac{x}{38} \cdot 38$$

$$38\sin(40°) = x$$

$$x = 24.42$$

7. $0^\circ \le \theta < 360^\circ$ Degree Mode

$$\sec\theta = -1.2241$$

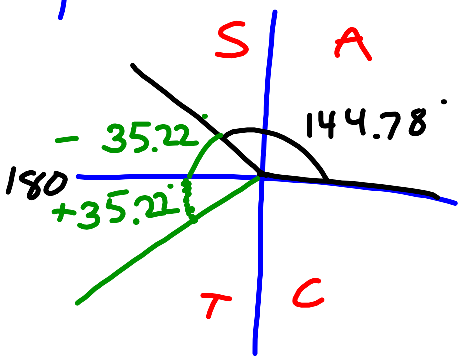
$$(\cos\theta) = \frac{1}{\sec\theta} = \left(\frac{1}{-1.2241}\right)$$

$\cos^{-1}$ $\cos^{-1}$

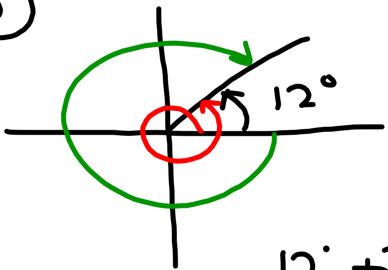
$\theta = 144.78^\circ$

and

215.22°



8



$12° + 360° = \underline{372°}$

$12° - 360° = \underline{-348°}$

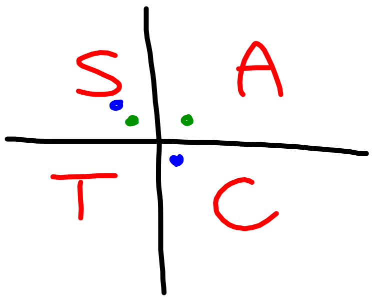
9. $\csc 5.23$ Radian Mode

$$= \frac{1}{\sin(5.23)} = -1.1507$$

10

$\tan\theta < 0$: II , IV

$\sin\theta > 0$: I , II



II

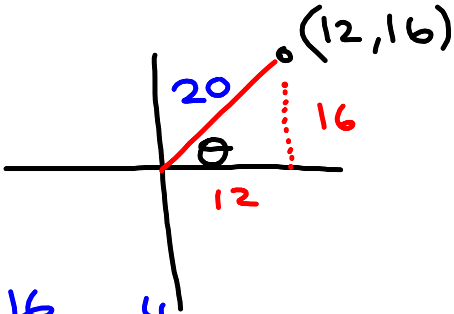
11

$$\frac{5\pi}{7}\left(\frac{180}{\pi}\right) = \frac{900\pi}{7}$$

12

$$480^\circ\left(\frac{\pi}{180}\right) = \frac{8\pi}{3}$$

13



$12^2 + 16^2 = c^2$

$144 + 256 = c^2$

$\sqrt{400} = \sqrt{c^2}$

$20 = c$

$\sin\theta = \frac{16}{20} = \frac{4}{5}$

$\csc\theta = \frac{5}{4}$

$\cos\theta = \frac{12}{20} = \frac{3}{5}$

$\sec\theta = \frac{5}{3}$

$\tan\theta = \frac{16}{12} = \frac{4}{3}$

$\cot\theta = \frac{3}{4}$

14

$\sin\theta = \frac{12}{2\sqrt{61}} \cdot \frac{\sqrt{61}}{\sqrt{61}} = \frac{6\sqrt{61}}{61}$

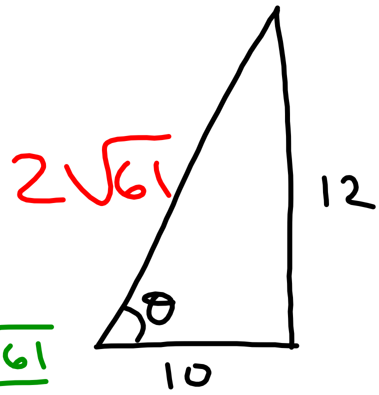
$\csc\theta = \frac{\sqrt{61}}{6}$

$\cos\theta = \frac{10}{2\sqrt{61}} \cdot \frac{\sqrt{61}}{\sqrt{61}} = \frac{5\sqrt{61}}{61}$

$\sec\theta = \frac{\sqrt{61}}{5}$

$\tan\theta = \frac{12}{10} = \frac{6}{5}$

$\cot\theta = \frac{5}{6}$



$10^2 + 12^2 = c^2$

$100 + 144 = c^2$

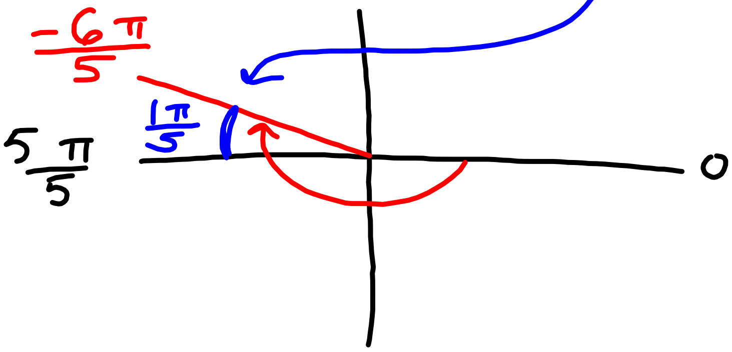
$\sqrt{244} = \sqrt{c^2}$

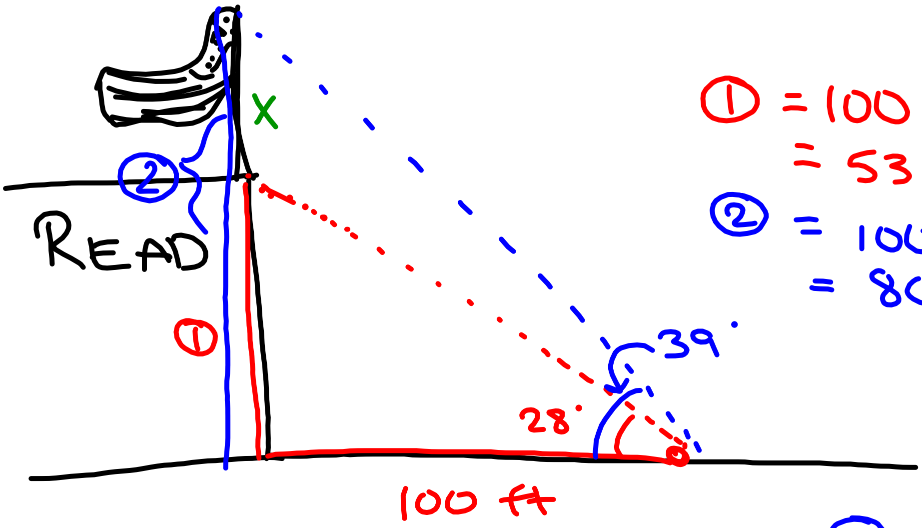
61 4

2

$c = 2\sqrt{61}$

15 reference angle $= \frac{1\pi}{5}$





$① = 100\tan(28°)$
$= 53.17$

$② = 100\tan(39°)$
$= 80.98$

$x = ② - ①$

$x = 80.98 - 53.17$

$x = 27.81$ feet

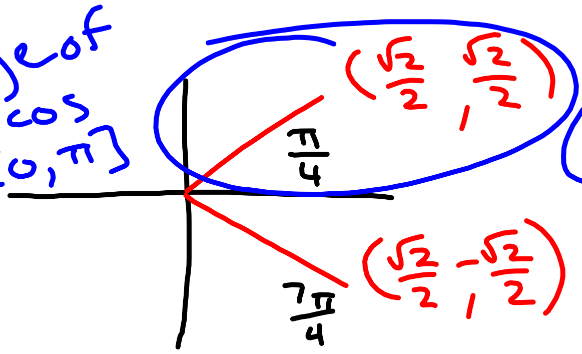
17

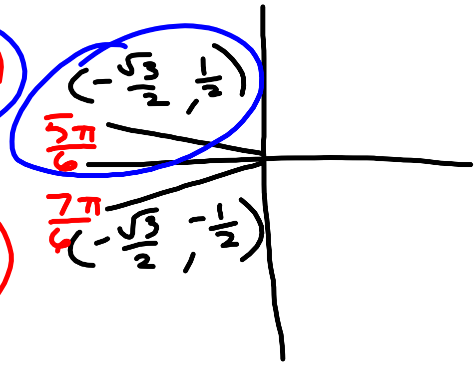
$$40 \cdot \sin(68) = \frac{h}{40} \cdot 40$$

$$h = 37.09 \text{ feet}$$

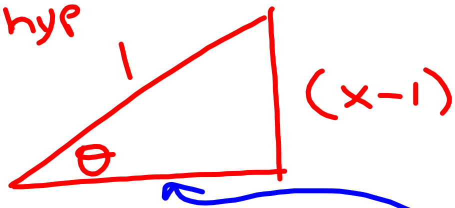
18 a) $\arccos\left(\frac{\sqrt{2}}{2}\right)$ b) $\arccos\left(-\frac{\sqrt{3}}{2}\right)$

range of arccos is $[0, \pi]$





(19) $\sec\left[\arcsin\left(\frac{x-1}{1}\right)\right]$ $\frac{\text{opp}}{\text{hyp}}$ θ



$$\sec\theta = \frac{\text{hyp}}{\text{adj}}$$

$$= \frac{1}{\sqrt{-x^2+2x}}$$

$$= \frac{\sqrt{-x^2+2x}}{-x^2+2x}$$

$$= \frac{-\sqrt{-x^2+2x}}{x^2-2x}$$

$$a^2+b^2=c^2$$

$$(x-1)^2+b^2=1^2$$

$$x^2-2x+1+b^2=1$$

$$b^2=-x^2+2x$$

$$\boxed{b=\sqrt{-x^2+2x}}$$

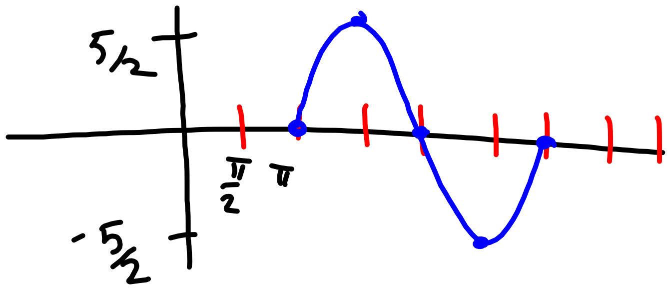
(20) $y = \frac{5}{2}\sin(x - 180^\circ) = \frac{5}{2}\sin(x - \pi)$

amplitude $= \frac{5}{2}$

Period $= \frac{2\pi}{b} = \frac{2\pi}{1} = 2\pi$

HS $\rightarrow \frac{c}{b} = \frac{\pi}{1}$

π to right



21 $g(x) = \frac{1}{4}\tan(x - 90^\circ) = \frac{1}{4}\tan\left(x - \frac{\pi}{2}\right)$

amp $= \frac{1}{4}$

per $= \frac{\pi}{b} = \frac{\pi}{1} = \pi$

22 $y = \sin x$

$y = \frac{1}{2}\sin(\pi x) - 3$

① vertical shrink by $\frac{1}{2}$.

② horizontal shrink by $1/\pi$.

③ vertical shift down 3.

23 $y = \tan x$

$y = \tan\left(x + \frac{\pi}{4}\right)$

① horizontal shift left $\frac{\pi}{4}$.

24 $y = -\tan\left(x - \frac{\pi}{3}\right)$

Vertical asymptote

tan: $x = \frac{\pi}{3} + n\pi$

$x = (\text{first asy}) + n(\text{period})$

$x - \frac{\pi}{3} = 0$

$+\frac{\pi}{3} \quad +\frac{\pi}{3}$

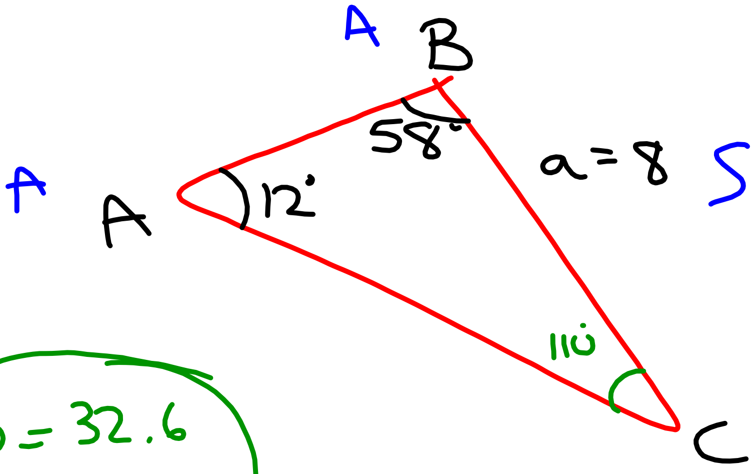
$x = \frac{\pi}{3}$

$\frac{\pi}{b} = \frac{\pi}{1} = \pi$

What are six trig functions of

triangle with terminal side through (-1,-3)?

25) $A = 12^\circ \quad B = 58^\circ \quad a = 8$



S

Law of Sines

$$\frac{\sin \overset{12}{\cancel{A}}}{\underset{8}{\cancel{a}}} = \frac{\sin \overset{58}{\cancel{B}}}{b} = \frac{\sin \overset{110}{\cancel{C}}}{c}$$

$$b = \frac{8 \cdot \sin(58)}{\sin(12)} = 32.6$$

$$c = \frac{8 \cdot \sin(110)}{\sin(12)} = 36.2$$

$b = 32.6$

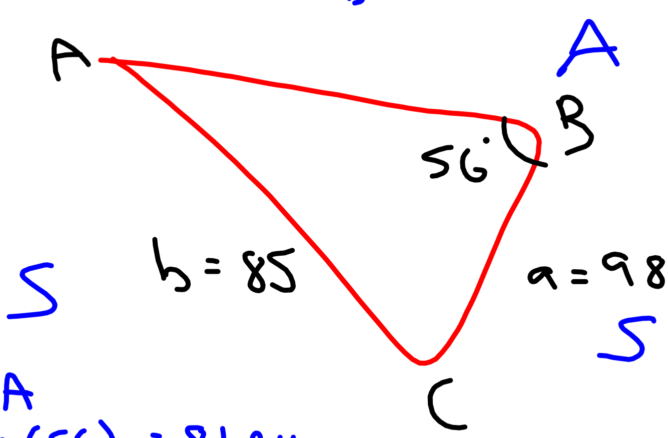
$c = 36.2$

26

$B = 56°$ "A" $a = 98$ "b" $b = 85$ "a" Find C.

$C = 51.1°$

$C' = 16.9°$

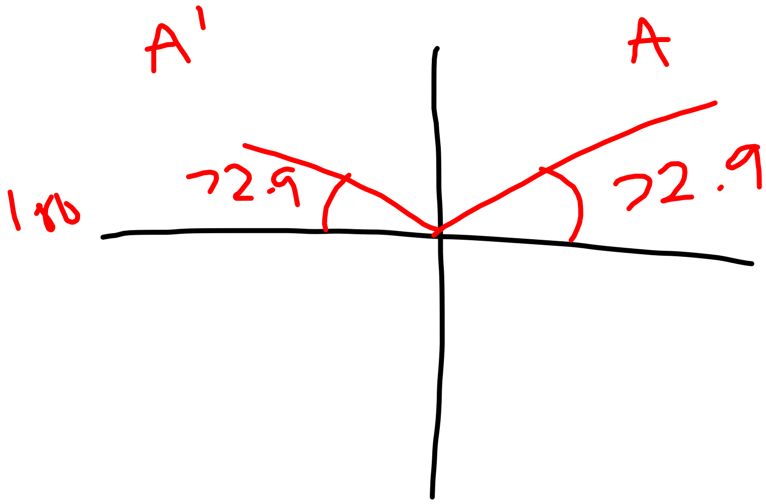


$h = b \sin A$
$= 98 \sin(56) = 81.24$

$81.24 < 85 < 98$

$h <$ "a" $<$ "b"

2 solutions



$$\frac{\sin A}{\cancel{a}\;98} = \frac{\sin \overset{56}{\cancel{B}}}{\cancel{b}\;85} = \frac{\sin C}{c}$$

$$\sin^{-1}(\sin A) = \sin^{-1}\left(\frac{98 \cdot \sin(56)}{85}\right) = 72.90^\circ = A$$

$$\Delta - B - A = C$$

$$C = 180 - 56 - 72.9 = 51.1^\circ$$

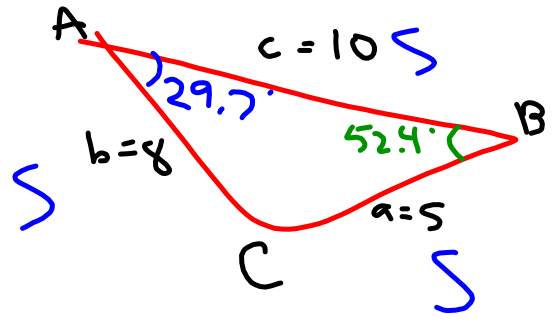
$$A' = 180 - A = 180 - 72.9$$

$$A' = 107.1^\circ$$

$$\Delta - B - A' = C'$$

$$C' = 180 - 56 - 107.1 = 16.9^\circ$$

27) $a = 5$, $b = 8$, $c = 10$ Solve the triangle.



Law of Cosines

$$A = \cos^{-1}\left(\frac{(8^2 + 10^2 - 5^2)}{(2(8)(10))}\right)$$

$A = 29.69°$

$$B = \cos^{-1}\left(\frac{(5^2 + 10^2 - 8^2)}{(2(5)(10))}\right)$$

$B = 52.41°$

$$\begin{array}{r} 180 \\ - 52.41 \\ - 29.69 \\ \hline 97.9° \end{array} = C$$

(28) $A = 71^\circ$ $b = 10$ $c = 19$, Find area.

$$\text{Area} = \frac{1}{2} bc \sin A$$

$$= \frac{1}{2}(10)(19)\sin(71)$$

$$= 89.82 \text{ cm}^2$$

29 A.E = 17°

A.E = 31°

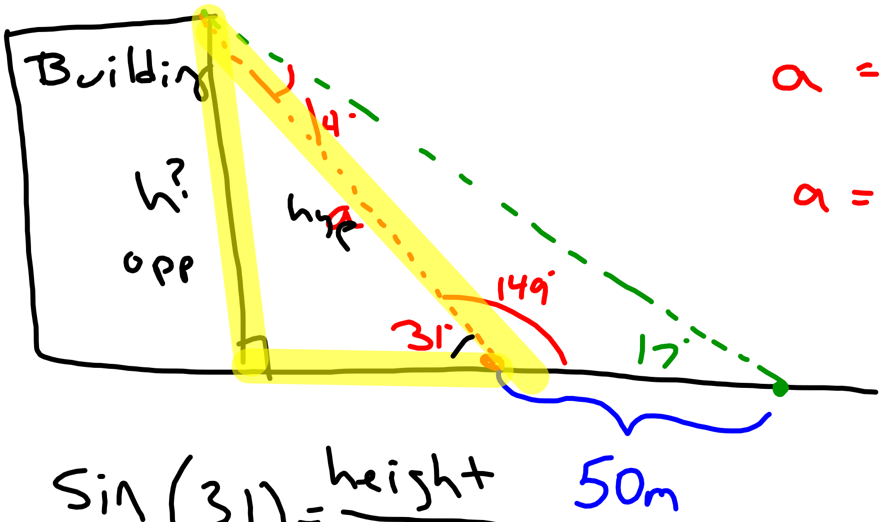
Law of Sines

ASA =

$$\frac{\sin(14)}{50} = \frac{\sin(17)}{a}$$

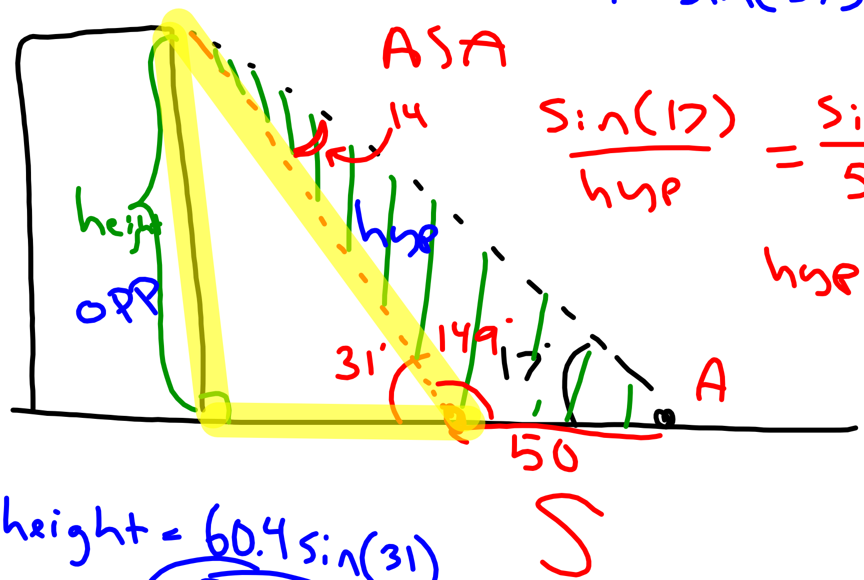
$$a = \frac{50\sin(17)}{\sin(14)}$$

$$a = \underline{60.43\text{m}}$$



$$\sin(31) = \frac{\text{height}}{60.43}$$

$$60.43\sin(31) = 31.12\text{ m}$$



* $\sin(31) = \dfrac{\text{height}}{\cancel{\text{hyp}}\ 60.4}$

$\dfrac{\sin(17)}{\text{hyp}} = \dfrac{\sin(14)}{50}$

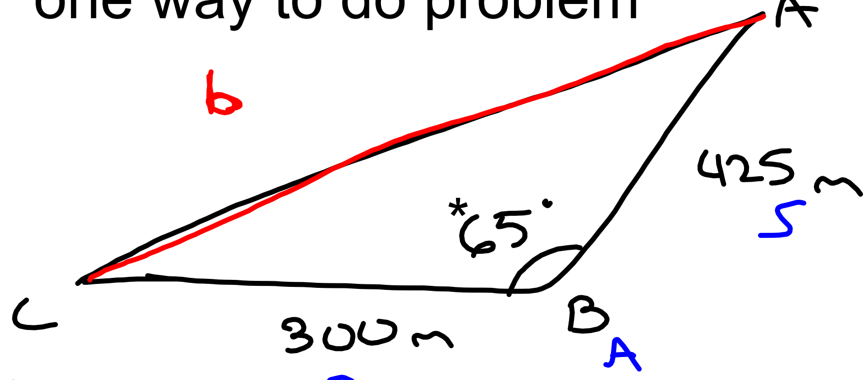
$\text{hyp} = \dfrac{50\sin(17)}{\sin(14)}$

$= 60.4$

* $\text{height} = 60.4\sin(31)$

$= 31.1$ m

30 *one way to do problem



Law of Cosines

$$b = \sqrt{300^2 + 425^2 - 2(300)(425)\cos(65)}$$

$= 403.5\text{ m}$

(31) $\sin x = \frac{2\sqrt{2}}{3}$ opp / hyp

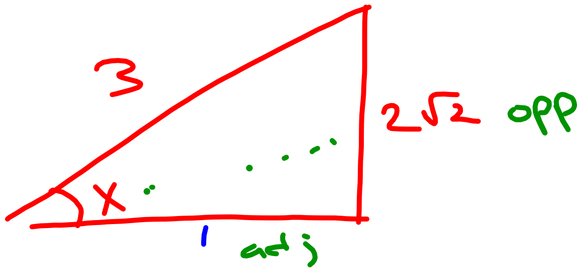
$\cos x = \frac{1}{3}$

$\sec x = 3$

$\csc x = \frac{3}{2\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{3\sqrt{2}}{4}$

$\tan x = \frac{2\sqrt{2}}{1}$

$\cot x = \frac{1}{2\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{4}$



$a^2 + b^2 = c^2$

$(2\sqrt{2})^2 + b^2 = 3^2$

$(4 \cdot 2) + b^2 = 9$

$8 + b^2 = 9$

$-8 \qquad -8$

$\sqrt{b^2} = \sqrt{1}$

$b = 1$

Skip 32

common den.

33) $\dfrac{(\cos x)\cos x}{(\cos x)(1+\sin x)} + \dfrac{(1+\sin x)(1+\sin x)}{\cos x\,(1+\sin x)}$

$$\frac{\overbrace{(\cos^2 x + \sin^2 x)}^{1} + 2\sin x + 1}{\cos x(1+\sin x)}$$

$1+\sin x$

$1+\sin x$

$$\frac{1+1+2\sin x}{\cos x(1+\sin x)}$$

$$\frac{2+2\sin x}{\cos x(1+\sin x)}$$

$$\frac{2\cancel{(1+\sin x)}}{\cos x\cancel{(1+\sin x)}}$$

$2\left(\dfrac{1}{\cos x}\right) = 2\sec x$

(34) $\cot^2 x - \cos^2 x = \cot^2 x \cos^2 x$

$$\frac{\cos^2 x}{\sin^2 x} - \frac{\cos^2 x \cdot \sin^2 x}{1 \cdot \sin^2 x}$$

$$\frac{\cos^2 x - \cos^2 \sin^2 x}{\sin^2 x}$$

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

$$\left(\frac{\cos^2 x}{\sin^2 x}\right)(\cos^2 x)$$

$\cot^2 x \cos^2 x = \cot^2 x \cos^2 x$ ✓

Rewrite
Add fract.
GCF
Pyth. Id.
Rewrite

$\cos^2 x + \sin^2 x = 1$
$-\sin^2 x \rightarrow$
$\cos^2 x = 1 - \sin^2 x$

35 $[0, 2\pi)$

$$3\tan^2 x - 1 = 0$$
$$\quad +1 \quad +1$$

$$\frac{3\tan^2 x}{3} = \frac{1}{3}$$

$$\sqrt{\tan^2 x} = \sqrt{\frac{1}{3}}$$

$$\tan^{-1}\left(\tan x\right) = \pm\frac{1}{\sqrt{3}} \quad \tan^{-1} \qquad \frac{y}{x}$$

$$x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$$

36

b. $2\sin x - 1 = 0$

$$\begin{array}{r} 2\sin x - 1 = 0 \\ +1 \quad +1 \\ \hline \end{array}$$

$$\frac{2\sin x}{2} = \frac{1}{2}$$

$$\sin^{-1}(\sin x) = \sin^{-1}\left(\frac{1}{2}\right)$$

$$x = \frac{\pi}{6}, \frac{5\pi}{6}$$

37

$$2\cos^2 x - \cos x = 1$$
$$-1 \qquad -1$$

$$\overset{a}{2}\cos^2 x - \overset{b}{}\cos x - \overset{c}{1} = 0$$

$$\left(\cos x - \tfrac{2}{2}\right)\left(\cos x + \tfrac{1}{2}\right) = 0$$

$a \cdot c$
-2
-2 $+1$
-1
b

$\cos x - 1 = 0$
$+1 \quad +1$
$\cos x = 1$
$\cos^{-1} \quad \cos^{-1} 1$
$x = 0$

$\cos x + \frac{1}{2} = 0$
$-\frac{1}{2} \quad -\frac{1}{2}$
$\cos x = -\frac{1}{2}$
$x = \frac{2\pi}{3}, \frac{4\pi}{3}$

38

$\sin(105^\circ)$

$\sin(45+60) = \sin(45)\cos(60)+\cos(45)\sin(60)$

$\left(\frac{\sqrt{2}}{2}\right)\left(\frac{1}{2}\right)+\left(\frac{\sqrt{2}}{2}\right)\left(\frac{\sqrt{3}}{2}\right)$

$\frac{\sqrt{2}}{4}+\frac{\sqrt{6}}{4}$

$\frac{\sqrt{2}+\sqrt{6}}{4}$

(39) $\tan u = \frac{3}{4}\ \frac{O}{A},\quad 0 < u < \frac{\pi}{2}$ I

$\csc v = \frac{\sqrt{10}}{3}\ \frac{H}{O}$

$\frac{\pi}{2} < v < \pi$ II

$\cos(u - v)$

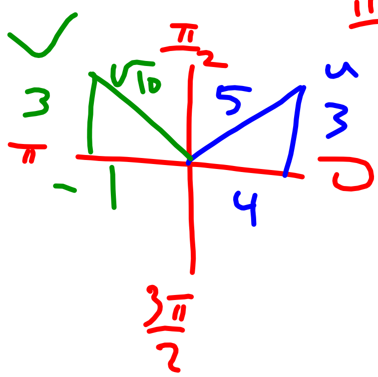
$= \cos u \cos v + \sin u \sin v$

$\left(\frac{4}{5}\right)\left(\frac{-1}{\sqrt{10}}\right) + \left(\frac{3}{5}\right)\left(\frac{3}{\sqrt{10}}\right)$

$\frac{-4}{5\sqrt{10}} + \frac{9}{5\sqrt{10}}$

$= \frac{-4+9}{5\sqrt{10}}$

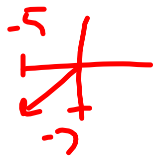
$= \frac{5}{5\sqrt{10}} \cdot \frac{\sqrt{10}}{\sqrt{10}} \quad \frac{\cancel{5}\sqrt{10}}{\cancel{5}\cdot 10} = \frac{\sqrt{10}}{10}$



48 $P(3,2)$ $Q(-2,-5)$

$$\vec{PQ} = \langle \overset{Q-P}{(-2-3)}, (-5-2) \rangle$$

$$\langle -5, -7 \rangle$$



$$|\vec{PQ}| = \sqrt{(-5)^2 + (-7)^2}$$

$$= \sqrt{25+49}$$

$$= \sqrt{74}$$

$$\theta = \tan^{-1}\left(\frac{-7}{-5}\right) = 54.4$$

$$+180$$

$$234.4^\circ$$

49

$4 - 8i$ in polar form

$\langle 4, -8 \rangle$

$\underset{\text{mag}}{r}\,(\text{cis}\,\underset{\text{dir}}{\theta})$

$r = \sqrt{4^2 + (-8)^2}$

$= \sqrt{80} = 2\sqrt{20} = 4\sqrt{5}$

$\theta = \tan^{-1}\left(\frac{-8}{4}\right) = {}^{-}63.4$

$+360$

296.6°

$4\sqrt{5}\left(\cos(297) + i\sin(297)\right)$

$4\sqrt{5}\left(\text{cis}(296.6)\right)$

Skip 32

com den.

(33) $\frac{\cos x}{\cos x(1+\sin x)} \cdot \frac{(\cos x)}{} + \frac{1+\sin x}{(\cos x)} \cdot \frac{(1+\sin x)}{(1+\sin x)}$

$\frac{\cos^2 x + 1 + 2\sin x + \sin^2 x}{\cos x(1+\sin x)} = \frac{2+2\sin x}{\cos(1+\sin x)}$

$\frac{2(1+\sin x)}{\cos x(1+\sin x)}$ $\quad 2\left(\frac{1}{\cos x}\right)$

$= 2\sec x$

(34) $\cot^2 x - \cos^2 x = \cot^2 x \cos^2 x$

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

Rewrite

common den.

$\frac{\cos^2 x - \cos^2 x \sin^2 x}{\sin^2 x}$

GCF

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

Pyth. ID

$\cos^2 x + \sin^2 x = 1$

$\frac{\cos^2 x\,(\cos^2 x + \sin^2 x - \sin^2 x)}{\sin^2 x}$

Rewrite

$\left(\frac{\cos^2 x}{\sin^2 x}\right)(\cos^2 x)$

$\cot^2 x \cos^2 x = \cot^2 x \cos^2 x$ ✓

35)

$$3\tan^2 x - 1 = 0$$
$$\quad +1 \quad +1$$

$$\frac{\cancel{3}\tan^2 x}{\cancel{3}} = \frac{1}{3}$$

$$\sqrt{\tan^2 x} = \sqrt{\frac{1}{3}}$$

$$\tan^{-1}(\tan x) = \left(\pm\frac{1}{\sqrt{3}}\right) \quad \frac{s}{x}$$

$$\tan^{-1}$$

$$X = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$$

36 b. $2\sin x - 1 = 0$

$\quad\quad\quad\quad +1 \quad +1$

$\frac{2\sin x}{2} = \frac{1}{2}$

$\sin x = \frac{1}{2}$

$x = \frac{\pi}{6}, \frac{5\pi}{6}$

37 $\quad 2\cos^2 x - \cos x = 1$

$\qquad\qquad\qquad\qquad\;\; -1 \qquad -1$

$2\cos^2 x - \cos x - 1 = 0$

$a \qquad\quad b \qquad\quad c$

$(\cos x - \frac{2}{2})(\cos x + \frac{1}{2}) = 0$

$\cos x - 1 = 0$

$\qquad +1 \quad +1$

$\cos x = 1$

$x = 0$

$\cos x + \frac{1}{2} = 0$

$\qquad -\frac{1}{2} \quad -\frac{1}{2}$

$\cos x = -\frac{1}{2}$

$x = \frac{2\pi}{3}, \frac{4\pi}{3}$

a·c

-2

-2   1

-1

b

38) $\sin(105^\circ)$

$= \sin(60+45) = \sin(60)\cos(45) + \cos(60)\sin(45)$

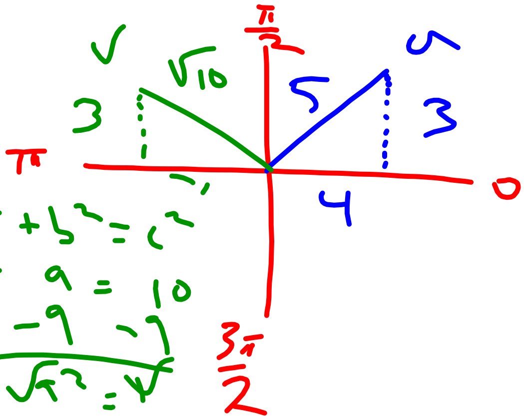
$\left(\frac{\sqrt{3}}{2}\right)\left(\frac{\sqrt{2}}{2}\right) + \left(\frac{1}{2}\right)\left(\frac{\sqrt{2}}{2}\right)$

$\frac{\sqrt{6}}{4} + \frac{\sqrt{2}}{4}$

$\frac{\sqrt{6}+\sqrt{2}}{4}$

(39) $\tan u = \frac{3}{4}$ $\quad 0 < u < \frac{\pi}{2}$

$\csc v = \frac{\sqrt{10}}{3}$ $\quad \frac{\pi}{2} < v < \pi$



$\cos(u - v)$

$= \cos u \cos v + \sin u \sin v$

$a^2 + b^2 = c^2$

$a^2 + 9 = 10$

$\underline{-9 \quad -9}$

$\sqrt{a^2} = \sqrt{1}$

$a = 1$

$\left(\frac{4}{5}\right)\left(\frac{-1}{\sqrt{10}}\right) + \left(\frac{3}{5}\right)\left(\frac{3}{\sqrt{10}}\right)$

$\frac{-4}{5\sqrt{10}} + \frac{9}{5\sqrt{10}}$

$\frac{\cancel{5}}{\cancel{5}\sqrt{10}} = \frac{1}{\sqrt{10}} \cdot \frac{\sqrt{10}}{\sqrt{10}} = \frac{\sqrt{10}}{10}$

40

$$\begin{bmatrix} 2 & 3 & 4 & 5 \\ -1 & 0 & 4 & -6 \end{bmatrix}$$

2×4

41 Solve for y.

$$x + 2y + z = 5$$
$$2x - y - 3z = 5$$
$$-2x + 3y + z = -11$$

$$\rightarrow \begin{bmatrix} 1 & 2 & 1 \\ 2 & -1 & -3 \\ -2 & 3 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 5 \\ 5 \\ -11 \end{bmatrix}$$

$$y = \frac{D_y}{D} = \frac{-20}{20}$$

$$y = -1$$

$$D = \left| \begin{matrix} 1 & 2 & 1 \\ 2 & -1 & -3 \\ -2 & 3 & 1 \end{matrix} \right| \begin{matrix} 1 & 2 \\ 2 & -1 \\ -2 & 3 \end{matrix}$$

$$= -1 + 12 + 6 - 2 + 9 - 4$$
$$= 20$$

$$D_y = \left| \begin{matrix} 1 & 5 & 1 \\ 2 & 5 & -3 \\ -2 & -11 & 1 \end{matrix} \right| \begin{matrix} 1 & 5 \\ 2 & 5 \\ -2 & -11 \end{matrix}$$

$$= 5 + 30 - 22 + 10 - 33 - 10$$
$$= -20$$

47 Find area $= \frac{1}{2}\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$

$= \frac{1}{2}\begin{vmatrix} 1 & 3 & 1 \\ 7 & 2 & 1 \\ 9 & 5 & 1 \end{vmatrix}\begin{matrix} 1 & 3 \\ 7 & 2 \\ 9 & 5 \end{matrix}$

$= \frac{1}{2}(\underline{2} + \underline{27} + \underline{35} - \underline{18} - \underline{5} - \underline{21})$

$= \frac{1}{2}(20)$

$= 10$ AREA IS POSITIVE!

50 $5(\cos(38^\circ) + i\sin(38^\circ))$

$r = 5$
magnitude

$\theta = 38^\circ$
Direction

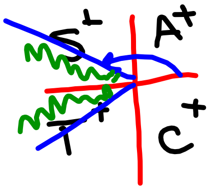
$\langle 5\cos(38), 5\sin(38) \rangle$

$\langle 3.94, 3.07 \rangle$

7) 2 values θ $(0^\circ \le \theta < 360^\circ)$

Degree Mode

$$\frac{1}{\sec\theta} = \frac{1}{-1.2241}$$



$$\cos\theta = \frac{1}{\sec\theta} = \frac{1}{-1.2241}$$

$$\cos^{-1}(\cos\theta) = \cos^{-1}\left(\frac{1}{-1.2241}\right)$$

$$\theta = 144.78^\circ$$

$$-180$$

$$-35.22^\circ$$

$$\theta = 35.22 + 180$$

$$= 215.22^\circ$$

37

$$2\cos^2 x - \cos x = 1$$
$$-1 \qquad -1$$
$$2\cos^2 x - \cos x - 1 = 0$$

$$\left(\cos x \frac{-2}{2}\right)\left(\cos x + \frac{1}{2}\right)$$

$$(\cos x - 1)\left(\cos x + \tfrac{1}{2}\right) = 0$$

$a=2$ × $a \cdot c$ -2; -2, 1; -1 b +

$$\cos x - 1 = 0$$
$$+1 \quad +1$$
$$\cos x = 1$$
$\cos^{-1}$ $\cos^{-1}(1)$

$$x = 0$$

$$\cos x + \tfrac{1}{2} = 0$$
$$-\tfrac{1}{2} \quad -\tfrac{1}{2}$$
$$(\cos x) = \left(-\tfrac{1}{2}\right)$$
$\cos^{-1}$ $\cos^{-1}$

$$x = \frac{2\pi}{3}, \frac{4\pi}{3}$$

(41) Solve for y.

$$\begin{bmatrix} 1 & 2 & 1 \\ 2 & -1 & -3 \\ -2 & 3 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 5 \\ 5 \\ -11 \end{bmatrix}$$

$$D = \begin{vmatrix} 1 & 2 & 1 \\ 2 & -1 & -3 \\ -2 & 3 & 1 \end{vmatrix}\begin{matrix} 1 & 2 \\ 2 & -1 \\ -2 & 3 \end{matrix} \quad +-1 + 12 + 6 - 2 - {}^-9 - 4$$

$$-1 + 12 + 6 - 2 + 9 - 4 = 20$$

$$D_y = \begin{vmatrix} 1 & 5 & 1 \\ 2 & 5 & -3 \\ -2 & -11 & 1 \end{vmatrix}\begin{matrix} 1 & 5 \\ 2 & 5 \\ -2 & -11 \end{matrix} \quad +5 + 30 + {}^-22 - {}^-10 - 33 - 10$$

$$5 + 30 - 22 + 10 - 33 - 10 = -20$$

$$y = \frac{D_y}{D} = \frac{-20}{20} = -1$$

$$y = -1$$

46

$$\begin{vmatrix} (5+2x) & -2 \\ (7-x) & 3 \end{vmatrix} = 5$$

$$3(5+2x) - (7-x)(-2) = 5$$

$$15 + 6x - (-14 + 2x) = 5$$

$$15 + 6x + 14 - 2x = 5$$

$$29 + 4x = 5$$
$$-29 \qquad -29$$

$$\frac{4x}{4} = \frac{-24}{4}$$

$$x = -6$$

34 verify.

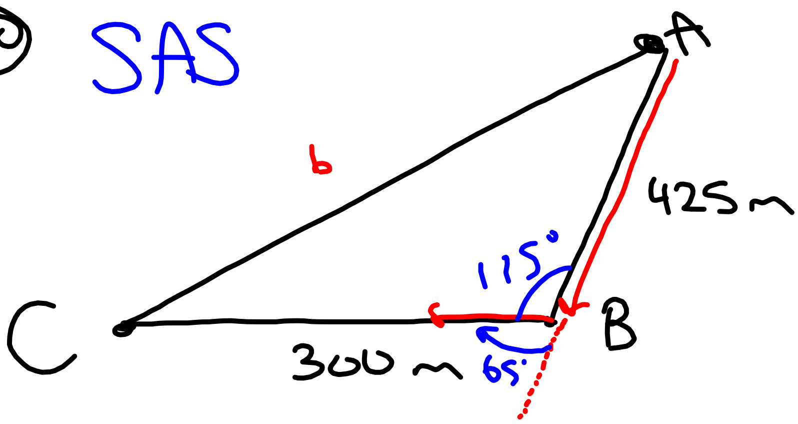
$$\cot^2 x - \cos^2 x = \cot^2 x \cos^2 x$$

35

$$3\tan^2 x - 1 = 0$$
$$\quad +1 \quad +1$$
$$\frac{3\tan^2 x}{3} = \frac{1}{3}$$
$$\tan^2 x = \frac{1}{3}$$
$$\sqrt{(\tan x)^2} = \sqrt{\frac{1}{3}} = \frac{\sqrt{1}}{\sqrt{3}}$$
$$(\tan x) = \left(\pm \frac{1}{\sqrt{3}}\right) \quad \frac{y}{x}$$
$$\cancel{\tan^{-1}} \qquad \tan^{-1}$$
$$x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{11\pi}{6}, \frac{7\pi}{6}$$

$$\frac{\left(\frac{1}{\cancel{2}}\right)}{\left(\frac{\sqrt{3}}{2}\right)} \cdot \frac{2}{\sqrt{3}} = \frac{1}{\sqrt{3}}$$

30 SAS



$b = \sqrt{a^2 + c^2 - 2ac \cdot \cos B}$

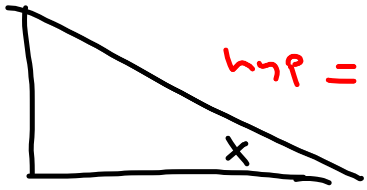
$= \sqrt{(300^2 + 425^2 - 2 \cdot 300 \cdot 425 \cdot \cos(115°))}$

$= 615.14$ m

(31) $\csc\left(\frac{\pi}{2} - x\right) = 3$ $\qquad \sin x = \frac{2\sqrt{2}}{3}$ $\frac{\text{opp}}{\text{hyp}}$

$\csc(x) = \frac{3}{2\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{3\sqrt{2}}{4}$

$2\sqrt{2} = \text{opp}$



hyp = 3

1 adj = a

$\cos(x) = \frac{1}{3}$

$\sec(x) = \frac{3}{1}$

$\tan(x) = \frac{2\sqrt{2}}{1}$

$\cot(x) = \frac{1}{2\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{4}$

$a^2 + b^2 = c^2$

$a^2 + (2\sqrt{2})^2 = 3^2$

$a^2 + 4 \cdot 2$

$a^2 + 8 = 9$

$\quad -8 \;\; -8$

$\sqrt{a^2} = \sqrt{1}$

$a = 1$

28 $A = 71°$ $b = 10\text{ m}$ $c = 19\text{ m}$

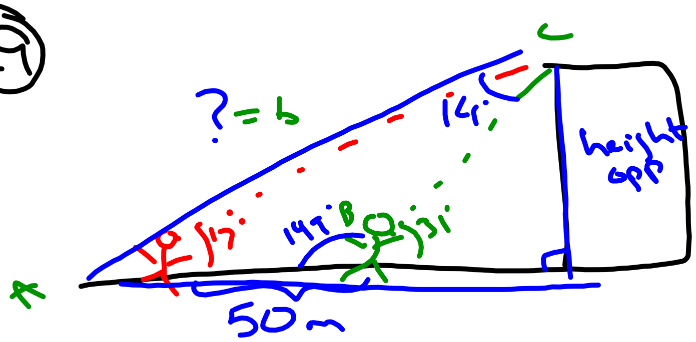
Area

$$\frac{1}{2}ac\sin B = \frac{1}{2}bc\sin A = \frac{1}{2}ab\sin C$$

$$\frac{1}{2}(10)(19)\sin(71°)$$

$$= 89.82\text{ m}^2$$

29



ASA → LoS

$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$ (A = 17, B = 149, C = 14, c = 50)

$\frac{b\sin(14)}{\sin(14)} = \frac{50\sin(149)}{\sin(14)}$

$b = 106.44\text{m}$

$\sin(17) = \frac{\text{opp}}{\text{hyp}}$ (hyp = 106.44)

$106.44\sin(17) = \text{opp}$

$31.12\text{ m} = \text{opp}$

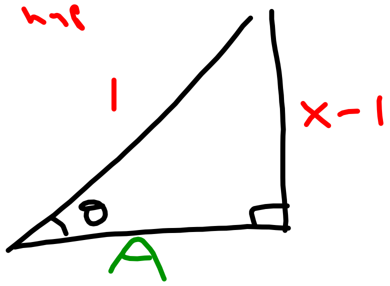
The building is 31.12 m tall.

or 90.25 ft

19 $\sec\left[\arcsin\left(\frac{x-1}{1}\right)\right]$ opp / hyp

$\sec\theta = \frac{H}{A}$

$\sec\theta = \frac{1}{x(2-x)}$



$a^2 + b^2 = c^2$

$a^2 + (x-1)^2 = 1^2$

$a^2 + x^2 - 2x + 1 = 1$

$a^2 = 2x - x^2$