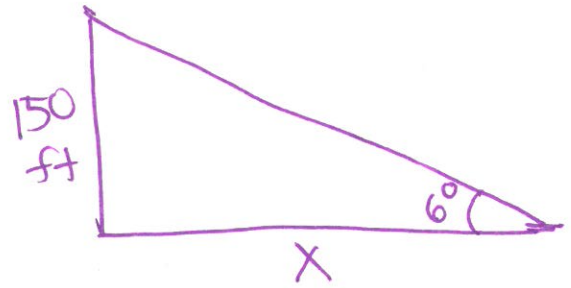
Ophelia Payne is walking to her office building which she knows is 150ft high. The angle to the top of the building from her current location is 6°. How much further does she need to walk?

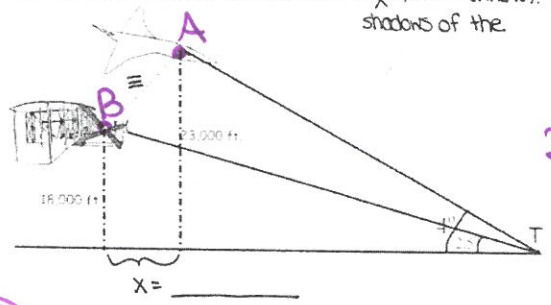


1427

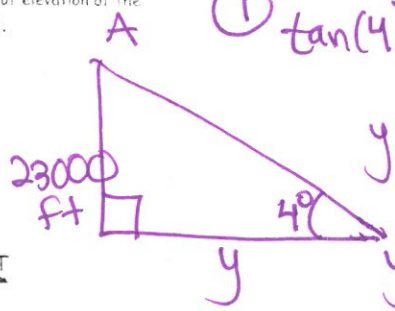
$\tan(6) = \frac{150}{x}$

$x = \frac{150}{\tan(6)} = 1427.15 \text{ ft} \approx \boxed{1427 \text{ ft}}$

7) Two airplanes, at points A and B as shown in the diagram below, have elevations of 23,000 ft. and 18,000 ft. respectively.
Both are flying east toward an airport control tower at T.
From T, the angle of elevation of the airplane at A is 4°, and the angle of elevation of the airplane at B is 2.5°. How far apart (in mi) are the airplanes? (Find x).



shadows of the

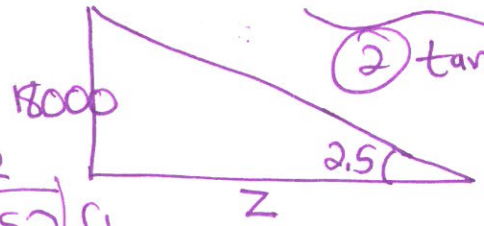


① $\tan(4) = \frac{23000}{y}$

$y = \frac{23000}{\tan(4)}$

$y = 328915.32 \text{ ft}$

83,352



② $\tan(2.5) = \frac{18000}{z}$

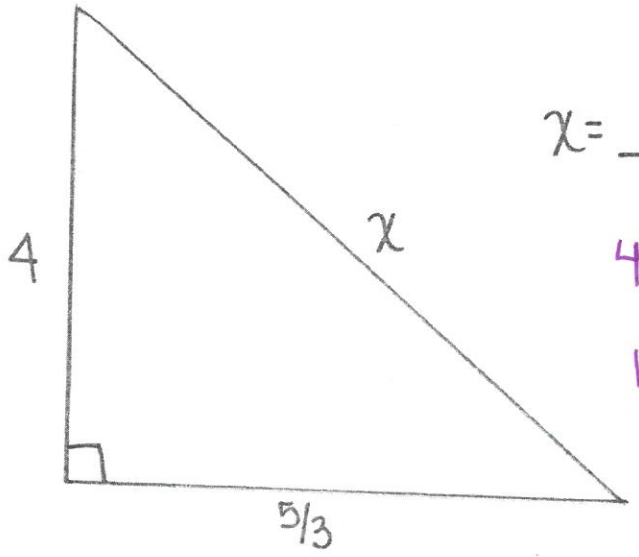
$z = \frac{18000}{\tan(2.5)}$

$z = 412267.78$

③ $x = z - y$

$x = 412267.78 - 328915.32$

$x = 83352.46 \approx \boxed{83352 \text{ ft}}$



x= _____

*use Pythagorean theorem if have all sides of a right △

13/3

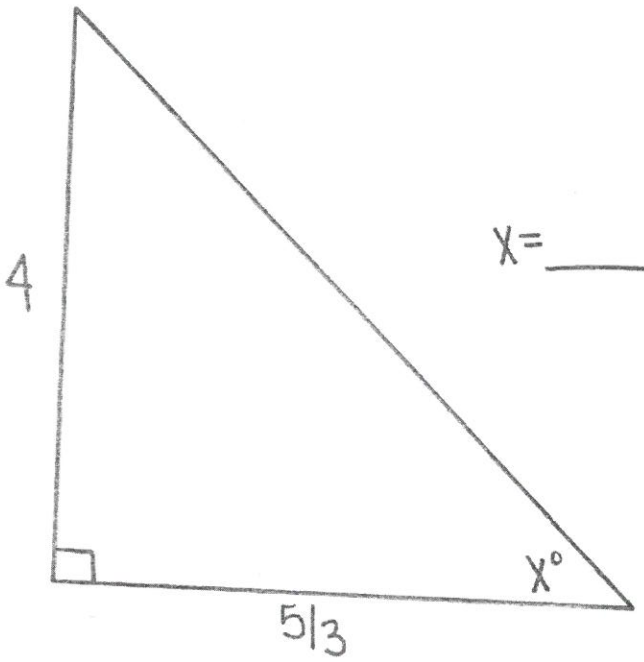
$4^2 + \left(\frac{5}{3}\right)^2 = x^2$

$16 + \frac{25}{9} = x^2$

$\frac{144}{9} + \frac{25}{9}$

$\frac{169}{9} = x^2$

$\sqrt{\frac{169}{9}} = x = \boxed{\frac{13}{3}}$



x= _____

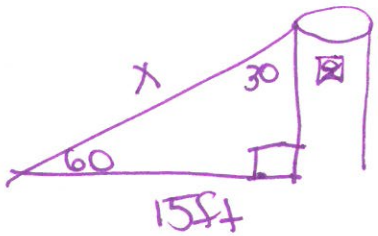
67.4

$\tan(x) = \frac{4}{(5/3)}$

$x = \tan^{-1}\left(\frac{4}{(5/3)}\right)$

$x = 67.38 \approx \boxed{67.4°}$

A damsel is in distress and is being held captive in a tower. Her knight in shining armor is on the ground below with a ladder. When the knight stands 15 feet from the base of the tower and looks up at his precious damsel, the angle of elevation to her window is 60 degrees. How long does the ladder have to be?



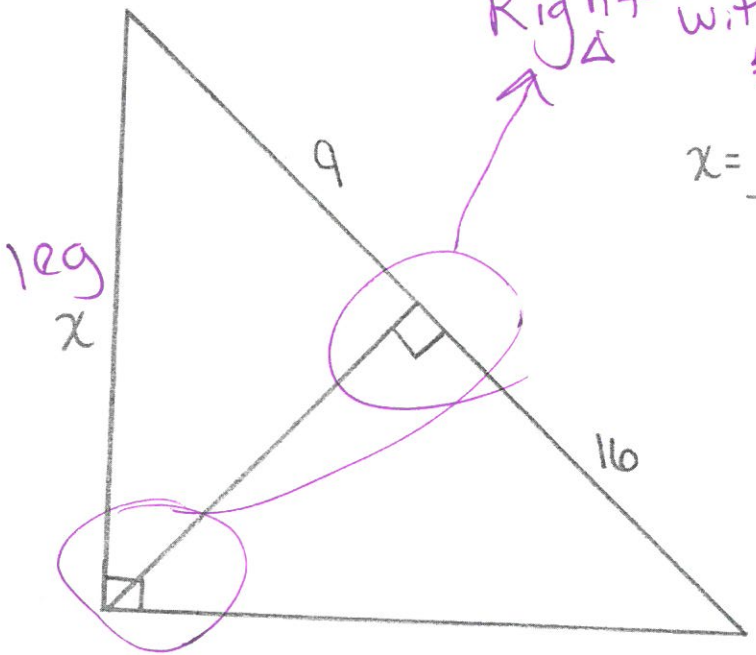
hyp = short · 2

$x = 15 \cdot 2$

$x = 30$ ft

30

15√3



Right △ with altitude in it AND leg labeled

$x =$ ____

Use Geometric mean

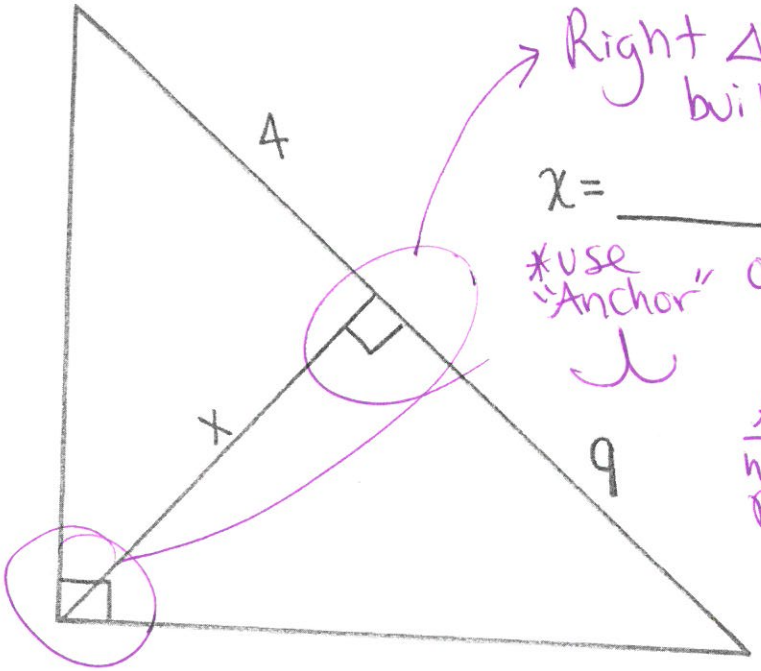
$\frac{\text{leg}}{\text{full hyp.}} = \frac{\text{hyp. piece close-by}}{\text{leg}}$

$\frac{x}{9} = \frac{25}{x}$

$x^2 = 9 \cdot 25$

$x = \sqrt{9 \cdot 25} = 15$

15



Right △ with Altitude built in ⇒

$x =$ _____ *Do Geometric mean with Altitude

*use "Anchor" OR

$$\frac{\text{Alt.}}{\text{hyp piece 1}} = \frac{\text{hyp piece 2}}{\text{Alt.}}$$

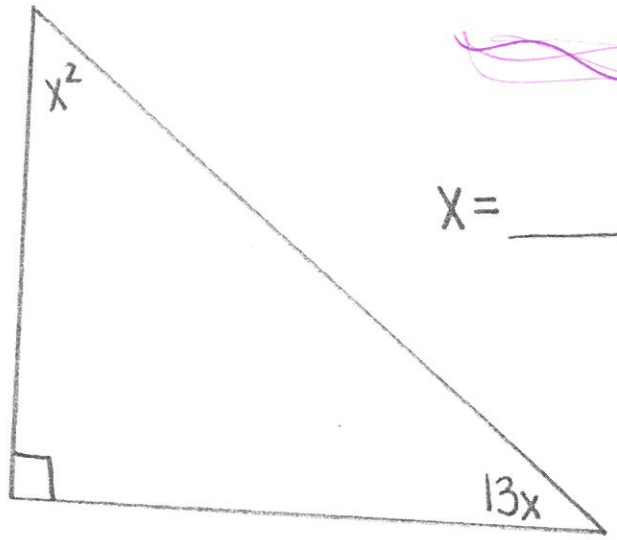
$$\frac{x}{4} = \frac{9}{x}$$

$x^2 = 36$

$x = \pm 6$ but no negative lengths

$\boxed{x = 6}$

6



$x =$ _____

$x^2 + 13x + 90 = 180$

$x^2 + 13x - 90 = 0$

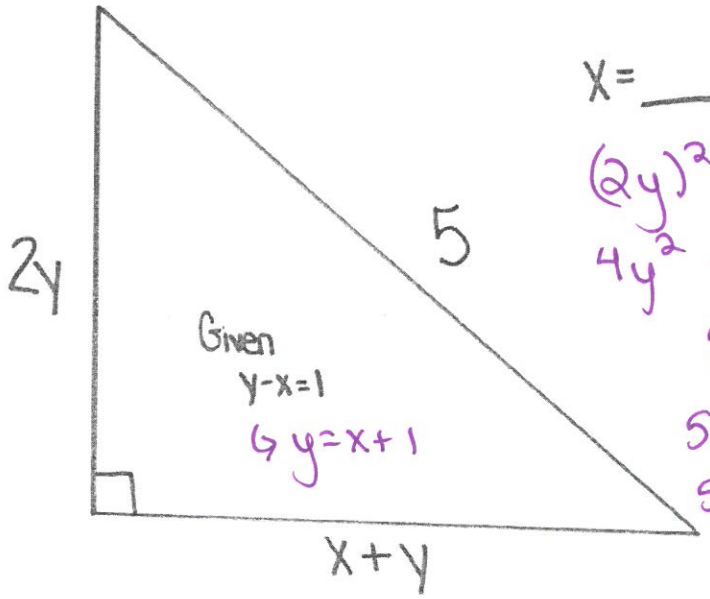
$(x + 18)(x - 5) = 0$

$x = -18, 5$

gives negative angle measure

$\boxed{x = 5}$

5



x= ____

*All sides marked ⇒ use Pyth. Thm.

$(2y)^2 + (x+y)^2 = 5^2$

$4y^2 + x^2 + 2xy + y^2 = 25$

$5y^2 + x^2 + 2xy = 25$

$5(x+1)^2 + x^2 + 2x(x+1) = 25$

$5(x^2+2x+1) + x^2 + 2x^2 + 2x = 25$

$5x^2 + 10x + 5 + 3x^2 + 2x = 25$

$8x^2 + 12x - 20 = 0$

$4(2x^2 + 3x - 5) = 0$

$4(2x^2 + 5x - 2x - 5) = 0$

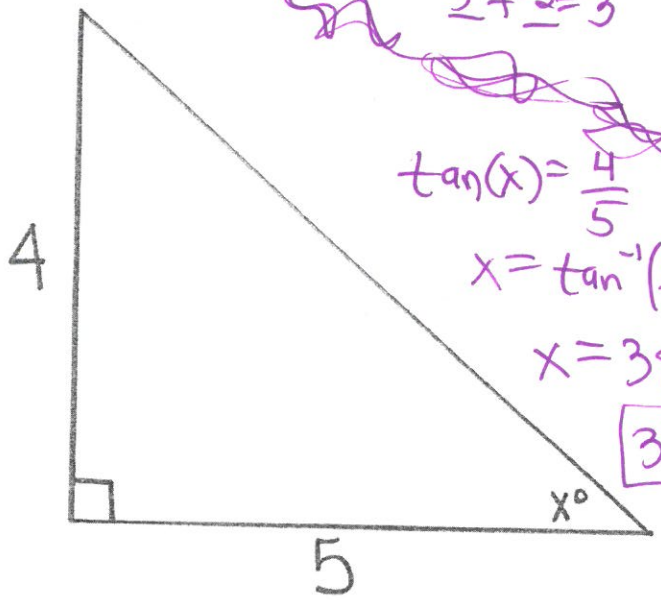
$4(x(2x+5) - 1(2x+5)) = 0$

$4(x-1)(2x+5) = 0$

$x = 1, -\frac{5}{2}$

↑ gives negative side lengths

1



$5 \cdot 2 = -10$

$5 + -2 = 3$

$\tan(x) = \frac{4}{5}$

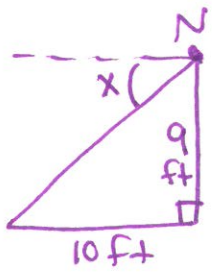
$x = \tan^{-1}\left(\frac{4}{5}\right)$

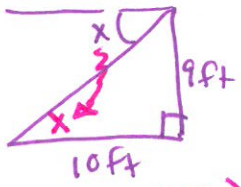
$x = 38.66°$

38.7°

38.7

Nancy stood on a ladder. Her eyes were 9 feet above the ground. On the ground, 10 feet away, was a lizard. What is the angle of depression from Nancy's eyes to the lizard?



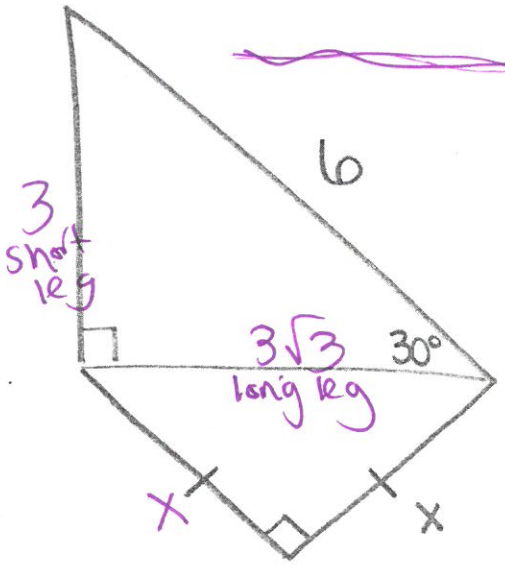


42

✱ x = ∠ of depr. = ∠ of elev. ✱

$\tan(x) = \frac{9}{10}$ $\quad x = \tan^{-1}\left(\frac{9}{10}\right)$

$x = 41.99° \approx \boxed{42°}$

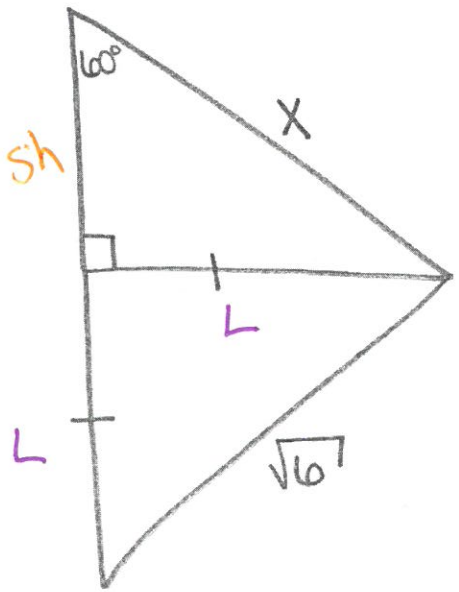


$x = \frac{3\sqrt{3}}{\sqrt{2}}$ b/c $\text{leg} = \frac{\text{hyp}}{\sqrt{2}}$

$x = \frac{3\sqrt{3}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$ no radical in denominator

$x = \frac{3\sqrt{6}}{2}$ or $\boxed{\frac{3}{2}\sqrt{6}}$

$\frac{3}{2}\sqrt{6}$



$H = L\sqrt{2}$

$\frac{\sqrt{6}}{\sqrt{2}} = \frac{L\sqrt{2}}{\sqrt{2}}$

$\sqrt{\frac{6}{2}} = L$

$\sqrt{3} = L$

THEN

L = Long Leg Lg in top Δ

$\sqrt{3} = sh \cdot \sqrt{3}$ b/c long leg $= sh\sqrt{3}$

$1 = sh$

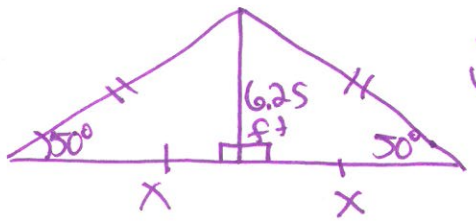
THEN $x = hyp = 2 \cdot sh$

$x = 2 \cdot 1$

$\boxed{x = 2}$

2

Brothers Bob and Tom Katz buy a tent that has a center pole 6.25 feet high. If the sides of the tent are supposed to make a 50° angle with the ground, how wide is the tent?



tent width $= 2x$

$\tan(50) = \frac{6.25}{x}$

$x = \frac{6.25}{\tan(50)}$

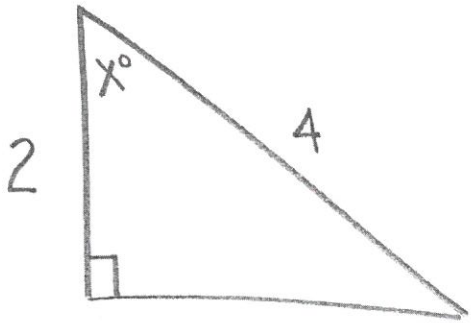
$x = 5.24$ ft

tent width $= 2x \Leftarrow$

tent width $= 2(5.24)$

tent width $= 10.489 \approx \boxed{10.5 \text{ ft}}$

10.5



$x =$ ____

60

$\cos(x) = \frac{2}{4}$

$x = \cos^{-1}\left(\frac{2}{4}\right)$ *use Inverse to find Angles

$x = \boxed{60^\circ}$

$3x - y = 11$

$x + 2y = 13$

$y =$ ____

*2 on top equation

$6x - 2y = 22$

$+ \quad x + 2y = 13$

$7x = 35$

$x = 5$

use Elimination method

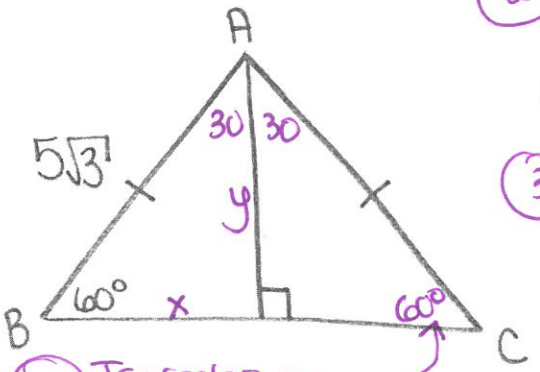
4

THEN substitute

$3(5) - y = 11$

$15 - y = 11$

$\boxed{y = 4}$



① Isosceles so
BUT really then it'll be equ. lateral ☺

Area of $\triangle ABC$ = _____

$sh = \frac{hyp}{2}$

② $x = \frac{5\sqrt{3}}{2}$

base $= 5\sqrt{3}$

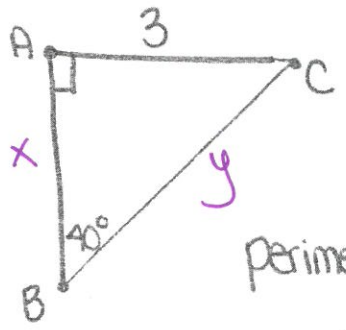
③ $y = Lg = sh \cdot \sqrt{3}$

$y = \frac{5\sqrt{3}}{2} \cdot \sqrt{3}$

$y = \frac{15}{2}$

④ Area $= \frac{1}{2} \cdot 5\sqrt{3} \cdot \frac{15}{2} = \frac{75\sqrt{3}}{4}$ or $\boxed{\frac{75}{4}\sqrt{3}}$

$\frac{75}{4}\sqrt{3}$



③ perimeter of $\triangle ABC = x + y + 3$

$= \frac{3}{\tan(40)} + \frac{3}{\sin(40)} + 3$

$= 3.575 + 4.667 + 3$

perimeter of $\triangle ABC$ = 11.242 $\approx \boxed{11.24}$

11.24

① $\tan(40) = \frac{3}{x}$

$x = \frac{3}{\tan(40)}$

$x = 3.575$

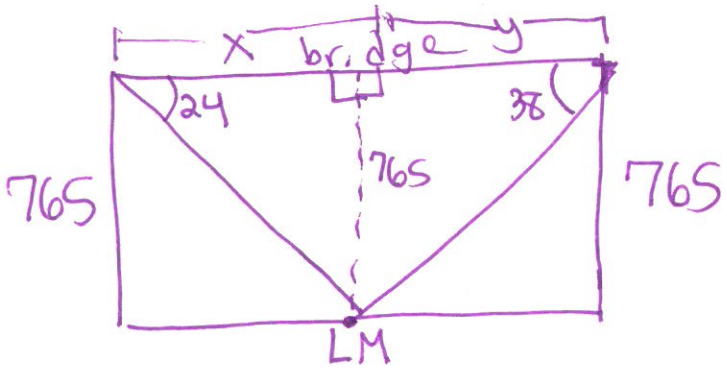
② $\sin(40) = \frac{3}{y}$

$y = \frac{3}{\sin(40)}$

$y = 4.667$

* round to extra decimal places throughout so that your answer is correct*

Two hikers are on opposite sides of a wooden plank bridge that spans a canyon. They are each 765 meters above the bottom of the canyon. They both site the same landmark on the bottom of the canyon floor. The angles of depression from each hiker are 38 degrees and 24 degrees. How long is the wooden plank bridge?



$x + y = \text{bridge}$

$\tan(24) = \frac{765}{x}$ $\quad$ $\tan(38) = \frac{765}{y}$

$y + x = \frac{765}{\tan(24)} + \frac{765}{\tan(38)}$

$\text{bridge} = y + x = 2697.37$

2697