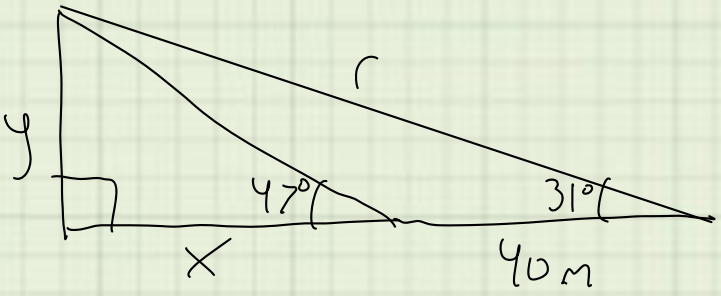
ENED 1100 Date: 9/8/2022 Assignment: HW 2.1 PPM	Section: ENED 1100 Team: 72	Name: Burgess Dean III Signature: Burgess Dean III	X/X

Problem: 2.1 Problem Presentation Method Q2

Find the height of the building.

DIAGRAM



THEORY

Law of sines

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Properties of a triangle

$$\theta_1 + \theta_2 + \theta_3 = 180^\circ$$

ASSUMPTIONS the building connects to the ground with a right angle

SOLUTION

1. Subtract 47° and 90° from 180° to find the missing angle of the small right triangle.

$$\begin{array}{r} 180 \\ -\ 90 \\ \hline 90 \end{array} \qquad \begin{array}{r} 90 \\ -\ 47 \\ \hline 43^\circ \end{array}$$

2. Subtract 31° and 90° from 180° to find the missing angle of the large right triangle.

$$\begin{array}{r} 180 \\ -\ 90 \\ \hline 90 \end{array} \qquad \begin{array}{r} 90 \\ -\ 31 \\ \hline 59^\circ \end{array}$$

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3. Subtract 43° from 59° to find the missing acute angle in the obtuse triangle

$$59 - 43 = 16^\circ$$

4. Subtract 31° and 16° from 180° to find the missing obtuse angle.

$$\begin{array}{r} 180 \\ -\ 31 \\ \hline 149 \end{array} \qquad \begin{array}{r} 149 \\ -\ 16 \\ \hline 133^\circ \end{array}$$

5. Use law of sines to find side r in the obtuse triangle.

$$\frac{40}{\sin 16} = \frac{r}{\sin 133} \qquad \frac{40 \sin 133}{\sin 16} = r$$

$$r = 106.133 \text{ m}$$

6. Use law of sines to find side y in the large right triangle.

$$\frac{y}{\sin 31} = \frac{106.133}{\sin 90} \qquad y = \frac{106.133 \sin 31}{\sin 90}$$

$$y = 54.662 \text{ m}$$

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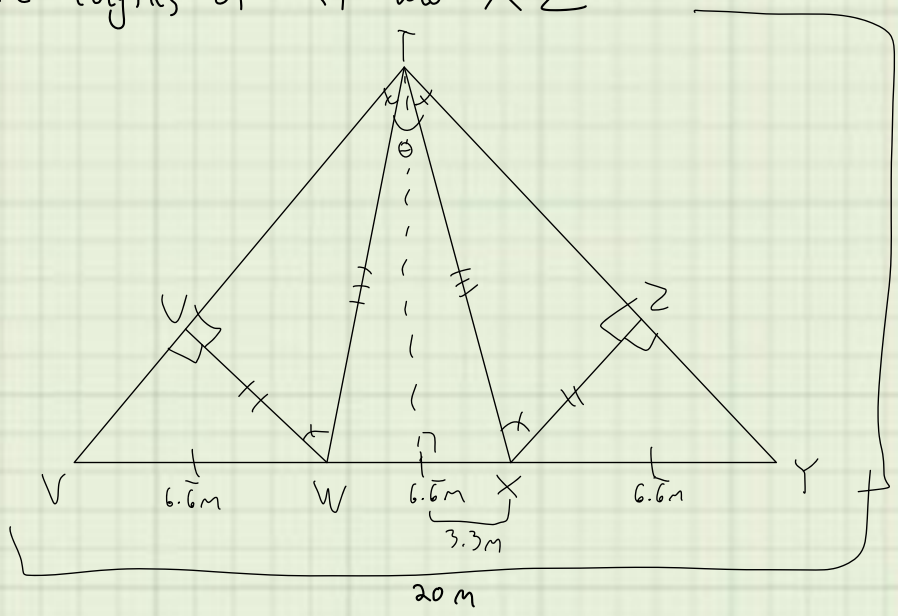
Problem: 2.1 Problem Presentation Method Q2

Determine the lengths of XT and XZ.

DIAGRAM



THEORY

Law of Sines

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Law of Cosines

$$c^2 = a^2 + b^2 - 2ab\cos C$$

Properties of a triangle

$$\theta_1 + \theta_2 + \theta_3 = 180^\circ$$

Pythagorean Theorem

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

ASSUMPTIONS

The truss is symmetric

SOLUTION

1. Divide 20, the length of the base, by 3 to find the length of each base segment.

$$20 \div 3 = 6.\overline{66}$$

2. Using the given height, as well as half a base segment, use Pythagorean Theorem to find TX

$$TX = \sqrt{(3.3)^2 + (2.7)^2} = 4.29\text{m}$$

3. Use law of cosines to find $\angle WTX$

$$(6.\overline{6})^2 = (4.29)^2 + (4.29)^2 - 2(4.29)(4.29)\cos C \qquad C = 101.974^\circ$$

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4. Subtract 101.974° from 180°, then divide by 2 to find the other two angles connected to T.

$$\begin{array}{r} 180 \\ -101.974 \\ \hline 78.03 \end{array}$$

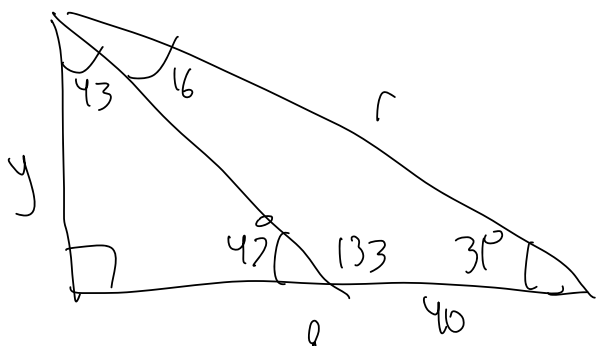
$78.03 \div 2 = 39.01°$

5. Find X2 using law of sines

$$\frac{4.29}{\sin 90} = \frac{X2}{\sin 39.01} \qquad \frac{4.29 \sin 39.01}{\sin 90}$$

$X2 = 2.7\ m$

1)



$$180 - 90 - 47 = 43^\circ \qquad 180 - 90 - 31 = 59^\circ \qquad 59 - 43 = 16$$

$$16 + 31 = 47 \qquad 180 - 47 = 133$$

$$180 - 31 = 149 \qquad 149 - 16 = 133$$

$$\frac{\sin 16}{40} = \frac{\sin 133}{r}$$

$$r \sin 16 = 40 \sin 133$$

$$r = \frac{40 \sin 133}{\sin 16} = 106.133$$

$$\frac{\sin 31}{y} = \frac{\sin 90}{106.133}$$

$$(106.133)\sin 31 = y \sin 90$$

$$\frac{r \sin 31}{\sin 90} = y \qquad y = 54.7$$

2)

$$2 \times 10^{1}\,m = 20\,m$$

$$TX = \sqrt{(3.\bar{3})^2 + (2.7)^2} = \underline{4.29\,m}$$

$$(6.\bar{6})^2 = (4.29)^2 + (4.29)^2 - 2(4.29)(4.29)\cos C$$

$$44.\bar{4} = 18.40 + 18.40 - 36.81\cos C$$

$$7.64 = -36.81\cos C$$

$$-0.21 = \cos C$$

$$C = \cos^{-1}(-0.21)$$

$$C = 101.97^{\circ}$$

$$180 - 101.974 = 78.0264$$

$$\theta_2 = 39.01^{\circ}$$

$$\frac{4.29}{\sin 90} = \frac{XZ}{\sin 39.01}$$

$$\frac{4.29 \sin 39.01}{\sin 90} = XZ \qquad XZ = 2.7003$$