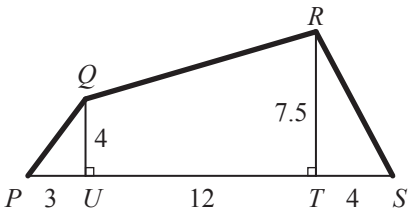
Problem of the Week
Problem C and Solution
Under the Big Top

Problem

A large tent is being set up for a fair. Two poles, QU and RT, are placed perpendicular to the ground and 12 m apart. Pole QU is 4 m in length and pole RT is 7.5 m in length. A tarp is placed over the poles and secured to the ground at P, 3 m from the base of pole QU, and S, 4 m from the base of pole RT.



Determine $PQ + QR + RS$, the length of the tarp.

Solution

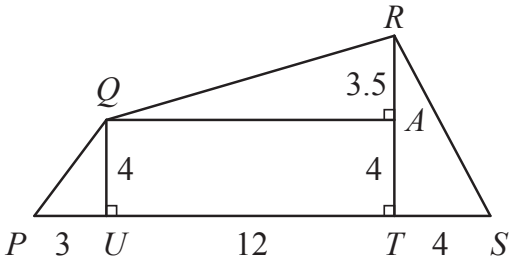
First, we will calculate PQ and RS.

Since $\angle PUQ = 90°$, we can apply the Pythagorean Theorem in $\triangle PUQ$. Thus $PQ^2 = QU^2 + PU^2 = 4^2 + 3^2 = 16 + 9 = 25$. Therefore, $PQ = 5$, since $PQ > 0$.

Similarly, $\angle RTS = 90°$, so we can apply the Pythagorean Theorem in $\triangle RTS$. Thus $RS^2 = RT^2 + TS^2 = 7.5^2 + 4^2 = 56.25 + 16 = 72.25$. Therefore, $RS = 8.5$, since $RS > 0$.

Now we will calculate QR.

Draw a line from Q perpendicular to RT. Let A be the point of intersection of the perpendicular with RT. Since QA is perpendicular to RT, $QATU$ is a rectangle. Therefore, $QA = UT = 12$ and $AT = QU = 4$. Thus $AR = RT - AT = 7.5 - 4 = 3.5$.



Since $\angle QAR = 90°$, we can apply the Pythagorean Theorem in $\triangle QAR$. Thus $QR^2 = QA^2 + AR^2 = 12^2 + 3.5^2 = 144 + 12.25 = 156.25$. Therefore, $QR = 12.5$, since $QR > 0$.

Therefore, the length of the tarp is $PQ + QR + RS = 5 + 12.5 + 8.5 = 26$ m.