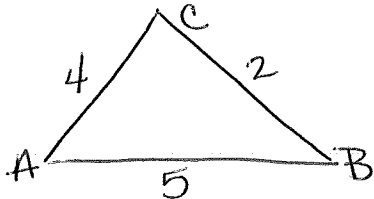


5-4 The Triangle Inequality

How to get from RHS to Dairy Queen?
What is the fastest route?

Triangle Inequality Theorem

The sum of the lengths of any two sides of a triangle is greater than the length of the third side.



$$\begin{aligned} AB + BC &> AC \\ BC + AC &> AB \\ AC + AB &> BC \end{aligned}$$

$$\begin{aligned} 4 + 2 &> 5 \\ 6 &> 5 \checkmark \end{aligned}$$

$$\begin{aligned} 2 + 5 &> 4 \\ 7 &> 4 \checkmark \end{aligned}$$

$$\begin{aligned} 4 + 5 &> 2 \\ 9 &> 2 \checkmark \end{aligned}$$

ex: Determine whether the given measures can be the lengths of the sides of a triangle.
8, 15, 17

$$\begin{aligned} 8 + 15 &\stackrel{?}{>} 17 \\ 23 &> 17 \checkmark \end{aligned}$$

$$\begin{aligned} 15 + 17 &\stackrel{?}{>} 8 \\ 32 &> 8 \checkmark \end{aligned}$$

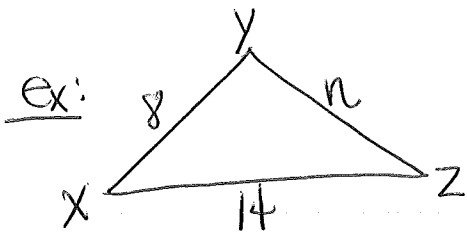
$$\begin{aligned} 17 + 8 &\stackrel{?}{>} 15 \\ 25 &> 15 \checkmark \end{aligned}$$

* Shortcut, if to find the sum of the two shortest sides to be greater than the third side, then they all work.*

ex: 6, 8, 14
↑ ↑
shortest

$$\begin{aligned} 6 + 8 &\stackrel{?}{>} 14 \\ 14 &\not> 14 \end{aligned}$$

no!
not a Δ



What are the possible lengths for n?

$$8 + 14 > n$$

$$22 > n$$

or

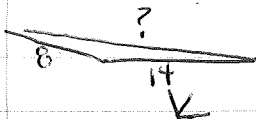
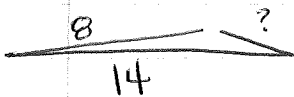
$$n < 22$$

$$8 + n > 14$$

$$\begin{array}{r} -8 \\ \hline n > 6 \end{array}$$

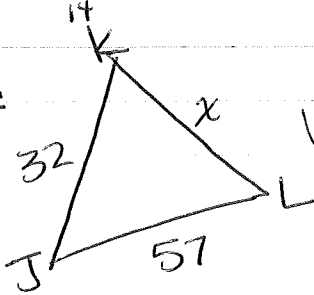
$$n + 14 > 8$$

$$\begin{array}{r} -14 \\ \hline n > -6 \end{array}$$



$$6 < n < 22$$

ex:



What are the possible lengths for x?

$$32 + 57 > x$$

$$89 > x$$

$$32 + x > 57$$

$$\begin{array}{r} -32 \\ \hline x > 25 \end{array}$$

$$57 + x > 32$$

$$\begin{array}{r} -57 \\ \hline x > -25 \end{array}$$

$$25 < x < 89$$