A. Returned Tests & Notebooks
B. Explained "Redemption" process for Test #1.
C. Demonstrated Trig Link on web page.
D. Gave Quiz #1: \( \csc \left( \frac{11\pi}{6} \right) \) exact.
E. There will be Quiz on Wed.

\[ \text{§6.5 Law of Cosines (LOC) p. 508.} \]

\[ c^2 = a^2 + b^2 \]

\[ c^2 = a^2 + b^2 - 2ab \cos C \]  \( \text{(1)} \)

also

\[ a^2 = b^2 + c^2 - 2bc \cos A \]  \( \text{or (2)} \)
\[ b^2 = a^2 + c^2 - 2ac \cos B \]  \( \text{or (3)} \)

B. Solve (1) for \( \cos C \) :

\[ 2ab \cos C = a^2 + b^2 - c^2 \]
\[ \cos C = \frac{a^2 + b^2 - c^2}{2ab} \]

\[ \cos B = \frac{a^2 + c^2 - b^2}{2ac} \]

C. LOC: SAS or SSS

I. SAS

\[ x^2 = 8^2 + 10^2 - 2(8)(10) \cos(60^\circ) \]
\[ = 164 - 80 = 84 \]
\[ x = \sqrt{84} \]
I would like to show you the basic idea behind the "proof" of the Law of Cosines. It is really very simple.

1. Draw any triangle—nothing special—definitely not a right triangle.

2. Now we construct a line segment from any vertex perpendicular to the opposite side—in this example, say from B and \( \perp \) to \( AC \).

3. So we have constructed two right triangles \( \triangle ABD \) and \( \triangle BCD \). From \( \triangle ADB \) we get
   \[ h^2 = c^2 - x^2 \]
   and from \( \triangle CDB \) we get \( h^2 = a^2 - (b-x)^2 \).
   Putting these two equations together, we get
   \[ c^2 - x^2 = a^2 - (b-x)^2. \]
   Solve this for \( a^2 \):
   \[ a^2 - (b-x)^2 = c^2 - x^2 \]
   \[ a^2 = c^2 - x^2 + (b-x)^2 \]
   \[ a^2 = c^2 + b^2 - 2bx + x^2 \]
   \[ a^2 = c^2 + b^2 - 2bx \quad (\star) \]

4. Now let's do some trig. Look at the left-hand triangle \( \triangle ADB \).
   \[ \cos A = \frac{\text{adj}}{\text{hyp}} = \frac{x}{c} \quad \therefore \quad (x = c \cos A) \]
   Now substitute this into (\star):
   \[ a^2 = b^2 + c^2 - 2bc \cos A \]
   This is one form of the Law of Cosines. The proofs of the other forms are similar.