01 Math Review

Civil Engineering Statics, STCS 200

Updated on: July 30, 2025

Statics and Math

- Statics is all math! All but the most trivial statics problems require algebra and/or trigonometry and/or geometry to solve.
- The good news is that the math is not very difficult. You won't need anything more advanced than high-school math.
- We will do a quick review here that should cover all the math you'll need for STCS 200.

Trigonometry

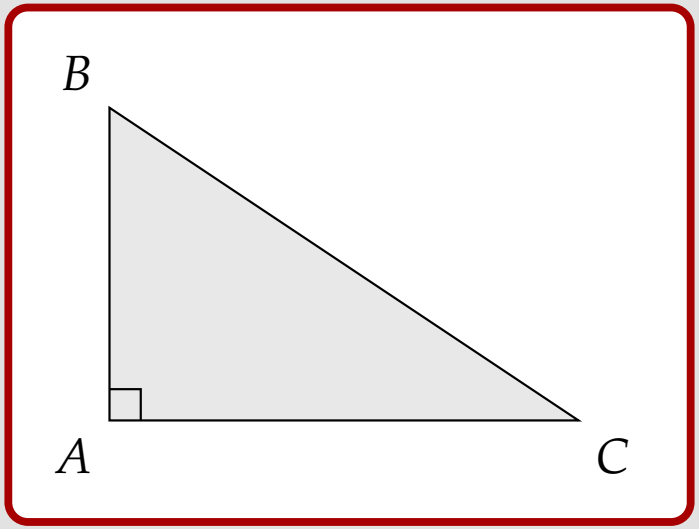
Triangles are a strong, stable shape and often used in engineering.

Triangles help avoid issues like this:

Triangles mean we need trigonometry.

Right Triangle

A **right triangle** is a triangle having one 90° angle.



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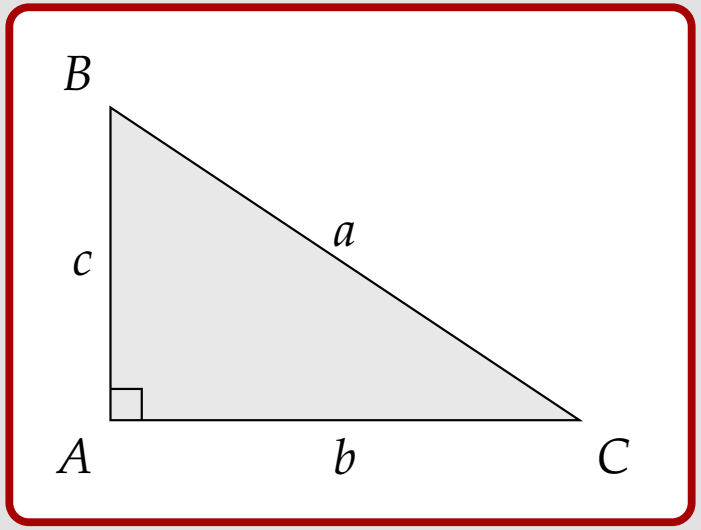

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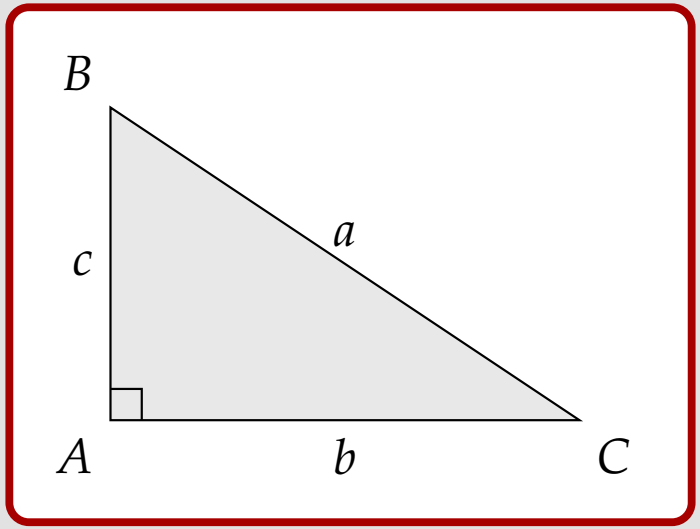

Label the three sides a, b and c. The side a, opposite the right angle, is called the **hypotenuse**.

If we know the lengths of any two sides, we can calculate the length of the third side using the **Pythagorean Theorem**:

Pythagorean Theorem

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

Significant Digits

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  It is **extremely important** to recognize that we can get no more accuracy out of a calculation than we put in. If the inputs to a problem have three significant digits, we cannot expect any higher accuracy than three significant digits in our result — even if the calculator does give ten digits.

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Non-zero digits **are** significant:

- 1234 has 4 significant digits.
- 12.34 has 4 significant digits.

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Zeros between non-zero digits are significant

- 12034 has 5 significant digits.
- 12.0034 has 6 significant digits.

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Leading zeros are **not** significant

- 0.1234 has 4 significant digits.
- 0.0001234 has 4 significant digits.

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Trailing zeros (on whole numbers, i.e. integers) are more **complicated**

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Calculations for Exercises

- In practive, it is often difficult to measure objects more accurately than to three significant digits so **input values for exercises are generally given to 3 significant digits**. (Or sometimes 4 significant digits if the leading significant digit is a 1)

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- Intermediate calculations will accumulate rounding errors quickly if we use only three significant digits and these can affect the final result. **For intermediate calculations, use 5 or more significant digits.**

  (When I write solutions down, I use 5 significant digits for intermediate calculations. You may use more if it is more convenient for you, e.g., if you are storing intermediate results in your calculator.)