Cool Geometry Formulas!

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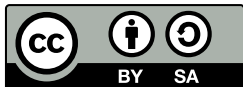
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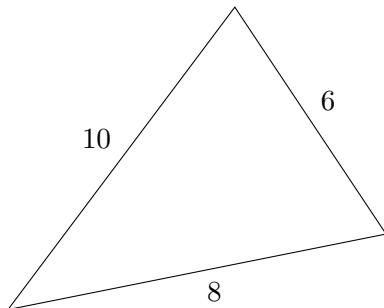
In order to use these next formulas, we need to know about a
wonderful concept called semiperimeter.

Semiperimeter, as the name suggests, refers to half the length of a
shape's overall perimeter!

For example, the semiperimeter of the triangle below is 12! Easy,
right?

A formula that can be used to calculate the area of triangles using semiperimeter!

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The formula is:

$$A = \sqrt{s(s-a)(s-b)(s-c)}$$

Where:

A is the area

s is the semiperimeter

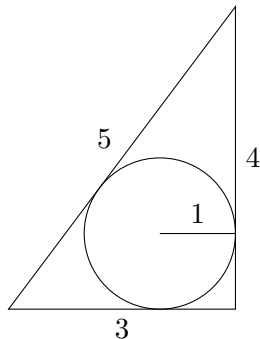a, b, and c are the sides of the triangle

The area of a triangle is also the product of a circle's inradius and its semiperimeter, or $A = rs$.

A triangle's inradius refers to the radius of its incircle, or the circle that can be inscribed within the triangle.
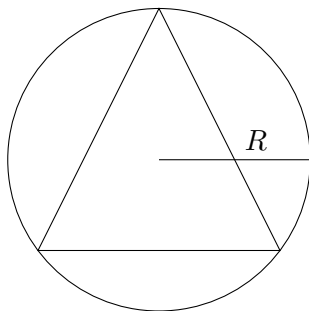
Here's a formula that can be used to calculate the circumradius!

$$R = \frac{abc}{4\sqrt{s(s-a)(s-b)(s-c)}} = \frac{abc}{4A}$$

A circumradius refers to, you can probably guess, the radius of the circle that the triangle can be inscribed in!

Similarly to Heron's formula, Brahmagupta's formula is another way to calculate area, however it involves the semiperimeter of a cyclic quadrilateral!

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The formula is:

$$K = \sqrt{(s-a)(s-b)(s-c)(s-d)}$$

Where:

K is the area

s is the semiperimeter

a, b, c, and d are the sides of the quadrilateral

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Now let's try some questions!

Calculate the sides of a triangle $\triangle ABC$ with area $883\,\mathrm{cm}^2$, if the ratio of the sides is $a : b : c = 15 : 7 : 19$.

A rhombus has a side length of $23\,\mathrm{cm}$ and one of its diagonals is $36\,\mathrm{cm}$ long. Calculate its area.

Calculate the circumference of the circle inscribed in a triangle with sides 418, 59, and 430.

In a newly built park, there will be a permanently placed rotating sprayer in order to irrigate the lawns. Determine the largest radius of the circle which can be irrigated by sprayer P, so not to spray park visitors on line AB. Distance $AB = 55\,\text{m}$, $AP = 36\,\text{m}$ and $BP = 28\,\text{m}$.