KEY

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1. Find the area of the largest rectangle that can be inscribed in the right triangle with side lengths 5, 12 and 13 if two of the sides are along the legs of the triangle.



We want to maximize $Area = x \cdot y$.

From the triangle above we can conclude that $\frac{12-x}{y} = \frac{12}{5}$. So, $y = \frac{5}{12}(12-x)$.

Therefore, we can write $Area = A(x) = \frac{5}{12}(12 - x)x = 5x - \frac{5}{12}x^2$.

 $A'(x) = 5 - \frac{5}{6}x$ Setting A'(x) = 0, we obtain x = 6.

We use the first derivative test for absolute extreme values to note that since A'(x) < 0 for x > 6 and A'(x) > 0 for x < 6, A(6) is the absolute maximum.

Plugging in $A(6) = 5 \cdot 6 - \frac{5}{12}(6)^2 = 30 - 15 = 15$.