

Triangle Problem:

Let one leg of the right triangle be x . Then the other leg of the triangle will be $20 - x$. Therefore the length of the hypotenuse $l = \sqrt{x^2 + (20 - x)^2} = \sqrt{2x^2 - 40x + 400}$. For minimum length of the hypotenuse, we have $\frac{dl}{dx} = \frac{1}{2}(2x^2 - 40x + 400)^{-\frac{1}{2}}(4x - 40) = 0$. This gives $x = 10$.

Further $\frac{d^2l}{dx^2} = -\frac{1}{4}(2x^2 - 40x + 400)^{-\frac{3}{2}}(4x - 40)^2 + 2(2x^2 - 40x + 400)^{-\frac{1}{2}} > 0$ for $x = 10$.

Therefore length of minimum hypotenuse $= \sqrt{2 \times 100 - 400 + 400} = 10\sqrt{2}$.

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