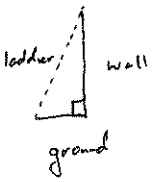
MTH 202 - Quiz 7

30 October 2015

Name: Solutions

Show all your work to receive full credit on the following problems; carefully organize your solutions so that the work is clear. No calculators or other electronic devices are allowed on this quiz.

1. (5 points) A ladder which is 65 feet long is placed on the ground 25 feet away from a vertical wall, and leans against the wall. How high on the wall is the spot where the ladder rests?



$65 = 5 \cdot 13$

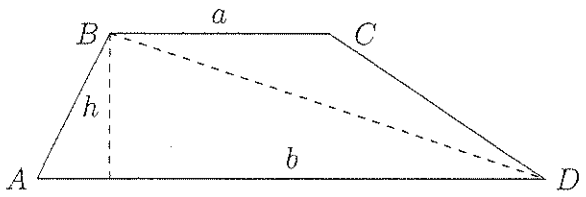
$25 = 5 \cdot 5$

$60 = 5 \cdot 12$

Triple: $(5, 12, 13)$

60 ft

2. (5 points) Consider the following trapezoidal figure:



(a) What is the area of triangle ΔABD?

$\frac{1}{2}ah$

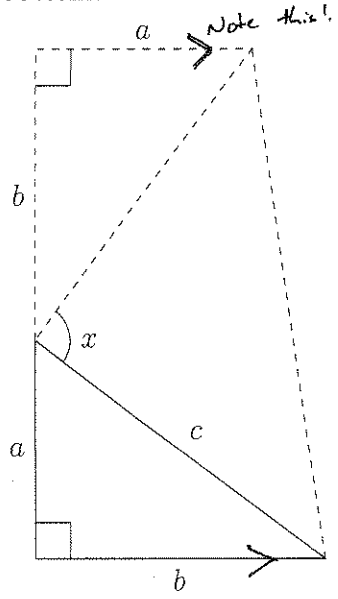
(b) What is the area of triangle ΔBCD?

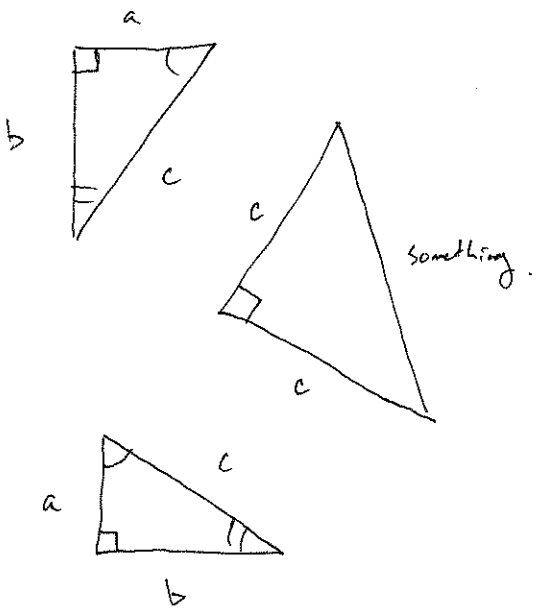
$\frac{1}{2}bh$

(c) Using the above two parts, we can conclude that the area of $ABCD$ is $\frac{1}{2}(a+b)h$. What fact is used to make this conclusion?

The areas of figures which only meet at edges add, so we get $\frac{1}{2}ah + \frac{1}{2}bh = \frac{1}{2}(a+b)h$.

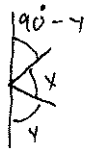
3. (15 points) This problem will walk you through another proof of the Pythagorean theorem, due to President James Garfield. Start with the following trapezoid, noting the right triangle at the bottom.





(a) Explain why $\angle x$ is a right angle.

two angles in right Δ add to 90



$\therefore \quad 180^\circ = (90^\circ - y) + x + y = 90^\circ + x$

$\therefore \quad x = 90^\circ$ ✓

(b) There are three triangles here; write down the area of each one in terms of a, b and c.

$\frac{1}{2}ab$ (bottom) $\qquad \frac{1}{2}c^2$ (right)

$\frac{1}{2}ab$ (top)

(c) Using the result from Problem 2(c), what is the area of the trapezoid in terms of a and b?

$\frac{1}{2}(a+b)(b+a)$

↑ altitude, called h before.

(d) After writing the areas of the three triangles and the area of the trapezoid, form an equation in a, b and c. Show how the equation simplifies to $a^2 + b^2 = c^2$.

$\frac{1}{2}(a+b)(b+a) = \frac{1}{2}ab + \frac{1}{2}ab + \frac{1}{2}c^2$

$\therefore \quad (a+b)(a+b) = 2ab + c^2$

$\therefore \quad a^2 + ab + ab + b^2 = 2ab + c^2$

$\therefore \quad a^2 + b^2 = c^2$ ✓