Solving Systems Continued: Word Problems

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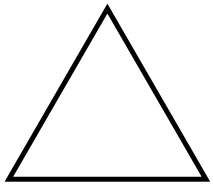
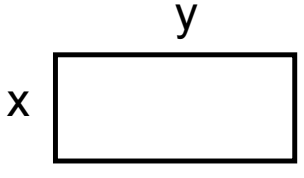
The sides of an equilateral triangle measure 10 cm. Suppose we have a rectangle with the same area and the same perimeter as this triangle.

a) Translate this situation into a system of equations.

b) Solve the system of equations to demonstrate that such a rectangle exists, and find its dimensions.





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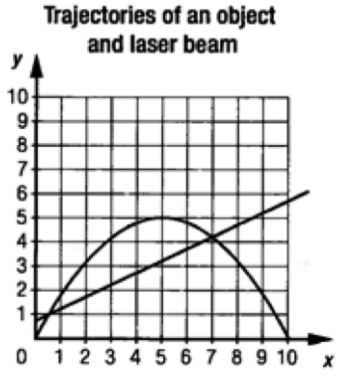
5. a)



b) The object is found at a height of 0.95 m and 4.2 when it crosses the laser beam.

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6. a) $(-2 - \sqrt{18}, -8 - 3\sqrt{18})$ and $(-2 + \sqrt{18}, -8 + 3\sqrt{18})$.

b) No solution.

c) $(-1, 3)$ and $\left(\frac{5}{2}, -\frac{1}{2}\right)$.

d) $\left(\frac{429}{198}, -\frac{121}{198}\right)$ and $(4, 0)$.

e) $(1, -14)$ and $(6, -29)$.

f) $\left(1, \frac{11}{2}\right)$ and $\left(\frac{11}{2}, 1\right)$.

g) $\left(\frac{3 - \sqrt{109}}{10}, \frac{118 - 6\sqrt{109}}{25}\right)$ and $\left(\frac{3 + \sqrt{109}}{10}, \frac{118 + 6\sqrt{109}}{25}\right)$.

h) $\left(-1, -\frac{8}{9}\right)$

i) $\left(\frac{1}{3}, -1\right)$

7. a) $x + y = 6.2$
$x^2 + y^2 = 25$

b) The rectangle measures 1.4 units by 4.8 units.

c) 1) Yes. The dimensions of the rectangle must be $(3.1 \pm \sqrt{8.29})$ units, therefore approximately 5.98 units for the length and 0.22 units for the width.

2) No, it is impossible. By solving the system of equations $x + y = 6$.
$x^2 + y^2 = 49$, you only obtain ordered pairs of which one of the coordinates is negative. You also know that the diagonal of a rectangle can never be greater than the sum of the measurements of its length and width because, in a triangle, the sum of the measurements of two sides is always greater than the measurement of the third side.