MA 15910, Lesson 7 notes  
Sections 6.5, 9.3, and 9.4 (Applied Problems using quadratic equations)

To solve an application (applied) problem.
1. Read the problem; carefully noting the information given and the question(s) asked. Possibly draw a picture.
2. Let a variable represent an unknown. You may have to use that variable in expression(s) to represent other unknowns in the problem.
3. Think of a plan: How is(are) the variable(s) and other numbers in the problem related. The plan will be a ‘sentence’ or formula that will lead to an equation.
4. Write an equation from the plan and solve.
5. Answer the question in the problem (with labels as necessary). Check reasonableness of answer.

Ex 1: The sum of a positive number and its square is 240. Find the number.

Ex 2: A rectangular multi-purpose room in a building has a length 7 meters greater than its width. The area of the room is 540 square meters. Find the dimensions of the room.
Ex 3: The outside dimensions of a picture frame of uniform width are 16 inches and 11 inches. If the area of the picture area that is exposed through the frame is 126 square inches, find the width of the frame.

Ex 4: The height \( h \) in feet of a baseball hit 3 feet above the ground is given by \( h = -16t^2 + 75t + 3 \) where \( t \) is time in seconds. At what times will the baseball be 89 feet above the ground? When will the baseball hit the ground? (Round answers to nearest tenth of a second.)
Ex 5: The product of two positive and consecutive odd integers is 323. Find the two integers.

Ex 6: The height of a triangle is 5 greater than its base. The area of the triangle is 25 square centimeters. Find the height of the triangle and the length of the base of the triangle.
Ex 7: Henry and Jason drive their motorcycles often between their homes. Henry lives in Hicksville and Jason lives in Countrytime. Henry rides his motorcycle at an average rate 10 kph faster than Jason’s average rate. Henry travels between the two towns in 75 minutes less time than Jason. Find both men’s average rates (in kmph), if the towns are 150 km apart.

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<th>Distance</th>
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<th>Time</th>
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<tbody>
<tr>
<td>Henry</td>
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**Job or Work Problems**

If a person can complete a job alone in 3 hours, we say he has a rate of $\frac{1}{3}$; he completes $\frac{1}{3}$ of the job per hour. In 2 hours he completes $2 \left( \frac{1}{3} \right)$ or $\frac{2}{3}$ of the job. We say his part of the job is $2/3$.

If a person can complete a job alone in 8 minutes, we say he has a rate of $\frac{1}{8}$; he completes $\frac{1}{8}$ of the job per minute. In 5 minutes he completes $5 \left( \frac{1}{8} \right)$ or $\frac{5}{8}$ of the job. We say his part of the job is $5/8$.

This leads to these formulas:

If a person can complete a job alone in $n$ units of time, his rate is $\frac{1}{n}$ per unit of time.

If he works at that rate for $m$ units of time; the part of the job completed by him is $\frac{1}{n} (m)$ or $\frac{m}{n}$ part of the job.

The plan for these types of problems is always: $(\text{part}_1 \text{ of job})(\text{time}_1) + (\text{part}_2 \text{ of job})(\text{time}_2) = 1 \text{ JOB}$. 
Ex 8:  Jay can work through a typical stack of invoices at the office in 1 hour less time than it takes Clay to work through the same sized typical stack of invoices. When working together; both can work through the typical stack of invoices in 1 ½ hours. How long does it take each man alone to work through a typical stack of invoices? If necessary, round each time to the nearest tenth of an hour.

Ex 9:  Find the measures of the 3 sides of the right triangle shown. Round to the nearest tenth, if necessary.
Ex 10: A ball is shot vertically upward from the ground. Its distance in feet off the ground in \( t \) seconds is given by the equation \( h = -16t^2 + 150t \). Approximate (to the nearest tenth of a second) after how many seconds will the ball be 200 feet off the ground.