Word Problems involving Quadratic Equations

Height in feet vs. Time in seconds
Ex 1. Abigail tosses a coin off a bridge into the stream below. The distance, in feet, the coin is above the water is modeled by the equation $y = -16x^2 + 96x + 112$. Where $x$ represents time in seconds.

- What is the greatest height of the coin?
- How much time will it take for the coin to hit the water?

Ans:

- $x_{min} = -10$
- $x_{max} = 10$
- $x_{scl} = 1$
- $y_{min} = -16$
- $y_{max} = 300$
- $y_{scl} = 1$
Ex 2. Use the following diagram to solve for the length of $AT$ in simplest radical form.

- What is the length of side $AT$?
- What is the length of side $BA$?
Ex 3. A square and rectangle have the same area. The length of the rectangle is five inches more than twice the length of the side of the square. The width of the rectangle is 6 inches less than the side of the square. Find the length of the side of the square.
Ex 4. The profits of Mr. Unlucky's company can be represented by the equation \( y = -3x^2 + 18x - 4 \), where \( y \) is the amount of profit in hundreds of thousands of dollars and \( x \) is the number of years of operation. He realizes his company is on the downturn and wishes to sell before he ends up in debt.

1. When will Unlucky's business show the maximum profit? **3 years**
2. What is the maximum profit? **2,300,000**
3. At what time will it be too late to sell his business? (When will he start losing money?) **After 3 years**
Ex 5. At a swim meet, Janet dives from a diving board that is 48 feet high. Her position above the water is represented by the equation $h(t) = -16t^2 + 24t + 40$, where $t$ represents time in seconds and $h(t)$ represents height in feet.

- After how many seconds does Janet enter the water? (Hint: Height above water would equal zero)
- What is the greatest height Janet reaches in her dive
- How long will it take to reach the max height?

| Ans: | X-min = |
|      | X-max = |
|      | X-scl = |
|      | Y-min = |
|      | Y-max = |
|      | Y-scl = |
Ex 6. Use the following diagram to solve for the length of all three sides in triangle SUN.

- What is the length of side SU?
- What is the length of side UN?
- What is the length of side NS?
Ex 7. American astronauts working on a space station on the moon toss a ball into the air. The height of the ball is represented by the equation \( f(t) = -2.7t^2 + 13.5t + 14 \), where \( t \) represents time in seconds since the ball was thrown and \( f(t) \) represents the height of the ball in feet.

- To the nearest hundredth of a second, after how much time does the ball hit the ground?
- To the nearest tenth of a foot, what is the greatest height the ball achieves?

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| X-min = |  |
| X-max = |  |
| X-scl = |  |
| Y-min = |  |
| Y-max = |  |
| Y-scl = |  |
Ex 8. Mr. Jackson had a rectangular shaped garden where the length was 2 less than twice the width. If the area of the garden was 420 square feet, find the dimensions of the garden.
Ex 9. Jocelyn and Kelly built rockets from assembly kits and are going to launch them at the same time to see whose rocket flies higher. If Jocelyn's rocket's height, in feet, can be described by the equation $J(x) = -16x^2 + 180x$ while Kelly's is represented by $K(x) = 16x^2 + 240x$.

- Who wins the rocket race? (What is the max height for both rockets?)
- After how many seconds does each rocket land?
- To the nearest tenth of a second, what was the difference in time for the two different rockets to reach their respective max heights?

| Ans: | X-min = 
|      | X-max = 
|      | X-scl = 
|      | Y-min = 
|      | Y-max = 
|      | Y-scl = |
Homework: Finish problems 5, 6, 8

Castle Learning 5 Due this Friday!!!