Algebra 2H
Quadratics Day 24 – Flying T-Shirts

Name: _____
Date: _____

Flying T-shirts (Revisited)

The Task

At a Varsity Basketball game, free t-shirts are being shot into the audience from a floor launcher. Chan wants to make sure his girlfriend catches the t-shirt, so they need to figure out which bleacher row she should sit in. Chan launches from center court. The t-shirt's travel path, according to the manufacturer's manual, is represented by the equation $y(x) = -0.05x^2 + 2.5x$,
where *y* represents the vertical height in feet in terms of the horizontal distance traveled, *x,* in feet. The bleachers begin 32 feet from center court and each bleacher row has a height of 1.5 feet and a width of 2 feet as shown in the diagram*. Use a line to represent the bleachers which touches the front edge of each row of seat and touches the floor 30 ft from center court as shown in the diagram*. The diagram is not necessarily drawn to scale.
Help Chan out. Using this information, determine which row Chan should tell his girlfriend should sit in.

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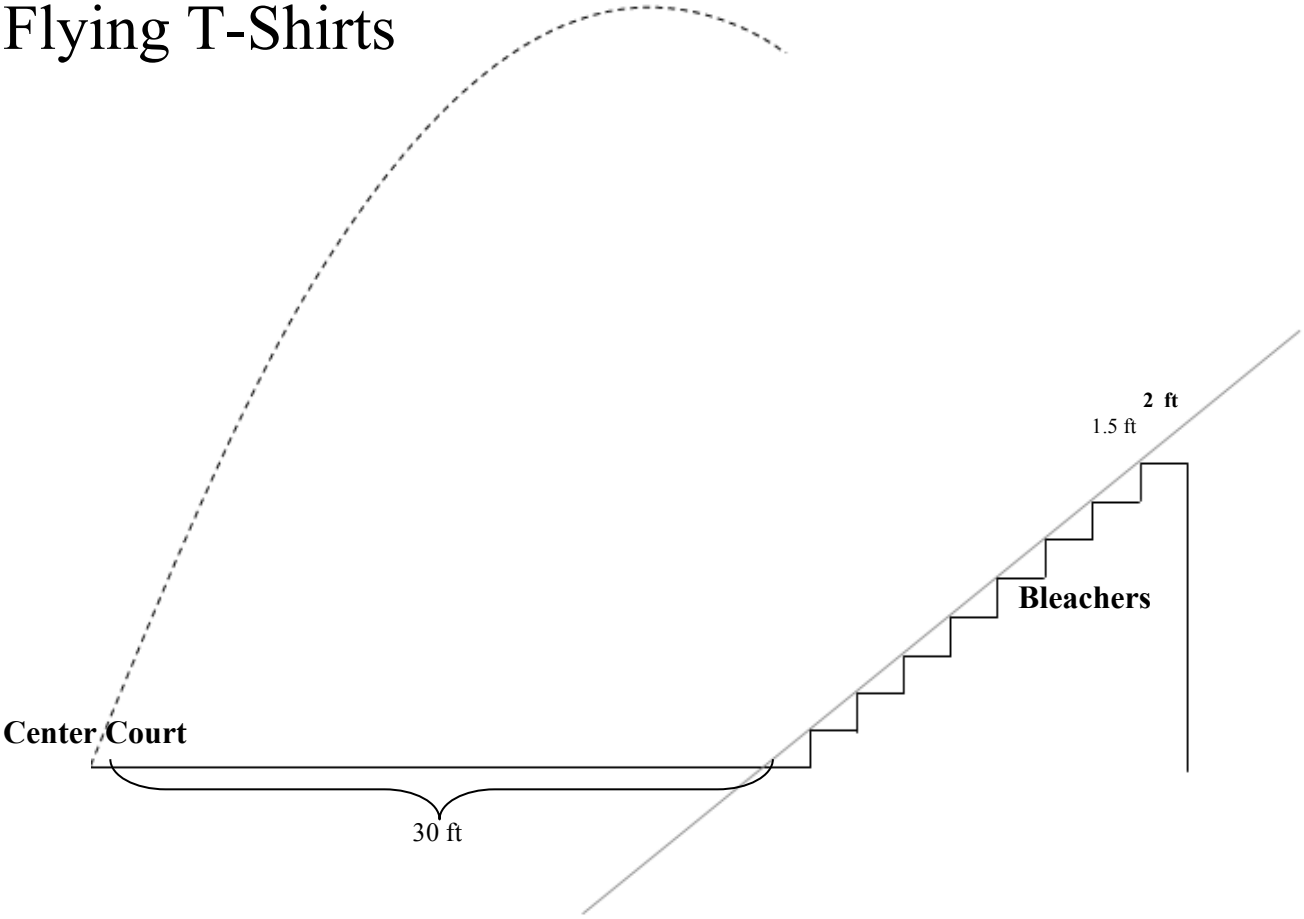
Flying T-Shirts



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Questions:

1. What else should we consider when we judge whether or not Chan's girlfriend will get the t-shirt?

2. If the support structure for the ceiling of the gym is 40 ft. above the floor, is there any danger that the t-shirt will strike part of the support structure?

3. How high does the shirt fly? If it struck part of the ceiling support structure or a lower hanging speaker at its highest point and fell straight down, would it land in the bleachers or on the floor? Describe where it would land on the bleachers or floor.

4. If the bleachers were folded up, how far from center court would the t-shirt hit the floor?

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Extension

1. An equivalent form of the t-shirt's travel path $y(x) = -0.05x^2 + 2.5x$ is $y(x) = -0.05(x - 25)^2 + 31.25$. What form of the equation is the new form?
   Confirm they are equivalent.

2. What do you notice about the coefficient in the equation $y(x) = -0.05(x - 25)^2 + 31.25$ and key points about the t-shirts path?

3. How do you think the equation $y(x) = -0.05(x - 25)^2 + 31.25$ would change if the t-shirt reached a maximum height of 40 feet? Justify your reasoning.