

Classroom to Campus: Math and Stats Challenge

Grade 10 - MFM2P

Topic C: Quadratic Relations of the form $ax^2 + bx + c$ Analyzing the Flight of a Soccer Ball

The general form of a quadratic equation for the height of an object is: $h(t) = at^2 + bt + c$ where:

- a represents the acceleration (in m/s^2);
- b represents the initial velocity (in m/s);
- c represents the initial height (in m) from which the ball was thrown;
- the time (in s) $t_{max} = -\frac{b}{2a}$ at which the maximum height occurs.

A person throws a ball straight up into the air. The height of the ball, h , in metres above the ground, is modeled by the quadratic equation:

$$h(t) = -5t^2 + 33t + 14$$

where t represents the time in seconds since the ball was kicked.

Using the given equation, answer the following questions:

- Determine the initial height from which the ball was thrown. *(Round your final answer to two decimal places. Include units.)*
- Determine the initial velocity of the ball when it is thrown. *(Round your final answer to two decimal places. Include units.)*
- Determine after how many seconds the ball will hit the ground. *(Round your final answer to two decimal places. Include units.)*
- Determine the time interval that the height of the ball is greater than 32 metres. *(Round your final answers to two decimal places. Include units.)*
- Determine the maximum height of the ball. *(Round your final answer to two decimal places. Include units.)*

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