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Problems Involving Quadratic Relations in Factored Form

Example 1

The profit of a chocolate bar can be modeled by the equation $P = -0.3(n-7)^2 + 10.8$, where P is the profit in Thousands of dollars and n is the number of chocolates sold in thousands.

a) What is the coordinates of the vertex? Explain what it represents

b) What is the y-intercept? Explain what it represents

c) What are the zeros? Explain what they represent.

UNDERSTANDING PROBLEMS RELATED TO FACTORED FORM

- draw sketches to help visualize the situation
- consider how key features relate to the context of the problem:
  - initial point = _____
  - break-even points/distance/time/etc. = _____
  - max/min profit/distance/height/etc. = _____ _____
  - point at which max/min occurs = _____

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Example 2

The path of a soccer ball can be modelled by the relation $h = -0.1d^2 + 0.5d + 0.6$, where *h* is the ball's height and *d* is the horizontal distance from the kicker. Both measured in meters.

a. Find the zeros of the relation.

b. What do the zeros mean in the context of the question?

Example 3

The arch of a small suspension bridge over a gorge can be modelled by the equation $y = -2x^2 + 4x + 6$ where *x* is the distance in meters from the edge of the gorge and *y* is the height above the ground, also in meters.

a. What are the zeros? What do they represent?

b. How long is the bridge? Justify your answer.

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Example 4

A rider on a mountain bike jumps off a ledge. Her path is modelled by the relation $h = -0.3d^2 + 1.2d + 1.5$, where *h* is her height above the ground and *d* is her horizontal distance from the ledge, both in metres.

a. What is the height of the ledge?

b. How far was the rider from the ledge when she landed?