## What is a related rates problem?

## Quick Check

Use implicit differentiation to find the derivative of the equation given below.
$x^{2}+9 y^{2}-4 x+3 y=0$

## An inflating balloon

Air is being pumped into a spherical balloon so that its volume increases at a rate of $100 \frac{\mathrm{~cm}}{\mathrm{~s}} \mathrm{~s}$. How fast is the radius of the balloon increasing when the diameter is 50 cm .

1 Understand the given and unknown quantities.
2 Introduce notation and make a labeled sketch to understand the situation.
3 Look for an equation to connect the given and unknown quantities/ rates of change.
4 Solve for the required rate of change.

## Ripples in a Pond

A pebble is dropped into a calm pond, causing ripples in the form of concentric circles. The radius $r$ of the outer ripple is increasing at a constant rate of 1 foot per second. When the radius is $4 f t$, at what rate is the total area $A$ of the disturbed water changing?

## Sliding Iadder 目

A ladder 10 ft long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a rate of $1 \mathrm{ft} / \mathrm{s}$, how fast is the top of the ladder sliding down the wall when the bottom of the ladder is 6 ft from the wall?

## Intersection of two roads

Car $A$ is traveling west at $50 \mathrm{mi} / \mathrm{h}$ and car $B$ is traveling north at $60 \mathrm{mi} / \mathrm{h}$. Both are headed for the intersection of two roads. At what rate are the cars approaching each other when car $A$ is 0.3 mi and car $B$ is 0.4 mi from the intersection?

Continue practice on handout
Explore the corresponding geogebra animations for different related rates scenarios posted as resources for the lesson on primethinker.com

