Math100C V

C23,34,35,26

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Related Rates

Objectives: Learn and implement a sequence of steps to solve related rates problems

What is related rates?

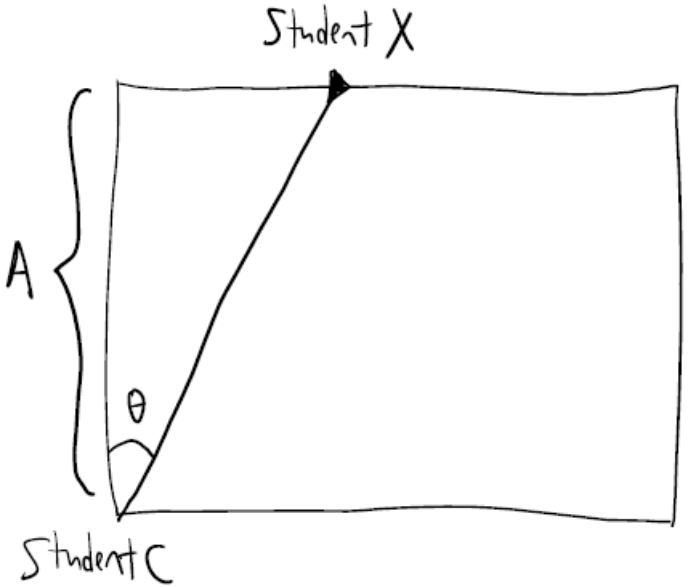
A ***related rate problem*** is one in which you are asked to find the rate of change of one thing given the rate of change of another thing.

Problems and takeaways

What is your walking speed?

Problems and takeaways

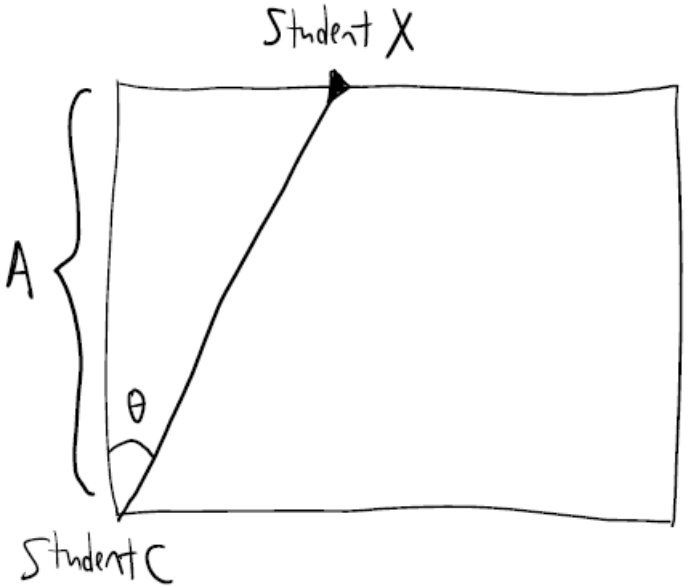
Suppose Student X starts in a corner of the room, and Student C stands in the other corner closest to Student X. A string is held tight between the them. As Student X walks along the long wall, the angle θ changes. Sketch the graph of θ with respect to time t.



Problems and takeaways

At the moment $\theta = \frac{\pi}{4}$, what would you guess is the rate of change of θ? **(Bonus question)**

https://www.desmos.com/calculator/entiisic2n



Steps to solve a related rates problem

(i) Draw and label a picture illustrating the problem. Start by drawing a rectangle representing a bird's eye view of the classroom.

(ii) What do we know? What information are we given?

(iii) What do we wish to find out?

Steps to solve a related rates problem

(iv) What is an equation that relates the thing whose rate we want to find out to the thing whose rate we know?

(v) Use differentiation --- in particular, the ***Chain rule*** --- to find the rate we need.

(vi) Does this answer “make sense”? How can we tell?

Summary: systematic steps to solve a related rates problem

(1) Draw and label a picture.
(2) Write down what is known.
(3) Write down what you wish to find.
(4) Write down an equation that relates the thing whose rate you want to the thing whose rate you know.
(5) If necessary, reduce the equation to one variable.
(6) Differentiate (using the Chain Rule) and solve.
(7) Do a “reality check” to see if your answer make sense.

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