Ladder Corner

Student Activity

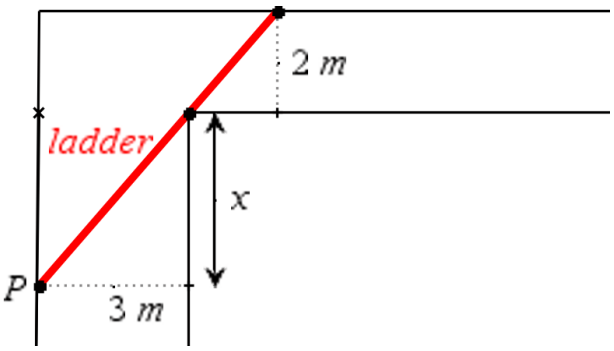
7 8 9 10 **11 12**

TI-Nspire | Investigation | Student | 20 min

Introduction

Maddi the painter has a selection of different length ladders. She has a job that requires her to paint some very high ceilings in a narrow corridor that contains several corners. Maddi would like to know what is the longest ladder she can take with her on this job.

She took some measurements of the corridors. One corridor has a width of 2 metres and the other a width of 3m as shown opposite.



Forming an Equation

Question: 1.

Maddi considers the first section of the ladder from point P to the corner. She refers to this section as L_1. Define a function $L_1(x)$ in terms of x.

Question: 2.

Maddi notices that the second section of the ladder, which she calls L_2 (from corner to end) forms a similar triangle to the first section. Define a function $L_2(x)$ in terms of x for the second section of the ladder.

Question: 3.

Define a function $L(x)$ in terms of x for the total length of the ladder including any domain restrictions.

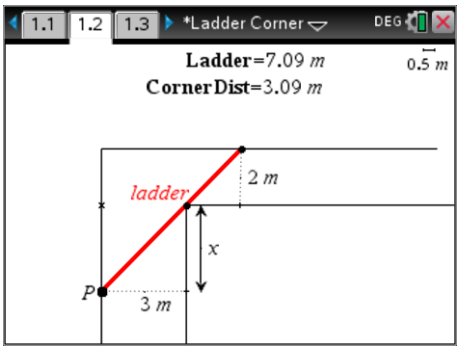
Validating the Equation

Open the TI-Nspire file "Ladder Corner".

Navigate to page 1.2

Grab point P and move it up and down. As point P moves up and down the height and area of the triangle is being collected automatically and stored in a spreadsheet on page 1.3.

Navigate to page 1.4 and graph the function $a(x)$ and confirm that it passes through the data points generated.



Question: 4.

Use CAS to determine the derivative of the function: $L(x)$.

Question: 5.

Determine the minimum value of the function $L(x)$ and explain why this is the maximum length of the ladder.

Question: 6.

Explain practically how Maddi might be able to get a longer ladder around the corner in the hallway.

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