

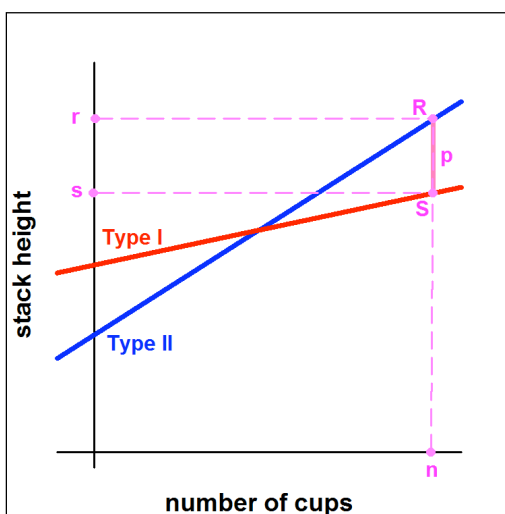
TASK 2.4.8: PATHS BETWEEN GRAPHS II**Solutions**

Shown here are graphs of the height functions of two types of cups (Type I and Type II). Recall that the graphs of the actual situation are scatter plots, sets of discrete points, since the situation is defined only for non-negative integers. The graph of the mathematical function that models the problem situation is a line drawn through these discrete points.

1. What does point R represent? What about point S?

Looking at the graph below, we can see that Point R represents a stack of n Type II cups, r cm tall.

Point S represents a stack of n Type I cups, s cm tall.



2. Explain what the length of segment RS represents.

The length of segment RS, p , represents the difference in height for the same number of Type I and Type II cups.

3. Here is a story about stacks:

“We stack our cups between movable shelves. By switching cup types, the shelves can be p cm closer together.”

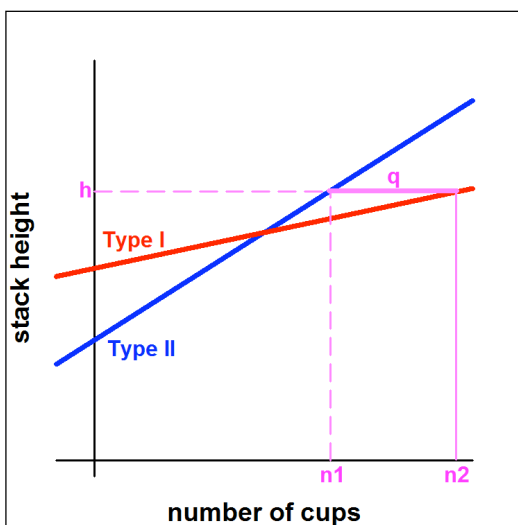
Show how this story can be represented by segment RS on the graph. The length p on the graph is how much closer the shelves can be placed by switching from Type I and Type II cups.

4. What does the intersection of these graphs represent? The intersection of the linear graphs is the number of cups when the height, h , of the Type I cups and the height, h , of the Type II cups are the same.

The question is:

What number n of cups gives the same height for the two kinds of stacks?

5. Consider the horizontal line segment with length q on the graph of the Type I and Type II functions.
- Explain what q represents.



The length q represents the number of additional cups of Type II that can be placed on the stack to attain the same height, h .

- What story might length q represent?

We stack our cups between shelves. By switching cup types, we are able to get q more cups in each stack.

6. For all possible parameters, can we always get more Type II cups on the shelves than Type I?

No. For all values of n less than the value of the intersection of the graphs for Type I and Type II cups, more Type I cups can be placed in a stack than Type II cups.

TASK 2.4.8: PATHS BETWEEN GRAPHS II

In the stacks of cups problem, we are interested in the relationship between two variables h and n :

h = the height of the stack in cm

n = the number of cups in the stack

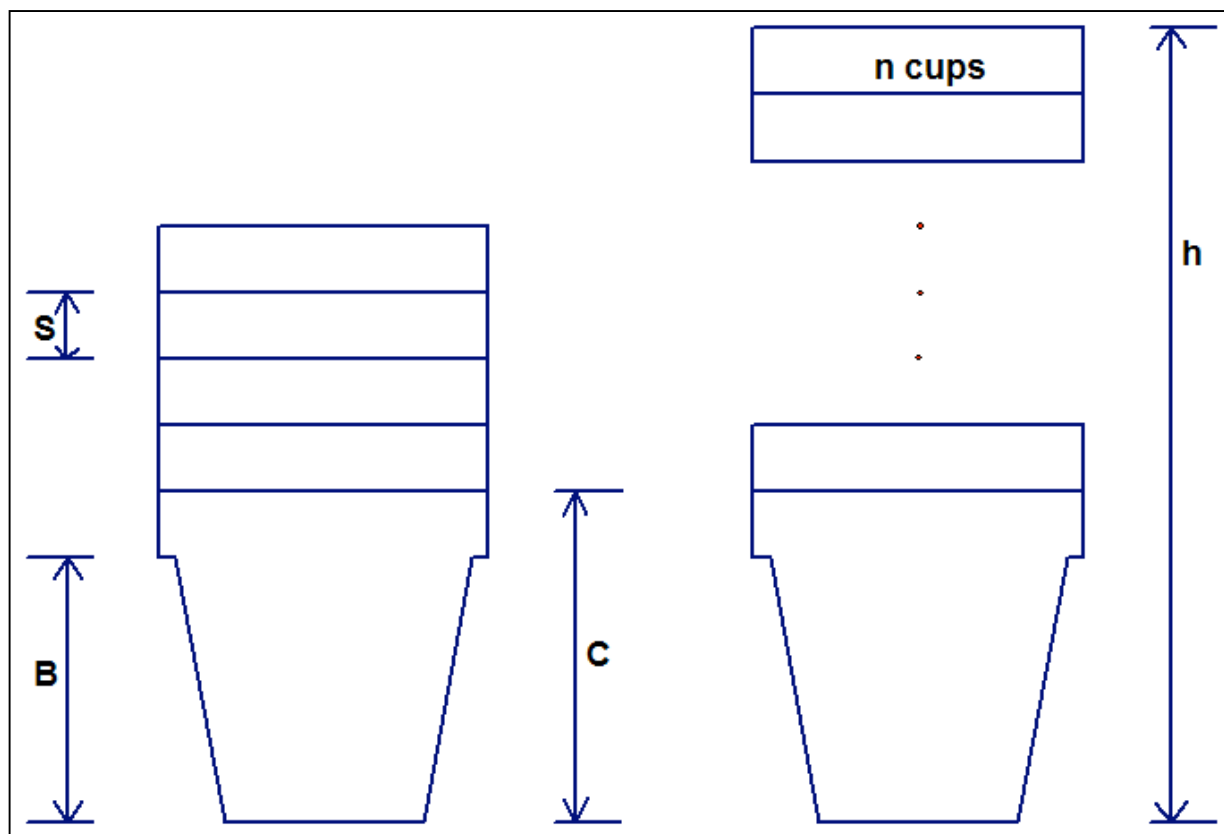
The dimensions of one particular type of cup have been labeled:

$C = 9.0$ cm = the individual cup height

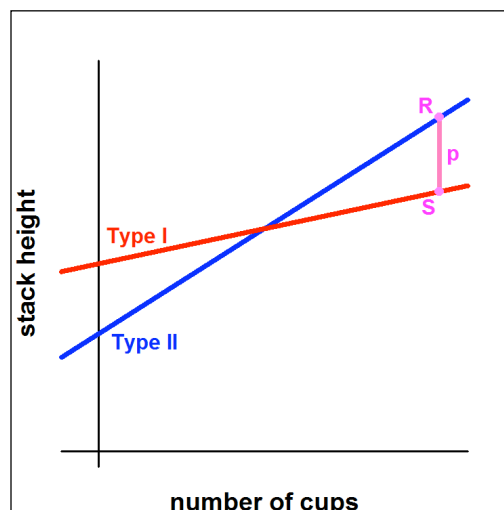
$S = 1.5$ cm = the “stick up” height of the cup (see diagram for clarification)

$B = 7.5$ cm = the height of the individual cup without the stick up part

Figure I



Shown here are graphs of the height functions of two types of cups (Type I and Type II). Recall that the graphs of the actual situation are scatter plots, sets of discrete points, since the situation is defined only for non-negative integers. The graph of the mathematical function that models the problem situation is a line drawn through these discrete points.



1. What does point R represent? What about point S?
2. Explain what the length of segment RS represents.
3. Here is a story about stacks:

“We stack our cups between shelves. By switching cup types the shelves can be p cm closer together.”

Show how this story can be represented by segment RS on the graph.

4. What does the intersection of these graphs represent?
5. Consider the horizontal line segment with length q on the graph of the Type I and Type II functions.
 - a. Explain what q represents.
 - b. What story might the length q represent?
6. For all possible parameters, can we always get more Type II cups on the shelf than Type I?