

Math Diversion Problem 637

P. Reany

June 6, 2025

A new scientific truth does not triumph by convincing its
opponents and making them see the light, but rather
because its opponents die and a new generation
grows up that is familiar with it.

— Max Planck

The problem is found at:

Source: Intermediate Algebra for College Students,
3rd Ed. (p. 169--171.)
Title: A Mixed-rate problem
Presenter: Robert Blitzer

1 The Problem

► A heat-loss survey by an electrical company indicated that a wall of a house containing 40 ft² of glass and 60 ft² of plaster lost 1920 BTU of heat (in a given time period). A second wall containing 10 ft² of glass and 100 ft² of plaster lost 1160 BTU of heat. Determine the heat lost per square foot of glass and plaster in that house. (This problem comes from *Intermediate Algebra for College Students*, 3rd Ed., p. 169–171.)

Rate heat loss BTU per sq ft:	R_G		R_P					
Wall material:	<table border="1"><tr><td>Glass</td></tr></table>	Glass	+	<table border="1"><tr><td>Plaster</td></tr></table>	Plaster	→	<table border="1"><tr><td>Whole wall</td></tr></table>	Whole wall
Glass								
Plaster								
Whole wall								
Material sq ft:	x		y		Total heat lost			
Wall #1:	40		60	→	1920			
Wall #2:	10		100	→	1160			

Figure 1. Heat leakage through glass and plaster.

2 The Solution

Let R_G be the rate of heat lost per square foot through glass, and R_P be the rate of heat lost per square foot through plaster.

Somehow this clever heat-loss technician is able to measure the heat lost through an entire wall. He then measures the square footage of the glass and plaster of this wall, and repeats this process for another wall, and then uses algebra to infer the heat loss through just the glass or just the plaster.

We can do this ourselves. The total heat lost for both walls is equal to the respective sums of the heat lost through their glass parts and their plaster parts:

$$\begin{aligned} 1920 &= 40R_G + 60R_P, \\ 1160 &= 10R_G + 100R_P, \end{aligned} \tag{1}$$

This gives us $R_G = 36$ [BTU] and $R_P = 8$ [BTU].