Is This a Math Class or an Art Class?

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Over the years, students have hurled that question at me as I try to teach the value of setting up certain types of problems with a drawing or simple sketch. I often answer it with the old saying "a picture is worth a thousand words." Can this be true for mathematics? Is a picture really worth a thousand words? The answer may be a resounding "yes."

Humans are visual beings. The graphic artists employed by large marketing firms have known this for many years. When they really want to get our attention as consumers, what do they do? The artists create a picture to accompany the product they are selling. Ideally, it's a drawing that catches our attention at first glance and holds it until their message has been conveyed. So how does this age-old marketing concept help us in the classroom? The eye sends the brain thousands of pieces of information with each glance we take. So why not harness some of this potential by using drawings as a tool for solving mathematics problems?

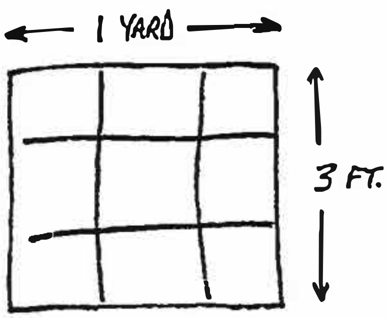
I teach students to consider employing a drawing or sketch as a routine part of problem solving. It has proven to be an effective technique for many students, even if only used to supplement other methods of approaching problems. Drawings can be particularly effective for students when confronted with problem types that fall into these two categories: 1) a problem type they don't normally encounter and therefore have little or no experience base to draw upon and 2) problems having lots of information which is difficult to organize. Sometimes using a drawing will enable students to solve a problem that they did not even know how to begin. The drawing provides a framework on which to attach the known information. With that in place, a process for solving the problem is more likely to emerge.

The problems that follow are much simpler to understand and solve once a visual reference has been produced. The sketches are left "rough" as they might look on a chalkboard or student's paper.

Problem 1

A contractor buys floor covering wholesale at cost of $10 per square yard. The contractor then marks the floor covering price up by 20 percent before quoting the price to customers. The customers are always given the price per square foot, as the contractor believes this is easier for the customer to understand. What is the price the contractor quotes per square foot of floor covering?

In this problem, the common mistake comes not from computing the percentage markup, but in treating an area problem as if it were a linear measurement problem. Students will add $2 to the price per square yard, then proceed incorrectly by dividing this figure by 3, since there are 3 feet in a yard. That step yields the incorrect answer since there are 9 square feet contained in 1 square yard. When shown the drawing below, most students immediately see their error.



SO 1 SQUARE YARD
EQUALS 9 SQUARE FT.

COST
$ 10.00 SQ. YARD
+ 2.00 (20% MARKUP)

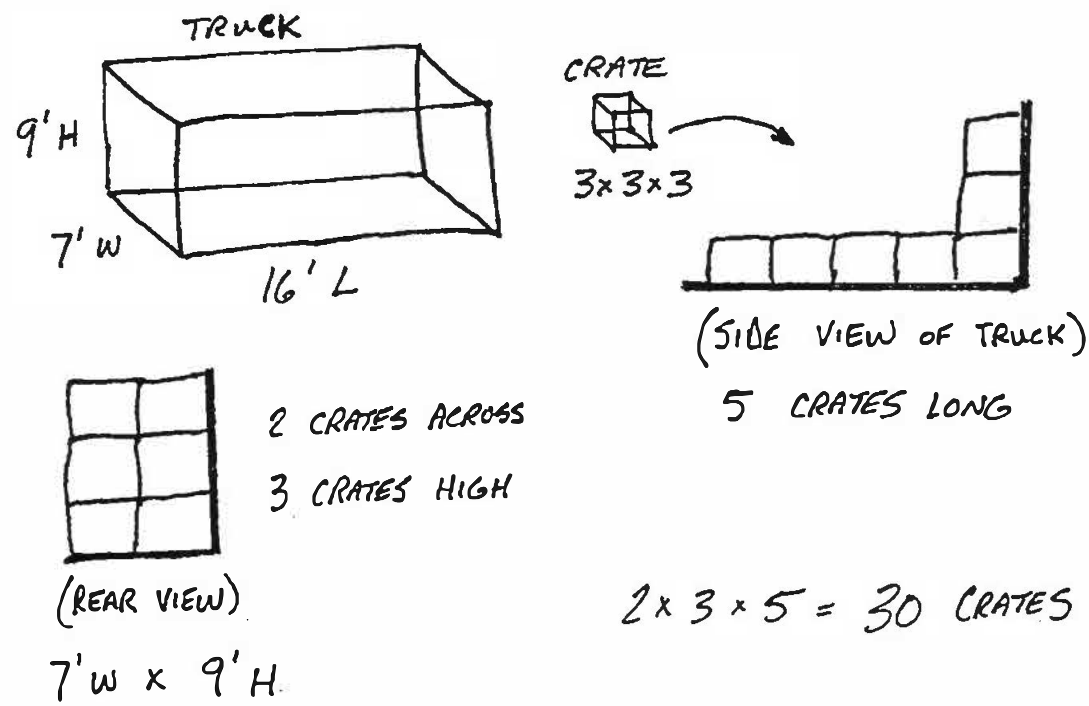
QUOTE 12.00 SQ. YARD
CONVERT
$ 12.00 ÷ 9 = $ 1.33

$ 1.33 SQ. FT.

Problem 2

A trucking company uses trucks with cargo dimensions of 7 feet wide, 16 feet long and 9 feet high. What is the maximum number of cube-shaped crates measuring 3 feet by 3 feet by 3 feet that will fit in the truck's cargo space?

Students often approach this problem confidently, computing the volume of the cargo space, then dividing that figure by each crate's volume of 27 cubic feet. But the crates are not a liquid item which can simply be poured into the truck until the volume is fully maximized. Their dimensions are both fixed and rigid, so the incorrect answer turns out to be a bit on the high side. A drawing clearly indicates that the crates may be stacked inside the truck 3 high, 2 across and 5 running the length.



Problem 3

A seafood wholesaler pays the following amounts for fish: $2.29/pound for tuna, $1.79/pound for mackerel, $2.07/pound for premium cod, $1.59/pound for small cod and $3.50/pound for swordfish. What is the total amount spent for the fish if the following quantities of each were purchased: 339 pounds swordfish, 1,202 pounds mackerel, 154 pounds premium cod, 874 pounds tuna and 561 pounds small cod?

In this problem a drawing would be of little use, but some mechanism for organizing the varying quantities and prices would clearly give a foothold for getting started. Here, a simple table seems to be the ideal approach. Begin by listing the fish in the left-hand column. Add columns for the prices paid, quantities purchased and tallied amounts.

	PRICE PD.		LBS. BOUGHT		
TUNA	2.29	x	874	=	2001.46
MACKEREL	1.79	x	1202	=	2151.58
PREM. COD	2.07	x	154	=	318.78
SM. COD	1.59	x	561	=	891.99
SWORDFISH	3.50	x	339	=	1186.50
			TOTAL SPENT		$ 6550.31