A Connecting Strategy for Ratio, Proportion, Per Cent Problems

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A table helps the mind organize data and understand problem situations. Cognitive psychology supports the proposition that the mind attempts to organize perceptual input, that memory is aided by perceptual and conceptual schemas, and that achievement is improved very significantly and efficiently when schemas are used for initial learning and repeated in practice and recall.

A generic table such as the following may	item	ratio	actual
assist students in a variety of ratio-proportion			
problems, with direct extensions to per cent,			
and to atomic weight problems in chemistry.			

A basic ratio problem would be step as follows:

1. For every six WWE fans, there are seven NASCAR fans. If there are 84 WWF fans, how	item	ratio	actual
	WWE	6	84
	NASCR	7	X
many NASCAR fails are mere?			

The table suggests a proportion perceptually: $\frac{6}{7} = \frac{84}{x}$.

Note A: Solution by cross-multiplication should include the caution that cross-multiplication is only valid over an equals symbol, and that the products must be written equal to each other for solution.

A more advanced ratio problem involves the concept of the total individuals involved.

2. For every eleven corn kernels there are six wheat kernels in the mess. If there are 206 kernels in all, how many are corn?	item	ratio	actual
	corn	11	X
	wheat	6	
	total	17	206

Note B: The data for wheat is incomplete but is no longer interesting

once the simplest proportion is evident:
$$\frac{11}{17} = \frac{X}{206}$$
.

Note C: The insertion of a table entry for TOTAL is an example of an initiative or innovation that students need to be encouraged to make.

Note D: Other methods of solution are common, of course; what is suggested here is a solution that is uncomplicated once the organization is complete.

2 There are a farmer 16 man and a farmer 1	item	ratio	actual
5. Three out of every 16 were oversized.	oversize	3	
oversized?	not	13	X
	TOTAL	16	48

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Note E: Another variety of initiative was needed.

Note F: Example 3 might have been worded, "Three-sixteenths were oversized..." and this strategy may be used for such problems, and perhaps can be introduced to students in earlier grades than those normally used to introduce the examples given here.

4. Forty-one per cent of the pans were dented. If 323 pans were not dented, how many pans were there in all?	item	ratio	actual
	dented	41	
	not	59	323
	TOTAL	100	X

Note G: Two initiatives are shown: the ratio total, and the complementary 59%

Per cent of increase in the following setting can be tricky, but the suggested schema provides clarity and efficient solution.

5. The successful solutions increased by	item	ratio	actual
110%. If there were 73 successes at the	start	100%	73
beginning, how many were there at the	increase	110%	
finish?	finish	210%	X

Note H: Initiative is needed in identifying the original amount as 100%. Note I: The concept of per cent of increase is clarified.

The problem may also be modified by providing the actual increase, or in asking for the actual increase.

6 The man has of maniataned materia	item	ratio	actual
increased from 671 to 710. What is the per	start	100%	671
appendicted as a financial of the financ	increase	X	41
cent of increase?	TOTAL		712

Note J: The insertion of 100% as the original amount is based on the definition of per cent of increase as well as the per cent of decrease. Each is defined in business and science as the amount of change divided by the original amount.

	item	ratio	actual
7. The number of holdouts decreased from	start	100%	30
30 to 23. What is the per cent of decrease?	decrease	X	7
	TOTAL		23

Applications to some basic chemistry problems require reference to atomic numbers from the Periodic Table of Elements.

8. In 78 grams	element	atomic wt*	atoms @	ratio	actual gm
of H ₂ SO ₄ , how	Hydrogen	1	2	2	
many grams are	Sulfur	32	1	32	X
there of sulfur?	Oxygen	16	4	64	
$TOTAL \rightarrow$	H_2SO_4			98	78

Thus, $\frac{32}{98} = \frac{X}{78}$, etc.

* Number of basic particles (electrons or protons or neutrons) in each atom.

Ten years ago, 70% of the mathematics portion of the ACT college board exam consisted of problems that could be solved using ratio and proportion. The importance of this topic was thus established for getting into higher education, and for succeeding in the mathematics portions of business, science, and so on.