Strategies for Solving Mixture Problems

#1. Go straight to the algebra.

#2. Build a table of just what you're given.

#3. Build a table of what you're given AND what you've figured out.

Each has advantages and drawbacks.

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Strategy #1 – Go Straight to Algebra

"How many pounds of chocolate-covered raisins costing $3.40 per pound and how many pounds of malted milk balls costing $3.00 per pound must be combined to create 10 pounds of a mixture costing $3.25 per pound?"

$$3.40 \cdot x + 3.00 \cdot (10 - x) = \$32.50$$

Obvious question:
"Where did *that* formula come from?"

Good for rapid calculation on small problems.
Breaks with larger problems; may require further explanation with a skeptical consumer.

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Strategy #2 – Build A Table Of Just What You're Given

Item	Pounds	$ per pound
Chocolate Raisins	x	3.40
Malted Milk Balls	10-x	3.00
Mixture	10	3.25

$$3.40 \cdot x + 3.00 \cdot (10 - x) = 3.25 \cdot 10$$

Good intermediate form.

Still leaves some questions: "Why 3.40 times *x* ?"

Also breaks on larger & more complex problems.

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Strategy #3 – Build A Table Of What You're Given AND What You've Figured Out

Item	Pounds	$ per pound	$ for this item
Chocolate Raisins	x	3.40	$3.40 \cdot x$
Malted Milk Balls	10-x	3.00	$3.00 \cdot (10\text{-}x)$
Mixture	10	3.25	$3.40 \cdot x + 3.00 \cdot (10\text{-}x) = 3.25 \cdot 10$

$$3.40 \cdot x + 3.00 \cdot (10 - x) = 3.25 \cdot 10$$

Wordy, but doesn't leave many questions.

Scales well to larger and more complex problems.

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Notice the Pattern

Multiply Across Rows

Item	Pounds	$ per pound	$ for this item
Chocolate Raisins	x	3.40	$3.40 \cdot x$
Malted Milk Balls	$10-x$	3.00	$3.00 \cdot (10-x)$
Mixture	10	3.25	$3.40 \cdot x + 3.00 \cdot (10-x) = 3.25 \cdot 10$

Add / Subtract Within Columns

$$3.40 \cdot x + 3.00 \cdot (10 - x) = 3.25 \cdot 10$$

Cost of Raisins + Cost of Malted Milk Balls = Cost of Mixture

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Other Problems Have The Same Pattern

Multiply Across

Item	$ invested	Interest rate	$ interest
Savings #1	**2500**	**4.25% = 0.0425**	$2500 \cdot 0.0425 = 106.25$
Savings #2	**1500**	x	$1500 \cdot x$
Combined Savings	(4000)	(0.05)	$106.25 + 1500 \cdot x =$ **200**

Add / Subtract Within Columns

$$106.25 + 1500 \cdot x = 200$$

Interest #1 + Interest #2 = Combined Interest

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Many Problems Have The Same Structure, But Sometimes It's Harder To See

"How many quarts of 90% solution have to be added to 12 quarts of 50% solution to create 75% solution"

Item	Quarts of solution	Concentration of pure "stuff"	Quarts of pure "stuff"
Solution #1	x	**90% = 0.90**	$0.90 \cdot x$
Solution #2	**12**	**50% = 0.5**	$12 \cdot 0.5$
Mixture	$12 + x$	**75% = 0.75**	$0.90 \cdot x + 12 \cdot 0.5 = 0.75 \cdot (12 + x)$

$$0.90 \cdot x + 12 \cdot 0.5 = 0.75 \cdot (12 + x)$$

Qts of pure stuff in #1 + Qts of pure stuff in #2 = Qts of pure stuff in the mixture

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Spreadsheet We're Building Today

Multiply Across Each Row

	A	B	C	D	E
1	Item	Number of pounds	Dollars per pound	Dollars	Add / subtract
2	Type A nuts	50	2	100	In 1st and 3rd columns
3	Type B nuts	3	6	18	
4	mixture			118	adding down (to get total $$ for mixture by adding $$ for ingredients)
5	mixture	53	5	265	mixture by multiplying total weight of the mixture, times the mixture's cost per pound)
6				-147	"Error" --- the difference between "adding down" and "multiplying across"

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