Word Problems with Systems

One type of word problem you will see is "break-even" problems. This is when the income = expense or when item 1 = item 2

Ex 1: A fashion designer makes and sells hats. The material for each hat costs $5.50. The hats sells for $12.50. If the designer spends $1400 on advertising, how many hats must the designer sell to break even?

$$\text{Income} = \text{expense}$$
$$12.50h = 5.50h + 1400$$
$$-5.50h \qquad -5.50h$$
$$\frac{7h}{7} = \frac{1400}{7}$$
$$\boxed{h = 200 \text{ hats}}$$

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Ex.2

A carpenter makes and sells rocking chairs. The material for each chair costs $22.50. The chairs sell for $75 each. If the carpenter spends $420 on advertising, how many chairs must he sell to break even?

$$\text{Income} = \text{expense}$$
$$75c = 22.50c + 420$$
$$-22.50c \quad -22.50c$$
$$\frac{52.50c}{52.50} = \frac{420}{52.50}$$
$$c = \boxed{8 \text{ chairs}}$$

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Ex.3

The local zoo is filling two water tanks for the elephant exhibit. One water tank contains 50 gallons of water and is filled at a constant rate of 10 gal/hr. The second tank contains 62 gallons of water and is filled at a constant rate of 4 gal/hr. When will the two tanks have the same amount of water?   hours

$$\text{tank 1} = \text{tank 2}$$
$$50 + 10h = 62 + 4h$$
$$\qquad -4h \qquad -4h$$
$$50 + 6h = 62$$
$$-50 \qquad -50$$
$$6h = 12$$
$$\boxed{h = 2 \text{ hours}}$$

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Another type of word problem is when you are comparing two things. For example, number of tickets sold and amount of money.

Ex.4

Movie tickets at a local theater cost $6 for adults and $2 for children under 12. If 175 tickets were sold with cash receipts of $750, how many of each kind of ticket were sold?

$$6a + 2c = 750 \Rightarrow 6a + 2c = 750$$
$$-2(a + c = 175) \Rightarrow -2a - 2c = -350$$
$$\qquad\qquad\qquad\qquad\qquad 4a = 400$$
$$100 + c = 175 \qquad \boxed{a = 100 \text{ adults}}$$
$$-100 \qquad -100$$
$$\boxed{c = 75 \text{ children}}$$

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Ex.5

Snack Bar A snack bar sells two sizes of snack packs. A large snack pack is $5, and a small snack pack is $3. In one day, the snack bar sold 60 snack packs for a total of $220. How many small snack packs did the snack bar sell?

$$5L + 3s = 220 \rightarrow 5L + 3s = 220$$
$$-5(L + s = 60) \rightarrow -5L - 5s = -300$$
$$\qquad\qquad\qquad\qquad \frac{-2s}{-2} = \frac{-80}{-2}$$
$$L + 40 = 60 \qquad \boxed{s = 40 \text{ small}}$$
$$-40 \quad -40$$
$$\boxed{L = 20 \text{ large}}$$

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Ex.6

Theater Tickets Adult tickets to a play cost $22. Tickets for children cost $15. Tickets for a group of 11 people cost a total of $228. Write and solve a system of equations to find how many children and how many adults were in the group.

$$22a + 15c = 228 \Rightarrow 22a + 15c = 228$$
$$-15(a + c = 11) \Rightarrow -15a - 15c = -165$$
$$\qquad\qquad\qquad\qquad 7a = 63$$
$$a + c = 11 \qquad \boxed{a = 9 \text{ adults}}$$
$$\boxed{c = 2 \text{ children}}$$

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Ex.7

You have a coin bank that has 275 dimes and quarters that total $51.50. How many of each type of coin do you have in the bank?

$$.10d + .25q = 51.50 \Rightarrow .10d + .25q = 51.50$$
$$-.10(d + q = 275) \Rightarrow -.10d - .10q = -27.50$$
$$.15q = 24$$
$$\frac{.15q}{.15} = \frac{24}{.15}$$

$$d + 160 = 275$$
$$-160 \quad -160$$
$$d = \boxed{115 \text{ dimes}}$$

$$q = \boxed{160 \text{ quarters}}$$

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Classwork: **worksheet #1 - 6**

#1,2 - round

Final Five

The difference of two numbers is 14. Their sum is 40. Find the numbers.

$$x - y = 14$$
$$x + y = 40$$

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