8.4 Value Problems & Mixtures

Name: _____

Example 1.

In a child's bank are 11 coins that have a value of $1.85. The coins are either quarters or dimes. How many coins each does child have?

	Number	Value	Total
Quarter	q	25	
Dime	d	10	
Total			

Using value table, use q for quarters, d for dimes
Each quarter's value is 25 cents, dime's is 10 cents

	Number	Value	Total
Quarter	q	25	$25q$
Dime	d	10	$10d$
Total			

Multiply number by value to get totals

	Number	Value	Total
Quarter	q	25	$25q$
Dime	d	10	$10d$
Total	11		185

We have 11 coins total. This is the number total.
We have 1.85 for the final total,
Write final total in cents (185)
Because 25 and 10 are cents

$$q + d = 11$$
$$25q + 10d = 185$$

First and last columns are our equations by adding
Solve by either addition or substitution.

$$-10(q + d) = (11)(-10)$$
$$-10q - 10d = -110$$

Using addition, multiply first equation by -10

$$-10q - 10d = -110$$
$$\underline{25q + 10d = 185}$$
$$\frac{15q}{15} \quad = \frac{75}{15}$$

Add together equations

Divide both sides by 15

$$q = 5$$

We have our q, number of quarters is 5

$$(5) + d = 11$$
$$\underline{-5 \qquad -5}$$
$$d = 6$$

Plug into one of original equations
Subtract 5 from both sides
We have our d, number of dimes is 6

5 quarters and 6 dimes   Our Solution

World View Note: American coins are the only coins that do not state the value of the coin. On the back of the dime it says "one dime" (not 10 cents). On the back of the quarter it says "one quarter" (not 25 cents). On the penny it says "one cent" (not 1 cent). The rest of the world (Euros, Yen, Pesos, etc) all write the value as a number so people who don't speak the language can easily use the coins.

Ticket sales also have a value. Often different types of tickets sell for different prices (values). These problems can be solve in much the same way.

Example 2.

There were 41 tickets sold for an event. Tickets for children cost $1.50 and tickets for adults cost $2.00. Total receipts for the event were $73.50. How many of each type of ticket were sold?

	Number	Value	Total
Child	c	1.5	
Adult	a	2	
Total			

Using our value table, c for child, a for adult
Child tickets have value 1.50, adult value is 2.00
(we can drop the zeros after the decimal point)

	Number	Value	Total
Child	c	1.5	$1.5c$
Adult	a	2	$2a$
Total			

Multiply number by value to get totals

	Number	Value	Total
Child	c	1.5	$1.5c$
Adult	a	2	$2a$
Total	41		73.5

We have 41 tickets sold. This is our number total
The final total was 73.50
Write in dollars as 1.5 and 2 are also dollars

$$c + a = 41$$ First and last columns are our equations by adding
$$1.5c + 2a = 73.5$$ We can solve by either addition or substitution

$$c + a = 41$$ We will solve by substitution.
$$\underline{-c \qquad -c}$$ Solve for a by subtracting c
$$a = 41 - c$$

$$1.5c + 2(41 - c) = 73.5 \qquad \text{Substitute into untouched equation}$$
$$1.5c + 82 - 2c = 73.5 \qquad \text{Distribute}$$
$$-0.5c + 82 = 73.5 \qquad \text{Combine like terms}$$
$$\underline{-82 - 82} \qquad \text{Subtract 82 from both sides}$$
$$-0.5c = -8.5 \qquad \text{Divide both sides by} -0.5$$
$$\overline{-0.5} \quad \overline{-0.5}$$
$$c = 17 \qquad \text{We have } c, \text{ number of child tickets is 17}$$
$$a = 41 - (17) \qquad \text{Plug into } a = \text{equation to find } a$$
$$a = 24 \qquad \text{We have our } a, \text{ number of adult tickets is 24}$$

17 child tickets and 24 adult tickets   Our Solution

Some problems will not give us the total number of items we have. Instead they will give a relationship between the items. Here we will have statements such as "There are twice as many dimes as nickles". While it is clear that we need to multiply one variable by 2, it may not be clear which variable gets multiplied by 2. Generally the equations are backwards from the English sentence. If there are twice as many dimes, than we multiply the other variable (nickels) by two. So the equation would be $d = 2n$. This type of problem is in the next example.

Example 3.

A man has a collection of stamps made up of 5 cent stamps and 8 cent stamps. There are three times as many 8 cent stamps as 5 cent stamps. The total value of all the stamps is \$3.48. How many of each stamp does he have?

	Number	Value	Total
Five	f	5	$5f$
Eight	$3f$	8	$24f$
Total			348

Use value table, f for five cent stamp, and e for eight
Also list value of each stamp under value column

	Number	Value	Total
Five	f	5	$5f$
Eight	e	8	$8e$
Total			

Multiply number by value to get total

	Number	Value	Total
Five	f	5	$5f$
Eight	e	8	$8e$
Total			348

The final total was 338 (written in cents)
We do not know the total number, this is left blank.

$$e = 3f \qquad \text{3 times as many 8 cent stamples as 5 cent stamps}$$
$$5f + 8e = 348 \qquad \text{Total column gives second equation}$$
$$5f + 8(3f) = 348 \qquad \text{Substitution, substitute first equation in second}$$
$$5f + 24f = 348 \qquad \text{Multiply first}$$
$$29f = 348 \qquad \text{Combine like terms}$$
$$\overline{29} \quad \overline{29} \qquad \text{Divide both sides by 39}$$
$$f = 12 \qquad \text{We have } f. \text{ There are 12 five cent stamps}$$
$$e = 3(12) \qquad \text{Plug into first equation}$$

$$e = 36 \qquad \text{We have } e, \text{ There are 36 eight cent stamps}$$

12 five cent, 36 eight cent stamps   Our Solution

8.4 Problem Set

Solve. Do work on a separate sheet of paper.

1) A collection of dimes and quarters is worth S15.25. There are 103 coins in all. How many of each is there?

2) The attendance at a school concert was 578. Admission was S2.00 for adults and S1.50 for children. The total receipts were S985.00. How many adults and how many children attended?

3) A purse contains S3.90 made up of dimes and quarters. If there are 21 coins in all, how many dimes and how many quarters were there?

4) A boy has S2.25 in nickels and dimes. If there are twice as many dimes as nickels, how many of each kind has he?

5) S3.75 is made up of quarters and half dollars. If the number of quarters exceeds the number of half dollars by 3, how many coins of each denomination are there?

6) A collection of 27 coins consisting of nickels and dimes amounts to S2.25. How many coins of each kind are there?

7) S3.25 in dimes and nickels, were distributed among 45 boys. If each received one coin, how many received dimes and how many received nickels?

8) There were 429 people at a play. Admission was S1 each for adults and 75 cents each for children. The receipts were S372.50. How many children and how many adults attended?

9) There were 200 tickets sold for a women's basketball game. Tickets for students were 50 cents each and for adults 75 cents each. The total amount of money collected was S132.50. How many of each type of ticket was sold?

10) There were 203 tickets sold for a volleyball game. For activity-card holders, the price was S1.25 each and for non-card holders the price was S2 each. The total amount of money collected was S310. How many of each type of ticket was sold?

11) At a local ball game the hotdogs sold for S2.50 each and the hamburgers sold for S2.75 each. There were 131 total sandwiches sold for a total value of S342. How many of each sandwich was sold?

12) At a recent Vikings game S445 in admission tickets was taken in. The cost of a student ticket was S1.50 and the cost of a non-student ticket was S2.50. A total of 232 tickets were sold. How many students and how many nonstudents attended the game?

13) A bank contains 27 coins in dimes and quarters. The coins have a total value of S4.95. Find the number of dimes and quarters in the bank.

14) A coin purse contains 18 coins in nickels and dimes. The coins have a total value of S1.15. Find the number of nickels and dimes in the coin purse.

15) A business executive bought 40 stamps for S9.60. The purchase included 25c stamps and 20c stamps. How many of each type of stamp were bought?

16) A postal clerk sold some 15c stamps and some 25c stamps. Altogether, 15 stamps were sold for a total cost of S3.15. How many of each type of stamps were sold?

17) A drawer contains 15c stamps and 18c stamps. The number of 15c stamps is four less than three times the number of 18c stamps. The total value of all the stamps is S1.29. How many 15c stamps are in the drawer?

18) The total value of dimes and quarters in a bank is S6.05. There are six more quarters than dimes. Find the number of each type of coin in the bank.

19) A child's piggy bank contains 44 coins in quarters and dimes. The coins have a total value of S8.60. Find the number of quarters in the bank.

20) A coin bank contains nickels and dimes. The number of dimes is 10 less than twice the number of nickels. The total value of all the coins is S2.75. Find the number of each type of coin in the bank.

21) A total of 26 bills are in a cash box. Some of the bills are one dollar bills, and the rest are five dollar bills. The total amount of cash in the box is S50. Find the number of each type of bill in the cash box.

22) A bank teller cashed a check for S200 using twenty dollar bills and ten dollar bills. In all, twelve bills were handed to the customer. Find the number of twenty dollar bills and the number of ten dollar bills.

23) A collection of stamps consists of 22c stamps and 40c stamps. The number of 22c stamps is three more than four times the number of 40c stamps. The total value of the stamps is S8.34. Find the number of 22c stamps in the collection.

24) A man has S5.10 in nickels, dimes, and quarters. There are twice as many nickels as dimes and 3 more dimes than quarters. How many coins of each kind were there?

25) 30 coins having a value of S3.30 consists of nickels, dimes and quarters. If there are twice as many quarters as dimes, how many coins of each kind were there?

26) A bag contains nickels, dimes and quarters having a value of S3.75. If there are 40 coins in all and 3 times as many dimes as quarters, how many coins of each kind were there?