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PER CENT FRACTIONS.

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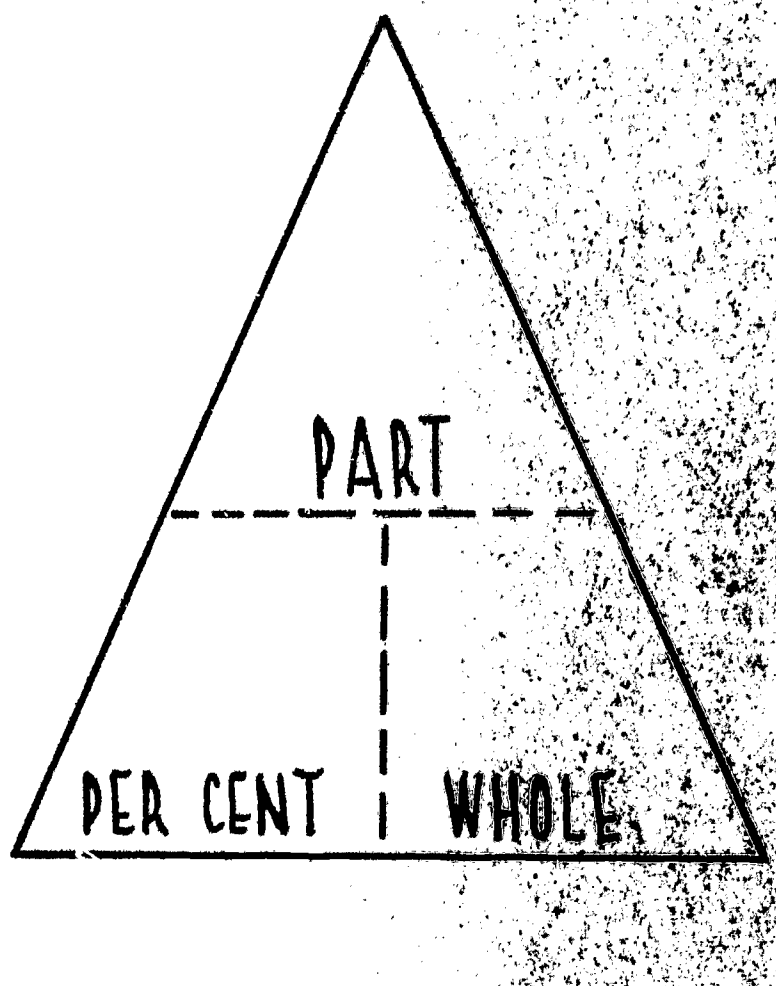
THIS BOOKLET, ONE OF A SERIES, HAS BEEN DEVELOPED FOR THE PROJECT, A PROGRAM FOR MATHEMATICALLY UNDERDEVELOPED PUPILS. A PROJECT TEAM, INCLUDING INSERVICE TEACHERS, IS BEING USED TO WRITE AND DEVELOP THE MATERIALS FOR THIS PROGRAM. THE MATERIALS DEVELOPED IN THIS BOOKLET INCLUDE (1) BASIC IDEAS ABOUT THE VALUE OF MONEY, (2) REVIEW OF FRACTIONS, (3) BUDGETS, (4) EQUIVALENT FRACTIONS WITH DENOMINATORS OF 100, AND (5) PER CENT. ACCOMPANYING THESE BOOKLETS WILL BE A "TEACHING STRATEGY BOOKLET" WHICH WILL INCLUDE A DESCRIPTION OF TEACHER TECHNIQUES, METHODS, SUGGESTED SEQUENCES, ACADEMIC GAMES, AND SUGGESTED VISUAL MATERIALS. (RP)

# PERCENT



# "FRACTIONS"



# ESEA TITLE III

# PROJECT MATHEMATICS

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November 1967

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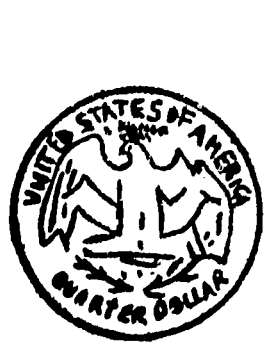
## Common, Decimal, and Percent Fractions

Which of these coins would you take if I offered you only one?


Which here?



Or here?





Did you choose the one that was largest in size?

Why not?

How did you decide?

What would a very young child choose?

Mister Money Man

May I present to you Mr. Money Man? Mr. Money Man is the idol of every teen-ager (plus a few of the older generation) for he has many different clothes to wear. And who doesn't like to wear something new and different?

Mr. Money Man is really Mr. Dollar Bill in disguise. However, no matter how he dresses, he can't fool anybody. He is very famous. Sometimes his friends call him "Mr. 100."

We can be Mr. Money Man's tailor and dress him as we wish.

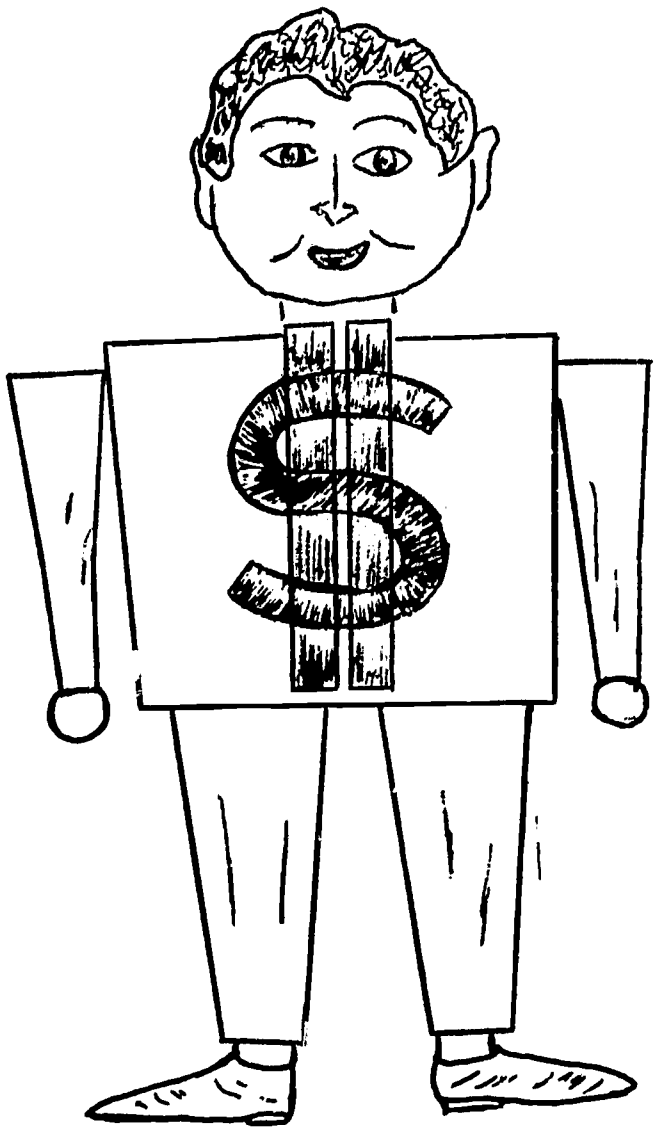
When Mr. Money Man dresses up, he wears a suit with 2 large silver buttons! Can you discover which coins he wears then? (Remember to keep his value always at 100.)

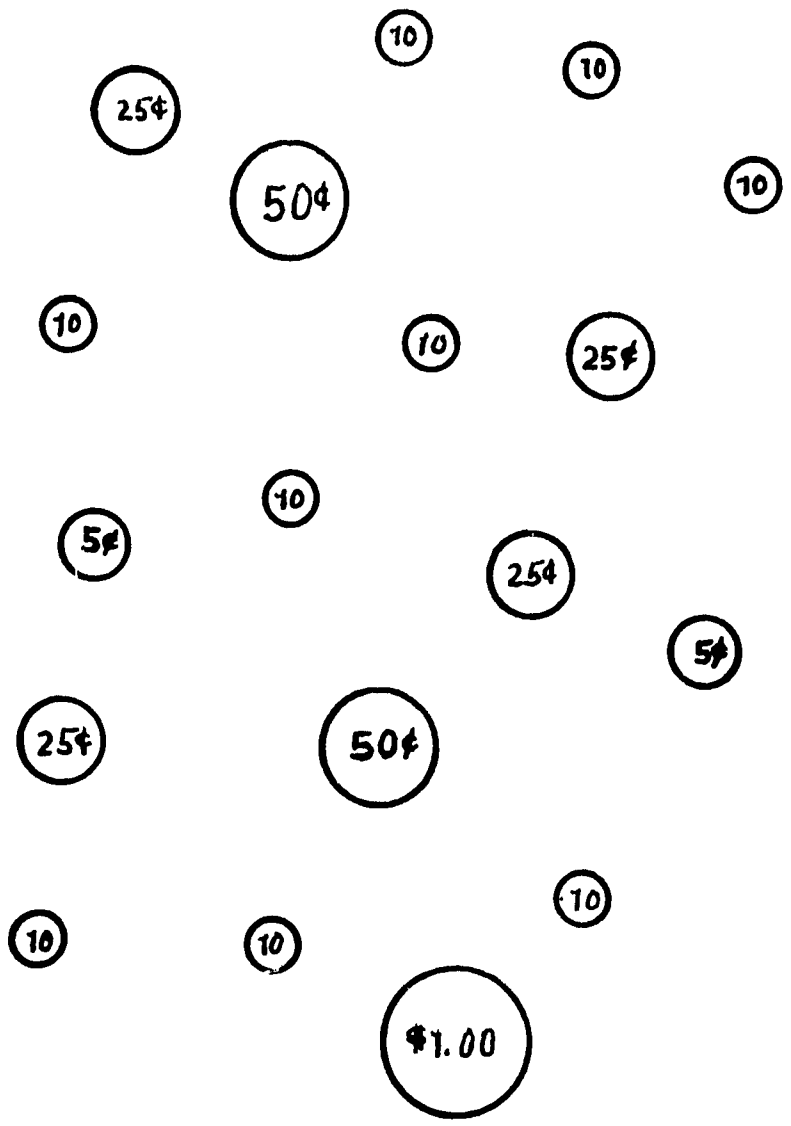
Sometimes he prefers to wear a sport jacket with 4 buttons. Do you have some coins that will serve his purpose?

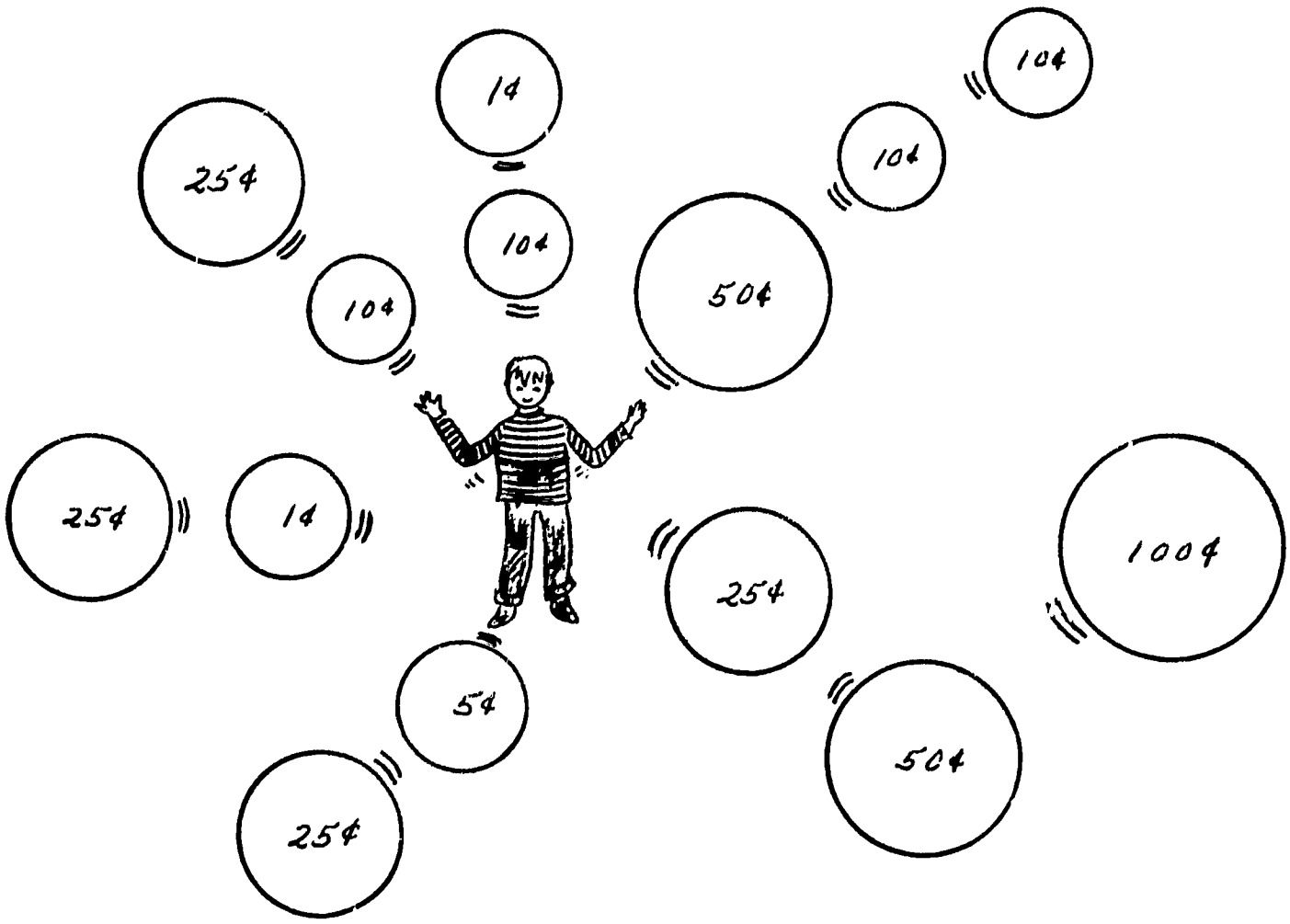
Mr. Money Man also has a double-breasted suit. This suit has 10 buttons arranged in 2 rows. Will you help dress him? What coin will you use knowing that he likes silver?

When Mr. Money Man pretends he's Liberace, he wears a complete silver jacket. How many and which coin will be used now?

At Halloween he goes to a costume ball. Now he is completely covered in coins! Can you come to his rescue and be his valet? How many coins do you think it will take to cover him completely?








From early childhood a sharp interest in money is developed in each person. As a tiny tot you gripped a penny or a nickel tightly in your fat little hand. You did not understand the value of your coin, but from your parents you quickly caught on that this shiny round thing was great! As you "grew up" you discovered that money was as necessary as food, water, clothing, and housing. For where could you exist without our basic needs if money was not around?

Do you like to have money?

Money is as interesting as eating, watching T.V. or surfing. Let us consider Mr. Money Man (alias Mr. One Dollar Bill) further. Think of a one dollar bill and all the different ways we could have it or its value in our pocket.

Would you really care what form the dollar was in so long as you had that amount?

## COMBINATIONS OF ONE DOLLAR USING ONLY ONE TYPE OF COIN

| | | | |
|---|---|---|---|
| One dollar bill | _____ | = | $ 1.00 |
| One silver dollar | _____ | = | _____ |
| Two half dollars (50 cent pieces) | 2 X .50 | = | _____ |
| Four quarters (25 cent pieces) | _____ | = | $ 1.00 |
| Ten dimes (___ cent pieces) | 10 X _____ | = | $ 1.00 |
| Twenty nickels (_____) | _____ .05 | = | _____ |
| One hundred pennies (1_____) | _____ | = | _____ |

Besides this list there are many, many combinations of coins that will make a dollar. We will not consider these groupings at this stage of our game.

Let's pretend that on weekends you walk your neighbor's poodle FiFi for one dollar. Each Saturday you receive your pay in one of the different forms from the preceding chart.

With this dollar you do many different things: go to a show, buy a soda or school supplies and even manage to save a bit. Let's see what you did last week.

| | | | |
|---|---|---|---|
| RECEIVED: | $ 1.00 | | (in form of 4 quarters) |
| SPENT: | 1 Bic pen | .25 | (1 quarter) |
| | 1 movie | .50 | (2 quarters) |
| | Saved | .25 | (1 quarter) |
| TOTAL: | | $1.00 | (4 quarters) |

**Fraction Review**

You had 4 quarters which equal one dollar. The dollar in quarters means a total of 4 quarters. Then one quarter would be one quarter out of four and we can write it as a rational number $\frac{1}{4}$.

But a quarter is also 25 pennies and a dollar is 100 pennies, so we could also say $\frac{25}{100}$.

This means that $\frac{1}{4}$ is the same as $\frac{25}{100}$.

In fact $\frac{1}{4} \times \frac{25}{25} = \frac{25}{100}$.

Remember $\frac{25}{25} = 1$, so we just multiplied $\frac{1}{4}$ by 1 in a special form.

Can we now say that $\frac{1}{4} = \frac{25}{100}$?

Have we renamed $\frac{1}{4}$ as $\frac{25}{100}$?

How can we check?

Let's review quickly before we proceed.

Remember from our Unit on "Action With Fractions" (page 4) these two definitions:

DENOMINATOR: The number below the horizontal line which tells the total number of objects or the total number of equal parts of an object.

In the above case the 4 equals 4 quarters and the 100 is the one dollar.

NUMERATOR: The number above the horizontal line tells how many of the total that are of special interest (or how many of the total we are discussing).

We are interested in 1 quarter or 25 cents.

On page 10 of the "Action With Fractions" Unit we discovered how to tell equivalent fractions by a cross multiplication.

Now shall we back up and recheck?

$$\frac{1}{4} = \frac{25}{100}$$

Cross multiplying $1 \times 100 = 4 \times 25$

If you said "yes" before, you were correct.

Let's chart what happened to your money.

**Budgets**

BUDGET FOR FIRST WEEK

| Items | Coins | Fractional Part of Total Coins | Value | Fractional Part of a Dollar | How Many Pennies? |
|---|---|---|---|---|---|
| 1 Bic pen | 1 quarter | $\frac{1}{4}$ | .25 | $\frac{25}{100}$ | 25 |
| 1 movie | 2 quarters | $\frac{2}{4}$ | .50 | $\frac{50}{100}$ | 50 |
| Saved | 1 quarter | $\frac{1}{4}$ | .25 | $\frac{25}{100}$ | 25 |
| TOTAL | 4 quarters | $\frac{4}{4}$ | 1.00 | $\frac{100}{100}$ | 100 |

What does $\frac{4}{4}$ equal? _____

How about $\frac{100}{100}$? _____

How much is 100 pennies in bills? _____ Quarters? _____

We have accounted for all our money and have expressed it in several ways.

## Activities

Fill in the missing parts of these charts.

BUDGET FOR SECOND WEEK

One dollar received from walking FiFi, in form of 2 half dollars.

Spent: 1 Hamburger and shake .50
1 Notebook .50

| Items | Coins | Fractional Part of Total Coins | Value | Fractional Part of a Dollar | How Many Pennies? |
|---|---|---|---|---|---|
| 1 Hamburger and shake | 1 half dollar | $\frac{1}{2}$ | _____ | _____ | 50 |
| 1 Notebook | _____ | _____ | .50 | _____ | _____ |
| TOTAL | 2 half dollars | _____ | _____ | $\frac{100}{100}$ | _____ |

BUDGET FOR THIRD WEEK

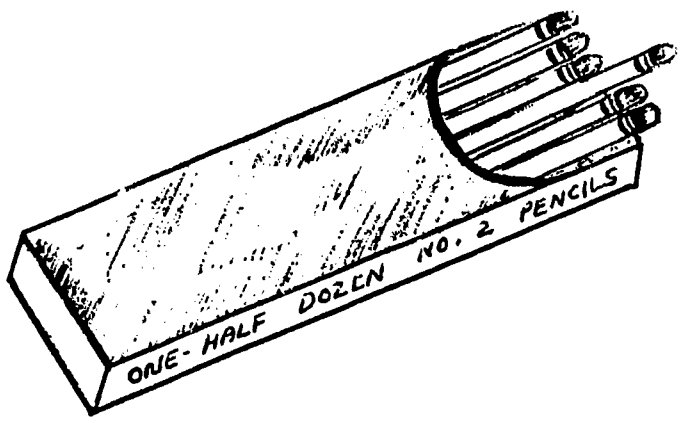
One dollar received in form of 10 dimes.

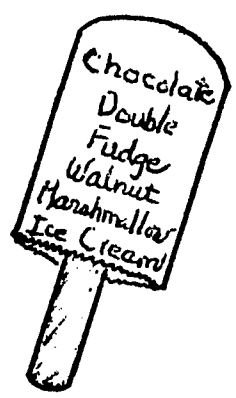
| Items | Coins | Fractional Part of Total Coins | Value | Fractional Part of a Dollar | How Many Pennies? |
|---|---|---|---|---|---|
| 1 Hot Rod Magazine | 3 dimes | ____ | .30 | ____ | ____ |
| 1 School lunch | ____ | $\frac{4}{10}$ | ____ | ____ | ____ |
| 1 Ice Cream bar | ____ | ____ | ____ | $\frac{10}{100}$ | ____ |
| Savings | ____ | ____ | ____ | ____ | 20 |
| TOTAL | ____ | ____ | ____ | ____ | ____ |

BUDGET FOR FOURTH WEEK

One dollar received in form of 20 nickels.

| Items | Coins | Fractional Part of Total Coins | Value | Fractional Part of a Dollar | How Many Pennies? |
|---|---|---|---|---|---|
| 1 Birthday card | 5 nickles | ____ | ____ | ____ | ____ |
| 6 Pencils | ____ | ____ | .15 | ____ | ____ |
| Savings | ____ | $\frac{12}{20}$ | ____ | ____ | ____ |
| TOTAL | ____ | ____ | ____ | ____ | 100 |

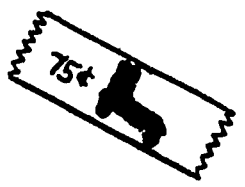
A school lunch costs 40¢, or: $\frac{40}{100}$

In terms of one dollar:

| Pennies | Nickels | Dimes |
|---|---|---|
| 40 of 100 = $\frac{40}{100}$ | 8 of 20 = $\frac{8}{20}$ | 4 of 10 = $\frac{4}{10}$ |
| Written as equivalent fractions: | $\frac{40}{100} = \frac{8}{20}$ | $\frac{40}{100} = \frac{4}{10}$ |
| Check: | 8 X 100 = 40 X 20 | 4 X 100 = 40 X 10 |
| | 800 = 800 | 400 = 400 |

## Activities

Suppose we only knew some part of a fraction. Maybe a denominator or even a numerator was missing. Could we find the missing parts?




EXAMPLE:

1 Roller Skating Ticket $.75 = \frac{75}{100} = \frac{\quad}{4}$

Cross multiplying

75 X 4 = ___ X 100

300 = ___ X 100

Is our missing part a 3?
Does 3 X 100 = 300?

Check yourself again: Is .75 made up of 3 quarters?

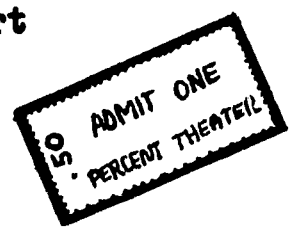
TRY THESE:

1 Chocolate Soda $.35 = \frac{35}{100} = \frac{7}{\square}$ ← Whole

1 Slicker Lipstick $.89 = \frac{\square}{100} = \frac{89}{100}$

3 Transistor Batteries (.20 each) $.60 = \frac{60}{100} = \frac{\square}{5}$ ← Part

1 Movie Ticket $.50 = \frac{50}{\square} = \frac{1}{2}$







What types of coins do you suppose were used to pay for the soda? the lipstick? batteries? and movie ticket?

100 Denominators

Let's chat! Have you noticed in renaming our fractions that one of the denominators was always Mr. Money Man? Can you rename these fractions so they will have a denominator of 100? Hint: Use cross multiplication.

$\frac{1}{2} = \frac{\square}{100}$ $\qquad$ $\frac{1}{5} = \frac{\square}{100}$

$\frac{1}{4} = \frac{\square}{100}$ $\qquad$ $\frac{2}{5} = \frac{\square}{100}$

$\frac{2}{4} = \frac{\square}{100}$ $\qquad$ $\frac{3}{5} = \frac{\square}{100}$

$\frac{3}{4} = \frac{\square}{100}$ $\qquad$ $\frac{4}{5} = \frac{\square}{100}$

$\frac{4}{4} = \frac{\square}{100}$ $\qquad$ $\frac{5}{5} = \frac{\square}{100}$

Note: This symbol is used to denote part of the fraction (numerator): $\square$

This symbol is used to denote the whole amount of the fraction (denominator): $\square$

Do you suppose you could ever fill in a numeration box with a mixed number? A fraction?

Try this one! $\frac{1}{3} = \frac{\square}{100}$

Cross multiplying

$3 \times \_\_\_\_ = 1 \times 100$

$3 \times \_\_\_\_ = 100$

Hint: Divide $3\overline{)100}$ $33\frac{1}{3}$

Check: $3 \times 33\frac{1}{3} = 100$

How about these?

$\frac{2}{3} = \frac{\square}{100}$

$\frac{3}{3} = \frac{\square}{100}$

$\frac{1}{6} = \frac{\square}{100}$

$\frac{2}{6} = \frac{\square}{100}$ Have you seen this one before?

$\frac{3}{6} = \frac{\square}{100}$ A new one?

$\frac{4}{6} = \frac{\square}{100}$ Look familiar?

$\frac{5}{6} = \frac{\square}{100}$

$\frac{6}{6} = \frac{\square}{100}$

$\frac{1}{8} = \frac{\square}{100}$

$\frac{2}{8} = \frac{\square}{100}$ Our friend, the quarter?

$\frac{3}{8} = \frac{\square}{100}$

$\frac{4}{8} = \frac{\square}{100}$ This one has many disguises!

$\frac{5}{8} = \frac{\square}{100}$

$\frac{6}{8} = \frac{\square}{100}$ Where have you met this one before?

$\frac{7}{8} = \frac{\square}{100}$

$\frac{8}{8} = \frac{\square}{100}$

Can any fraction be renamed with a denominator of 100? _____

**EXTRA**

Start with a quarter. Now, double that amount: $\frac{1}{4}$, or one quarter

double: $2 \times \frac{1}{4} = \frac{2 \times 1}{4} = \frac{2}{4}$

$= 2$ quarters

Start with a quarter and triple that amount: $\frac{1}{4}$, or one quarter

triple: $3 \times \frac{1}{4} = \frac{3 \times 1}{4} = \frac{3}{4}$

$= 3$ quarters

Notice: To double a fraction, multiply the numerator by 2.
To triple a fraction, multiply the numerator by 3.

What if you wanted 4 times the value of the fraction?

Start with a quarter. Now, half that amount: $\frac{1}{2}$ of $\frac{1}{4} = \frac{1}{8}$

or: $\frac{1}{2}$ of $25¢ = 12\frac{1}{2}¢$

$= \frac{12\frac{1}{2}}{100}$

Then: $\frac{1}{8} = \frac{12\frac{1}{2}}{100}$

Double $\frac{1}{8}$: $2 \times \frac{1}{8} = \frac{2}{8}$

$= \frac{2 \times 12\frac{1}{2}}{100} = \frac{25}{100}$

Does $\frac{2}{8} = \frac{25}{100}$ ?

Now, complete these problems:

$$\frac{1}{8} = \frac{12\frac{1}{2}}{100}$$

$$\frac{2}{8} = \frac{2 \times 12\frac{1}{2}}{100} = \frac{25}{100}$$

$\frac{2}{8} = \frac{3 \times 12\frac{1}{2}}{100} = \frac{37\frac{1}{2}}{100}$

$\frac{4}{8} =$ _____ = ____

$\frac{5}{8} =$ _____ = ____

$\frac{6}{8} =$ _____ = ____

$\frac{7}{8} =$ _____ = ____

$\frac{8}{8} =$ _____ = ____

Given the first answer, complete for $\frac{1}{6}$ :

$\frac{1}{6} = \frac{16\frac{2}{3}}{100}$

$\frac{2}{6} =$ _____ = ____

$\frac{3}{6} =$ _____ = ____

$\frac{4}{6} =$ _____ = ____

$\frac{5}{6} =$ _____ = ____

$\frac{6}{6} =$ _____ = ____

## Activities

Work all problems as in the example below:

EXAMPLE: $\frac{3}{4} \times \frac{\square}{100}$

$4 \times \square = 3 \times 100$

$4 \times \square = 300$

$4\overline{)300}$ → $75$, $28$, $20$, $20$

$\square = 75$

1. $\frac{\square}{8} = \frac{62\ 1/2}{100}$

2. $\frac{\square}{4} = \frac{25}{100}$

3. $\frac{1}{3} = \frac{\square}{100}$

4. $\frac{19}{20} = \frac{\square}{100}$

5. $\frac{\square}{10} = \frac{70}{100}$

6. $\frac{\square}{8} = \frac{37\ 1/2}{100}$

7. $\frac{2}{3} = \frac{\square}{100}$

8. $\frac{600}{800} = \frac{\square}{100}$

9. $\frac{10}{22} = \frac{\square}{100}$

10. $\frac{300}{360} = \frac{\square}{100}$

11. $\frac{24}{72} = \frac{\square}{100}$

12. $\frac{21}{63} = \frac{\square}{100}$

13. $\frac{5}{\square} = \frac{20}{100}$

14. $\frac{10}{70} = \frac{\square}{100}$

15. $\frac{35}{50} = \frac{\square}{100}$

16. $\frac{32}{42} = \frac{\square}{100}$

17. $\frac{\square}{350} = \frac{6}{100}$

18. $\frac{26}{78} = \frac{\square}{100}$

Mr. Per Cent

We have discovered how to give Mr. Money Man's name of 100 to any common fraction. Now, may I present to you Mr. Money Man's twin (bet you didn't think he had one)--Mr. Per Cent! Mr. Per Cent comes as finely dressed as his noble brother. Latin ancestry dominates Mr. Per Cent. It is believed that the Romans were taxed part of the value of their property, just as it is done to our people today. Later in history, probably during the Middle Ages, the explanation of profit and loss was a "certain number in a hundred." Then Latin words were formed to "fit the expression"--such as "per cento," "p cento," "p ceto," and "per centum."

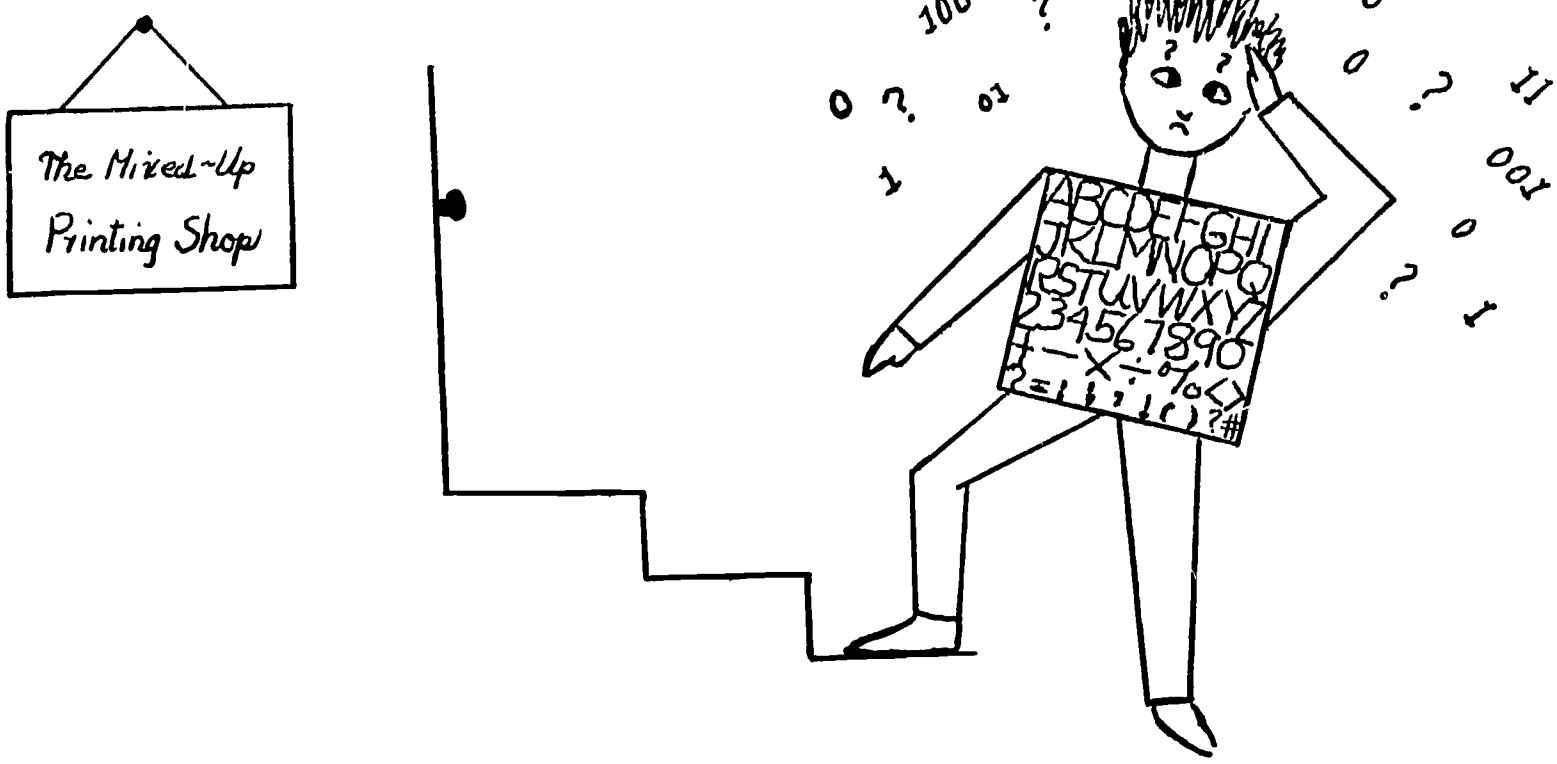
Can you see how Mr. Per Cent gets his name?

Percent may be expressed with this symbol % . Our symbol is a form of those used during the seventeenth century:

$$\text{per } \frac{o}{c}, \quad \text{p } \frac{o}{c}, \quad \text{or} \quad \text{per } \frac{o}{o}.$$

FUN NOTE!

There is the story told that our percent symbol came into use because some printer got these three symbols, 100, mixed up, and it came out 010. Can you see how our percent symbol could be connected with this mistake? It is a good way to remember Mr. Per Cent, for doesn't he stand for 100?



## Activities

How do you read the fraction $\frac{75}{100}$? If you answered seventy-five hundredths, you are correct. For 75 percent, we think "seventy-five hundredths," for Mr. Per Cent has a denominator of 100. Written, it looks like this:

$$75\,\% = \frac{75}{100}$$

**TRY THESE:**

$50\,\% = \frac{\square}{100}$

$35\,\% = \frac{\square}{100}$

$80\,\% = \frac{\square}{100}$

$25\,\% = \frac{\square}{100}$

$40\,\% = \frac{\square}{100}$

$10\,\% = \frac{\square}{100}$

$4\,\% = \frac{\square}{100}$

$5\,\% = \frac{\square}{100}$

$33\frac{1}{3}\,\% = \frac{\square}{100}$

$70\,\% = \frac{\square}{100}$

$18\,\% = \frac{\square}{100}$

$12\frac{1}{2}\,\% = \frac{\square}{100}$

$1\,\% = \frac{\square}{100}$

$37\frac{1}{2}\,\% = \frac{\square}{100}$

$100\,\% = \frac{\square}{100}$

$90\,\% = \frac{\square}{100}$

Can you fill in the correct percent?

Example: $\frac{75}{100} = \underline{75\,\%}$

$\frac{50}{100} = \underline{\quad}\,\%$

$\frac{25}{100} = \underline{\quad}\,\%$

$\frac{10}{100} = \underline{\quad}\,\%$

$\frac{30}{100} = \underline{\quad}\,\%$

$\frac{45}{100} = \underline{\quad}\,\%$

$\frac{2}{100} = \underline{\quad}\,\%$

$\frac{11}{100} = \underline{\quad}\,\%$

$\frac{12\ 1/2}{100} = \underline{\quad}\,\%$

$\frac{66\ 2/3}{100}$ = ____%

$\frac{16\ 2/3}{100}$ = ____%

$\frac{18}{100}$ = ____%

$\frac{90}{100}$ = ____%

$\frac{33\ 1/3}{100}$ = ____%

$\frac{80}{100}$ = ____%

$\frac{37\ 1/2}{100}$ = ____%

$\frac{60}{100}$ = ____%

$\frac{40}{100}$ = ____%

$\frac{20}{100}$ = ____%

Fill in the missing parts.

EXAMPLE: $\frac{1}{2} = \frac{50}{100} =$ 50 %

$\frac{1}{4} = \frac{\square}{100} =$ ____%

$\frac{1}{3} = \frac{\square}{100} =$ ____%

$\frac{1}{5} = \frac{\square}{100} =$ ____%

$\frac{1}{6} = \frac{\square}{100} =$ ____%

$\frac{3}{4} = \frac{\square}{100} =$ ____%

$\frac{1}{8} = \frac{\square}{100} =$ ____%

$\frac{1}{10} = \frac{\square}{100} =$ ____%

$\frac{2}{5} = \frac{\square}{100} =$ ____%

$\frac{1}{20} = \frac{\square}{100} =$ ____%

## More Activities

Can you fill in the correct percent?

EXAMPLE: We know that $\frac{2}{5} = \frac{40}{100}$ ; therefore, $\frac{2}{5}$ must be equal to 40 %.

$\frac{1}{4}$ = ____%

$\frac{1}{2}$ = ____%

$\frac{3}{10}$ = ____%

$\frac{3}{5}$ = ____%

$\frac{9}{10}$ = ____%

$\frac{4}{5}$ = ____%

$\frac{3}{4}$ = ____%

$\frac{2}{5}$ = ____%

$\frac{1}{10}$ = ____%

CAN YOU FILL IN THE MISSING PARTS OF THIS CHART?

| COIN | VALUE OR DECIMAL | HUNDREDTHS | RENAMING PART OF DOLLAR | PERCENT |
|---|---|---|---|---|
| 1 half dollar | .50 | $\frac{\square}{100}$ | $\frac{1}{2}$ | 50 % |
| 1 quarter | .25 | $\frac{25}{100}$ | $\frac{1}{4}$ | ___ % |
| 2 quarters | ___ | $\frac{50}{100}$ | $\frac{2}{4} = \frac{1}{2}$ | 50 % |
| 3 quarters | .75 | $\frac{75}{100}$ | $\frac{\square}{4}$ | 75 % |
| 4 quarters | 1.00 | $\frac{100}{\square}$ | $\frac{1}{1} = 1$ | 100 % |
| 1 dime | .10 | $\frac{10}{100}$ | $\frac{1}{\square}$ | 10 % |
| 2 dimes | ___ | $\frac{20}{100}$ | $\frac{2}{10} = \frac{1}{5}$ | 20 % |
| 3 dimes | .30 | $\frac{\square}{100}$ | $\frac{3}{10}$ | ___ % |
| 4 dimes | .40 | $\frac{40}{100}$ | $\frac{\square}{\square} = \frac{2}{5}$ | 40 % |
| 5 dimes | .50 | $\frac{\square}{\square}$ | $\frac{5}{10} = \frac{1}{2}$ | 50 % |
| 6 dimes | ___ | $\frac{60}{100}$ | $\frac{6}{10} = \frac{3}{5}$ | 60 % |
| 7 dimes | .70 | $\frac{70}{100}$ | $\frac{7}{10}$ | ___ % |
| 8 dimes | .80 | $\frac{\square}{\square}$ | $\frac{8}{10} = \frac{\square}{\square}$ | 80 % |
| 9 dimes | .90 | $\frac{90}{100}$ | $\frac{9}{10}$ | 90 % |
| 10 dimes | ___ | $\frac{100}{100}$ | $\frac{1}{1} = 1$ | ___ % |
| 1 nickel | .05 | $\frac{5}{100}$ | $\frac{\square}{20}$ | 5 % |
| 2 nickels | .10 | $\frac{\square}{100}$ | $\frac{1}{10}$ | 10 % |
| 3 nickels | ___ | $\frac{15}{\square}$ | $\frac{3}{20}$ | 15 % |
| 4 nickels | .20 | $\frac{20}{100}$ | $\frac{4}{20} = \frac{\square}{\square}$ | ___ % |

| COIN | VALUE OR DECIMAL | HUNDREDTHS | RENAMING PART OF DOLLAR | PERCENT |
|---|---|---|---|---|
| 5 nickels | ____ | $\frac{25}{100}$ | $\frac{\square}{\square} = \frac{1}{4}$ | 25 % |
| 6 nickels | .30 | $\frac{\square}{\square}$ | $\frac{6}{20} = \frac{\square}{\square}$ | ___% |
| 7 nickels | ____ | $\frac{35}{100}$ | $\frac{7}{20} =$ | 35 % |
| 8 nickels | .40 | $\frac{\square}{\square}$ | $\frac{8}{20} = \frac{\square}{\square}$ | 40 % |
| 9 nickels | ____ | $\frac{45}{100}$ | $\frac{\square}{\square}$ | ___% |
| 10 nickels | .50 | $\frac{50}{100}$ | $\frac{10}{20} = \frac{1}{2}$ | ___% |
| 11 nickels | ____ | $\frac{55}{100}$ | $\frac{11}{20}$ | 55 % |
| 12 nickels | .60 | $\frac{60}{\square}$ | $\frac{12}{20} = \frac{3}{5}$ | 60 % |
| 13 nickels | .65 | $\frac{65}{100}$ | $\frac{\square}{\square}$ | 65 % |
| 14 nickels | .70 | $\frac{70}{100}$ | $\frac{14}{20} = \frac{7}{10}$ | ___% |
| 15 nickels | .75 | $\frac{\square}{\square}$ | $\frac{15}{20} = \frac{3}{4}$ | 75 % |
| 16 nickels | ____ | $\frac{80}{100}$ | $\frac{16}{20} = \frac{4}{5}$ | 80 % |
| 17 nickels | .85 | $\frac{85}{100}$ | $\frac{\square}{\square}$ | 85 % |
| 18 nickels | .90 | $\frac{90}{100}$ | $\frac{18}{20} = \frac{9}{10}$ | 90 % |
| 19 nickels | .95 | $\frac{95}{100}$ | $\frac{19}{20}$ | 95 % |
| 20 nickels | 1.00 | $\frac{100}{100}$ | $\frac{20}{20}$ | 100 % |
| 1 penny | .01 | $\frac{\square}{100}$ | $\frac{1}{100}$ | ___% |
| 2 pennies | ____ | $\frac{2}{100}$ | $\frac{2}{\square} = \frac{\square}{50}$ | 2 % |
| 3 pennies | .03 | $\frac{\square}{\square}$ | $\frac{3}{100}$ | ___% |
| 4 pennies | .04 | $\frac{4}{100}$ | $\frac{4}{\square} = \frac{1}{25}$ | 4 % |
| 5 pennies | ____ | $\frac{5}{100}$ | $\frac{5}{\square} = \frac{\square}{20}$ | ___% |

| COIN | VALUE OR DECIMAL | HUNDREDTHS | RENAMING PART OF DOLLAR | PERCENT |
|---|---|---|---|---|
| 18 pennies | .18 | | $\frac{18}{100} = \frac{\square}{\square}$ | 18 % |
| 33 pennies | .33 | $\frac{33}{\square}$ | $\frac{\square}{100}$ | ___ % |
| 42 pennies | ___ | $\frac{42}{100}$ | $\frac{\square}{100} = \frac{21}{\square}$ | 42 % |
| 50 pennies | .50 | | $\frac{\square}{\square} = \frac{1}{2}$ | ___ % |
| 66 pennies | .66 | | $\frac{66}{100} = \frac{\square}{\square}$ | 66 % |
| 75 pennies | ___ | $\frac{75}{100}$ | $\frac{\square}{\square} = \frac{\square}{\square}$ | 75 % |
| 84 pennies | .84 | $\frac{\square}{100}$ | $\frac{84}{100} = \frac{21}{\square}$ | ___ % |
| 100 pennies | 1.00 | | $\frac{100}{\square} = \frac{\square}{\square}$ | 100 % |

After completing your charts, answer these questions:

1. How many sets of equivalent fractions are there? For example: $\frac{1}{2}$, $\frac{2}{4}$, $\frac{5}{10}$, $\frac{10}{20}$, $\frac{50}{100}$ is one set of equivalent fractions. _____

2. How many decimal values from the chart named a half-dollar? _____
   a quarter? _____ a dime? _____ a nickel? _____
   75 cents? _____

3. Name all the coin combinations that equal $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$, and 1.
   _____

4. Did you find any patterns when you did the nickel combinations? _____
   _____

5. Look at the percent column for the nickels. What does that list of numbers suggest? _____

6. Do any patterns exist in the dimes combinations? _____

7. How about the quarters? _____ the half-dollars? _____

8. What do you suppose would happen if all the pennies from 1 to 100 were listed? Would a definite pattern be formed? _____

9. Do you think you could orally tell any combination of pennies? _____

10. Try these: 25 pennies, 31 pennies, 48 pennies, 57 pennies, 63 pennies.

LET'S CHAT!

We know how to rename a fraction in terms of a hundred and we are able to give it a percent name. We consider our Mr. 100 as a whole complete amount. Remember our picture of what a fraction is? Let's do it in terms of hundredths, percent.

$$\frac{\text{Part of amount}}{\text{Whole amount}} = \frac{\text{Part of hundred}}{\text{Whole hundred (100)}}$$

We can cross multiply and find any missing part of our picture. Let's try some problems and see if we can use all of the things we've just learned.

EXAMPLE I

There are 124 students in chorus. 75% of them are girls. How many are girls?

Express 75% as a fraction with a denominator of 100.

$$\frac{75}{100}$$

The "whole amount" of students in chorus is 124.

We want to find "part of the students."

We can now set up our problem.

$$\frac{\square \text{ Part of students}}{124 \text{ Whole amount of students}} = \frac{75 \text{ Part percent}}{100 \text{ Whole percent}}$$

Cross multiplying

$\square \times 100 = 124 \times 75$

$\square \times 100 = 9300$

$\square = \frac{9300}{100}$

$\square = 93$. There are 93 girls in chorus.

EXAMPLE II

The school football team won 4 games. They played 8. What percent of the games played did they win?

$$\frac{4 \text{ (Part of games)}}{8 \text{ (Whole amount of games}} = \frac{\square \text{ (Part percent)}}{100 \text{ (Whole percent)}}$$

## Activities

1. In a school of 500 pupils, 50 were absent on Monday. What percent was absent?

$$\frac{50}{500} = \frac{\square}{100}$$

2. Jack worked 10 problems and said he had 60 percent more to complete. How many problems were there?

$$\frac{10}{\square} = \frac{60}{100}$$

3. If 40,000 families in Sun Cove, or 80 percent of the residents, own their own homes, how many families live there?

$$\frac{40{,}000}{\square} = \frac{80}{100}$$

4. Batman pays 25 percent of his $5,000 salary for his costume. What does he pay for each outfit?

$$\frac{\square}{5{,}000} = \frac{25}{100}$$

5. Robin looked at a hotrod marked $1,500. The car dealer offered to sell the "heap" for 80 percent of the price. How much would Robin have to pay for the car?

$$\frac{\square}{1{,}500} = \frac{80}{100}$$

6. Four days is what percent of a week?

$$\frac{4}{7} = \frac{\square}{100}$$

7. I watch T.V. 3 hours every night. What percent of my time do I spend each day doing this? (Hint: Remember how many hours in a day.)

$$\frac{3}{24} = \frac{\square}{100}$$

## Additional Activities

Solve the following problems.

1. I had 100 pennies. I spent 34 of them. What percent did I have left?

2. On a test of 25 math problems, John missed one. What percent of the problems were missed?

3. The human body is $\frac{2}{3}$ water. What percent is this?

4. Bread is about 36% water. How many ounces of water are in an 18 ounce loaf?

5. Mary spent 25% of her money. She spent $10 on a school sweater. How much money did Mary have?

6. A furniture store was advertising chairs for "25% off." If a red leather chair was priced at $75, how much will be taken off of this price?

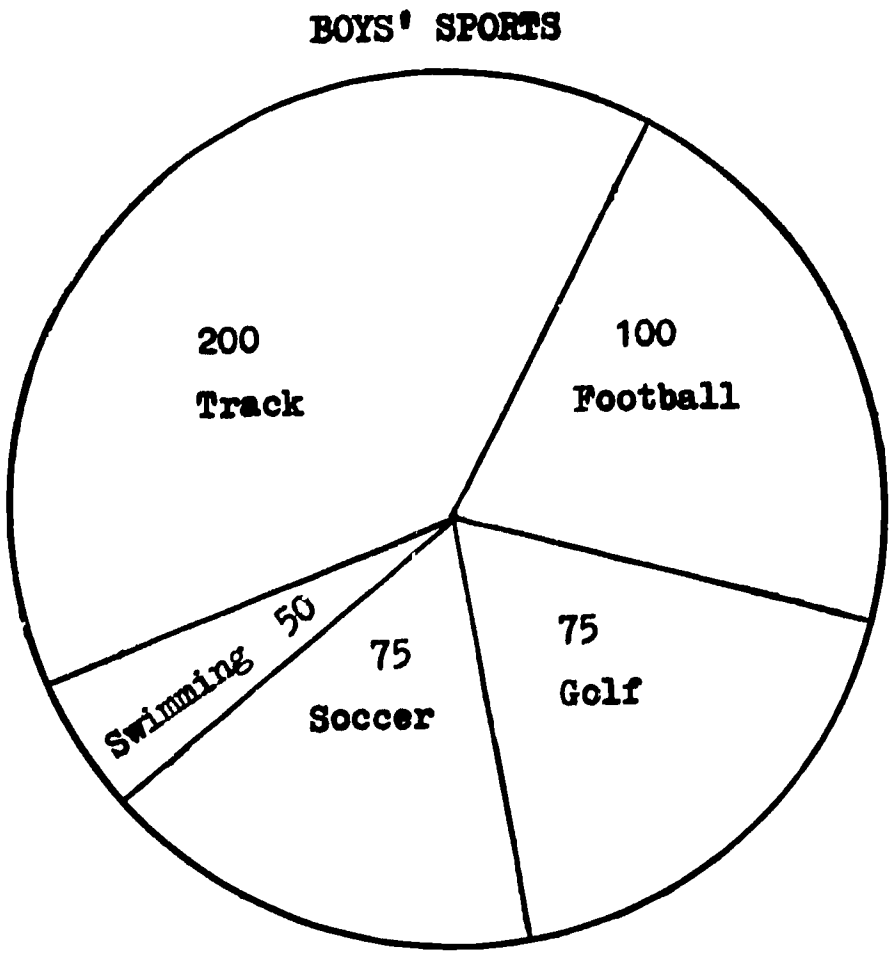
7. David had 5 dollars. He spent 3 dollars on a new shirt jac. What percent of his money did he spend? What percent of his money is left?

8. Jack's new car is 10% faster than his old car which cruised at 55 mph. At what speed does his new car cruise?

9. Did you know that some candy is 40% sugar? I have a 5 pound box of chocolates. How many pounds of my candy could be sugar?

10. A quarterback completed 3 out of 4 passes. What percent of the attempted passes did he complete?

$$\frac{3}{4} = \frac{\square}{100}$$




This graph is called a circle graph and shows the number of boys in John Smith Junior High School who take part in sports.

How many boys at John Smith Junior High School take part in sports? _____ This would be called _____ % of the boys taking part in sports?

In the spaces below fill in the number of boys in each sport and the portion of the whole that this number is.

| | NUMBER OF BOYS | FRACTIONAL PART OF TOTAL NUMBER OF BOYS | DECIMAL PART | PERCENT |
|---|---|---|---|---|
| Soccer | _____ | _____ | _____ | _____ |
| Golf | _____ | _____ | _____ | _____ |
| Track | _____ | _____ | _____ | _____ |
| Football | _____ | _____ | _____ | _____ |
| Swimming | _____ | _____ | _____ | _____ |
| Totals | _____ | _____ | _____ | _____ |

Here are two budgets showing how people spent their money.

This family has an income of $3,600 a year. They have found they can best use the money by spending the following percents for each item. How many dollars do they spend for each item?

| | | |
|---|---|---|
| Food | 35% | _____ |
| Rent | 18% | _____ |
| Clothing | 15% | _____ |
| Household Bills | 12% | _____ |
| Personal Expenses | 15% | _____ |
| Savings | 5% | _____ |
| TOTALS | 100% | $3600 |

The Abbot family has $6,600 a year to spend after they have paid income tax. Mr. Abbot decided to budget the following percents for the necessary expenses. How many dollars would the Abbots spend for each thing?

| | | |
|---|---|---|
| Food | 25% | _____ |
| Shelter | 17% | _____ |
| Clothing | 16% | _____ |
| Operating expenses | 14% | _____ |
| Personal expenses | 18% | _____ |
| Savings | 10% | _____ |
| TOTALS | ___% | _____ |

We have discovered that the whole of anything is 100 percent of it. Therefore, if we take something and break it into parts, these parts must add up to 100 percent.

Let's pretend that we have $30.00 to spend for Christmas presents and have decided to spend the following percent for each gift:

**Christmas List**

| | |
|---|---|
| Father | 20% _____ |
| Mother | 20% _____ |
| Grandmother | 15% _____ |
| Sister Jane | 12% _____ |
| Brother John | 10% _____ |
| Brother Bob | 8% _____ |
| Friends | 13% _____ |
| Cards, ribbon, paper, etc. | 2% _____ |
| TOTAL | _____ |

What is the total of the column of percents? _____

What is the total of the dollars' column? _____

The total of all the parts is 100 percent--the whole.

Now that we know how to solve percent problems, let's see if we can discover some short cuts to make our work simpler.

Solve the following problems and place the answers in the space provided.

12% of 25 = _____ 28% of 50 = _____

25% of 12 = _____ 50% of 28 = _____

48% of 75 = _____ 60% of 25 = _____

75% of 48 = _____ 25% of 60 = _____

Do you see anything interesting about the answers to the pairs of problems? What do you notice about the parts of the problems?

Yes, the answers are the same, and the numbers in the problem have been reversed.

Have you learned anything in math this year that might explain why we can reverse the numbers and still get the same answer?

Is it one of the properties that we have studied? What does the commutative property tell us? Does this explain what we have just discovered?

Does knowing the commutative property make it easier for you to do some percentage problems? Why?

We know the fractions that 25%, 50%, 75% equal and can multiply by them more easily than by the decimals. If you have learned the fraction equivalents, it will be simpler for you to change the problem and multiply by the simple fraction.

Now, let's use this new discovery to work the following problems:

36% of 50 = _____ 33% of 50 = _____

16% of 25 = _____ 72% of 75 = _____

42% of 75 = _____ 80% of 50 = _____

14% of 50 = _____ 67% of 100 = _____

46% of 10 = _____ 25% of 50 = _____

Now that we have looked at the way that money can be budgeted, let's make a budget for your allowance.

How much allowance do you receive each week? What items do you spend it on? How much do you spend for each item? What percent of your total allowance is each item? What percent is the total amount of money you receive?

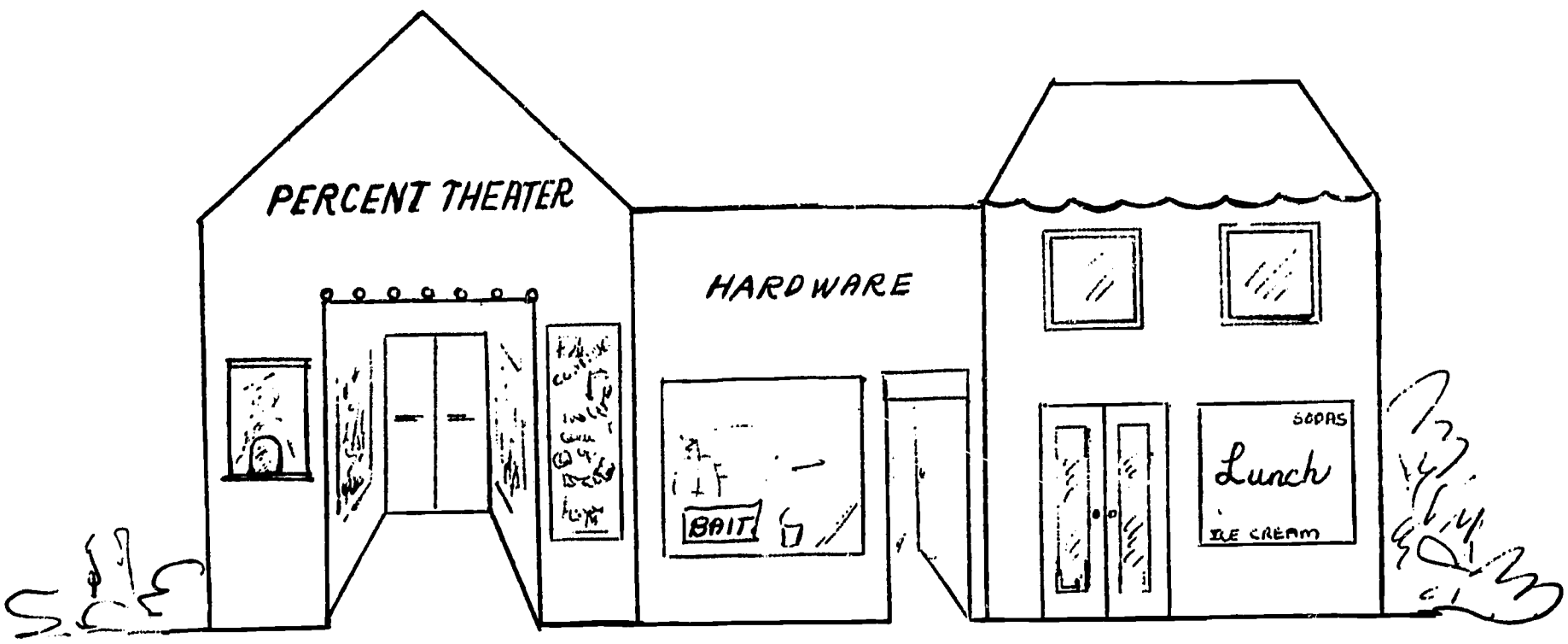
In the space below make a table showing your budget for your allowance.

Use the budget of my allowance, shown below, as an example to follow.

**Total weekly allowance:** $ 5.00

| | | | |
|---|---|---|---|
| Movies | $ 1.50 | $\frac{150}{500}$ | 30% |
| Cokes, etc. | $ 2.50 | $\frac{250}{500}$ | 50% |
| Lunch | $ .50 | $\frac{50}{500}$ | 10% |
| Fishing bait | $ .25 | $\frac{25}{500}$ | 5% |
| Miscellaneous | $ .25 | $\frac{25}{500}$ | 5% |
| TOTALS | $ 5.00 | $\frac{500}{500}$ | |

**Your Total weekly allowance:** _____



## SUPPLEMENTARY EXERCISES

**Find the solutions to the following problems.**

1. 10% of 432 =
2. 40% of 200 =
3. 5% of 20 =
4. 52% of 92 =
5. $66\frac{2}{3}$% of 30 =
6. $87\frac{1}{2}$% of 56 =
7. 5% of 15 =
8. 80% of 200 =
9. $37\frac{1}{2}$% of 160 =
10. 16% of 125 =
11. 24% of 50 =
12. 32% of 64 =
13. 6% of 24 =
14. 16% of 500 =
15. 81% of 100 =
16. 72% of 200 =
17. 5% of 60 =
18. 15% of 45 =
19. 77% of 96 =
20. 34% of 26 =
21. 32% of 24 =
22. 4% of 24 =
23. 12% of 76 =
24. 25% of 12 =
25. 11% of 62 =
26. 8% of 62 =
27. 20% of 92 =
28. 80% of 40 =
29. 50% of 62 =
30. 35% of 40 =
31. $12\frac{1}{2}$% of 40 =
32. 50% of 52 =
33. 25% of 60 =
34. $33\frac{1}{3}$% of 90 =
35. 20% of 50 =
36. 10% of 40 =
37. 30% of 50 =
38. 75% of 100 =
39. 40% of 60 =
40. 60% of 80 =
41. 20% of 30 =
42. 18% of 36 =
43. 25% of 50 =
44. 30% of 90 =
45. 10% of 100 =

Find the answers to the following problems.

1. 36 = ____% of 40
2. 20% of $3.75 = ____
3. 50% of 6,240 = ____
4. ____% of 225 = 162
5. 75% of 96 = ____
6. 25% of 300 = ____
7. 20% of ____ = 18
8. ____% of 160 = 20
9. 13% of ____ = 52
10. 40% of 200 = ____

Write the fraction (common) for each of the following:

1. 50% = ____
2. 25% = ____
3. $33\frac{1}{3}\%$ = ____
4. $66\frac{2}{3}\%$ = ____
5. 20% = ____
6. $37\frac{1}{2}\%$ = ____
7. $87\frac{1}{2}\%$ = ____
8. 73% = ____
9. 11% = ____
10. 42% = ____

Percent means _____

The percent sign is _____

One hundred percent of anything is _____ of it.

Fifty percent means _____ of anything.

30

Write the following as fractions then percents:

| | | | |
|---|---|---|---|
| 1. | Five hundredths | $\frac{5}{100}$ | 5 % |
| 2. | Four hundredths | | |
| 3. | Twenty hundredths | | |
| 4. | 45 hundredths | | |
| 5. | 37 hundredths | | |
| 6. | Nine hundredths | | |
| 7. | Eight hundredths | | |
| 8. | Thirty hundredths | | |
| 9. | 94 hundredths | | |
| 10. | 24 hundredths | | |
| 11. | Ten hundredths | | |
| 12. | Forty hundredths | | |
| 13. | 25 hundredths | | |
| 14. | $33\frac{1}{3}$ hundredths | | |
| 15. | Thirty-five hundredths | | |
| 16. | $37\frac{1}{2}$ hundredths | | |
| 17. | Sixteen hundredths | | |
| 18. | $12\frac{1}{2}$ hundredths | | |
| 19. | Sixty hundredths | | |
| 20. | 100 hundredths | | |
| 21. | $87\frac{1}{2}$ hundredths | | |

**Fill in the missing answers.**

1. 25% = $\frac{\square}{100}$
2. 50% = $\frac{\square}{100}$
3. 75% = $\frac{\square}{100}$
4. 20% = $\frac{\square}{100}$
5. 35% = $\frac{\square}{100}$
6. 40% = $\frac{\square}{100}$
7. 80% = $\frac{\square}{100}$
8. 30% = $\frac{\square}{100}$
9. 5% = $\frac{\square}{100}$
10. 2% = $\frac{\square}{100}$

11. $\frac{25}{100}$ = _____%
12. $\frac{3}{100}$ = _____%
13. $\frac{1}{100}$ = _____%
14. $\frac{18}{100}$ = _____%
15. $\frac{30}{100}$ = _____%
16. $\frac{40}{100}$ = _____%
17. $\frac{15}{100}$ = _____%
18. $\frac{10}{100}$ = _____%
19. $\frac{20}{100}$ = _____%
20. $\frac{75}{100}$ = _____%

**Now try these:**

1. $\frac{1}{2}$ = $\frac{\square}{100}$ = _____%
2. $\frac{1}{4}$ = $\frac{\square}{100}$ = _____%
3. $\frac{3}{4}$ = $\frac{\square}{100}$ = _____%
4. $\frac{1}{5}$ = $\frac{\square}{100}$ = _____%
5. $\frac{1}{10}$ = $\frac{\square}{100}$ = _____%
6. $\frac{3}{5}$ = $\frac{\square}{100}$ = _____%
7. $\frac{1}{20}$ = $\frac{\square}{100}$ = _____%
8. $\frac{7}{10}$ = $\frac{\square}{100}$ = _____%

11. 20% = $\frac{\square}{100}$ = _____ (fraction)
12. 40% = $\frac{\square}{100}$ = _____
13. 10% = $\frac{\square}{100}$ = _____
14. 50% = $\frac{\square}{100}$ = _____
15. 25% = $\frac{\square}{100}$ = _____
16. 80% = $\frac{\square}{100}$ = _____
17. 5% = $\frac{\square}{100}$ = _____
18. 75% = $\frac{\square}{100}$ = _____

**Change these percents to fractions. Reduce them to lowest terms.**

1. 5% = _____
2. 28% = _____
3. 40% = _____
4. 37% = _____
5. 33% = _____
6. 4% = _____
7. 25% = _____
8. 45% = _____
9. 50% = _____
10. 75% = _____

**Change these fractions to percents.**

1. $\frac{1}{2}$ = _____%
2. $\frac{1}{4}$ = _____%
3. $\frac{3}{10}$ = _____%
4. $\frac{1}{5}$ = _____%
5. $\frac{6}{8}$ = _____%
6. $\frac{5}{10}$ = _____%
7. $\frac{1}{8}$ = _____%
8. $\frac{4}{5}$ = _____%
9. $\frac{1}{3}$ = _____%
10. $\frac{2}{5}$ = _____%

**Express these percents as fractions with denominators of 100.**

1. 90% = _____
2. 40% = _____
3. 140% = _____
4. 80% = _____
5. $16\frac{2}{3}\%$ = _____
6. 30% = _____
7. $12\frac{1}{2}\%$ = _____
8. 310% = _____
9. 250% = _____
10. 70% = _____
11. 10% = _____
12. $37\frac{1}{2}\%$ = _____
13. $66\frac{2}{3}\%$ = _____
14. 50% = _____
15. $62\frac{1}{2}\%$ = _____

**Give the correct percent for each fraction.**

1. $\frac{1}{2}$ = _____
2. $\frac{1}{3}$ = _____
3. $\frac{1}{4}$ = _____
4. $\frac{1}{5}$ = _____
5. $\frac{1}{10}$ = _____
6. $\frac{2}{3}$ = _____
7. $\frac{3}{4}$ = _____
8. $\frac{2}{5}$ = _____
9. $\frac{3}{5}$ = _____
10. $\frac{4}{5}$ = _____
11. $\frac{1}{6}$ = _____
12. $\frac{5}{6}$ = _____
13. $\frac{1}{8}$ = _____
14. $\frac{3}{8}$ = _____
15. $\frac{5}{8}$ = _____
16. $\frac{7}{8}$ = _____
17. $\frac{3}{10}$ = _____
18. $\frac{7}{10}$ = _____
19. $\frac{9}{10}$ = _____
20. $\frac{1}{20}$ = _____

**Give the fractional equivalents of the following percents.**

1. 50% = _____
2. 5% = _____
3. 30% = _____
4. 90% = _____
5. $16\frac{2}{3}\%$ = _____
6. 25% = _____
7. $12\frac{1}{2}\%$ = _____
8. 40% = _____
9. $87\frac{1}{2}\%$ = _____
10. $33\frac{1}{3}\%$ = _____
11. 75% = _____
12. 70% = _____
13. $62\frac{1}{2}\%$ = _____
14. $83\frac{1}{3}\%$ = _____
15. 10% = _____
16. $66\frac{2}{3}\%$ = _____
17. 60% = _____
18. 80% = _____

Can you solve these?

1. _____% of 60 = 45
2. _____% of 90 = 60
3. 40% of 250 = _____
4. 25% of _____ = 32
5. _____% of 24 = 72
6. _____% of 40 = 24
7. $37\frac{1}{2}$% of 160 = _____
8. _____% of 20 = 18
9. 12% of _____ = 804
10. 25% of 80 = _____
11. 8% of _____ = 992
12. 25% of 492 = _____
13. 15% of 120 = _____
14. 5% of 80 = _____
15. 10% of 100 = _____
16. 5% of 3500 = _____
17. 8% of 700 = _____
18. 90% of 620 = _____
19. 25% of 800 = _____
20. 7% of 7200 = _____
21. 40% of 365 = _____
22. 80% of 920 = _____
23. 75% of 1200 = _____
24. 3% of 65 = _____
25. 30% of 65 = _____

**Find the correct answers to the following:**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1. | 25% of | 356 | = _____ | 25 | = _____ | 7600 | = _____ |
| 2. | $66\frac{2}{3}$% of | 153 | = _____ | 1545 | = _____ | 8100 | = _____ |
| 3. | 75% of | 196 | = _____ | 4550 | = _____ | 2220 | = _____ |
| 4. | 80% of | 750 | = _____ | 650 | = _____ | 960 | = _____ |
| 5. | 20% of | 825 | = _____ | 2025 | = _____ | 125 | = _____ |
| 6. | $12\frac{1}{2}$% of | 480 | = _____ | 1440 | = _____ | 5280 | = _____ |
| 7. | $87\frac{1}{2}$% of | 832 | = _____ | 2240 | = _____ | 2128 | = _____ |
| 8. | $83\frac{1}{3}$% of | 906 | = _____ | 8400 | = _____ | 6426 | = _____ |
| 9. | $16\frac{2}{3}$% of | 966 | = _____ | 1320 | = _____ | 3750 | = _____ |
| 10. | 50% of | 502 | = _____ | 1772 | = _____ | 1528 | = _____ |

**Can you do these involving money?**

1. 15% of $325 = _____

2. 4% of $250 = _____

3. 75% of $98 = _____

4. 2% of $23.98 = _____

5. 8% of $19.60 = _____

6. 3% of $75 = _____

7. 100% of $120 = _____