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ABSTRACT

This is the second remedial workbook-text in a two-part series written for deaf students at the secondary level. It covers fractions, geometry formulas, decimals and percents, and time. For the first workbook, see SE 015 827, and for the teacher's guide, see SE 015 829. (DT)

STATE OF NEW JERSEY
DEPARTMENT OF EDUCATION
DIVISION OF VOCATIONAL EDUCATION

UNDERSTANDING MATH - 2

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UNDERSTANDING MATH - PART II

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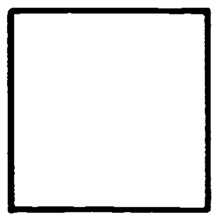
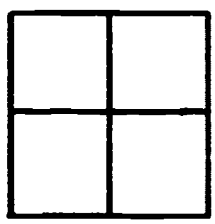
CHAPTER V — FRACTIONS

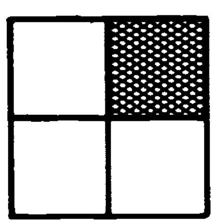
We will now learn about FRACTIONS. Fractions are numbers which can be added, subtracted, multiplied, or divided. But they are different from the numbers you've worked with up to now. A fraction is a **part** of a number. A fraction is **less than one**. And a fraction **looks different** from **whole numbers.**



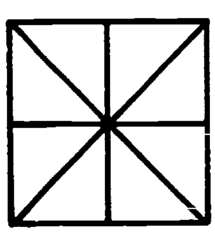
Here we have a square.



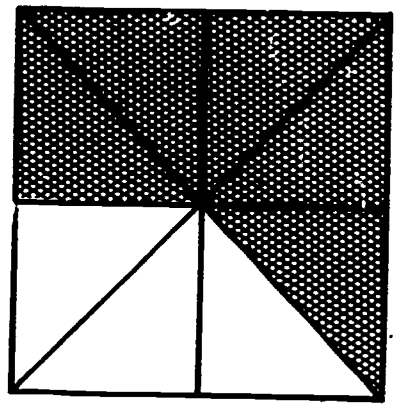
Now, if we divide the square into four parts, it looks like this.



When we color one of the small parts, we have colored one of the four or $\frac{1}{4}$ of the parts.



Let's take our same square and divide it into eight parts.



How many parts of the square are colored in this drawing?

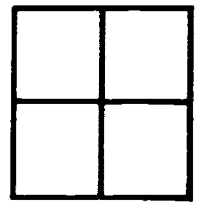
If your answer was "5" for the question above, you are correct. If you said "$\frac{5}{8}$" you gave a perfect answer.

These examples show you the idea of fractions. A fraction is a part of **one**. In this case we have used one square. We could divide it into 100 small parts, but it would still be **one square**. We could divide it into 1,000 tiny parts, but all the parts put together would still make only **one square**.

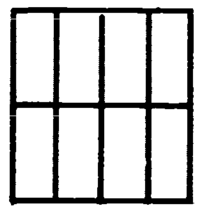
Now this brings up an interesting point. In the first example, we divided one square into four smaller squares. Each small square is $\frac{1}{4}$ of the big square. The small squares add up to (total) one square, so we could say that $\frac{4}{4} = 1$.

In the second example, we divided the same square into eight parts. Each part is $\frac{1}{8}$ of the square. Again all eight parts together still only equal **one**, so then $\frac{8}{8}$ also must equal 1. ($\frac{8}{8} = 1$). Even when the square is divided into 100 parts, all the small parts still add up to one. ($\frac{100}{100} = 1$).

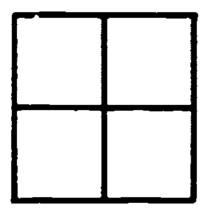
This idea of fractions is true with any number. Whenever the top number of a fraction is the same as the lower number, the fraction will equal one. Later on we will see fractions with the top number larger than the lower number. A fraction like that will equal more than one.



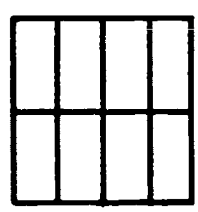
Color $\frac{1}{4}$ of this square.



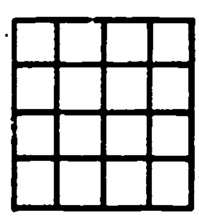
Color $\frac{1}{8}$ of this square.



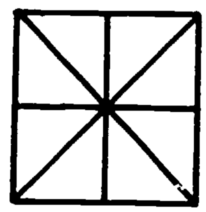
Color $\frac{3}{4}$ of this square.



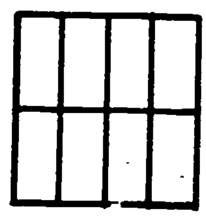
Color $\frac{6}{8}$ of this square.



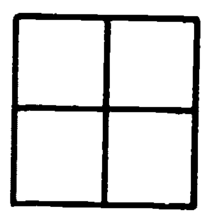
Color $\frac{4}{16}$ of this square.



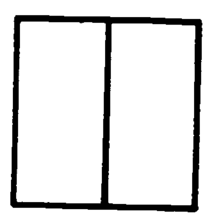
Color $\frac{8}{8}$ of this square.



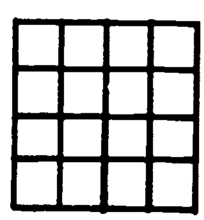
Color $\frac{4}{8}$ of this square.



Color $\frac{2}{4}$ of this square.



Color $\frac{1}{2}$ of this square.

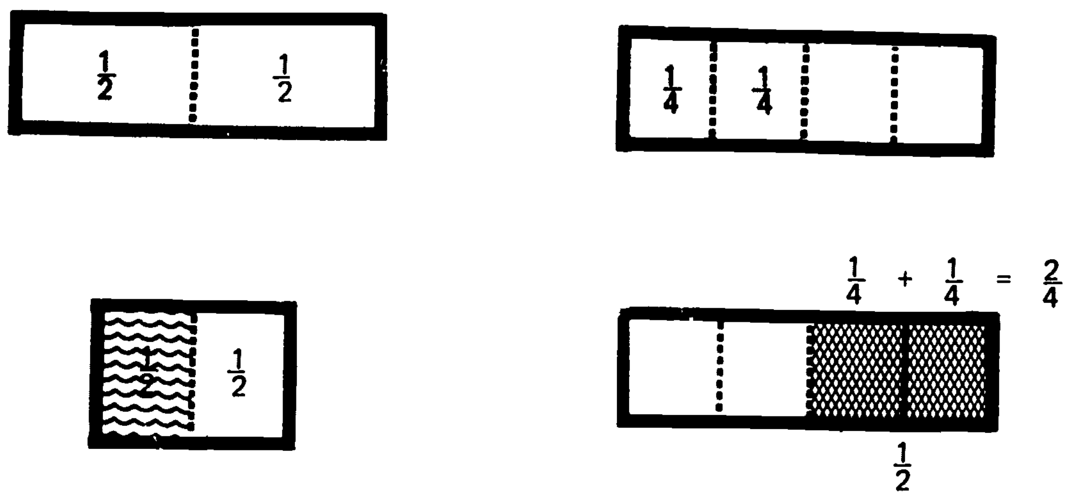


Color $\frac{8}{16}$ of this square.

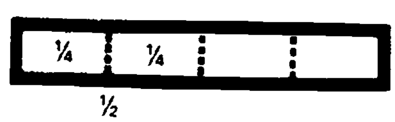
No one likes a fat and sloppy fraction, so let's practice **reducing fractions.**

Let's begin by looking at these fractons: $\frac{1}{2}$ and $\frac{2}{4}$. We shall show them as parts of a circle.

The shaded area in each circle is the same! This shows us that $\frac{2}{4}$ is the same as $\frac{1}{2}$.
We can also see that fractions may be in many different shapes.
Example:

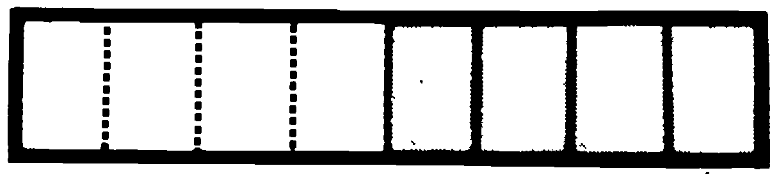


Since it is easier to work with reduced (lower) numbers, let's take a look at the following examples and see how we can reduce fractions to their **lowest terms.** This means change them to equal fractions having smaller numbers.



We know that $\frac{2}{4}$ and $\frac{1}{2}$ are really the same size. Let's look at another example.

$$\frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} = \frac{4}{8}$$



$$\frac{1}{2}$$

Here are two ways to reduce fractions: One way is to draw a picture of the fraction and choose the lowest numbered fraction which is the same size. If you had many problems to do, this way of reducing would take a long time.

A second way of reducing fractions is much easier and faster. Let's take a look at the examples

2 = 2	We know from division that there is one 2 in the number 2,
2 + 2 = 4	Two 2's in the number 4,
2 + 2 + 2 = 6	And three 2's in the number 6.

In the fraction $\frac{2}{4}$, we first choose a number that divides evenly into both the numerator (2) and the denominator (4). If we think for a minute, we see that both of the numbers can be divided by the number 2.

$$(?)\ \frac{2}{4} = \underline{\qquad} \qquad\qquad (2)\ \frac{2}{4} = \frac{1}{2}$$

If we divide both the numerator and the denominator by 2, we get $\frac{1}{2}$.
Let's try another one.

$$(?)\ \frac{2}{6} = \underline{\qquad}$$

Could you think of what number would divide into both the numerator (2), and the denominator(6)? If your answer was the number "2", you were right!

$$(?)\ \frac{2}{6} = \underline{\qquad} \qquad\qquad (2)\ \frac{2}{6} = \frac{1}{3}$$

Let's try selecting a few more numbers to reduce fractions with.

$$(?)\ \frac{2}{8} = \underline{\qquad} \qquad (?)\ \frac{3}{6} = \underline{\qquad} \qquad (?)\ \frac{4}{8} = \underline{\qquad}$$

Now that you have practiced choosing numbers that will reduce fractions, let's try some problems.

Let's race on over to the problems on the next page.

My Score________________________

Best score is 24 correct answers.

Fair score is 20-22 correct answers.

	A	B	C	D
1.	(?) $\frac{2}{10}$ = ____	(?) $\frac{2}{12}$ = ____	(?) $\frac{3}{9}$ = ____	(?) $\frac{4}{12}$ = ____
2.	$\frac{6}{12}$ = ____	$\frac{8}{12}$ = ____	$\frac{9}{12}$ = ____	$\frac{10}{12}$ = ____
3.	$\frac{7}{14}$ = ____	$\frac{3}{15}$ = ____	$\frac{5}{15}$ = ____	$\frac{6}{15}$ = ____
4.	$\frac{9}{15}$ = ____	$\frac{10}{15}$ = ____	$\frac{12}{15}$ = ____	$\frac{2}{16}$ = ____
5.	$\frac{8}{16}$ = ____	$\frac{4}{16}$ = ____	$\frac{10}{16}$ = ____	$\frac{2}{18}$ = ____
6.	$\frac{9}{18}$ = ____	$\frac{4}{20}$ = ____	$\frac{3}{18}$ = ____	$\frac{5}{20}$ = ____

What do we know so far? Well, we know that a fraction is less than 1. A fraction with both the top and bottom numbers the same will equal 1. Also, as you have just seen, some fractions are the same as others. For example; $\frac{8}{16}$, $\frac{4}{8}$, $\frac{2}{4}$, and $\frac{1}{2}$ are the same. Also $\frac{3}{4}$ and $\frac{6}{8}$ are the same. But the most important thing to remember is what we told you first, that a fraction is less than one.

I would like to introduce you to some members of the "fraction family." You have already met two of them. The "proper" fraction and the "equal" fraction. The proper fraction has the top number smaller than the bottom number. The "twins," or equal fractions, are those like $\frac{1}{4} = \frac{2}{8}$, and $\frac{1}{2} = \frac{8}{16}$. These are fractions that have the same value.

Two other members of the family are a little different. "Mixed" numbers (like $1\frac{3}{4}$), and that top-heavy, sloppy, unwanted "improper" fraction.

Now this improper fraction is like a big bully. You have to learn how to reduce him to a smaller member or he will get into trouble with your answer. Actually, if you find an "improper" fraction (the top number is larger than the bottom number) all you do is divide the bottom number into the top number. This will give you a mixed number, that is, a whole number and a proper fraction.

Example:

$$\frac{6}{4} = \left(\begin{array}{r} 1 \\ 4\overline{)6} \\ -4 \\ \hline 2 \end{array} \quad = \quad \begin{array}{r} 1\,2/4 \\ 4\overline{)6} \\ -4 \\ \hline 2 \end{array}\right) \qquad 1\tfrac{2}{4} = 1\tfrac{1}{2}$$

Example:

$$\frac{10}{8} = \left(\begin{array}{r} 1 \\ 8\overline{)10} \\ 8 \end{array} \quad = \quad \begin{array}{r} 1\,2/8 \\ 8\overline{)10} \\ -8 \\ \hline 2 \end{array}\right) \qquad 1\tfrac{2}{8} = 1\tfrac{1}{4}$$

Example:

$$\frac{14}{4} = \left(\begin{array}{r} 3 \\ 4\overline{)14} \\ 12 \end{array} \quad = \quad \begin{array}{r} 3\,2/4 \\ 4\overline{)14} \\ -12 \\ \hline 2 \end{array}\right) \qquad 3\tfrac{2}{4} = 3\tfrac{1}{2}$$

Try a few yourself. Change these improper fractions to mixed numbers. If the answer is not in its lowest terms, reduce it to lowest terms.

1. $\frac{7}{4}$ = ( ) =

2. $\frac{15}{2}$ = ( ) =

3. $\frac{17}{8}$ = ( ) =

4. $\frac{67}{3}$ = ( ) =

5. $\frac{72}{8}$ = ( ) =

6. $\frac{89}{16}$ = ( ) =

7. $\frac{15}{10}$ = ( ) =

8. $\frac{18}{4}$ = ( ) =

My Score________________

Best score is 28 correct answers.
Fair score is 24-26 correct answers.

	A	B	C	D
1.	$\frac{5}{4} =$	$\frac{7}{6} =$	$\frac{9}{8} =$	$\frac{11}{7} =$
2.	$\frac{15}{8} =$	$\frac{15}{3} =$	$\frac{16}{9} =$	$\frac{18}{9} =$
3.	$\frac{12}{3} =$	$\frac{12}{4} =$	$\frac{12}{6} =$	$\frac{12}{5} =$
4.	$\frac{15}{5} =$	$\frac{18}{3} =$	$\frac{18}{5} =$	$\frac{18}{7} =$
5.	$\frac{6}{5} =$	$\frac{8}{3} =$	$\frac{6}{4} =$	$\frac{9}{6} =$
6.	$\frac{12}{8} =$	$\frac{12}{9} =$	$\frac{15}{4} =$	$\frac{15}{6} =$
7.	$\frac{18}{8} =$	$\frac{20}{4} =$	$\frac{20}{5} =$	$\frac{20}{6} =$

Now mixed numbers are all right. They are just whole numbers with a fraction. You may add or subtract them and you can multiply and divide them also.

Perhaps the easiest and best way for us to learn to use fractions is just to start doing problems. Let's first ADD some proper fractions.

Look-alike fractions have the same bottom numbers, like $\frac{1}{4}$ and $\frac{2}{4}$. It is just as easy to add these as to add 1 apple and 2 apples. One apple plus two apples makes 3 apples. How much do $\frac{1}{4} + \frac{2}{4}$ make?

Example:

$$\begin{array}{r} \frac{1}{4} \\ + \frac{2}{4} \\ \hline \end{array}$$

Add the top numbers, but leave the bottom number the same!

$$\begin{array}{r} \frac{1}{4} \\ + \frac{2}{4} \\ \hline \frac{3}{4} \end{array}$$

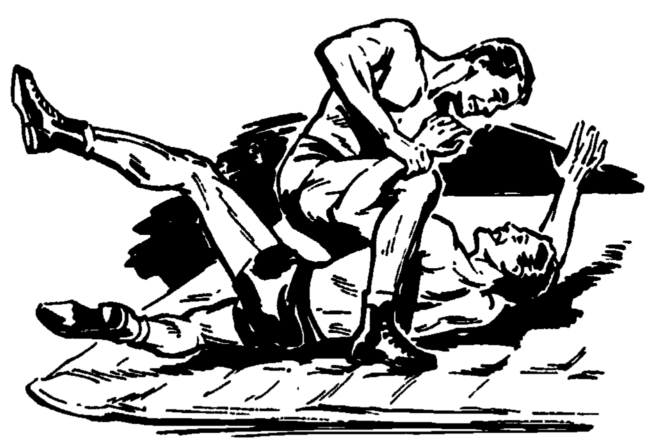
Example:

$$\begin{array}{r} \frac{3}{5} \\ + \frac{2}{5} \\ \hline \frac{5}{5} \end{array} = 1$$

Example:

$$\begin{array}{r} \frac{3}{8} \\ + \frac{7}{8} \\ \hline \frac{10}{8} \end{array} = 1\frac{2}{8} = 1\frac{1}{4}$$

Let's wrestle with some more problems on the next page!



My Score____________________

Best Score is 20 correct answers.

Fair score is 16-18 correct answers.

	A	B	C	D
1.	$\frac{1}{2} + \frac{1}{2}$	$\frac{1}{4} + \frac{1}{4}$	$\frac{3}{8} + \frac{1}{8}$	$\frac{2}{3} + \frac{1}{3}$
2.	$\frac{1}{5} + \frac{3}{5}$	$\frac{5}{6} + \frac{1}{6}$	$\frac{6}{8} + \frac{1}{8}$	$\frac{4}{8} + \frac{1}{8}$
3.	$\frac{3}{4} + \frac{2}{4}$	$\frac{3}{6} + \frac{3}{6}$	$\frac{5}{6} + \frac{4}{6}$	$\frac{4}{5} + \frac{1}{5}$
4.	$\frac{5}{8} + \frac{7}{8}$	$\frac{4}{8} + \frac{3}{8}$	$\frac{1}{8} + \frac{5}{8}$	$\frac{5}{6} + \frac{3}{6}$
5.	$\frac{7}{8} + \frac{4}{8}$	$\frac{2}{8} + \frac{6}{8}$	$\frac{4}{9} + \frac{8}{9}$	$\frac{5}{12} + \frac{9}{12}$

Subtraction of fractions is just like addition. When you subtract, you only subtract the top numbers. Your bottom number remains the same.

Example:

$$\begin{array}{r} \frac{3}{8} \\ -\ \frac{1}{8} \\ \hline \end{array} \qquad \begin{array}{r} \frac{3}{8} \\ -\ \frac{1}{8} \\ \hline \frac{2}{8} \end{array} = \frac{1}{4}$$

Example:

$$\begin{array}{r} \frac{3}{4} \\ -\ \frac{2}{4} \\ \hline \end{array} \qquad \begin{array}{r} \frac{3}{4} \\ -\ \frac{2}{4} \\ \hline \frac{1}{4} \end{array}$$

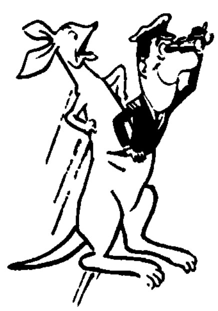
Watch this one!

Example:

$$\begin{array}{r} 1 \\ -\ \frac{1}{4} \\ \hline \end{array} \qquad (1 = \tfrac{4}{4}) \qquad \begin{array}{r} \frac{4}{4} \\ -\ \frac{1}{4} \\ \hline \frac{3}{4} \end{array}$$

Example:

$$\begin{array}{r} 1 \\ -\ \frac{3}{16} \\ \hline \end{array} \qquad (1 = \tfrac{16}{16}) \qquad \begin{array}{r} \frac{16}{16} \\ -\ \frac{3}{16} \\ \hline \frac{13}{16} \end{array}$$



The Kangaroo seems to think this is ridiculous, but the problems on the next page aren't!

My Score ____________________

Best score is 20 correct answers.

Fair score is 16-18 correct answers.

	A	B	C	D
1.	$\frac{2}{4} - \frac{1}{4}$	$\frac{3}{8} - \frac{1}{8}$	$1 - \frac{1}{2}$	$\frac{5}{3} - \frac{4}{3}$
2.	$\frac{3}{5} - \frac{1}{5}$	$\frac{5}{6} - \frac{2}{6}$	$\frac{6}{8} - \frac{5}{8}$	$\frac{4}{8} - \frac{1}{8}$
3.	$\frac{7}{5} - \frac{3}{5}$	$\frac{2}{3} - \frac{1}{3}$	$\frac{3}{4} - \frac{2}{4}$	$\frac{4}{6} - \frac{3}{6}$
4.	$\frac{4}{8} - \frac{3}{8}$	$1 - \frac{7}{8}$	$\frac{15}{16} - \frac{12}{16}$	$1 - \frac{3}{4}$
5.	$\frac{7}{9} - \frac{3}{9}$	$1 - \frac{8}{9}$	$\frac{11}{12} - \frac{4}{12}$	$1 - \frac{1}{12}$

Now we all know that problems do not always come with fractions that have the same lower number. Suppose we had to add $\frac{1}{2} + \frac{1}{4}$. To do this, we must change one of the fractions so that it has the same bottom number as the other. In this case we use the larger lower number and change the smaller number to the larger by dividing.

Example:

$$\left.\begin{array}{r} \frac{1}{2} \\ \\ +\frac{1}{4} \end{array}\right\} \quad \left\{\begin{array}{l} \frac{1}{2} = \frac{?}{4} \\ \\ \frac{1}{4} = \frac{1}{4} \end{array}\right\}$$

Divide $2\overline{)4}^{\,2}$. Multiply your answer by the top number.

$2 \times 1 = 2$

So $\frac{1}{2} = \frac{2}{4}$.

Now complete your problem:

$$\begin{array}{r} \frac{2}{4} \\ \\ +\frac{1}{4} \\ \hline \end{array}$$

Example:

$$\left.\begin{array}{r} \frac{3}{4} \\ \\ +\frac{1}{8} \end{array}\right\} \quad \left\{\begin{array}{l} \frac{3}{4} = \frac{?}{8} \\ \\ \frac{1}{8} = \frac{1}{8} \end{array}\right\}$$

$$\frac{3}{4} \times 4\overline{)8}^{\,2} = \frac{6}{8}$$

Now complete the problem:

$$\begin{array}{r} \frac{6}{8} \\ \\ +\frac{1}{8} \\ \hline \end{array}$$

We have just done the opposite of reducing a fraction to lowest terms. We have changed a fraction to higher terms. We have not changed the value of the fraction.

How do we know that we have not changed the value of the fraction? Let's take the fraction we just got, $\frac{6}{8}$, and reduce it to lowest terms.

$\frac{6}{8} = \frac{3}{4}$. This is the fraction we started out with!

We have just changed the form (appearance) of the fraction so that we can solve our problem.

You must learn to change fractions from one form to another, because: Fractions can be added or subtracted **only if they have the same lower number.**

Looking for something?

How about some math problems?

They are on the next page!

My Score____________________

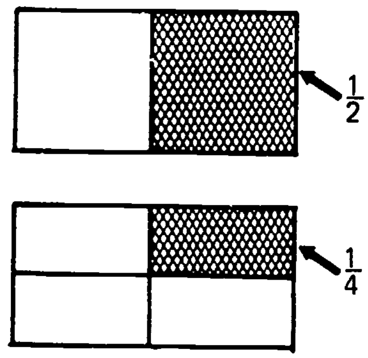
Best score is 27 correct answers.

Fair score is 23-25 correct answers.

	A	B	C
1.	$\frac{1}{4} = \frac{\underline{\quad}}{8}$	$\frac{2}{3} = \frac{\underline{\quad}}{6}$	$\frac{1}{2} = \frac{\underline{\quad}}{8}$
2.	$\frac{3}{4} = \frac{\underline{\quad}}{8}$	$\frac{1}{2} = \frac{\underline{\quad}}{6}$	$\frac{1}{3} = \frac{\underline{\quad}}{9}$
3.	$\frac{2}{8} = \frac{\underline{\quad}}{4}$	$\frac{6}{8} = \frac{\underline{\quad}}{4}$	$\frac{2}{4} = \frac{\underline{\quad}}{2}$
4.	$\frac{4}{6} = \frac{\underline{\quad}}{3}$	$\frac{4}{8} = \frac{\underline{\quad}}{2}$	$\frac{2}{5} = \frac{\underline{\quad}}{10}$
5.	$\frac{3}{4} = \frac{\underline{\quad}}{16}$	$\frac{1}{2} = \frac{\underline{\quad}}{4}$	$\frac{4}{5} = \frac{\underline{\quad}}{10}$
6.	$\frac{4}{5} = \frac{\underline{\quad}}{10} = \frac{\underline{\quad}}{20}$	$\frac{1}{2} = \frac{\underline{\quad}}{4} = \frac{\underline{\quad}}{8}$	$\frac{9}{12} = \frac{\underline{\quad}}{4}$
7.	$\frac{8}{16} = \frac{\underline{\quad}}{8} = \frac{\underline{\quad}}{32}$	$\frac{1}{2} = \frac{8}{\underline{\quad}} = \frac{2}{\underline{\quad}}$	$\frac{3}{15} = \frac{\underline{\quad}}{5}$
8.	$\frac{3}{4} = \frac{\underline{\quad}}{8} = \frac{12}{\underline{\quad}}$	$\frac{1}{4} = \frac{\underline{\quad}}{8} = \frac{4}{\underline{\quad}}$	$\frac{6}{15} = \frac{\underline{\quad}}{5}$
9.	$\frac{2}{3} = \frac{\underline{\quad}}{9} = \frac{12}{\underline{\quad}}$	$\frac{1}{4} = \frac{\underline{\quad}}{16} = \frac{\underline{\quad}}{8}$	$\frac{4}{20} = \frac{\underline{\quad}}{5}$

Have you noticed something funny about fractions? Not "funny – ha ha" – but "funny – unusual." The smaller the lower number, the **larger** the size of the fraction! This is easily seen by looking at a picture.

Example:



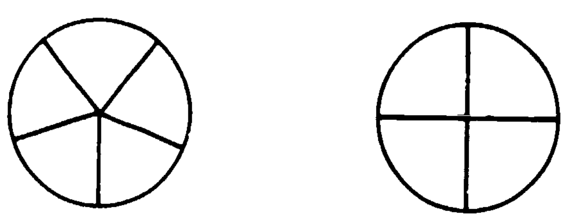
Which of these fractions has the larger lower number?

Which of these fractions is the larger?

In fact, we know that $\frac{1}{2} = \frac{2}{4}$. This means it takes **two** of the $\frac{1}{4}$ blocks to make one of the $\frac{1}{2}$ blocks. Now this is an important point to remember. It is probably this one point that causes most boys and girls to become confused when working with fractions. Just look at these and think:

$$\frac{1}{2} = \frac{2}{4} = \frac{4}{8} = \frac{8}{16} = \frac{16}{32} = \frac{32}{64} = \frac{64}{128} = \frac{1}{2}$$

Now which of these is larger: $\frac{1}{4}$ or $\frac{1}{5}$? The lower number 5 is **larger** than the lower number 4. Therefore $\frac{1}{5}$ must be smaller than $\frac{1}{4}$. Which would you rather have, $\frac{1}{5}$ of a pie or $\frac{1}{4}$ of a pie?



Which is larger, $\frac{3}{4}$ or $\frac{3}{5}$? We know now that $\frac{1}{4}$ is larger than $\frac{1}{5}$. So we can be sure that $\frac{3}{4}$ is larger than $\frac{3}{5}$.

Here's a harder problem: Which is larger, $\frac{3}{4}$ or $\frac{5}{8}$? We know that $\frac{1}{8}$ is smaller than $\frac{1}{4}$, but here we have 5 eighths and 3 fourths. So we can't be sure. But if we had the same lower numbers, we could compare them.

We can change $\frac{3}{4}$ to $\frac{6}{8}$. Now we can see that $\frac{6}{8}$ is larger than $\frac{5}{8}$. This tells us that $\frac{3}{4}$ is also larger than $\frac{5}{8}$.

Jump over to the next page
and you'll find some fractions to complete!

My Score____________________

Best Score is 33 correct answers.

Fair score is 28-30 correct answers.

Circle the larger fraction of each pair:

	A	B	C
1.	$\frac{3}{4}$ or $\frac{1}{2}$	$\frac{1}{3}$ or $\frac{1}{4}$	$\frac{1}{2}$ or $\frac{1}{5}$
2.	$\frac{1}{4}$ or $\frac{1}{6}$	$\frac{3}{4}$ or $\frac{3}{5}$	$\frac{2}{3}$ or $\frac{2}{5}$
3.	$\frac{3}{7}$ or $\frac{3}{8}$	$\frac{7}{10}$ or $\frac{9}{10}$	$\frac{1}{10}$ or $\frac{1}{20}$
4.	$\frac{5}{8}$ or $\frac{5}{7}$	$\frac{2}{3}$ or $\frac{2}{4}$	$\frac{4}{5}$ or $\frac{9}{10}$
5.	$\frac{2}{5}$ or $\frac{2}{10}$	$\frac{1}{2}$ or $\frac{5}{12}$	$\frac{7}{8}$ or $\frac{3}{4}$
6.	$\frac{4}{5}$ or $\frac{4}{9}$	$\frac{7}{8}$ or $\frac{5}{8}$	$\frac{7}{16}$ or $\frac{7}{8}$
7.	$\frac{5}{8}$ or $\frac{3}{8}$	$\frac{5}{16}$ or $\frac{3}{8}$	$\frac{5}{10}$ or $\frac{4}{5}$
8.	$\frac{2}{3}$ or $\frac{4}{9}$	$\frac{3}{10}$ or $\frac{4}{5}$	$\frac{3}{4}$ or $\frac{5}{12}$

	A	B	C
9.	$\frac{5}{6}$ or $\frac{2}{3}$	$\frac{3}{5}$ or $\frac{7}{10}$	$\frac{7}{9}$ or $\frac{2}{3}$
10.	$\frac{4}{7}$ or $\frac{4}{9}$	$\frac{5}{7}$ or $\frac{5}{8}$	$\frac{7}{12}$ or $\frac{5}{6}$
11.	$\frac{6}{10}$ or $\frac{1}{2}$	$\frac{8}{9}$ or $\frac{2}{3}$	$\frac{1}{6}$ or $\frac{1}{7}$

My Score________________

Best score is 20 correct answers.

Fair score is 16-18 correct answers.

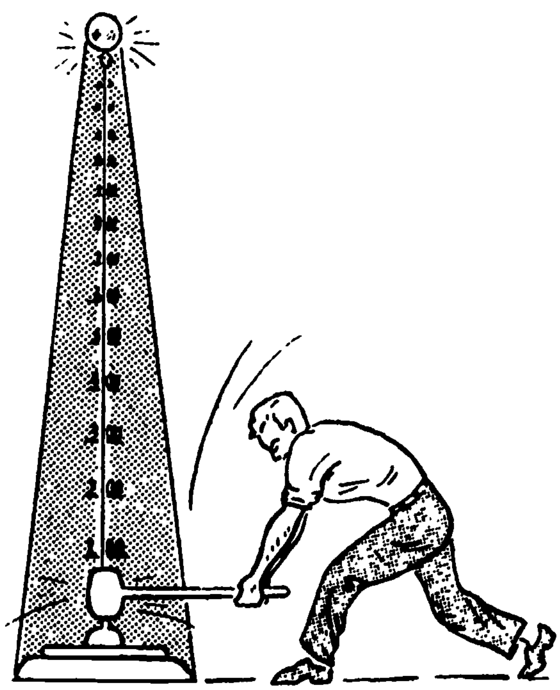
Place these fractions in order of size. Start with smallest number first.

Example: $\frac{3}{4}$ $\frac{1}{4}$ $\frac{2}{4}$ = $\frac{1}{4}$ $\frac{2}{4}$ $\frac{3}{4}$

	A	B
1.	$\frac{2}{7}$ $\frac{4}{7}$ $\frac{1}{7}$ = _ _ _	$\frac{3}{4}$ $\frac{5}{4}$ $\frac{1}{4}$ = _ _ _
2.	$\frac{2}{3}$ $\frac{1}{3}$ $\frac{5}{6}$ = _ _ _	$\frac{7}{10}$ $\frac{4}{5}$ $\frac{3}{5}$ = _ _ _
3.	$\frac{1}{4}$ $\frac{1}{8}$ $\frac{1}{16}$ = _ _ _	$\frac{5}{6}$ $\frac{1}{2}$ $\frac{2}{3}$ = _ _ _
4.	$\frac{3}{4}$ $\frac{1}{16}$ $\frac{3}{8}$ = _ _ _	$\frac{5}{16}$ $\frac{1}{2}$ $\frac{1}{16}$ = _ _ _
5.	$\frac{2}{3}$ $\frac{3}{6}$ $\frac{5}{6}$ = _ _ _	$\frac{1}{6}$ $\frac{4}{5}$ $\frac{5}{5}$ = _ _ _
6.	$\frac{3}{8}$ $\frac{4}{4}$ $\frac{5}{16}$ = _ _ _	$\frac{1}{2}$ $\frac{4}{16}$ $\frac{7}{8}$ = _ _ _
7.	$\frac{13}{16}$ $\frac{7}{8}$ $\frac{3}{4}$ = _ _ _	$\frac{1}{8}$ $\frac{1}{32}$ $\frac{5}{32}$ = _ _ _
8.	$\frac{5}{16}$ $\frac{6}{16}$ $\frac{7}{8}$ = _ _ _	$\frac{2}{4}$ $\frac{3}{8}$ $\frac{5}{8}$ = _ _ _

9. $\frac{2}{9}$ $\frac{1}{3}$ $\frac{2}{3}$ = __ __ __ $\frac{2}{3}$ $\frac{4}{9}$ $\frac{7}{9}$ = __ __ __

10. $\frac{5}{12}$ $\frac{2}{3}$ $\frac{3}{4}$ = __ __ __ $\frac{11}{12}$ $\frac{1}{3}$ $\frac{5}{6}$ = __ __ __



Sometimes you cannot divide the smaller lower number into the larger lower number. How then can you compare these fractions? You must find a number that both the larger and the smaller number will divide into.

Example: Which is larger, $\frac{3}{4}$ or $\frac{4}{5}$?

5 is the larger number, but 4 will not divide into 5. You must find a new lower number that both 4 and 5 will divide into.

You can always multiply the lower numbers together. Multiply 4 by 5, and you get 20. Then change both fractions:

$$\frac{3}{4} = \frac{15}{20} \qquad \frac{4}{5} = \frac{16}{20}$$

Now you can see that $\frac{4}{5}$ is the larger fraction.

But there are times when you will get very large numbers if you multiply the lower numbers together. And there are also times when you can quickly see an easier way. So you can try multiplying the larger number by 2 and then by 3, and 4, and so on until a number is found that both will divide into.

Example:

$$\left.\begin{array}{r} \frac{3}{4} \\ \\ +\ \frac{1}{6} \end{array}\right\} \quad \text{Try } (2 \times 6 = 12) \qquad 4\overline{)12}^{\,3} \qquad \begin{array}{l} \frac{3}{4} \times \frac{3}{3} = \frac{9}{12} \\ \\ \frac{1}{6} \times \frac{2}{2} = \frac{2}{12} \end{array} \qquad \begin{array}{r} \frac{3}{4} = \frac{9}{12} \\ \\ +\ \frac{1}{6} = \frac{2}{12} \end{array}$$

Remember both these methods when you are doing these practice problems.

Circle the larger fraction:

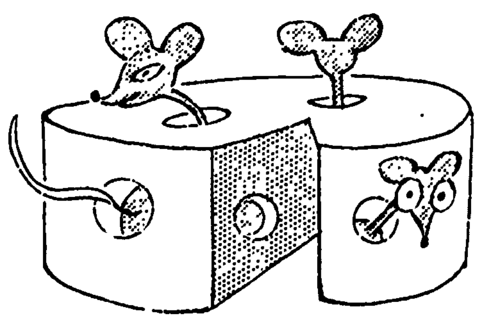
	A	B	C
1.	$\frac{2}{5}$ or $\frac{1}{4}$	$\frac{1}{2}$ or $\frac{2}{3}$	$\frac{2}{3}$ or $\frac{3}{4}$
2.	$\frac{3}{8}$ or $\frac{1}{3}$	$\frac{3}{4}$ or $\frac{5}{6}$	$\frac{7}{10}$ or $\frac{3}{4}$

3. $\frac{3}{8}$ or $\frac{2}{5}$ $\frac{5}{6}$ or $\frac{7}{8}$ $\frac{1}{2}$ or $\frac{5}{10}$

Add:

4. $\frac{1}{3} + \frac{1}{4}$ $\frac{3}{4} + \frac{1}{6}$ $\frac{1}{3} + \frac{1}{8}$

$\frac{2}{5} + \frac{1}{4}$ $\frac{2}{3} + \frac{1}{9}$ $\frac{1}{2} + \frac{1}{5}$



My Score____________________

Best score is 24 correct answers.
Fair score is 18–22 correct answers.

	A	B	C	D
1.	$\frac{1}{2} + \frac{1}{4} =$	$\frac{5}{16} - \frac{1}{4} =$	$\frac{1}{2} - \frac{1}{4} =$	$\frac{1}{4} + \frac{3}{16} =$
2.	$\frac{3}{8} + \frac{1}{2} =$	$\frac{1}{4} - \frac{1}{8} =$	$\frac{1}{4} + \frac{3}{8} =$	$\frac{1}{2} + \frac{1}{16} =$
3.	$\frac{3}{4} - \frac{1}{2} =$	$\frac{5}{8} - \frac{1}{2} =$	$\frac{5}{16} - \frac{2}{8} =$	$\frac{2}{3} - \frac{1}{2} =$
4.	$\frac{3}{4} + \frac{3}{8} =$	$\frac{7}{8} - \frac{1}{4} =$	$\frac{7}{8} - \frac{2}{3} =$	$\frac{3}{2} - \frac{7}{8} =$

5. $\frac{7}{8} + \frac{3}{4}$ $\qquad$ $\frac{1}{2} + \frac{1}{3}$ $\qquad$ $\frac{5}{8} - \frac{3}{8}$ $\qquad$ $\frac{3}{4} - \frac{5}{8}$

6. $\frac{2}{3} + \frac{4}{9}$ $\qquad$ $\frac{1}{3} + \frac{5}{6}$ $\qquad$ $\frac{5}{12} + \frac{2}{3}$ $\qquad$ $\frac{7}{12} + \frac{5}{6}$

My Score________________

Best score is 20 correct answers.
Fair score is 16-18 correct answers.

	A	B	C	D
1.	$\frac{1}{2} + \frac{1}{2}$	$\frac{3}{8} + \frac{5}{8}$	$\frac{3}{4} + \frac{1}{4}$	$\frac{2}{3} + \frac{2}{3}$
2.	$\frac{1}{2} + \frac{1}{4}$	$\frac{9}{16} + \frac{7}{16}$	$\frac{4}{8} - \frac{3}{8}$	$\frac{3}{4} - \frac{1}{4}$
3.	$\frac{3}{4} - \frac{2}{3}$	$\frac{1}{2} + \frac{1}{8}$	$\frac{1}{4} + \frac{1}{8}$	$\frac{1}{2} - \frac{1}{4}$
4.	$\frac{5}{8} + \frac{7}{8}$	$1 - \frac{5}{16}$	$\frac{1}{2} + \frac{3}{4}$	$\frac{4}{16} + \frac{3}{4}$
5.	$\frac{16}{16} - \frac{1}{2}$	$\frac{7}{8} - \frac{5}{8}$	$\frac{3}{4} + \frac{7}{16}$	$\frac{9}{16} + \frac{4}{16}$

My Score_______________

Best score is 20 correct answers.
Fair score is 16-18 correct answers.

	A	B
1.	$N + \frac{1}{2} = \frac{3}{2}$; N = ___	$N + \frac{1}{3} = \frac{2}{3}$; N = ___
2.	$N + \frac{5}{8} = \frac{11}{8}$; N = ___	$N + \frac{3}{10} = \frac{7}{10}$; N = ___
3.	$N - \frac{1}{4} = \frac{3}{4}$; N = ___	$N + \frac{1}{4} = \frac{1}{2}$; N = ___
4.	$N - \frac{2}{3} = \frac{1}{3}$; N = ___	$N - \frac{3}{4} = \frac{7}{4}$; N = ___
5.	$N - \frac{1}{4} = \frac{1}{2}$; N = ___	$N + \frac{2}{4} = 1$; N = ___
6.	$N + \frac{1}{4} = 1$; N = ___	$N - \frac{3}{8} = \frac{5}{8}$; N = ___
7.	$N - \frac{7}{16} = \frac{1}{16}$; N = ___	$N - \frac{1}{2} = \frac{1}{4}$; N = ___
8.	$N - \frac{3}{4} = \frac{1}{4}$; N = ___	$N + \frac{7}{16} = \frac{12}{16}$; N = ___
9.	$N + \frac{5}{8} = \frac{7}{8}$; N = ___	$N - \frac{3}{4} = 18$; N = ___
10.	$N - \frac{7}{8} = \frac{1}{16}$; N = ___	$N + \frac{5}{16} = \frac{7}{8}$; N = ___

How did you like those last problems? Don't look now, but you were doing some Algebra!! How about that! Well, before your brain starts to get too big, let's get back to fractions.

Multiplying one simple fraction by another is an easy job. You just multiply the top numbers and then multiply the bottom numbers. It does not matter whether the fractions have the same lower numbers or not.

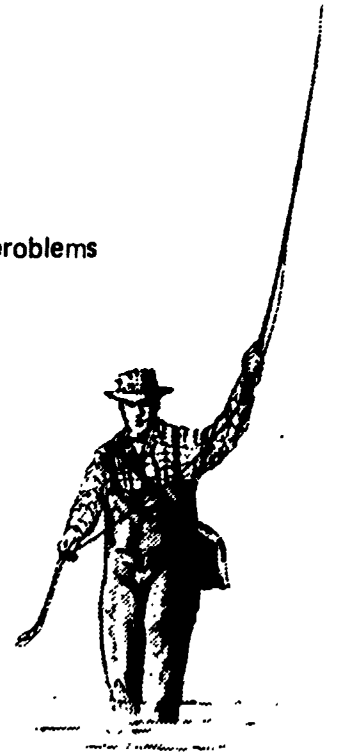
Example: $\frac{2}{3} \times \frac{5}{6} = \frac{2 \times 5}{3 \times 6} = \frac{10}{18} = \frac{5}{9}$

Example: $\frac{1}{4} \times \frac{1}{4} = \frac{1 \times 1}{4 \times 4} = \frac{1}{16}$ O.K.?

Now when you multiply by a whole number, the **first thing you do** is put a "1" under the whole number. This makes the number a fraction. Then you just multiply.

Example: $3 \times \frac{3}{4} = \frac{3}{1} \times \frac{3}{4} = \frac{3 \times 3}{1 \times 4} = \frac{9}{4} = 2\frac{1}{4}$

You don't need bait to catch the problems
on the next page!



My Score____________________

Best score is 20 correct answers.

Fair score is 16-18 correct answers.

	A	B
1.	$\frac{1}{2} \times \frac{3}{4} =$	$2 \times \frac{3}{4} =$
2.	$4 \times \frac{1}{4} =$	$\frac{2}{3} \times \frac{1}{4} =$
3.	$\frac{3}{8} \times 6 =$	$\frac{1}{6} \times \frac{1}{5} =$
4.	$\frac{9}{2} \times \frac{7}{4} =$	$\frac{2}{3} \times \frac{5}{6} =$
5.	$\frac{8}{9} \times \frac{3}{4} =$	$\frac{1}{2} \times 15 =$
6.	$\frac{1}{8} \times \frac{1}{9} =$	$\frac{4}{5} \times \frac{5}{4} =$
7.	$\frac{2}{3} \times \frac{3}{5} =$	$5 \times \frac{3}{8} =$
8.	$\frac{2}{3} \times \frac{3}{4} =$	$8 \times \frac{3}{4} =$
9.	$\frac{4}{9} \times \frac{1}{3} =$	$\frac{5}{6} \times \frac{2}{9} =$
10.	$\frac{7}{8} \times 2 =$	$\frac{3}{5} \times 4 =$

Try these problems. See how much canceling you can do.

1. $\frac{2}{3} \times \frac{3}{5} =$

2. $\frac{1}{4} \times \frac{4}{5} =$

3. $\frac{3}{4} \times \frac{1}{3} =$

4. $\frac{2}{5} \times \frac{1}{8} =$

5. $\frac{1}{6} \times \frac{6}{7} =$

6. $\frac{2}{3} \times \frac{3}{4} =$

7. $\frac{5}{8} \times \frac{3}{10} =$

8. $\frac{9}{10} \times \frac{5}{9} =$

9. $\frac{1}{5} \times \frac{10}{13} =$

10. $\frac{3}{8} \times \frac{2}{3} =$

Now that you see an easier way to multiply fractions, go back to page 171. Do these problems again, using cancellation whenever you can.

Now suppose you had this problem: $\frac{5}{8} \times \frac{8}{9}$.

Doing it the regular way takes real work:

$$\frac{5}{8} \times \frac{8}{9} = \frac{5 \times 8}{8 \times 9} = \frac{40}{72} = \frac{5}{9}$$

There is a shortcut to multiplying fractions, and it makes the problems fun instead of work. The shortcut is called CANCELLATION. In the problem above, we can just CROSS OUT the 8's (cancel them) and replace them with 1's. Then we get:

$$\frac{5}{8} \times \frac{8}{9} = \frac{5 \times \cancel{8}^{1}}{{}_{1}\cancel{8} \times 9} = \frac{5}{9}$$ Much, much quicker and easier!

Why can we do this? the reason is:

We do not change the value of a fraction if we divide both parts of it by the same number. We divided both parts by 8.

If you look at the first way we did this problem, you will see that first we multiplied 5 by 8, and then we multiplied 8 by 9. Then, when we got the answer ($\frac{40}{72}$), we had to divide both parts of the fraction by **8**. Now we know how to divide **first**, and cut our work way, way down!

Suppose the problem had been $\frac{3}{8} \times \frac{8}{9}$.

$$\frac{3}{8} \times \frac{8}{9} = \frac{\overset{1}{\cancel{3}} \times \overset{1}{\cancel{8}}}{\underset{1}{\cancel{8}} \times \underset{3}{\cancel{9}}} = \frac{1}{3}$$

We can divide both parts by 8; as before, and we can also divide both parts by **3**.

This time we get our answer immediately, and we had fun doing it, too.

See if you can follow this problem.

$$\frac{8}{15} \times \frac{3}{4} = \frac{\overset{2}{\cancel{8}} \times \overset{1}{\cancel{3}}}{\underset{5}{\cancel{15}} \times \underset{1}{\cancel{4}}} = \frac{2}{5}$$

What numbers did we divide by?

Now that we all know how to multiply fractions, let's take a step back to addition and subtraction. But this time we will work with **mixed numbers.** A mixed number, you remember, is a whole number and a fraction.

To add or subtract mixed numbers, you do the fractions first and then the whole numbers. Remember – the bottom numbers of the fractions must be the same if you want to add or subtract them.

Example:

$$\begin{array}{r} 6\frac{3}{8} \\ -\ 2\frac{1}{8} \\ \hline \end{array} \qquad \begin{array}{r} 6\frac{3}{8} \\ -\ 2\frac{1}{8} \\ \hline \frac{2}{8} \end{array} \qquad \begin{array}{r} 6\frac{3}{8} \\ -\ 2\frac{1}{8} \\ \hline 4\frac{2}{8} \end{array}$$

Example:

$$\begin{array}{r} 5\frac{1}{2} \\ +\ 7\frac{1}{4} \\ \hline \end{array} \qquad \begin{array}{rcr} 5\frac{1}{2} & = & \frac{}{4} \\ +\ 7\frac{1}{4} & = & \frac{1}{4} \\ \hline & & \end{array} \qquad \begin{array}{r} 5\frac{2}{4} \\ +\ 7\frac{1}{4} \\ \hline \frac{3}{4} \end{array} \qquad \begin{array}{r} 5\frac{2}{4} \\ +\ 7\frac{1}{4} \\ \hline 12\frac{3}{4} \end{array}$$

Another example:

$$\begin{array}{r} 6\frac{3}{8} \\ +\ 18 \\ \hline \end{array} \qquad \begin{array}{r} 6\frac{3}{8} \\ +\ 18 \\ \hline \frac{3}{8} \end{array} \qquad \begin{array}{r} 6\frac{3}{8} \\ +\ 18 \\ \hline 24\frac{3}{8} \end{array}$$

And another:

$$\begin{array}{r} 5\frac{5}{8} \\ +\ 3\frac{1}{2} \\ \hline \end{array} \qquad \begin{array}{r} 5\frac{5}{8} \\ +\ 3\frac{}{8} \\ \hline \end{array} \qquad \begin{array}{r} 5\frac{5}{8} \\ +\ 3\frac{4}{8} \\ \hline \end{array} \qquad \begin{array}{r} 5\frac{5}{8} \\ +\ 3\frac{4}{8} \\ \hline \frac{9}{8} \end{array} \qquad \begin{array}{r} 5\frac{5}{8} \\ +\ 3\frac{4}{8} \\ \hline 8\left(1\frac{1}{8}\right) \end{array} = 9\frac{1}{8}$$

Let's hop again to the next page for some more problems!.

My Score_______________

Best score is 15 correct answers.

Fair score is 11-13 correct answers.

	A	B	C
1.	$7\frac{3}{8} + 7\frac{4}{8}$	$14\frac{1}{2} - 12\frac{1}{4}$	$8\frac{3}{4} - 5\frac{1}{2}$
2.	$9\frac{7}{8} - 6$	$10\frac{3}{8} + 2\frac{1}{2}$	$5\frac{3}{16} + 9\frac{7}{16}$
3.	$8\frac{1}{8} - \frac{1}{16}$	$4\frac{5}{8} + 3\frac{1}{4}$	$7\frac{7}{8} - 7\frac{3}{4}$
4.	$9\frac{1}{2} - 6\frac{1}{2}$	$14\frac{3}{16} + 1\frac{4}{8}$	$5\frac{1}{2} + 4\frac{8}{16}$
5.	$7\frac{1}{3} + 3\frac{1}{3}$	$3\frac{5}{8} + 4$	$7\frac{1}{2} - 4\frac{1}{2}$

Now that you're so good at adding and subtracting mixed numbers, it's time to learn to multiply by mixed numbers. But – hold up a minute! There's something else you have to learn about first: how to change a mixed number to an **improper fraction.**

By now we know how to change an improper fraction to a mixed number. Let's review:

$$\frac{13}{5} = 5\overline{)13}^{\,2\frac{3}{5}} \qquad \begin{array}{r} 13 \\ -10 \\ \hline 3 \end{array}$$

We **divided** the bottom number into the top number and wrote the remainder as a fraction. So $\frac{13}{5}$ became $2\frac{3}{5}$.

Now, starting with $2\frac{3}{5}$, we **multiply** the whole-number part (2) by the lower number of the fraction (5), **add** in the top part of the fraction, and put the number we get over the lower number. It sounds very hard, but just take it step by step.

+ SECOND

$$2\frac{3}{5} \qquad\qquad \text{THIRD} \longrightarrow \frac{13}{5}$$

FIRST x

O.K. Let's try another. Change $3\frac{1}{4}$ to an improper fraction..

$3\frac{1}{4}$: 4 x 3 = 12, plus 1 = 13. Put the 13 over the 4.

$$3\frac{1}{4} = \frac{13}{4}.$$

Got it? Now you try a few on your own. Change these to improper fractions:

	A		B		C	
1.	$2\frac{4}{5}$	=	$1\frac{3}{4}$	=	$3\frac{1}{3}$	=
2.	$1\frac{1}{2}$	=	$4\frac{2}{3}$	=	$10\frac{1}{2}$	=
3.	$8\frac{1}{8}$	=	$5\frac{3}{4}$	=	$9\frac{3}{10}$	=
4.	$12\frac{1}{2}$	=	$1\frac{1}{10}$	=	$11\frac{2}{3}$	=
5.	$6\frac{2}{3}$	=	$15\frac{1}{4}$	=	$13\frac{1}{2}$	=

Now we are ready to multiply by mixed numbers. We just change the mixed number into an improper fraction first.

Example: $2\frac{1}{4} \times \frac{1}{2}$

Change $2\frac{1}{4}$ first to $\frac{9}{4}$. Then

$$\frac{9}{4} \times \frac{1}{2} = \frac{9 \times 1}{4 \times 2} = \frac{9}{8} = 1\frac{1}{8}$$

To multiply a fraction by a **whole number**, you remember what to do: Put a "1" under the whole number, and it becomes a fraction (an improper fraction).

Example: $2\frac{3}{8} \times 5$

Change both parts to improper fractions first.

$$\frac{19}{8} \times \frac{5}{1} = \frac{19 \times 5}{8 \times 1} = \frac{95}{8} = 11\frac{7}{8}$$

Do not leave your answer as an improper fraction. Change it to a mixed number in its lowest terms.

Let's fly to the next page for some more practice problems!

My Score________________

Best score is 20 correct answers.
Fair score is 16-18 correct answers.
(If your **score** is below 15, you need more practice)

	A	B
1.	$\frac{1}{2} \times 1\frac{1}{4} =$	$5 \times 4\frac{1}{3} =$
2.	$18 \times 4\frac{1}{2} =$	$21 \times \frac{1}{3} =$
3.	$\frac{1}{5} \times 2\frac{1}{3} =$	$\frac{1}{4} \times 2\frac{1}{4} =$
4.	$8 \times 7\frac{1}{4} =$	$3\frac{1}{2} \times 10 =$
5.	$1\frac{2}{4} \times \frac{3}{4} =$	$8 \times 5\frac{7}{8} =$
6.	$4 \times 7\frac{1}{8} =$	$\frac{7}{8} \times 10\frac{1}{2} =$
7.	$\frac{5}{4} \times \frac{9}{8} =$	$1\frac{3}{4} \times 4\frac{1}{2} =$
8.	$2\frac{3}{4} \times 36 =$	$2\frac{1}{4} \times 2\frac{1}{2} =$
9.	$6\frac{1}{2} \times 4 =$	$3\frac{1}{4} \times \frac{1}{2} =$
10.	$9 \times 3\frac{1}{3} =$	$5\frac{2}{3} \times 6 =$

To divide a fraction is quite easy. All you do is multiply! Are you confused? Well, it's true! But before you multiply, you INVERT (turn upside down) the number you are dividing by.

Example: $\frac{1}{6} \div \frac{3}{4} = \frac{1}{6} \times \frac{4}{3} = \frac{4}{18} = \frac{2}{9}$

Invert

Example: $\frac{5}{8} \div \frac{3}{4} = \frac{5}{8} \times \frac{4}{3} = \frac{20}{24}$

Invert

Example: $\frac{5}{8} \div 2 = \frac{5}{8} \div \frac{2}{1} = \frac{5}{8} \times \frac{1}{2} = \frac{5}{16}$

Invert

In any division problem, v ıst understand which of the numbers is the divisor and which is the dividend.

Example: #1 $8 \div \frac{1}{2}$ = In tł . ase, 8 is divided by $\frac{1}{2}$ $(\frac{1}{2}\overline{)\,8})$

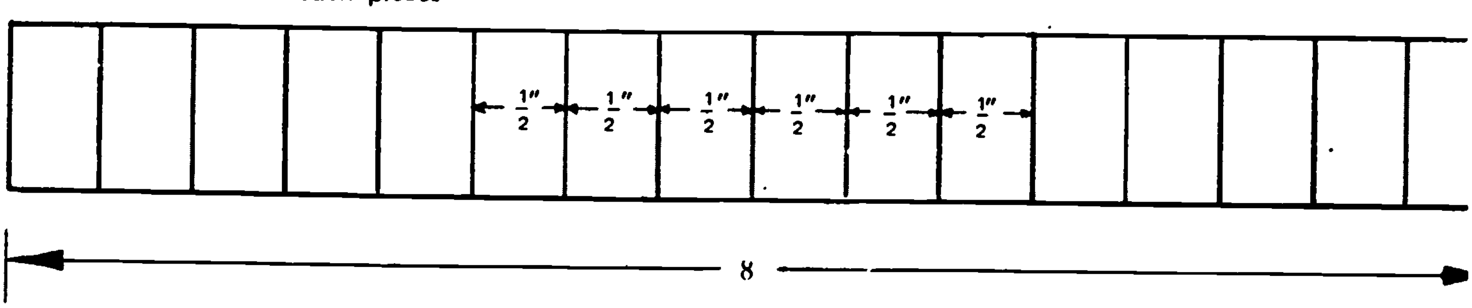
Example: #2 $\frac{1}{2} \div 8$ = In thi · se, the $\frac{1}{2}$ is divided by 8 $(8\overline{)\,\frac{1}{2}})$

Do you understand the difference? There is a big difference in the answers. Using our two examples, we can see the difference.

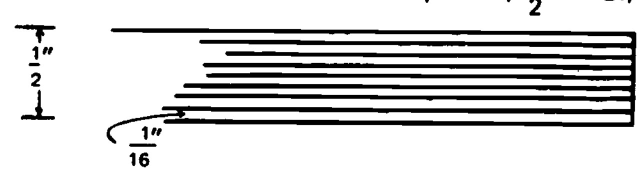
Example: #1 $8 \div \frac{1}{2} = \frac{8}{1} \times \frac{2}{1} = 16$ (There are 16 $\frac{1}{2}$'s in 8).

Example #2 $\frac{1}{2} \div 8 = \frac{1}{2} \times \frac{1}{8} = \frac{1}{16}$ (There are 8 $\frac{1}{16}$'s in $\frac{1}{2}$)

Let's make these problems more real. Suppose you had to make some pieces of wood $\frac{1}{2}$" long. Your instructor gave you a piece of wood 8" long. How many pieces $\frac{1}{2}$" long can you cut from the 8" piece? (This is example #1, 8" ÷ $\frac{1}{2}$".) You could cut 16 such pieces



You have a $\frac{1}{2}$" wide piece of plastic tape that must be cut into 8 equal strips of tape. How wide will each piece be? (This is example #2, $\frac{1}{2}$" ÷ 8.) Each strip would be $\frac{1}{16}$"wide.



One more thing for you to think about! Usually, when you divide a number by another number, you get a smaller number than you started with:

$12 \div 3 = \quad 3\overline{)12} \quad = \quad 4$ (You can see that 4 is smaller than 12)

But when you divide by a fraction, you get a larger number than you started with:

$12 \div \frac{1}{3} \quad = \quad \frac{12}{1} \times \frac{3}{1} \quad = \quad \frac{36}{1} \quad = \quad 36$ (You can see that 36 is larger than 12)

DANGER! Do not confuse these division problems with problems like

$\frac{1}{2}$ of 8

or $\frac{2}{3}$ of 36"

The key word in these problems is "OF." As soon as you see that "OF" you say: MULTIPLY!

$$\frac{1}{2} \text{ of } 8 \quad = \quad \frac{1}{2} \times 8 \quad = \quad \frac{1}{2} \times \frac{8}{1} \quad = \quad \frac{8}{2} \quad = \quad 4$$

$$\frac{2}{3} \text{ of } 36'' \quad = \quad \frac{2}{3} \times 36 \quad = \quad \frac{2}{3} \times \frac{36}{1} \quad = \quad \frac{72}{3} \quad = \quad 24''$$

Try these sample problems:

1. $\frac{2}{3} \div \frac{3}{4} =$
2. $\frac{3}{4} \div 3 =$
3. $2 \div \frac{1}{2} =$
4. $\frac{1}{2} \div 16 =$
5. $\frac{3}{4} \div \frac{3}{4} =$
6. $10 \div \frac{1}{5} =$
7. $\frac{1}{10}$ of 80 =
8. $\frac{1}{6}$ of 12 =
9. $8 \div \frac{1}{4} =$
10. $\frac{1}{4} \div 8 =$

Searching for something?
You can find math problems
on the next page!

My Score________________

Best score is 20 correct answers.
Fair score is 16-18 correct answers.

	A	B
1.	$\frac{3}{4} \div 3 =$	$\frac{4}{3} \div 2 =$
2.	$\frac{9}{16} \div 10 =$	$\frac{12}{2} \div 6 =$
3.	$2 \div \frac{1}{2} =$	$1 \div \frac{1}{3} =$
4.	$2 \div \frac{2}{3} =$	$\frac{3}{2} \div \frac{1}{2} =$
5.	$\frac{1}{2} \div \frac{1}{2} =$	$\frac{3}{4} \div \frac{1}{4} =$
6.	$1 \div \frac{1}{3} =$	$\frac{2}{3} \div \frac{1}{2} =$
7.	$16 \div \frac{3}{4} =$	$21 \div \frac{1}{3} =$
8.	$14 \div \frac{1}{2} =$	$\frac{1}{2} \div 10 =$
9.	$24 \div \frac{3}{8} =$	$\frac{3}{16} \div 3 =$
10.	$\frac{3}{4} \div 48 =$	$\frac{3}{4} \div \frac{1}{2} =$

My Score____________________

Best score is 12 correct answers.

Fair score is 9-10 correct answers.

(If your score is below 8, you need more practice)

Change these to division problems and solve them.

1. How many $\frac{1}{2}$'s are in 8"?

2. How many $\frac{1}{4}$'s are in 12"?

3. How many $\frac{1}{3}$ yards are in 15 yards?

4. How many $\frac{3}{4}$'s are in 12?

5. How many $\frac{2}{3}$ yards are in 6 yards?

6. How many $\frac{1}{8}$'s are in 16"?

7. How many $\frac{1}{4}$ miles are in 20 miles?

8. How many $\frac{1}{3}$ yards are in 18 yards?

9. How many $\frac{3}{8}$'s are in 24"?

10. How many $\frac{3}{10}$'s gallons are in 21 gallons?

11. How many $\frac{1}{4}$ lbs. are in 6 lbs.?

12. How many $\frac{1}{2}$ oz. are in 8 oz.?

My Score____________________

Best score is 20 correct answers.
Fair score is 16-18 correct answers.
(If your score is below 15, you need more practice)

	A	B
1.	$\frac{1}{2}$ of 10 =	$\frac{1}{8}$ of 10 =
2.	$\frac{1}{2}$ of 30" =	$\frac{1}{3}$ of 30" =
3.	$\frac{1}{8}$ of 30 yds. =	$\frac{1}{2}$ of 40 boys =
4.	$\frac{1}{4}$ of 40 nails =	$\frac{1}{8}$ of 40 girls =
5.	$\frac{1}{3}$ of 24" =	$\frac{1}{4}$ of 24 eggs =
6.	$\frac{1}{2}$ of 35 =	$\frac{1}{3}$ of 32 =
7.	$\frac{2}{3}$ of 15 =	$\frac{3}{16}$ of 32 =
8.	$\frac{1}{2}$ of 48 =	$\frac{3}{4}$ of 24 =
9.	$\frac{3}{4}$ of 20 =	$\frac{1}{16}$ of 16 =
10.	$\frac{2}{3}$ of 18 =	$\frac{7}{8}$ of 56 =

To divide when you have a mixed number, you again change it to an improper fraction by multiplying by the lower number and adding the top. We did these before — remember?

Example: $3\frac{1}{2} \div 6 = (\overset{+}{\underset{\times}{3\frac{1}{2}}} = \frac{7}{2})\ \frac{7}{2} \div \underbrace{\frac{6}{1} = \frac{7}{2} \times \frac{1}{6}}_{\text{Invert}} = \frac{7}{12}$

Example: $9 \div 3\frac{1}{3} = (\overset{+}{\underset{\times}{3\frac{1}{3}}} = \frac{10}{3})\ \frac{9}{1} \div \underbrace{\frac{10}{3} = \frac{9}{1} \times \frac{3}{10}}_{\text{Invert}} = \frac{27}{10}$

$\frac{27}{10} = 2\frac{7}{10}$

Do these sample problems.

1. $10 \div 3\frac{1}{5} =$

2. $26 \div 6\frac{1}{2} =$

3. $6\frac{4}{5} \div \frac{3}{5} =$

4. $5\frac{2}{3} \div \frac{1}{3} =$

5. $13 \div 3\frac{1}{4} =$

6. $7\frac{3}{4} \div \frac{1}{4} =$

7. $3\frac{1}{8} \div 5 =$

8. $10\frac{1}{2} \div 4 =$

9. $6\frac{1}{2} \div 4 =$

10. $8\frac{3}{4} \div 8 =$

Let's go back now and take up a hard problem in subtraction. You remember how to subtract fractions:

$$\begin{array}{r} \frac{1}{2} \\ -\ \frac{1}{8} \\ \hline\hline \end{array} \qquad \begin{array}{r} \frac{1}{2} = \frac{}{8} \\ -\ \frac{1}{8} \\ \hline\hline \end{array} \qquad \begin{array}{r} \frac{4}{8} \\ -\ \frac{1}{8} \\ \hline\hline \end{array} \qquad \begin{array}{r} \frac{4}{8} \\ -\ \frac{1}{8} \\ \hline\hline \frac{3}{8} \end{array}$$

Even when we had a more difficult problem like this, we learned how to do it.

$$\begin{array}{r} 1 \\ -\ \frac{1}{8} \\ \hline\hline \end{array} \qquad \begin{array}{r} \frac{8}{8} \\ -\ \frac{1}{8} \\ \hline\hline \end{array} \qquad \begin{array}{r} \frac{8}{8} \\ -\ \frac{1}{8} \\ \hline\hline \frac{7}{8} \end{array}$$

In that last problem, we changed the 1 to $\frac{8}{8}$. If we had been subtracting a different fraction, we could have changed the 1 to $\frac{3}{3}$, or $\frac{4}{4}$, or $\frac{5}{5}$, or any such fraction. They are all equal to 1.

This gives us a clue as to how we could handle a problem like this:

$$\begin{array}{r} 6\frac{1}{4} \\ -\ 2\frac{1}{2} \\ \hline\hline \end{array} \qquad \begin{array}{r} 6\frac{1}{4} = \frac{1}{4} \\ -\ 2\frac{1}{2} = \frac{}{4} \\ \hline\hline \end{array} \qquad \begin{array}{r} 6\frac{1}{4} \\ -\ 2\frac{2}{4} \\ \hline\hline \end{array}$$

Now you and I both know that you cannot subtract 2 from 1. Right? So you cannot subtract $\frac{2}{4}$ from $\frac{1}{4}$.

So we must borrow. We take 1 away from 6, which leaves us 5. We then change the 1 to a fraction (in this case $\frac{4}{4}$) and add it to our fraction (in this case, $\frac{1}{4}$).

$$\begin{array}{r} \overset{5(1)}{\cancel{6}}\frac{1}{4} \\ -\ 2\frac{2}{4} \\ \hline\hline \end{array} \qquad \begin{array}{r} 5\frac{1}{4} + \overset{}{\frac{4}{4}} = 5\frac{5}{4} \\ -\ 2\frac{2}{4} \qquad\qquad\quad \\ \hline\hline \end{array} \qquad \begin{array}{r} 5\frac{5}{4} \\ -\ 2\frac{2}{4} \\ \hline\hline \end{array}$$

(Now we can subtract!)

Example:

$$\begin{array}{r} 4\frac{1}{8} \\ -1\frac{1}{4} \\ \hline \end{array} \qquad \begin{array}{rcr} 4\frac{1}{8} & = & \frac{1}{8} \\ -\ 1\frac{1}{4} & = & \frac{2}{8} \\ \hline \end{array} \qquad \begin{array}{r} \overset{3(1)}{\cancel{4}}\frac{1}{8} \\ -\ 1\frac{2}{8} \\ \hline \end{array} \xrightarrow{\ \frac{8}{8}\ } \begin{array}{r} 3\frac{1}{8} + \frac{8}{8} = 3\frac{9}{8} \\ -\ 1\frac{2}{8} \qquad\qquad \\ \hline \end{array} \qquad \begin{array}{r} 3\frac{9}{8} \\ -\ 1\frac{2}{8} \\ \hline \end{array}$$

Let's shoot for a good score on the next page!

My Score________________________

Best score is 18 correct answers.

Fair score is 14-16 correct answers.

	A	B	C
1.	$8\frac{3}{8} - 3\frac{5}{8}$	$7\frac{1}{4} - 4\frac{3}{4}$	$6\frac{1}{3} - 2\frac{2}{3}$
2.	$9\frac{1}{8} - 7\frac{1}{2}$	$6\frac{1}{5} - 3\frac{4}{5}$	$5\frac{1}{2} - 3\frac{9}{16}$
3.	$4\frac{1}{8} - 1\frac{3}{4}$	$2\frac{1}{4} - 1\frac{1}{2}$	$8\frac{1}{16} - 2\frac{5}{8}$
4.	$12\frac{1}{4} - 11\frac{7}{8}$	$23\frac{1}{3} - 19\frac{3}{4}$	$35\frac{1}{8} - 17\frac{1}{2}$
5.	$42\frac{1}{8} - 29\frac{1}{8}$	$29 - 10\frac{5}{16}$	$65\frac{1}{4} - 24\frac{3}{8}$
6.	$36 - 27\frac{5}{9}$	$53\frac{2}{3} - 38\frac{8}{9}$	$81\frac{1}{6} - 56\frac{5}{12}$

These will be of interest to girls.

1. Ann bought $\frac{3}{4}$ lb. of gum drops, $\frac{1}{4}$ lb. of salted nuts, and $\frac{1}{2}$ lb. of mints. How much did her package weigh altogether?__________

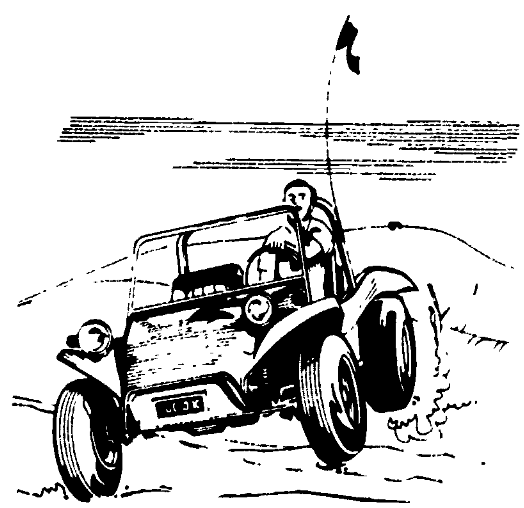
2. Jean needed 3 yards of ribbon to wrap prizes. If she bought yellow and blue ribbon and the blue ribbon was $\frac{3}{4}$ of a yard long, how long was her yellow ribbon?__________

3. Susan had a narrow piece of cloth $\frac{3}{4}$" wide. If she cut off $\frac{3}{8}$", how much cloth did she have left?__________

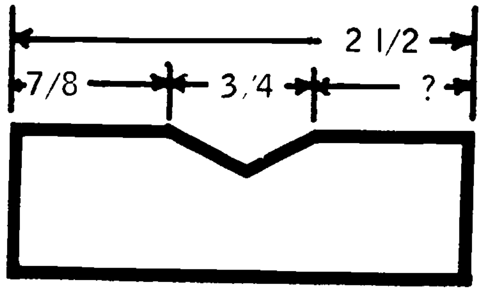
4. Myrtle cut a pie into eight pieces and served $\frac{3}{4}$ of them. How many pieces did she have left?__________

5. Aprons, made in Power Sewing, use $\frac{3}{4}$ of a yard of cloth. How many aprons can be made from a bolt of cloth 18 yards long? __________

Let's rush on over
to the problems on the next page.



1.

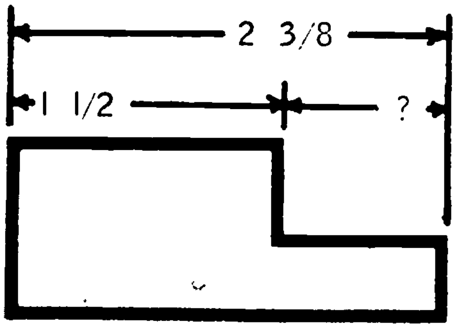


? = ____

2. $8 \times \frac{3}{5}$ = ____

3. $5 \times \frac{7}{8}$ = ____

4.

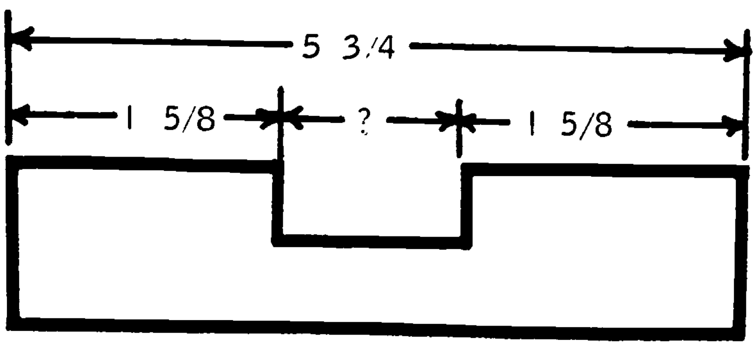


How long is this piece? ____

5. $8\frac{1}{2}$
$- 3\frac{5}{8}$

6. $8\frac{3}{4}$
$- 3\frac{5}{8}$

7.



? = ____

8. $\frac{3}{4} \times \frac{1}{2}$ = ____

9. $\frac{3}{4} \times \frac{1}{8}$ = ____

10. $8 \times \frac{1}{2}$ = ____

11. $9 \times \frac{3}{4}$ = ____

12. $\frac{1}{2} \times \frac{1}{4}$ = ____

13. $3\frac{1}{2} \times 2\frac{1}{4}$ = ____

14. $5\frac{3}{4} \times 8$ = ____

15. $\frac{2}{3} \times 5\frac{1}{4}$ = ____

1. $\frac{3}{8} + \frac{1}{8} =$

2. $\frac{1}{4} + \frac{7}{16} =$

3. $\frac{2}{5} + \frac{3}{4} =$

4. $\frac{2}{5} + \frac{1}{5} =$

5. $\frac{9}{16} + \frac{5}{16} =$

6. $\frac{7}{9} + \frac{1}{9} =$

7. $\frac{3}{8} - \frac{1}{8} =$

8. $\frac{3}{4} - \frac{1}{4} =$

9. $\frac{7}{8} - \frac{3}{8} =$

10. $\frac{7}{16} - \frac{3}{16} =$

11. $\frac{1}{4} - \frac{1}{4} =$

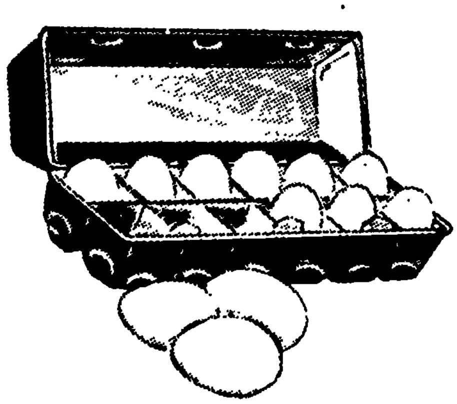
12. $\frac{8}{10} - \frac{3}{10} =$

13. $\frac{3}{4} + \frac{3}{8} =$

14. $\frac{9}{16} + \frac{1}{4} =$

15. $\frac{7}{8} + \frac{1}{16} =$

16. $\frac{3}{4} + \frac{1}{2} =$



1. 1 Dozen Eggs = __________ Eggs
2. ¼ Dozen Eggs = __________ Eggs
3. 1½ Dozen Eggs = __________ Eggs
4. $\frac{3}{4}$ Dozen Eggs = __________ Eggs

1. 1 Pound of Meat = __________ Oz.
2. 2 Pounds of Meat = __________ Oz.
3. ½ Pound of Meat = __________ Oz.
4. 3½ Pounds of Meat = __________ Oz.
5. $2\frac{3}{4}$ Pounds of Meat = __________ Oz.

WORK SHEET FOR GIRLS

Complete the yard goods inventory below.

Date	Amount used	Balance
		37 yards
	$2\frac{1}{2}$ yds	
	$1\frac{1}{4}$ yds	
	$7\frac{1}{4}$ yds.	
	$3\frac{1}{3}$ yds.	
	$4\frac{3}{4}$ yds.	
	2 yds.	
	$1\frac{1}{2}$ yds	
	$6\frac{3}{4}$ yds.	
	$2\frac{2}{3}$ yds.	

These problems will be of interest to boys.

1. One of our graduates runs a construction company with his father. If they have a truck that can carry $5\frac{1}{2}$ tons of sand, how many tons can they deliver in 3 loads? __________.

2. If the truck's gas tank holds $18\frac{3}{4}$ gallons, how much does it cost to fill the tank if the gas costs 40¢ a gallon?__________.

3. The truck can travel 9 miles on a gallon of gas. How far could the truck go on a full tank of gas?__________.

4. Mr. Hartmann has to make two shelves. One is $1\frac{1}{2}$ feet long and the other is $7\frac{1}{2}$ feet long. Can he cut them both from a board $9\frac{1}{4}$ feet long?__________.

5. Bob worked $3\frac{3}{4}$ hours on Monday, $4\frac{1}{2}$ hours on Tuesday, and $\frac{1}{2}$ hour on Wednesday. How many hours has he worked so far?

These problems will be of interest to boys.

1. The beautiful wreaths at Christmas time are made by the boys in Floriculture. Each wreath uses $3\frac{1}{4}$ feet of wire. If the boys make 24 wreaths, how much wire will they use?__________.

2. A picture measured $2\frac{3}{4}$"x $3\frac{1}{4}$". If the boys in Photoengraving enlarged it so that each side was twice its size, what will it measure then?__________.

3. 9" is the same as $\frac{3}{4}$ feet. If the boys in Heating and Ventilation are cutting wire 9" long, how many 9" pieces of wire can be cut from one piece 16' long?_______.

4. Jim unpacked a carton of eggs in the school kitchen. If there were 4 layers of eggs and $2\frac{1}{2}$ dozen eggs in each layer, how many eggs did he unpack?_______. If he dropped and broke ¼ dozen, how many did he break?__________

These problems will be of interest to girls.

1. Lisa is using a recipe for four people, but she is cooking for only two people. If the recipe calls for $\frac{3}{4}$ cup of milk, how much should she use?__________.

2. If a quart of ice cream measures 9" long, how many "cuts" of ice cream $\frac{3}{4}$" thick can you cut from a quart?__________.

3. A ¼-pound of butter measures 5" long. How many ¼" "pats" can you cut from a quarter-pound?__________.

4. How many ½-lb. packages of bacon can be made from 16 lbs. of bacon?__________

5. The girls made 7½ dozen cookies for the Halloween Party. If the guests ate $\frac{2}{3}$ of the cookies, how many cookies were left?__________.

These problems will be of interest to boys.

1. The Metal Shop boys were cutting pieces of rod $1\frac{1}{2}$' long from 60' of rod. How many pieces can they cut?__________.

2. One seat cover uses $\frac{2}{3}$ of a yard. How many covers can the Upholstery Shop make from 4 yards?__________.

3. The Print Shop is making name cards $2\frac{3}{4}$" long. How many can they cut from "cover stock" 11" long?__________.

4. Mr. Golden was cutting pieces of felt measuring $\frac{3}{4}$ of a yard long. How many pieces did he cut from $10\frac{1}{2}$ yards of felt?__________.

5. A boy in the Print Shop found that "Lower Case" letters measure $\frac{1}{10}$" wide. How many letters can be set in $\frac{1}{2}$"?________ In $\frac{3}{4}$"?________ In 1"? __________.

These are for everyone!

1. $\frac{6}{8}$ is the same as a) $\frac{4}{16}$ b) $\frac{3}{4}$ c) $1\frac{1}{3}$

2. 3 inches is the same as a) ¼ of a foot b) $\frac{1}{3}$ of a foot c) ½ of a foot

3. The sum of $4\frac{1}{4} + 2\frac{3}{4}$ is between
   a) 5 and 6 b) 6 and 8 c) 8 and 9

4. 3½ and 4¼ added together is between
   a) 5 and 7 b) 6 and 7 c) 7 and 8

5. 20 is a) ½ of 100 b) $\frac{1}{5}$ of 100 c) $\frac{1}{3}$ of 100

6. 33 is about a) $\frac{1}{3}$ of 100 b) ½ of 100 c) ¼ of 75

7. 4¼ and 5½ are the same as a) 9 + ½ b) 10 - ½ c) $9 + \frac{3}{4}$

8. $$\frac{(1\frac{1}{2} + 1\frac{1}{2}) \div (3 \times 1)}{(\frac{3}{8} + \frac{5}{8}) + (\frac{1}{4} + \frac{3}{4})}$$

(Clue: Do the part above the heavy line first; then do the lower part.)

Now you're really flying!
Next we're going to learn about FORMULAS!

EXTRA CREDIT PROBLEMS

1. Mr. Hartmann covered an old $2\frac{5}{8}$" thick door with ¼" thick plywood on one side and $\frac{3}{16}$" masonite on the other. How thick is the door now?

2. We covered our drafting tables with plastic measuring $\frac{3}{16}$" thick. If the table tops were $1\frac{1}{8}$" thick, could we put a 1¼" bolt all the way through the finished tables now?

3. The jointer took a $\frac{1}{32}$" cut off a $\frac{3}{4}$" board. What does the board measure now?

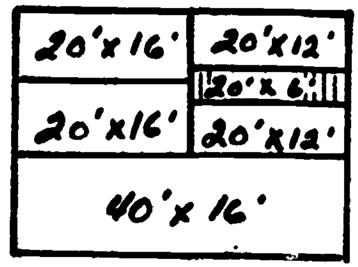
4. If a man can lay 24 sq. ft. of floor tile in an hour, how long will it take him to tile a floor 120 sq. ft. in area?

5. 24 boards each $1\frac{7}{8}$" thick were piled on the floor. How high is the pile?

6. If each of the boards in question 5 was planed down $\frac{3}{16}$", how high is the pile now?

Let's keep the ball going
and do the problems on the following pages.

1. "Peddlers Village" coverted an old barn into 5 shops and a stairway leading to the upstairs. What are the outside dimensions of the barn if it now looks like this?



2. Two of the shops rent for $125 per (for each) month, two larger shops rent for $135 per month, and the largest shop for $250 per month. What is the total rent collected each month?

3. If a total of 42 people work in these shops and $\frac{1}{3}$ of them are men, how many women work here?

4. The owners of the barn then decided to fix up the second story. By dividing this area exactly in half, they made two shops the same size. How many square feet is in each new shop?

5. If the new shops rent for the same price as the big shop downstairs, what is the total rent collected per month now?

These problems will be of interest to girls.

1. Helen's cookie recipe calls for $1\frac{3}{4}$ cups of sugar. How much sugar would she use if she doubles the recipe?

2. There were $2\frac{1}{4}$ pints of cream in the refrigerator. Kathy used $\frac{1}{2}$ pint in a recipe. How much cream is left?

3. Of the $3\frac{1}{8}$ yards of material Jane bought for her pants suit, $1\frac{3}{4}$ yards were needed to make the top. How many yards are to be used in the pants?

4. Sharon found 3 half-yards of material; how many yards is that altogether?

5. A social club collected dues from $\frac{5}{6}$ of its 36 members. How many members paid their dues?

These problems will be of interest to boys.

1. Ronald needs $1\frac{3}{4}$ quarts of paint to spray his car. How many quarts will he need if he paints the car twice?

2. Sheldon ordered $3\frac{1}{8}$ yards of material to reupholster a chair. If he needs $1\frac{3}{4}$ yards to cover the frame, how many yards are left to cover the cushions?

3. Mr. Hartmann had 2¼ pints of maple stain. Martin used ½ pint. How much stain is left?

4. Dick found 3 half-lengths of metal pipe. How many lengths does he have altogether?

5. A sports club collected dues from $\frac{5}{6}$ of its 42 members. How many members have paid their dues?

A mechanic in a garage is paid $4.50 an hour. If he worked on your car for these different times, how much is your labor bill for repairs?

1. Replace shock absorbers
   Front, ½ hour $________
   Rear, $\frac{3}{4}$ hour $________
   Total labor $______

2. Check and adjust caster, camber, toe-in
   1½ hours
   Total labor $______

The chief mechanic earns $6.00 per hour. What is your labor bill for this job?

3. Renew head gasket 2¼ hours $________
   Replace power-steering hose ¼ hours $________
   Replace power-steering pump ½ hour $________
   Adjust valves $\frac{3}{4}$ hour $________
   Total labor $________

1. Bill's car failed inspection because of a defective exhaust system. Bill took his car to the garage to have the work done. What was his total bill?

	Labor	Parts
Exhaust pipe, replace	$4.50	$ 6.50
Muffler, replace	4.00	18.75
Tailpipe, replace	5.00	5.70
		1.55 Tax
	Total	$________

2. Alfred had the same problem with his car except his was a large 8-cylinder engine, so he had to replace two of each of the parts. The labor cost 1½ times what Bill paid. How much did Alfred pay to have his car fixed?

3. Which is cheaper, a minor tune-up at $10.50, or this set of jobs: compression test $4.00, spark plugs cleaned $3.00, ignition timed $3.50, air filter cleaned $.50, battery cables checked $1.50.

1. A caterer spent for food and labor: $78.29 for breakfast, $131.25 for lunch, and $278.16 for dinner. The caterer gave the customer a bill for $585.00. What was the cater's profit?

2. This same caterer bought 500 lbs. of lobsters for $1.16 a pound. If he made a profit of 30¢ a pound, how much did he sell the lobsters for?

3. Frank and Marie just bought a new house in a development for $25,000. If it cost the builder $22,708.92 for materials, labor and other things, how much was the builder's profit?

4. Frank and Marie had to pay $\frac{1}{3}$ of the price of the house before they could move in. How much did they pay?

These problems will be of interest to boys.

1. Mr. Simpson filled the oil tank in the Heating and Ventilation Shop. If the tank holds 575 gallons and fuel oil costs 14½¢ per gallon, what did it cost to fill the tank for the first time?

2. Two National League baseball teams drew 2,081,380 and 1,282,628 fans each last season. Two American League teams had 1,737,464 and 1,218,097 fans each in attendance for the season. Which had more fans, the National or American League teams?

3. Fifteen members of a club took a bus trip to Washington, D. C. If the total cost was $255, what did the trip cost each boy?

4. Bill Brown worked at the drive-in movie last week. On the first four days in July the movie had 520, 784, 948, and 1,012 people in attendance. What was the total number of people who came to the drive-in during this time?

5. Alan is treasurer of his class. The class ordered him to pay four bills, one for $9.50, one for $13.75, one for $4.36, and one for $24.95. If the class treasury had $175.00 in it to start, how much does it have left after Alan pays the bills?

This problem will be of interest to girls.

Mrs. Green gave the girls in class this recipe. Half of the class was to double the recipe, the other group was to halve the recipe. What amounts did each group need of each item?

	Doubled	Halved
1½ lbs. of ground veal	______	______
½ lb. of ground pork	______	______
1½ cups of cracker crumbs	______	______
4 eggs	______	______
$\frac{3}{4}$ cup of milk	______	______
¼ teaspoon of nutmeg	______	______
1 tablespoon of butter	______	______
1 tablespoon of onion juice	______	______
1¼ teaspoons of salt	______	______
¼ teaspoon of pepper	______	______
¼ cup chopped celery	______	______
$\frac{1}{8}$ cup chopped parsley	______	______

These problems will be of interest to girls

1. The girls in Power Machine Sewing are making print-shop aprons. Each apron uses $\frac{3}{4}$ of a yard of cloth. If Mr. Vellardi cut 75 yards of cloth for the job, how many aprons can the girls make?

2. There are $5\frac{1}{3}$ tablespoons in $\frac{1}{3}$ of a cup.
   How many tablespoons in $\frac{2}{3}$ of a cup?__________
   How many tablespoons in a whole cup?__________
   How many tablespoons in ½ of a cup?__________

3. The local hospital allows ¼ pound of cereal for each patient's breakfast. If the hospital used 750 lbs. this morning, how many patients were served breakfast?

4. The Girls' Club went to New York City for dinner and to see a play. The trip cost a total of $255.00 for 15 girls. How much did it cost each girl?

1. Mary Anne has saved $10 towards a new hair dryer she likes. If this is ¼ of the money Mary Anne needs, how much is the hair dryer?

2. Larry sold 120 boxes of candy for the Senior Class. If this is four times as many as Larry's girl friend sold, how many has she sold?

3. Five girls had six school pens each. How many pens were there altogether?

4. Jeanne spent 35¢ on a headband. If this was $\frac{1}{3}$ of the money she had in her pocketbook, how much did she start out with?

5. Lori sold $75.00 worth of magazine subscriptions this week. This was $15 more than last week. What were last week's sales?

1. Many companies pay their salesmen to drive their own cars while on business. If a salesman travels 364 miles on a selling trip, and the company pays him 12¢ a mile, how much did the company pay this salesman for the use of his car?

2. Our school weather station can record the highest temperature reached each day. In one week last April, it recorded these "highs": 55°, 67°, 73°, 70° and 50°.
   a. What was the average daily highest temperature?__________.
   b. What was the difference between the highest and lowest of these temperatures? __________.

3. A small car was bought for $2,050 new. Two years later it was sold for $1,350. How much value did the car lose per year?

4. Mr. Murray told the boys that the tools they were making could be $\frac{1}{64}$" larger than the proper size, and it would be all right. If the measurement was $2\frac{5}{16}$" on the blueprint, what would be the largest size allowed?_____ If another measurement was $6\frac{9}{32}$" on the blueprint, what would the "oversize" measurement be?

1. If 2 pints = 1 quart, how many quarts are in 14 pints?

2. Mary's new tennis outfit cost \$18. Her tennis shoes cost ½ as much. How much did Mary pay for her shoes?

3. Marion earns \$2 an hour. How many hours will it take her to earn \$16?

4. If you buy cupcakes by the 12-dozen (144) they cost 8½¢ each. How much would 12 dozen cost?

5. If you paid \$6.00 for a hat and half as much for gloves, how much did you pay altogether?

1. Mr. Spector wants to fertilize a garden that is 40' x 30'. If he is to use 4 pounds per 100 square feet, how much fertilizer will he need? ______ If the fertilizer is ¼ bone meal, how many pounds of bone meal will be put on the garden? ______

2. In another spot Mr. Spector wants to put grass seed on a lawn that is 180' x 60'. If he uses 1 pound of seed for every 300 square feet of lawn, how many pounds of seed does he need?

3. Snow fence weighs 76 pounds per 100'. Mr. Spector ordered 3 100' rolls of snow fence. How much did this order weigh?

4. The Floriculture boys are putting in a brick walk. They figured that it would take 2,070 bricks. New bricks cost 8½¢ each. How much would the walk cost using new bricks? ______ The boys decided to use second-hand brick at 5½¢ each. How much did the walk cost? ______

1. Mrs. Kane bought 11 yards of muslin for \$1.95 a yard. She paid \$3.50 for drapery hooks. How much did she spend altogether?

2. There are 232 students in a school. If each student borrows 2 books a week from the library, how many books are on loan each week?

3. Linda's boyfriend weighs 181½ pounds, and Grace's boyfriend weighs $178\frac{3}{4}$ pounds. What is the difference in their weights?

4. Betty needs 2 pieces of material 2½ yards each, and 1¼ yards more to finish her curtains. How many yards does she need altogether?

5. Margaret promised to work $1\frac{3}{4}$ hours in the Dining Room on Thursday. She worked $\frac{1}{2}$ hour at breakfast, $\frac{3}{4}$ hour at lunch and $\frac{3}{4}$ hour at dinner. Did she keep her promise?

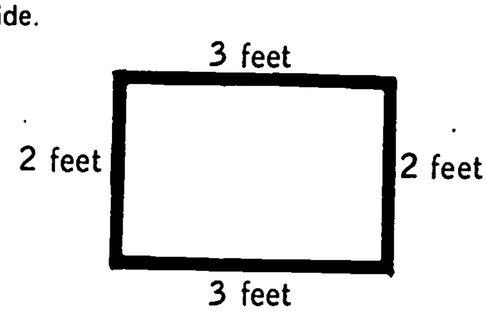
CHAPTER VI – FORMULAS

So far we have learned and practiced the four basic skills in math: Addition, Subtraction, Multiplication, and Division. We have also learned how to work with fractions. Now let's try putting our knowledge of mathematics to use in another way.

How would you like to learn some ALGEBRA? The word "algebra" may be a new word to you. Algebra is simply solving problems by using letters, such as a, b, c, d, etc., in place of numbers.

If you use the math you have already learned, you should have no trouble in doing the problem. Let's look at an example using letters in place of numbers to make a problem easier.

Imagine you had a picture and you wanted to make a frame for it. First you would measure each side.



Next you would add all the sides together.

$$\left.\begin{array}{r} 2 \text{ feet} \\ 3 \text{ "} \\ 2 \text{ "} \\ + 3 \text{ "} \\ \hline 10 \text{ feet} \end{array}\right\}$$

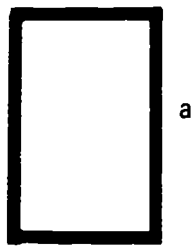
The 10 feet is called the PERIMETER. The perimeter is the distance around something.

Now you know that you need 10 feet of wood to make the picture frame.

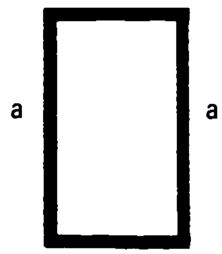
Another way to figure how much wood we need would be to use a FORMULA. The formula uses letters in place of numbers. The reason we use a formula is that it gives us a clear picture of the problem and is often a faster way of doing a problem. The formula is ALWAYS TRUE.

Let us find the formula for the perimeter of a RECTANGLE. A rectangle is a shape like the picture above, or like a page of this book. Remember: the perimeter is the distance around the rectangle. In other words, it is the sum of all four sides.

Let us give a name to the length of one side of the rectangle. We will call it "a."



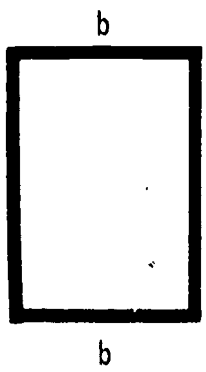
Since the opposite sides of a square or rectangle are the same size, the opposite side is also equal to "a." Can we add these two sides, to get a part of the perimeter? If the sides were each 10" long, we would know that the sum of them would be 10+10, or 2x10, or 20. We can add "a" to "a" in the same way: $a+a = 2 \times a$, or 2a, which means the same thing.



$$\left.\begin{array}{r} a \\ +\ \underline{a} \\ 2a \end{array}\right\}$$

We now know that 2 sides of the rectangle are equal to 2a.

Let us call the length of the two other sides of the picture "b."



$$\left.\begin{array}{r} b \\ +\ \underline{b} \\ 2b \end{array}\right\}$$

We now know that the other two sides of the rectangle are equal to 2b.

Now let us add all four sides together. We get 2a+2b. But the sum of all the sides is called the perimeter. What do you know — we've got our formula!

PERIMETER = 2a + 2b

This formula will always be true, no matter how long or short the sides are.

Before we go on to a problem, let's look at a new word — "substitute."

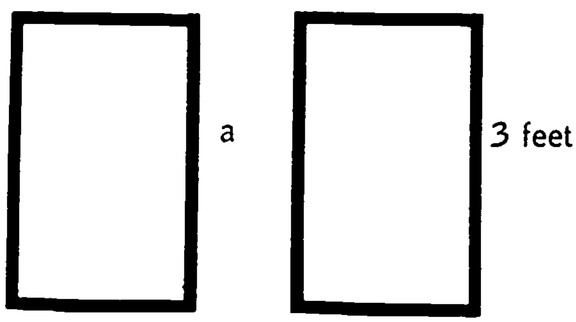
In a ball game, one player can **substitute** for another. In school, one teacher sometimes **substitutes** for another. In math we have substitutes too. We can **substitute** a number for a letter.

Now let's look again at our formula:

PERIMETER = 2a + 2b

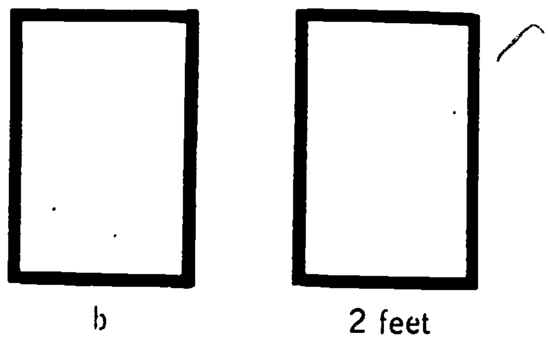
You know that "a" is one of the sides of the rectangle, and "b" is one of the sides joining "a" at a corner.

Let's get back to our picture that needed framing. One of the sides of the picture frame is to be 3 feet long. We will call this the "a" side. Let us see if we can **substitute** 3 for "a" in the formula.



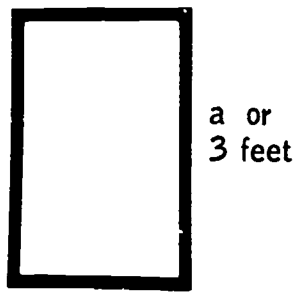
P = 2a + 2b
P = 2(3) +
P = 6 +

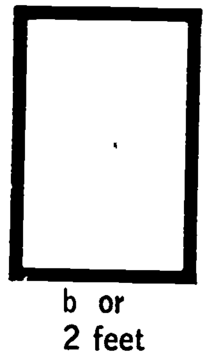
The other side is 2 feet long. We will substitute 2 for "b."

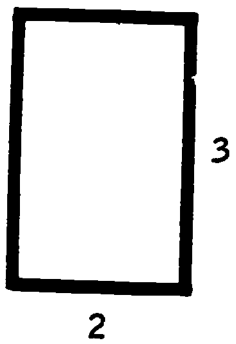


P = 2a + 2b
P = + 2(2)
P = + 4

Now that you have seen how to substitute numbers for letters, let's look at the formula all at one time.





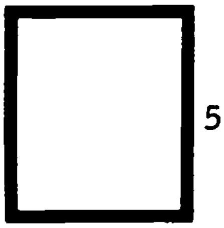


$$P = 2a + 2b$$
$$P = 2(3) + 2(2)$$
$$P = 6 + 4$$
$$P = 10 \text{ feet}$$

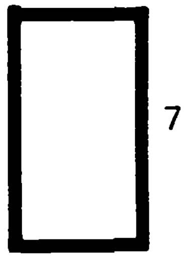
Do you think you can do some yourself? Let's try!

First we will practice substituting for the letter "a".

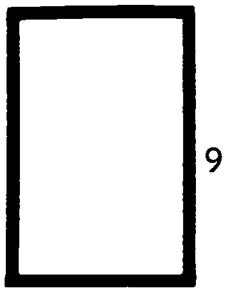
1. Let a = 5 feet
Then 2a = 2( )
2a = feet



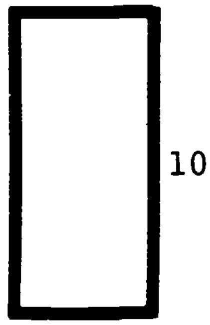
2. Let a = 7 feet
Then 2a = 2 ( )
2a = feet



3. Let a = 9 inches
Then 2a = 2( )
2a = inches

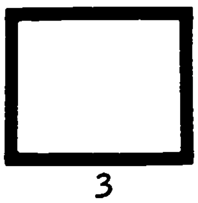


4. Let a = 10 miles
Then 2a = 2( )
2a = miles

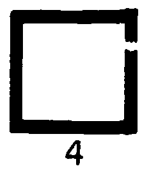


Now let's practice substituting for the letter "b".

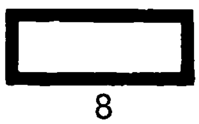
5. Let b = 3 feet
Then 2b = 2( )
2b = feet



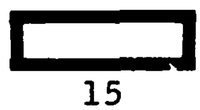
6. Let b = 4 inches
Then 2b = 2( )
2b = inches



7. Let b = 8 yards
Then 2b = 2( )
2b = yards



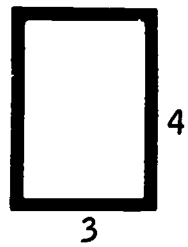
8. Let b = 15 feet
Then 2b = 2( )
2b = feet



Now we will substitute numbers for letters in the formula for perimeter.

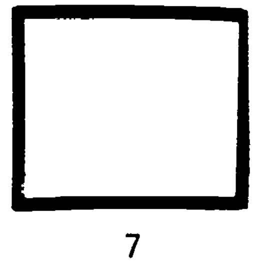
1.

P = 2a + 2b
P = 2( ) + 2( )
P = +
P = feet



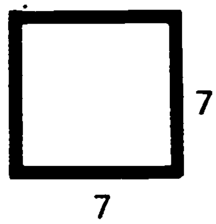
2.

P = 2a + 2b
P = 2( ) + 2( )
P = +
P = feet



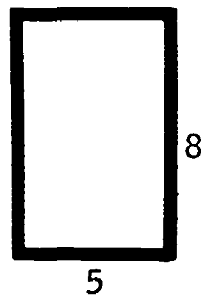
3.

P = 2a + 2b
P = 2( ) + 2( )
P = +
P = feet



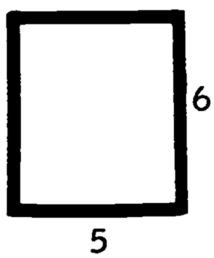
4.

P = 2a + 2b
P = 2( ) + 2( )
P = +
P = inches



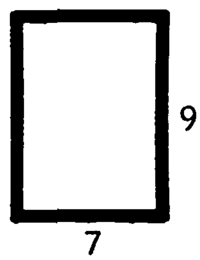
5.

P = 2a + 2b
P = 2( ) + 2( )
P = +
P = yards



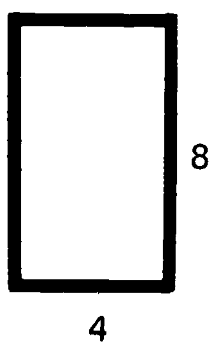
6.

P = 2a + 2b
P = 2( ) + 2( )
P = +
P = miles



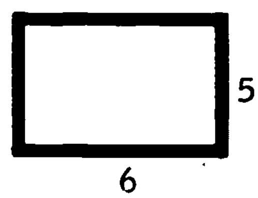
7.

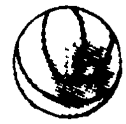
P = 2a + 2b
P = 2( ) + 2( )
P = +
P = feet



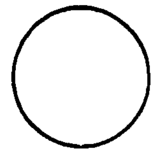
8.

P = 2a + 2b
P = 2( ) + 2( )
P = +
P = inches



Let's look at this picture. 

If someone asked you what this picture was, you would say it was a basketball. If he asked you to describe this picture (tell what it looks like), what would you say? An easy way to describe it would be to say "It is a circle."

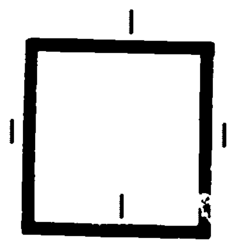


A circle

Before, we were talking about a picture to be framed. The shape of the picture was a rectangle. The basketball has a certain shape. It is a circle. When we show just the shape of something, we call the shape a **figure.**

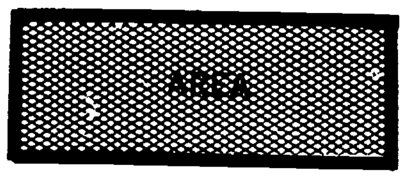
Look at the next figure.

If we wanted to describe this figure, we would say that it is square. A square that is 1 inch on one side, would be 1 inch on the other three sides.

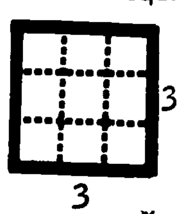


Now you know about three different shapes or figures: the rectangle, the circle, and the square. Now we shall talk about a very important word: AREA.

Area is the whole amount of space **inside** a figure.

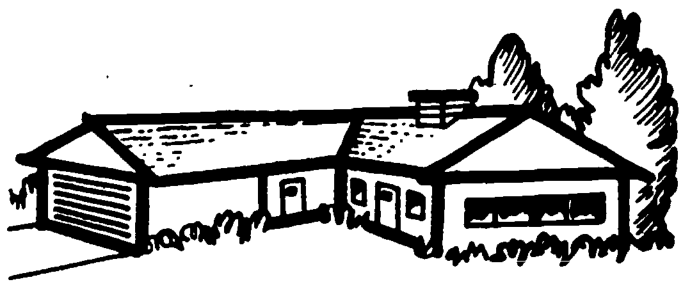


What would be the area of a square 3′ on each side? We could draw a picture like this, making little squares that are 1 foot on each side. Then we could count the number of small squares in the space. If we add up the small squares, we get 9 squares or 9 **square feet.** A faster and much easier way is to multiply the two sides together (3 x 3). We again get the same answer: 9.



Remember this important fact: **AREA is always measured in SQUARE measure** – square feet, square inches, square yards, square miles.

Let's imagine that you wanted to buy a lot to build this house on, and the people who own the lot say you can buy it for $3.00 a square foot.



Now, $3.00 doesn't sound like too much money, but let's see how much the people really are asking for their lot. The lot is 100 x 100 feet.

If we multiply the two sides together, we can find how many square feet of land there are in the lot.

$$\begin{array}{r} 100 \\ \times\ 100 \\ \hline \end{array}$$

square feet

Did you get 10,000 square feet as your answer? Good!

If there are 10,000 square feet in the lot and it costs $3.00 for each square foot, this means it would cost $30,000 for the lot.

Do you have $30,000 for the lot? If not, you had better look around for a cheaper price for each square foot.

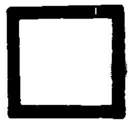
Now that you have a good idea of how to figure square feet, let's try some problems.

My Score ______________

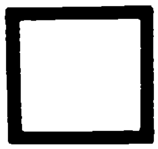
Best score is 10 correct answers.
Fair score is 6-8 correct answers.

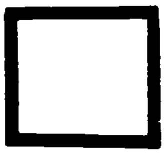
---

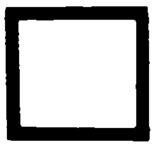
1.  4
4
___ x ___ = ___ sq.ft.

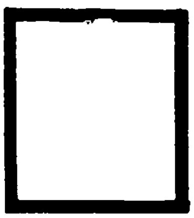
 6
6
___ x ___ = ___ sq.yds.

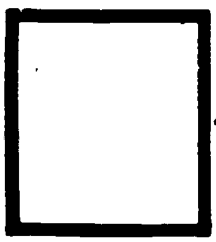
2.  8
8
___ x ___ = ___ sq.ft.

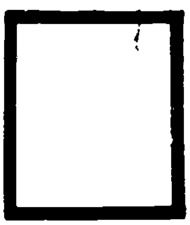
 10
10
___ x ___ = ___ sq.ft.

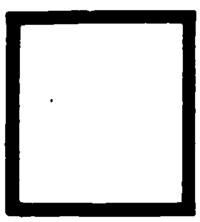
3.  15
15
___ x ___ = ___ sq.ft.

 20
20
___ x ___ = ___ sq.in.

4.  33
33
___ x ___ = ___ sq.ft.

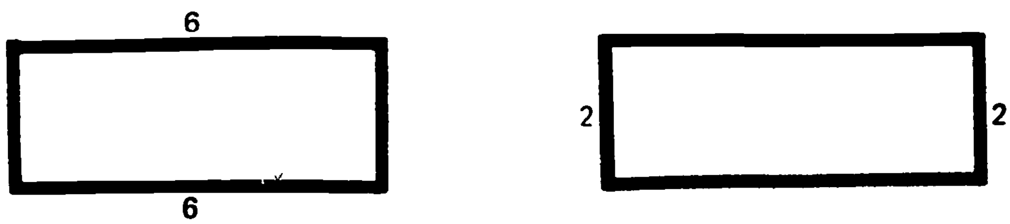
 48
48
___ x ___ = ___ sq.yds.

5.  55
55
___ x ___ = ___ sq.ft.

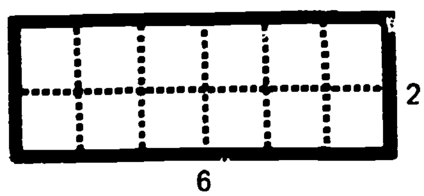
 62
62
___ x ___ = ___ sq.in.

Now that you have a good understanding of how to figure the area of a square, let's try something with a different shape. Let's try a rectangle.

A RECTANGLE looks almost like a square, but only the OPPOSITE sides are equal. Here is a rectangle that measures 6′ on the long side and 2′ on the short side.



To find the number of square feet in a rectangle, you can either add the small squares or multiply the sides just as you did for the square.



If we count the number of small squares, we see that there are 12 squares. If we multiply the two sides together, we also get 12 squares for an answer. (6 x 2 = 12).

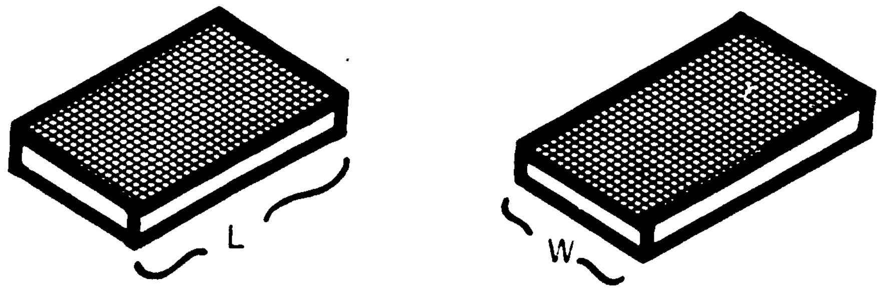
We can use a formula to find the number of square feet in a square or rectangle.

The formula we use to find the area of a square or rectangle is:

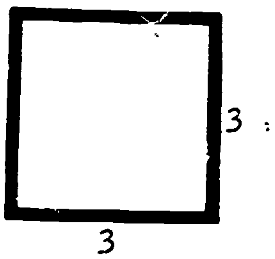
$$\text{AREA} = L \times W$$

The letters you see above mean more than just "a" and "b". The letter "L" means **length** (how long something is). The letter "W" means **width** (how wide something is).

To find the area of a rectangle, we will substitute numbers for the L and the W.



The following problem has been done for you:

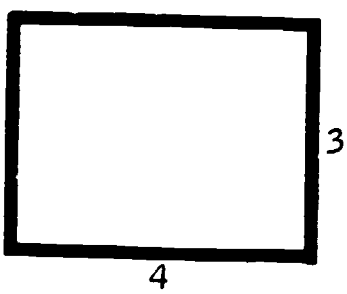


AREA = L x W

A = 3 x 3

A = 9 square inches

Try the next one yourself!



AREA = L x W

A = ___ x ___

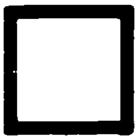
A = ____square inches

Now let's try some problems on the next page!

My Score ____________

Best score is 12 correct answers.
Fair score is 8 - 10 correct answers.

---

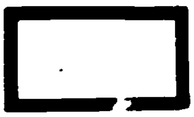
1.  2

2

AREA = L x W

A = ___ x ___

A = ___ square inches

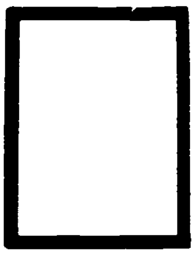
2.  3

6

A = L x W

A = ___ x ___

A = ___ sq. in.

3.  5

4

A = L x W

A = ___ x ___

A = ___ sq. in.

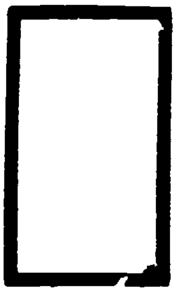
4.  1

7

A = L x W

A = ___ x ___

A = ___ sq. in.

5.  8

5

A = L x W

A = ___ x ___

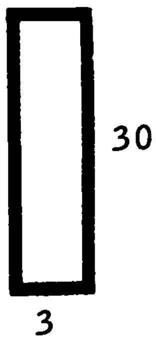
A = ___ sq. in.

6. 

A = L x W

A = ___ x ___

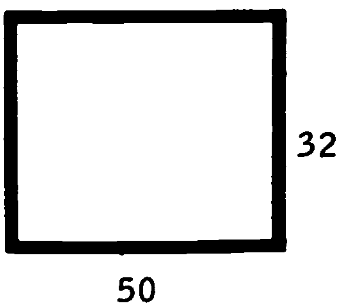
A = ___ sq. in.

7. 

A = L x W

A = ___ x ___

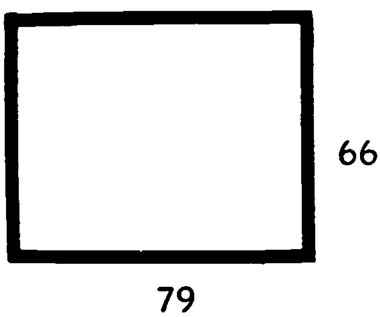
A = ___ sq. ft.

8. 

A = L x W

A = ___ x ___

A = ___ sq. ft.

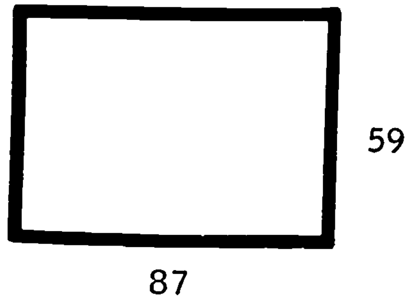
9. 

A = L x W

A = ___ x ___

A = ___ sq. ft.

10.

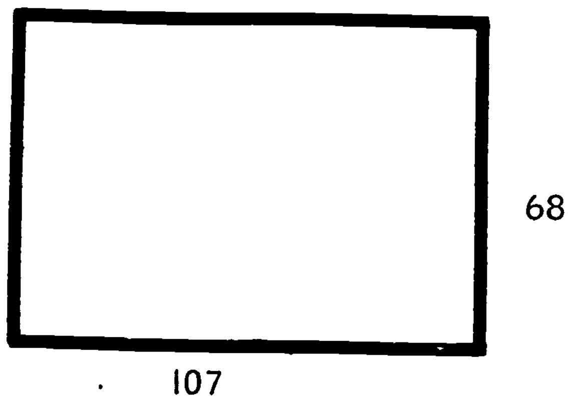


A = L x W

A = ____ x ____

A = ____ sq. ft.

11.

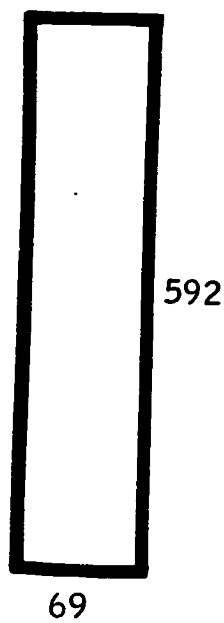


A = L x W

A = ____ x ____

A = ____ sq. ft.

12.



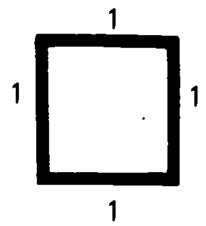
A = L x W

A = ____ x ____

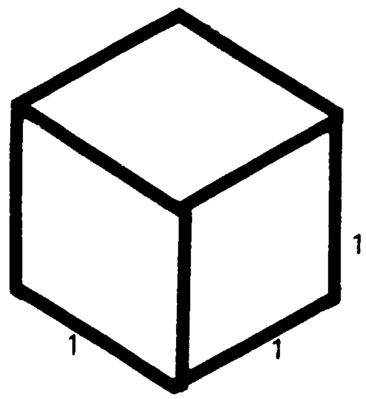
A = ____ sq. ft.

The next figure we will talk about is the **cube**. I'm sure that you have seen ice cubes. First, let's take a look at a square again.

Remember we said that a square measures the same on all sides. The square is a flat figure. It has length and width (which are equal).

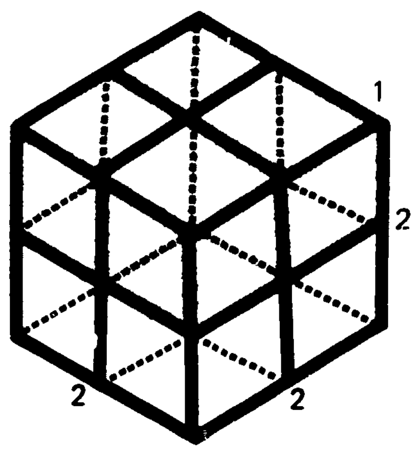


A cube also measures the same on all sides. But a cube is not flat. It has length and width and **height**. It is a **solid** figure.



The figure you see here is one **cubic inch**.

Suppose we have a cube that is 2 inches long, 2 inches wide, and 2 inches high. Let's draw lines at the inch marks and see how many 1-inch cubes we can find.



Let's pretend we are looking down on this cube from up above it. We can see 4 small cubes. But underneath the 4 cubes are 4 more cubes. So we could count 8 1-inch cubes in all.

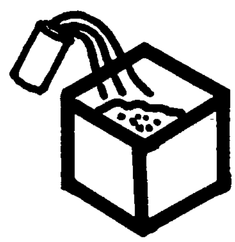
You can imagine how confusing it would be to have to count each and every cube in a larger figure. So this would be a good time to learn the formula for finding the number of cubes in a solid figure. (These cubes may be cubic inches, cubic feet, cubic yards, etc.)

The formula is:

$$\text{VOLUME} = L \times W \times H$$

That is, volume = length x width x height.

The word "volume" means the space that something takes up. If this cube was open on the top, we could fill it up with water or sand.



This cube takes up space and has volume.

So far, the only solid figures we have seen have been cubes, which are equal on all edges. If we called the length of any edge "E", then, in the formula for volume,

L would equal E,
W would equal E,
and H would equal E.

Just as we substituted numbers for letters, we can substitute E for the other letters, and we get

$$\text{Volume} = E \times E \times E$$

There is a short way of writing ExExE. It is E^3. So we have

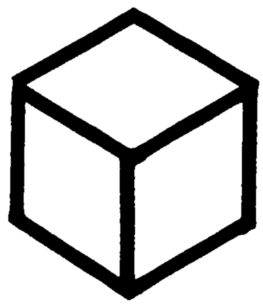
$$\text{Volume} = E^3$$

The small 3 tells us that we have to multiply the length of the edge 3 times.

If an edge of a cube was 3 inches, the formula would look like this:

$V = E^3$
$V = E \times E \times E$
$V = 3 \times 3 \times 3$
$V = (3 \times 3) \times 3$
$V = (9) \times 3$
$V = 27$ cubic inches

Why don't you try the next problem?



$V = E^3$

$V = 2 \times 2 \times 2$

$V = (\quad \times \quad) \times 2$

$V = (\quad) \times 2$

$V = \quad$ cubic inches

If you got an answer of 8 cubic inches, you were right, and are ready for the next practice problems.

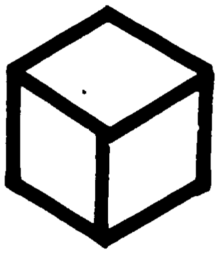
If you got a different answer, you should look over the examples and try again.

Let's hop on over to the problems on the next page.

My Score ______

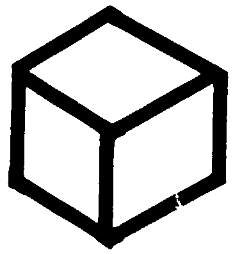
Best score is 8 correct answers.
Fair score is 5-6 correct answers.

1.



E = 4"

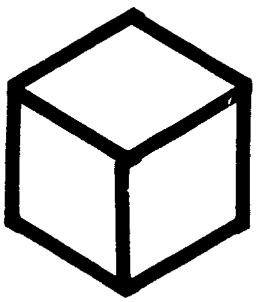
V = ___



E = 5"

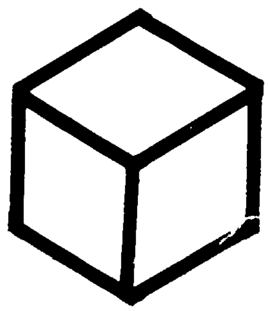
V = ___

2.



E = 7"

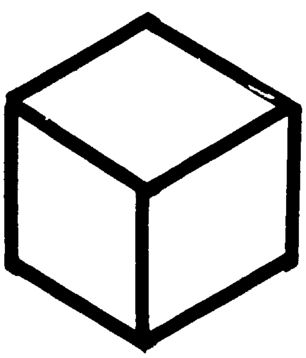
V = ___



E = 9"

V = ___

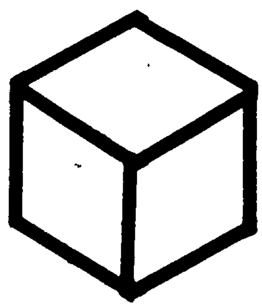
3.



E = 11"

V = ___

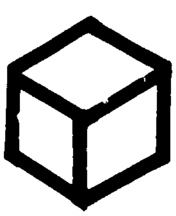
E = 11"



E = 12"

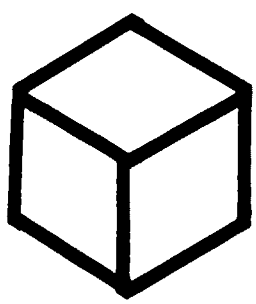
V = ___

4.



E = 15"

V = ___



E = 20"

V = ___

These problems will be of interest to boys.

1. John wanted to know how many square inches were on the top of his study desk. If the desk is 30 inches long and 20 inches wide, how many square inches are there on the top of the desk? ______ square inches.

2. Sam bought a new television and wanted to know how many square inches there were if the screen measures 18 x 20 inches. ______ square inches.

3. Mr. Brown bought a lot for his house. The lot contained 5000 square feet and it cost Mr. Brown 95¢ a square foot. How much did the lot cost?$__________

4. Mr. Jones wanted to make a patio for his backyard and he needed to know how many square feet of paving blocks to order. The patio measured 24 feet x 18 feet. How many square feet was this?_______square feet.

5. A neighbor of Mr. Jones has a driveway which has 42 square yards. The driveway is to be filled with stones to a depth (height) of 1 foot. How many cubic yards of stones must Mr. Jones order? Hint: 1 foot = $\frac{1}{3}$ yard. ________ cubic yards.

These problems will be interest to girls

1. JoAnn has a cutting board in the kitchen which measures 10 x 14 inches. How many square inches does the board contain?________square inches.

2. Penny wanted her family to buy carpeting for the living room floor. If the room measures 4 yards by 5 yards, how many square yards of carpet would they need?_______ square yards.

3. Mrs. Jones has a dining room table which measures 4' x 6'. She wants to buy a table pad for it. How many square feet will she need? ______ square feet.

4. If a stick of butter measures 1 x 1 x 5 inches, how many cubic inches does it contain?_______cubic inches.

5. A piece of cheese measures 2 x 3 x 5 inches. How many cubic inches does this piece of cheese contain? ______ cubic inches.

EXTRA CREDIT PROBLEMS

Using the formula A = LxW, find the following area:

1. Mr. Huggins covered his "den" with indoor-outdoor carpet. If the room measured 9' x 12', how many square feet of carpeting did he need? __________

2. If 9 square feet equals one square yard, how many square yards of carpet did he need? __________

3. Mr. Huggins paid $6.00 a yard for the carpet and installation. How much did it cost him to install the carpet? __________

4. Mr. Huggins liked his den so much that he decided to cover his bathroom floor the same way. This room is 6' square. How much will this installation cost him? __________.

5. A tile floor for the same bathroom would cost $4.50 a square yard. How much more did the carpet job cost than the tile floor job? __________

Using the formula V = LxWxH, find the following volumes:

1. How many cubic feet are in a garden storage shed that measures 10' long by 7' wide x 6' high? __________

2. How many cubic feet are in a swimming pool that has a depth of 7' and is 20' x 32'? __________

3. Mr. Alcor needed a box that would contain 46 cubic feet. If he found a box that measured 24" x 48" x 72", would it be big enough? __________

4. Which has more cubic feet, a box 4' square or one that measures 5' long, 3' deep, and 4' wide? __________

5. If there are $7\frac{1}{2}$ gallons of water in each cubic foot of water, how many gallons of water are there in a backyard swimming pool that has 4' of water and is 16' wide and 24' long? __________

CHAPTER VII – DECIMALS

Are you one of the people who thinks that decimals are just too hard to understand? Well, let's see if we can help you.

Decimal numbers are really fractions. Like other fractions, they mean LESS THAN ONE.

Have you ever bought gasoline for 37.9 cents a gallon? What does the .9 mean? It means **less than** a **whole** cent. It means $\frac{9}{10}$ of a cent (9 **tenths** of a cent).

Suppose some one told you how to reach his house: "After you leave the highway, the house is 2.4 miles down Hillside Road." What does .4 mean? It means less than a whole mile. It means that the house is more than 2 miles down the road, but less than 3 miles. It means $\frac{4}{10}$ of a mile (4 **tenths** of a mile).

So we see that one number to the RIGHT of a decimal point really means a **fraction with 10 as the bottom number.**

3.2 means $3\frac{2}{10}$
10.7 means $10\frac{7}{10}$

What does 100.5 mean?
What does 1000.1 mean?
Now tell what each of these numbers really means:

(1) 2.3	(2) 6.9	(3) 12.9
(4) 13.7	(5) 65.6	(6) 19.8
(7) 72.1	(8) 123.5	(9) 4,320.4
(10) 1,004.2		

The decimal point separates the number into two parts. The part to the LEFT means **whole numbers** (1 or more than 1); the part to the RIGHT means **fractions** (less than 1).

$$\xleftarrow{\text{LEFT}} \bullet \xrightarrow{\text{RIGHT}}$$

We just saw that one number after a decimal point means a fraction with 10 as the bottom number.

What about a number like 37.15? The 37 is to the left of the decimal point, so this is the whole-number part. The first number to the right of the decimal point is a 1. This means $\frac{1}{10}$. What does the second number (5) mean? It means $\frac{5}{100}$ (5 hundredths).

But when we look at the number 37.15, we don't say "thirty-seven and 1 tenth and 5 hundredths." Let's see what $\frac{1}{10}$ plus $\frac{5}{100}$ equals.

$$\begin{array}{rcl} \frac{1}{10} & = & \frac{10}{100} \\ +\frac{5}{100} & = & \frac{5}{100} \\ \hline & & \frac{15}{100} \end{array}$$

So we say 37.15 is "thirty-seven and 15 hundredths."

The number 59.84 is 59 $\frac{84}{100}$, or "fifty-nine and 84 hundredths."

Tell what these numbers mean:

16.45	4.76	35.09

Now how about a third number to the right of a decimal point? This means a fraction with a bottom number of 1000. For example,

15.167 means 15 $\frac{167}{1000}$

Now try these. Tell what each number means.

(1) 10.3	(2) 25.19	(3) 46.21
(4) 100.38	(5) 44.123	(6) 99.01
(7) 368.03	(8) 161.095	(9) 204.999
(10) 6.407		

You will not see many decimals like 6.407 (unless you are in the metals trades), but you see decimals like 27.95 almost every day. Where? Well, put a dollar sign in front of it.

\$27.95 means 27 $\frac{95}{100}$

or 27 dollars and 95 cents.

You will be working very often with dollars and cents. They are decimal numbers too.

Look at the number 437.295

We will write it this way: 4⋮3⋮7 . 2⋮9⋮5

We know from our early work that the part to the left of the decimal point means

$$400 + 30 + 7.$$

and now we know that the part to the right of the decimal point means

$$\frac{2}{10} + \frac{9}{100} + \frac{5}{1000}.$$

We can make a little picture that will show this for any number.

Whole-Number World				Decimal-Fraction World		
( )	( )	( )	.	( )	( )	( )
Any number here is really that many groups of HUNDREDS.	Any number here is really that many groups of TENS.	Any number here has its OWN value.		Any number here is really that many groups of TENTHS.	Any number here is really that many groups of HUNDREDTHS.	Any number here is really that many groups of THOUSANDTHS.

Now – one other thing. If you see a number WITHOUT a decimal point, you must know that there really IS a decimal point AFTER the number. It is just UNDERSTOOD to be there!

39 is really 39.

4500 is really 4500.

Feel any better now about decimals? It not, go back over these few pages. Your teacher will help you.

ADDITION OF DECIMALS

Adding decimals only has one rule: Keep the decimal points in line! If you are to get the correct answer, the decimal points must be exactly over or under each other:

↓
.
↓
.
↓
.
—
.
↑

Bring the decimal point straight down into your answer. If you do this first, you will not have to worry about it any more. You just go ahead and add as you always do.

Simple! You bet, and if you do it this way, your decimal point will always be in the right place.

Try these samples:

$ 16.95	$ 21.75	$ 14.98	$40.80
+ 10.50	+ 9.25	+ 12.89	+31.20

Add $11.49 and $8.49

Add $26.70 to $19.85

Add 14.5 gallons and 11.9 gallons

Add 13.2 gallons; 10.1 gallons; 4.3 gallons and 5 gallons (Careful!)

Add .375 and .500 and .625

Add .75; 1.50; 2.25; and .875

My Score ________

Best score is 42 correct answers.
Fair score is 35 correct answers.

	A	B	C	D	E	F
1)	1.0 + 3.0	4.0 + 3.0	6.0 + 2.0	8.0 + 1.0	9.0 + 1.4	3.8 + 5.1
2)	2.1 + 4.0	3.0 + 6.0	6.0 + 2.9	7.0 + 2.4	5.0 + 4.9	2.0 + 3.8
3)	3.0 + 4.5	5.1 + 2.6	6.3 + 1.4	8.2 + 1.7	7.8 + 2.1	2.4 + 7.3
4)	7.2 + 2.9	3.6 + 5.4	5.7 + 2.4	7.2 + 1.8	8.1 + 1.9	4.2 + 3.9
5)	6.8 + 2.7	5.7 + 4.6	3.8 + 9.5	2.6 + 9.1	9.3 + 3.9	4.4 + 7.7
6)	5.9 + 6.2	4.7 + 8.4	5.5 + 5.5	9.6 + 8.7	6.9 + 7.8	7.4 + 6.5
7)	8.7 + 5.9	9.9 + 9.9	6.8 + 7.9	9.5 + 3.9	9.4 + 8.7	9.7 + 9.6

My Score ________

Best score is 36 correct answers.
Fair score is 30 correct answers.

	A	B	C	D	E	F
1)	3.9 + 9.9	4.8 + 9.8	7.7 + 9.2	8.2 + 9.0	9.0 + 1.0	4.2 + 1.9
2)	60.2 + 20.4	30.3 + 40.2	50.1 + 20.3	70.4 + 20.5	50.3 + 40.4	30.8 + 40.1
3)	40.7 + 30.4	60.8 + 30.3	40.9 + 20.8	50.8 + 20.4	20.7 + 40.8	60.8 + 20.9
4)	20.7 + 31.2	42.6 + 30.2	63.9 + 24.8	46.4 + 52.8	38.4 + 43.6	59.3 + 41.8
5)	38.6 + 12.4	58.7 + 23.4	47.9 + 31.9	27.4 + 34.6	58.9 + 32.8	73.5 + 18.5
6)	48.3 + 74.9	37.6 + 97.6	25.4 + 85.6	88.0 + 40.9	68.6 + 92.4	94.8 + 90.3

Copy the following numbers in a column and ADD:

2.6 + 43.2 + 68.2 = ____

(HINT - Remember to keep the decimal point in a straight line!)

SUBTRACTION OF DECIMALS

In subtraction you must also keep the decimal points in line. If you do not keep the decimal points in line, you cannot get the right answer!

Bring the decimal point straight down into your answer. If you do this first, you will not have to worry about it anymore. You can just go ahead and subtract as you always do.

Try a few samples to be sure you know —

S 41.80	S 19.49	S 39.50
- 30.20	- 8.47	- 18.98

Subtract $21.95 from $65.00

Subtract 4.7 gallons from 9.3 gallons

This is the way you'll feel when you get a good score on the problems on the next page.

My Score ______

Best score is 42 correct answers.
Fair score is 35 correct answers.

	A	B	C	D	E	F
1)	7.0 - 3.0	2.0 - 1.0	4.0 - 3.0	9.0 - 2.0	[illegible].0 [illegible].0	7.0 - 5.0
2)	7.0 - 6.0	5.0 - 1.0	6.2 - 1.0	3.2 - 1.0	8.3 - 2.0	6.7 - 5.0
3)	3.9 - 1.0	6.3 - 5.1	7.8 - 4.2	3.9 - 1.8	6.7 - 1.1	2.2 - 1.0
4)	3.3 - 2.1	6.5 - 2.2	7.4 - 3.2	8.1 - 2.1	9.2 - 8.1	7.3 - 3.3
5)	3.4 - 1.4	5.8 - 2.8	4.6 - 1.2	5.4 - 4.1	8.4 - 2.3	5.6 - 1.1
6)	4.9 - 2.2	6.6 - 5.5	7.4 - 3.3	3.5 - 2.1	6.5 - 4.4	3.8 - 1.2
7)	7.7 - 4.4	9.9 - 1.0	8.1 - 2.0	3.9 - 1.3	7.6 - 2.1	8.4 - 1.1

My Score ______

Best score is 42 correct answers.
Fair score is 35 correct answers.

	A	B	C	D	E	F
1)	6.8 - 1.2	4.9 - 3.1	8.8 - 1.7	4.2 - 2.3	3.2 - 1.6	4.1 - 2.3
2)	7.1 - 1.9	7.0 - 2.1	3.1 - 2.9	9.1 - 2.6	8.0 - 2.3	7.0 - 4.1
3)	5.5 - 3.6	4.8 - 1.9	6.7 - 6.6	4.2 - 2.8	8.1 - 2.8	9.1 - 6.9
4)	40.6 - 20.5	20.3 - 10.2	70.6 - 20.5	63.4 - 20.6	48.3 - 10.4	59.2 - 20.8
5)	89.1 - 30.9	68.4 - 20.5	83.2 - 40.7	93.2 - 50.6	93.2 - 70.9	86.4 - 26.6
6)	94.3 - 74.6	82.1 - 22.4	76.8 - 26.9	45.6 - 25.8	37.6 - 27.6	72.4 - 53.4
7)	69.3 - 22.4	87.2 - 37.4	92.1 - 62.4	83.2 - 24.6	72.5 - 23.6	87.6 - 38.7

Suppose you have to subtract \$53.25 from \$100. To keep the figures straight, add a decimal point and two zeros to the \$100:

$$\left.\begin{array}{r} \$100 \\ -\ 53.25 \\ \hline \end{array}\right\} \text{ becomes } \left\{\begin{array}{r} \$100.00 \\ 53.25 \\ \hline \end{array}\right\} \text{ Now subtract.}$$

Sometimes you may have a problem in addition or subtraction where the decimals do not end in the same column. You can add zeros to help you keep the numbers straight. Zeros added to the right of a decimal number do not change the value of the number.

$$\left.\begin{array}{r} 14.1 \\ +\ 28.98 \\ \hline \end{array}\right\} \text{ becomes } \left\{\begin{array}{r} 14.10 \\ +\ 28.98 \\ \hline \end{array}\right\} \text{ Now add.}$$

Do you think you have it now? Try these to be sure!

(1) .2 .008 + .05	(2) .37 .04 + .9	(3) \$ 2.87 9.42 + 6.30	(4) \$ 14.95 50.00 + 63.00
(5) 66.89 - 38.59	(6) 46.07 - 40.76	(7) .406 - .4052	(8) 15.8 - 9.5

(9) Subtract 106.30 from 293.55

(10) Add 47.06; 4.607; .0476; 460.7

(11) Subtract 27.47 from 875.1

(12) Add \$50; \$61.75; and \$6.00

(13) Subtract 25¢ from \$4.50

(14) Add \$2,400; \$17.95; and \$232

(15) Subtract .375 from .875

MULTIPLYING DECIMALS

In multiplying decimals you set up your problem as you have done before. Be sure the decimal point is in its correct place in each number, but they do not have to be in line for multiplication.

Example: Multiply 2.10 by .5

```
(Set up problem) 2.10        Now multiply 2.10
                 x .5                      x .5
                 ----                      ----
                                           1050
```

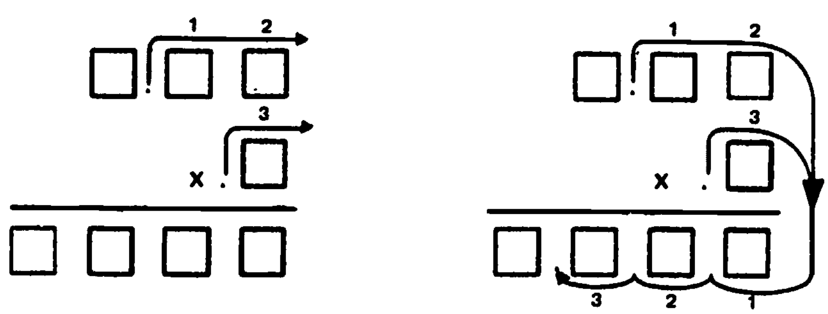
Now the decimal point becomes important to make your answer correct. Count the number of places to the RIGHT of EACH decimal point in the problem.

```
Example:      1 2
            2.1 0
               3
             x .5
            -----
          1 0 5 0
```

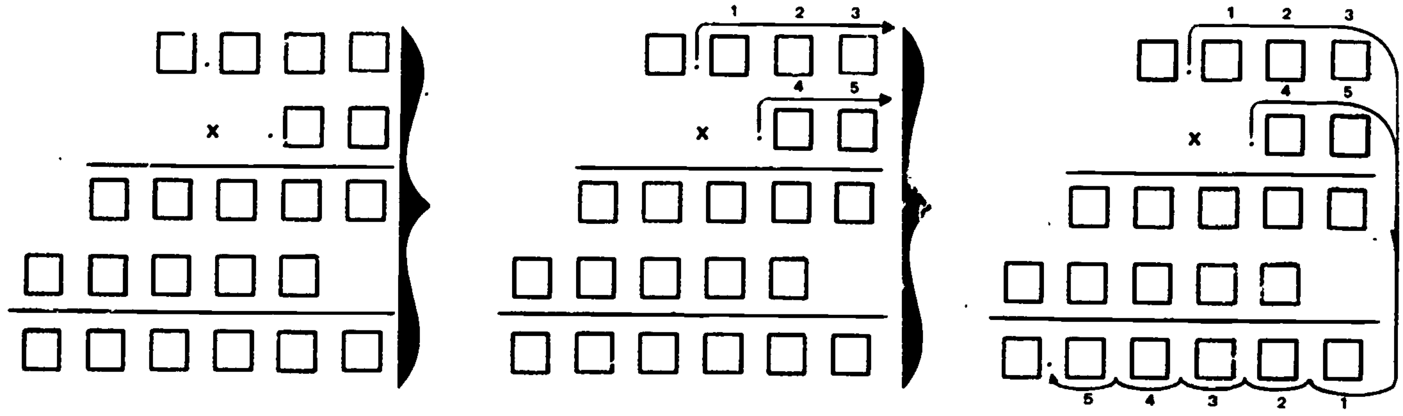
Now count this many places in your answer, starting after the last number and moving from right to left. (←)

```
Example:      1 2
            2.1 0
               3
             x .5
            -----
          1.0 5 0
            3 2 1
```

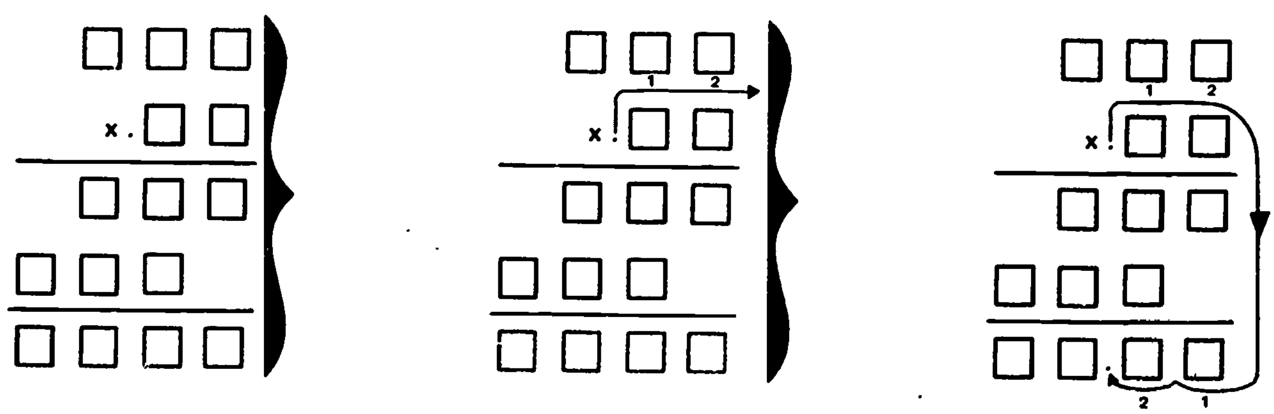
Look at this again without numbers:



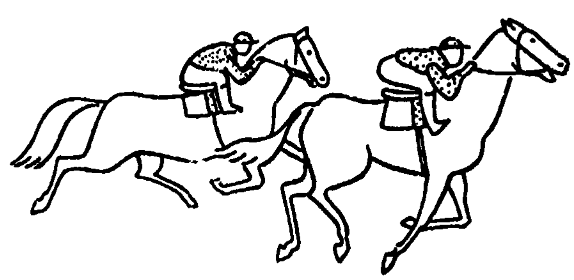
Here is another:



And another:



Now race over to the next page and see how well you can do with some problems.



Try a few using numbers.

1.
$$\begin{array}{r} 2.22 \\ \times\ .2 \\ \hline 444 \end{array} \qquad \begin{array}{r} 2.22 \\ \times\ .2 \\ \hline 444 \end{array} \qquad \begin{array}{r} 2.22 \\ \times\ .2 \\ \hline \end{array}$$

2.
$$\begin{array}{r} 33.3 \\ \times 1.2 \\ \hline \end{array} \qquad \begin{array}{r} 33.3 \\ \times 1.2 \\ \hline \end{array}$$

3.
$$\begin{array}{r} 2.11 \\ \times\ 4 \\ \hline \end{array} \qquad \begin{array}{r} 2.11 \\ \times\ 4 \\ \hline \end{array}$$

4.
$$\begin{array}{r} 5.10 \\ \times\ .2 \\ \hline \end{array}$$

5.
$$\begin{array}{r} \$3.20 \\ \times\ 3 \\ \hline \end{array}$$

6.
$$\begin{array}{r} 263.2 \\ \times\ .25 \\ \hline \end{array}$$

7.
$$\begin{array}{r} 1.375 \\ \times\ .25 \\ \hline \end{array}$$

8.
$$\begin{array}{r} 14.25 \\ \times .10 \\ \hline \end{array}$$

My Score ________

Best score is 42 correct answers.
Fair score is 35 correct answers.

	A	B	C	D	E	F
1)	3.2 x 4.3	4.1 x 5.0	2.3 x 4.5	5.1 x 3.2	4.4 x 5.2	3.6 x 4.0
2)	2.7 x 3.4	3.8 x 2.2	2.7 x 3.3	3.8 x 4.1	2.6 x 4.4	3.7 x 2.2
3)	2.0 x 3.2	6.2 x 4.0	4.1 x 3.0	4.0 x 2.3	4.6 x 1.0	3.0 x 4.1
4)	4.7 x 3.0	6.9 x 3.0	4.8 x 5.0	3.8 x 2.6	7.4 x 2.5	3.7 x 4.8
5)	4.9 x 6.7	8.3 x 5.7	9.6 x 6.1	8.2 x 7.6	4.9 x 8.8	9.7 x 3.9
6)	8.8 x 7.7	9.0 x 8.0	9.3 x 1.9	6.4 x 8.8	8.7 x 6.6	7.7 x 9.9
7)	6.5 x 9.8	3.9 x 1.8	9.8 x 8.9	6.9 x 8.4	9.7 x 7.9	1.9 x 9.9

My Score ______

Best score is 36 correct answers.
Fair score is 30 correct answers.

	A	B	C	D	E	F
1)	7.0 x 9.3	8.3 x 9.0	7.7 x 8.0	9.0 x 4.9	9.9 x 9.9	8.8 x 7.0
2)	2.2 x .33	2.3 x .46	63 x 2.4	32 x 4.1	6.8 x 40	6.9 x 30
3)	43 x 6.0	2.8 x 70	4.3 x 6.8	.33 x 2.8	.26 x .39	.48 x 52
4)	3.7 x 6.8	48 x 2.7	5.8 x 49	.33 x 8.1	.27 x .46	8.9 x 97
5)	39.1 x 22.1	27.2 x 43.6	36.5 x 2.23	46.7 x 2.25	47.5 x 28.6	32.8 x 16.7
6)	46.7 x 2.38	472 x 1.68	82.7 x 1.69	322 x 1.40	278 x 93.6	88.7 x 42.9

Sometimes we find that we need more places in our answer than we have numbers.
Example:

$$\begin{array}{r} .375 \\ \times .25 \\ \hline 1875 \\ 750 \\ \hline 9375 \end{array} \qquad \begin{array}{r} {}^{1\,2\,3} \\ .3\,7\,5 \\ {}^{4\,5} \\ \times\ .2\,5 \\ \hline 1\,8\,7\,5 \\ 7\,5\,0 \\ \hline ?\,9\,3\,7\,5 \end{array}$$

When we try to count off 5 places, we find only 4 numbers. To make the fifth place, put in a zero and then the decimal point.

$$.\underset{5}{0}\,\underset{4}{9}\,\underset{3}{3}\,\underset{2}{7}\,\underset{1}{5}$$

Want to see another?

Example:

$$\begin{array}{r} .325 \\ \times .30 \\ \hline 9750 \end{array} \qquad \begin{array}{r} {}^{1\,2\,3} \\ .3\,2\,5 \\ {}^{4\,5} \\ \times\ .3\,0 \\ \hline .\,\underset{5}{?}\,\underset{4}{9}\,\underset{3}{7}\,\underset{2}{5}\,\underset{1}{0} \end{array} \qquad \begin{array}{r} .\,3\,2\,5 \\ \times\ .\,3\,0 \\ \hline .\,\underset{5}{0}\,\underset{4}{9}\,\underset{3}{7}\,\underset{2}{5}\,\underset{1}{0} \end{array}$$

Try these:

1. $\begin{array}{r} .475 \\ \times .20 \\ \hline \end{array}$ 2. $\begin{array}{r} .25 \\ \times .2 \\ \hline \end{array}$ 3. $\begin{array}{r} .29 \\ \times .3 \\ \hline \end{array}$

4. $\begin{array}{r} .150 \\ \times\ .5 \\ \hline \end{array}$ 5. $\begin{array}{r} .65 \\ \times .04 \\ \hline \end{array}$ 6. $\begin{array}{r} .981 \\ \times\ .1 \\ \hline \end{array}$

DIVIDING DECIMALS

When a decimal point shows up in a math problem, it will be in one of three types of problems.

□ □)□ □.□ □

1. There is a decimal point INSIDE the division sign but NONE outside.

.□ □)□ □.□ □

2. There is a decimal point OUTSIDE the division sign and one INSIDE, too.

.□ □)□ □ □ □

3. There is a decimal point OUTSIDE the division sign but NONE inside.

Type #1 is the easiest to do. There is no decimal point outside the division sign. So you just see where the decimal point is inside the division sign and put one in for your answer straight up from it.

Example:

$$6\overline{)12\uparrow 36} \qquad 5\overline{)2\uparrow 00} \qquad 8\overline{)\uparrow 488}$$

(Finish these sample problems for practice.)

Try these sample problems:

1) $6\overline{).84}$ 2) $7\overline{)4.9}$ 3) $8\overline{).96}$ 4) $12\overline{)2.88}$

5) $5\overline{)21.5}$ 6) $37\overline{)59.2}$ 7) $23\overline{)8.05}$ 8) $6\overline{)1.8}$

9) $20\overline{)5.00}$ 10) $85\overline{)25.50}$ 11) $8\overline{)1.000}$

12) $20\overline{)13.00}$ 13) $15\overline{)11.00}$ 14) $8\overline{)9.44}$

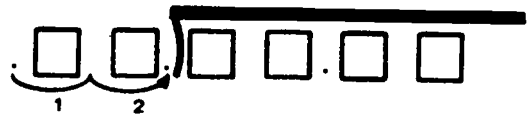
15) $7\overline{).042}$ 16) $32.4 \div 10$ 17) $5.62 \div 100$

18) $293.3 \div 7$ 19) $6\overline{)43.74}$ 20) $8\overline{)3.108}$

Let's skate on over to the problems on the next page.

Type #2 problems are a little harder. You have a decimal point outside the division sign. First, you move the outside decimal point to the right, up against the division sign, counting the spaces as you do it.

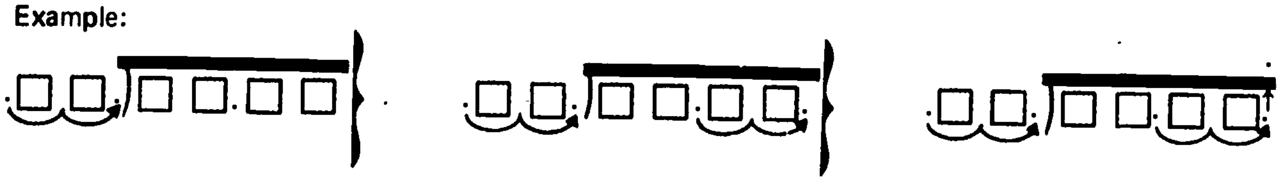
Example:



Now move the inside point to the right (→) the same number of places.

Immediately, you put in the decimal point for the answer – straight up from its new **position.**

Example:



Examples:

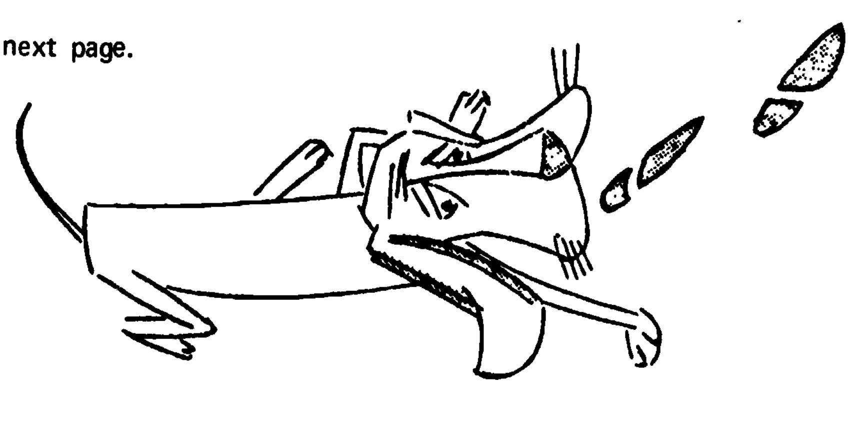
.10)20.00   .8)16.08   .6)180.30

Finish these problems to be sure you know how.

Then follow these tracks

and see how well you can do

with the problems on the next page.



My Score ______ Best score is 35 correct answers.
Fair score is 28 correct answers.

	A	B	C	D	E
1)	$4\overline{).32}$	$3\overline{).123}$	$2\overline{).122}$	$5\overline{).305}$	$6\overline{).612}$
2)	$6\overline{)12.6}$	$3\overline{)18.6}$	$5\overline{)45.5}$	$7\overline{)42.7}$	$6\overline{)54.6}$
3)	$7\overline{)21.7}$	$3\overline{)2.76}$	$6\overline{)1.86}$	$8\overline{)16.8}$	$9\overline{)81.9}$
4)	$8\overline{)6.48}$	$9\overline{)36.9}$	$8\overline{)5.68}$	$2\overline{)64.4}$	$3\overline{)12.6}$
5)	$.2\overline{)1.22}$	$.4\overline{)44.4}$	$6\overline{)6.66}$	$.5\overline{).350}$	$.6\overline{).426}$
6)	$.3\overline{).126}$	$.7\overline{)2.87}$	$.6\overline{)61.2}$	$.8\overline{)40.8}$	$.9\overline{)6.39}$
7)	$.5\overline{)4.50}$	$.8\overline{).880}$	$.7\overline{)2.17}$	$.4\overline{).444}$	$.6\overline{)5.46}$

My Score ______

Best score is 30 correct answers.
Fair score is 24 correct answers.

	A	B	C	D	E
1)	$.12\overline{).120}$	$1.4\overline{)2.80}$	$1.6\overline{)32.0}$	$1.3\overline{)3.90}$	$1.5\overline{)45.0}$
2)	$.17\overline{).340}$	$.18\overline{)3.60}$	$.20\overline{).400}$	$.25\overline{)10.00}$	$.36\overline{)72.00}$
3)	$.31\overline{).9300}$	$4.3\overline{)8.600}$	$5.5\overline{)110.0}$	$.46\overline{)92.00}$	$.80\overline{)16.00}$
4)	$10.2\overline{)204.0}$	$12.3\overline{).3690}$	$1.42\overline{)28.400}$	$2.02\overline{).8080}$	$3.33\overline{)9.990}$
5)	$1.2\overline{)1.560}$	$1.1\overline{)2.508}$	$2.4\overline{)5.040}$	$.22\overline{)4.840}$	$.21\overline{)23.10}$
6)	$1.4\overline{)154.0}$	$.13\overline{).169}$	$.12\overline{).132}$	$.13\overline{)2.990}$	$.11\overline{)3.410}$

My Score____________________

Best Score is 15 answers.
Fair score is 13 correct answers.

---

(1) $3.9\overline{)5.46}$

(2) $.7\overline{)29.33}$

(3) $2.4\overline{)91.2}$

(4) $2.5\overline{)12.25}$

(5) $.26\overline{).01274}$

(6) $2.4\overline{)16.230}$

(7) $.8\overline{)3.000}$

(8) $1.0\overline{)3.60}$

(9) $.20\overline{).1300}$

(10) $.25\overline{)20.00}$

(11) $15.00 \div .60$

(12) $15.00 \div 2.5$

(13) $68.75 \div 2.5$

(14) $.07\overline{)3.234}$

(15) $2.8\overline{)10.64}$

Type #3 problem is the tricky one. There is a decimal point outside the division sign. You move it to the right, up against the division sign. When you go to move the point inside the division sign, you don't find a point to move!

You remember we said that any number that does not have a decimal point really has an UNDERSTOOD decimal point after the last number. Well, since it's understood, we can put it there. This will not change it at all. You put the point right behind the last number inside the division sign.

Example: $.10\overline{)22}$ $.10\overline{)22.}$

Now add at least two zeros to the inside number. (Sometimes you have to add more than two, but usually two will be enough.) This also will not change the number.

Example: $.10\overline{)22}$ $.10\overline{)22.00}$

Now you can move both decimal points (outside and inside, too) just as you did in the type # 2 problems.

Examples: $.10\overline{)22}$ $.10\overline{)22.00}$ $.\underbrace{1\,0}_{1\;2}.\overline{)2\,2\,.\underbrace{0\,0}_{1\;2}.}$

$.03\overline{)6}$ $.03\overline{)6.00}$ $.\underbrace{0\,3}.\overline{)6\,.\underbrace{0\,0}.}$

$1.2\overline{)24}$ $1.2\overline{)24.00}$ $1\,.\underbrace{2}_{1}.\overline{)2\,4\,.\underbrace{0}_{1}.\,0}$

(You may finish these problems for practice.)

Try these to make sure you understand this kind of problem.

(1) $.41\overline{)82}$ (2) $.31\overline{)1767}$ (3) $2.7\overline{)1161}$

(4) $2.4\overline{)912}$ (5) $1.7\overline{)612}$ (6) $.6\overline{)12}$

(7) $.9\overline{)315}$ (8) $.8\overline{)944}$ (9) $.2\overline{)6}$

(10) $.5\overline{)3915}$

Let's drive over to the problems
on the next page.

Here's something new. Look at this problem:

```
          23.
.24.) 5 .64.
      4 8
      ---
        84
        72
        --
        12
```

There is a remainder of 12. You can put the 12 over the 24 and your answer will be

$$23\frac{12}{24} = 23\frac{1}{2}$$

But there is another way to give the answer. When we are working with decimals, it's nice to give the answer in decimals. To do this, you can add a zero after the decimal point inside the division sign. This will not change the number. Then just bring down the zero and finish the problem.

```
        23 .5
.24, ) 5.64, 0
       48
       --
        84
        72
        ---
        120
        120
        ---
```

You do not have to do this at the beginning of the problem. If you need another number to bring down, add a zero (after a decimal point), and you have your number!

Now see how we did this problem:

```
                             . 8
1.5)1.26        1 .5,)1 .2, 6
                      1  2  0
                      -------
                            6
```

There is no number to bring down, so we add a zero after the 6 in the division sign.

```
          . 84
1.5.)1 .2, 60
     1  2  0
     -------
           60
           60
           --
```

If this didn't come out even, we could add another zero. We could add as many zeros as we needed.

Try these for yourself:

$1.2\overline{)5.1}$ $\quad 36\overline{)315}$

NOTE: You may have to put in a decimal p[illegible] you can add zeros. BE SURE to put one in for the ANSWER, straight up from the [illegible] you put in.

My Score____________

Best score is 12 correct answers.
Fair score is 9 correct answers.
If you score less than 8 correct answers you need more practice

---

(1) $22\overline{)47.3}$ (2) $2.3\overline{)11.04}$ (3) $.23\overline{)1.2374}$

(4) $32\overline{)408}$ (5) $4.8\overline{).017376}$ (6) $5.2\overline{)106.6}$

(7) $.52\overline{)1066}$ (8) $52\overline{)10.66}$ (9) $.34\overline{)61.20}$

(10) $75 \div .05$ (11) $24\overline{)871.2}$ (12) $.48\overline{)1.7376}$

My Score____________

Best Score is 18 correct answers
Fair Score is 15 correct answers.
If you score below 12 correct answers you need more practice.

---

1) Add:
.1 + .001 + 1.0

2) Subtract:
37.9 - 22

3) Add:
.020 + .008

4)
```
  1.6000
- .0016
```

5)
```
 22.3
x.41
```

6)
```
 31.25
x  42
```

7) Subtract
.1 - .001

8) Subtract:
.08 -.02

9) Add:
14 + 3.06

10) Add:
31.2 + 27

11) Subtract:
41 – 8.35

12) Add:
25.4 + 132

13) $.9\overline{)8.19}$

14)
```
  38.90
x .025
```

15)
```
  .23
x .3
```

16)
```
  19.510
-   .321
```

17)
```
 378.90
x  2.3
```

18)
```
  45.2
x .003
```

My Score___________

Best score is 18 correct answers.
Fair score is 15 correct answers.
If you score below 12 correct answers you need more practice.

---

1)	Add: .03 + .30 + 300	2)	1.407 x22	3)	Add: 1.407 + 22
4)	Subtract: 22 - 1.407	5)	Add: 20¢ + 90¢ + 5¢	6)	Add: 47.31 + .121 + 2
7)	41.62 x .3	8)	$.3\overline{)1.29}$	9)	1.6 x 1.6
10)	.16 x .16	11)	.24 x.4	12)	$.5\overline{).0125}$
13)	2.07 x7.1	14)	3.72 x.23	15)	2.04 x 4
16)	$.03\overline{)27.9}$	17)	20.41 x 2.1	18)	$9\overline{).0819}$

My Score___________

Best score is 15 correct answers.
Fair score is 13 correct answers.
If you score below 11 correct answers you need more practice.

---

1) $\begin{array}{r} 3.12 \\ \times .24 \\ \hline \end{array}$	2) $\begin{array}{r} 62.6 \\ \times 2.3 \\ \hline \end{array}$	3) $\begin{array}{r} 62.6 \\ +\ 2.3 \\ \hline \end{array}$
4) $\begin{array}{r} 3.52 \\ \times .6 \\ \hline \end{array}$	5) $.5\overline{).125}$	6) $\begin{array}{r} 22.3 \\ \times\ 10.2 \\ \hline \end{array}$
7) $\begin{array}{r} 2.04 \\ \times\ 21 \\ \hline \end{array}$	8) $\begin{array}{r} 3.2 \\ \times\ 4 \\ \hline \end{array}$	9) $.03\overline{)2.79}$
10) $\begin{array}{r} 6.203 \\ \times\ .13 \\ \hline \end{array}$	11) $.5\overline{)4.05}$	12) $\begin{array}{r} 24.08 \\ \times .2 \\ \hline \end{array}$
13) $\begin{array}{r} 96.48 \\ \times .7 \\ \hline \end{array}$	14) $.010\overline{)20.300}$	15) $\begin{array}{r} 720.9 \\ \times .073 \\ \hline \end{array}$

1. A refrigerator costs $25 down and $18.50 a month for 12 months. How much will the refrigerator cost altogether?__________

2. Jim worked 5 days, 8 hours a day. If he was paid $1.75 an hour, how much was he paid for the week?__________

3. Alice bought several things at Korvette's. How much did she spend if her receipt showed $21.19, $3.50, $6.72, $8.65, and $9.85? $__________

4. Frank collected dues from the club members. How much money did he have if he collected 91 pennies, 12 nickels, 7 dimes, 6 quarters and 4 half dollars? $________

5. Anne had a $10 bill when she started shopping. After she came home she counted the money she had left. She had $3.07. How much had she spent? $____________

6. Three boys went out together to collect money for the UN Children's Fund (UNICEF) at Halloween. They put all the money together and found they had $17.25. What was the average amount collected by each boy? $__________

7. Melissa bought supplies for a surprise birthday party for her friend. She paid $1.59 for a paper table cloth, 15 cents for napkins, 29 cents for paper plates, and 27 cents for birthday candles. She bought 8 party hats at 12 cents each and 8 ballons at 5 cents each. What did she pay altogether? $__________

PERCENT

You have often seen signs or ads like these:

"SPECIAL – – 25% Off Regular Price,"

"THIS WEEK ONLY –– Take 10% Off Any Coat or Jacket."

Do you know what they mean?

Percents are very important, just as important as fractions and decimals. It may seem funny to you, but

A FRACTION IS A PART OF "ONE" OR A "WHOLE" THING.

A DECIMAL IS A FRACTION WITH A LOWER NUMBER OF 10 OR 100 OR 1000.

A PERCENT IS ALSO A FRACTION IN A DIFFERENT FORM.

Let's look at that funny sign for percent – %. When it was first used it looked like this: /100, and it was the division sign over the number 100. It was called "per centum" meaning "for each hundred." As the years passed, the form changed to %, and the word changed to "percent," but the meaning did not change:

25% still means "25 out of each hundred."

Well, we know another way to write "25 out of each hundred." Here it is:

$\frac{25}{100}$ (a fraction)

And still another way:

.25 (a decimal)

So when a store advertises "25% off," it really means " $\frac{25}{100}$ off." Usually we write fractions in their lowest terms. We can reduce the fraction $\frac{25}{100}$ to $\frac{5}{20}$ to $\frac{1}{4}$. The store is taking ¼ off the regular price.

How much is 10% off? 10% really means $\frac{10}{100}$ or $\frac{1}{10}$. So 10% off is $\frac{1}{10}$ off.

How much is 5% of something? 5% means $\frac{5}{100}$. We can reduce $\frac{5}{100}$ to lowest terms, and it becomes $\frac{1}{20}$. So 5% of something is $\frac{1}{20}$ of it.

How much is 20% ?

$$20\% = \frac{20}{100} = \frac{2}{10} = \frac{1}{5}$$

Now do you really believe that a percent is a fraction? Just put the percent number over 100, and reduce it to lowest terms if it can be reduced. Try these. Change these to fractions in their lowest terms:

1) 10%	2) 30%
3) 50%	4) 75%
5) 5%	6) 18%
7) 63%	8) 90%
9) 4%	10) 98%
11) 1%	12) 49%

How much would 100% be? Let's do what we did before -- put the percent number over 100.

$\frac{100}{100} = 1$ This means 100% = 1

Every winter coat reduced 15% to 25%

Now we know that a percent is really a fraction with a lower number of 100. Let's see if we really understand how percents are used.

Example: Robin did a page of 20 problems in arithmetic and got 90% of them right. How many did she get right?

We know that 90% = $\frac{90}{100} = \frac{9}{10}$.

Now we have to find out how much $\frac{9}{10}$ of 20 (problems) is.

$$\frac{9}{10} \times 20 = \frac{9}{\cancel{10}_{1}} \times \frac{\cancel{20}^{2}}{1} = 18$$

So 90% of 20 problems is 18 problems.

Example: Richard bought a slightly damaged football at 50% of the regular price of \$12. How much did he pay?

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

$$\tfrac{1}{2} \text{ of } \$12 = \frac{1}{2} \times 12 = \frac{1}{\cancel{2}_{1}} \times \frac{\cancel{12}^{6}}{1} = \$6$$

Richard paid \$6. for the football.

Example: In March, a store advertised 25% off all marked prices on winter jackets. If a jacket had a price tag of \$18, how much could you take off the price?

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

$$\tfrac{1}{4} \text{ of } \$18 = \frac{1}{\cancel{4}_{2}} \times \frac{\cancel{18}^{9}}{1} = \frac{9}{2} = \$4\tfrac{1}{2} \quad \text{(or \$4.50)}$$

You notice that we do not multiply by a percent. **We change it to a fraction first.**

Problems: Find

1) 20% of 50

2) 10% of $80

3) 50% of 200

4) 25% of 36

5) 5% of $100

6) 90% of 150

7) 75% of 12

8) 80% of $25

9) 5% of $10

10) 15% of 220

Some people find it easy to remember percents by comparing them with money.

Example: 50% reminds you of 50 cents ($.50) or a half dollar.
25% reminds you of 25 cents ($.25), or ¼ dollar, or a "quarter."
10% reminds you of 10 cents ($.10), or $\frac{1}{10}$ dollar, or a dime.
5% reminds you of 5 cents ($.05), or a nickel.

100% then reminds you of $1.00, or a whole dollar. 100% of something is the whole thing.

100% of 349 = 349

Now we know that percents are really fractions with a lower number of 100.

But a short time ago we learned about another kind of number that could be written as a fraction with a lower number of 100. It was a **decimal** like — —

.15 or .98 or .25 or .06 .

These could be written:

$\frac{15}{100}$ or $\frac{98}{100}$ or $\frac{25}{100}$ or $\frac{6}{100}$

Now we know that they can also be written:

15% 98% 25% 6%

This means we can also write percents as decimals.

$15\% = \frac{15}{100} = .15$

How do we change a percent to a decimal? We just **remove the % sign and put a decimal point in two places to the left.** The two little zeros in the percent sign (%) can help you remember the two places.

15% = .15% = .15

98% = .98% = .98

6% = .06% = .06

The only tricky part is to remember to put the point **two places** to the left of the end of the number. So

6% = .06 3% = .03 125% = 1.25

In the last lesson we worked problems by changing percents to fractions. Sometimes problems are easier to do if we change percents to decimals.

Example: Kevin agreed to pay 2% of his salary to the United Fund for 10 weeks. If his weekly pay came to $87.60, how much did he give to the United Fund each week?

We know $2\% = \frac{2}{100} = \frac{1}{50}$. We would have to multiply $87.60 by $\frac{1}{50}$. That would not be too easy. But

2% = .02

It is easy to multiply $87.60 by .02 – –

$$\begin{array}{r} 87.60 \\ \times\ .02 \\ \hline 1.7520 \end{array}$$

So Kevin would pay $1.75 a week for 10 weeks. (The rest of the decimal is too small to bother with.)

Example: What is 59% of 240?

59% = .59

$$
\begin{array}{r}
240 \\
\times\ .59 \\
\hline
2160 \\
1200 \\
\hline
141.60
\end{array}
$$

Answer: 141.60

Now you do these:

A. Change these percents to decimals:

1) 15%	2) 37%	3) 4%
4) 95%	5) 62%	6) 10%
7) 8%	8) 3%	9) 13%

B. Do these problems in the way that is easiest for you:

1) 10% of 90	2) 14% of 72	3) 35% of 100
4) 40% of 250	5) 63% of 145	6) 3% of 49
7) 6% of \$2000	8) 55% of 230	9) 25% of 440
10) 90% of 180	11) 72% of \$310	12) 75% of 600

Remember: When doing problems with percents,

YOU MAY CHANGE PERCENTS TO FRACTIONS OR YOU MAY CHANGE PERCENTS TO DECIMALS,

but you NEVER work with the percent as it is, with the percent sign (%).

1. The store offered a 25% discount (25% off the price) on power lawn mowers in September. How much would the discount be on a mower with a price tag of $72.00? $_____, How much would you actually pay for the mower? $________

2. Melanie got a mark of 80% on the quiz. If there were 25 questions, how many questions did she get right?_______ How many questions did she get wrong?_____

3. A factory found that 2% of the hammer handles it made were not good enough to sell. If it has turned out 4,800 handles, how many could not be sold?__________

4. There were 450 seniors, and 54% of them were girls. How many were girls? _______ How many were boys? __________

5. Fifty percent of the 62 points made in the basketball game were made by Will Brown. How many points did Will score?__________.

6. A liquid used for making pickles is 65% vinegar. How much vinegar is in a quart (32 ounces) of the pickling liquid?______ ounces.

7. Jim received $1.80 an hour on a job. If the job took him 8 hours, how much was his pay? $_____ If 23% was taken off his pay for taxes, how much was taken off? $_______ How much was Jim's "take home pay"?

You know how to change percents to decimals.

37% = .37% = .37

Decimal goes
TWO PLACES
to the left.

Sometimes you will have to change decimals to percents.

Well, it's as easy as eating candy. Just move the decimal point **two places to the right** and add the % sign.

.10 = 10.% = 10%

.98 = 98.% = 98%

.08 = 08.% = 8%

We usually drop
the decimal point
before the percent sign
(for whole numbers).

Now if you find it hard to remember how to move the decimal point, think of a number that you use a lot, like 50. You probably remember the decimal .50, because you remember 50 cents. Try to remember 50%, because that's a percent that's used very often. If you remember these, you can always go back to them. You will know how to change any decimal to a percent or any percent to a decimal.

.50 = 50.% = 50%
.03 = 03.% = 3%

Try these. Change each to a %.

1) .50	2) .36	3) .07	4) .88
5) .25	6) .90	7) .99	8) 1.00
9) .06	10) .02	11) .20	12) .16
13) .44	14) .75	15) .01	16) 1.25

Now let's draw a "picture" of a percent problem.

$\underline{\qquad}$ % of $\underline{\qquad}$ = $\underline{\qquad}$

Here's a problem like the ones we've had: Find 6% of \$30. We'll fill in the "blanks" in our picture:

$\underline{6\%}$ of $\underline{\$30}$ = $\underline{\ ?\ }$

All we have to do is **multiply** the two numbers on the left. We can't multiply by 6% as it is, so we'll change it to the decimal .06.

$$.06 \times \$30 = ?$$

$$\begin{array}{r} 30 \\ .06 \\ \hline 1.80 \end{array}$$

$$= \$1.80 \longleftrightarrow 1.80$$

We can call this a Type 1 problem.

Here is another type of percent problem. We will call it Type 2.

What percent of \$30 is \$1.80?

We will draw the same picture, and fill in the numbers in the proper places.

$\underline{\qquad}$ % of $\underline{\qquad}$ = $\underline{\qquad}$

$\underline{\ ?\ }$ % of $\underline{\$30}$ = $\underline{\$1.80}$

When our picture looks like this, instead of multiplying, we **divide**.

$$\begin{array}{r} .06 \\ 30\overline{)1.80} \\ 1\ 80 \\ \hline \end{array} \qquad .06 = 06.\% = 6\%$$

Now, how did we know which numbers to put into which places?

1. We used a ? for the percent because that was what we had to find.
2. We put the \$30 after the word "of" because the problem said of \$30.
3. We put the \$1.80 after the = sign because the problem said "is" and "is" means "is equal to."
4. We divided the \$1.80 by the \$30 because we knew from the problem that we would get a percent less than 100% (or a number less than 1). This means we would have to divide the **smaller** number (\$1.80) by the **larger** (\$30).

Let's try another one of this type.

What percent of 250 is 25%?

_____ % of _____ = _____

__?__ % of __250__ = __25__

$$\begin{array}{r} .1 \\ 250\overline{)\,25.0} \\ 25\,0 \\ \hline \end{array}$$

(Add a zero after the decimal point)

Or, we could do our division this way:

$$\frac{25}{250} = \frac{5}{50} = \frac{1}{10} = .1 = 10.\% = 10\%$$

A. Here are a few more examples of Type 1 problems:

1) 3% of 18 = ?

2) 4% of 40 = ?

3) 10% of 20 =

4) 50% of 200 =

5) 6% of 48 =

6) 18% of 50 =

B. Now try some of Type 2:

1) _____% of 120 = 6?
2) What percent of 200 is 100?
3) _____% of 100 is 30?
4) What percent of 360 is 18?
5) Find what percent of 220 the number 35.2 is.

C. Now do these:

1) Find 6% of $120.
2) What is 10% of 250?
3) What percent of 100 is 79?
4) Find what percent 20 is of 400.
5) What is 15% of 300?
6) _____% of 400 is 350?
7) Find 3% of 149.
8) _____% of 150 is 30?
9) Find what percent 30 is of 150.
10) What percent of 1000 is 100?

CHANGING FRACTIONS TO DECIMALS

Before we do any more problems, there is one more change you should learn. This is changing a fraction to its decimal form. Sometimes people say "change to its decimal equivalent" which means what a fraction is equal to as a decimal.

To be sure you understand what we are talking about, let us look at money. (You always like to look at money! Right?)

We know that there are four quarters in one dollar:

$$\begin{array}{rr} 25¢ & \$\ .25 \\ 25¢ & \$\ .25 \\ 25¢ & \$\ .25 \\ +\ 25¢ & +\$\ .25 \\ \hline \$\ 1.00 & \$\ 1.00 \end{array}$$

The quarters are the four equal parts of the dollar.

If we take one of the quarters, we have taken one fourth, which can be written ¼. If you can remember back, or look back to Chapter V in this book, you will remember how to add fractions, like this:

$$\begin{array}{r} \frac{1}{4} \\ \frac{1}{4} \\ \frac{1}{4} \\ +\ \frac{1}{4} \\ \hline \frac{4}{4} \text{ or } 1 \end{array}$$

Now if we put this all together, we know that ¼ of a dollar is the same as .25 so we can say ¼ = .25.

We can also say that ¾ = .75 because if you add

$$\begin{array}{rcr} \frac{1}{4} & = & .25 \\ \frac{1}{4} & = & .25 \\ +\ \frac{1}{4} & = & +\ .25 \\ \hline \frac{3}{4} & = & .75 \end{array}$$

But if you did not know that ¼ = .25 —— you could find out easily. Let us show you how you change a fraction like ¼ to its decimal equivalent.

You divide. That's all, just divide.

You divide the top number of the fraction by the bottom number.

Example: $\frac{1}{4} = 4\overline{)1}$ (Divide top number by the botton number)

$\frac{1}{4} = 4\overline{)1.00}$ (Add decimal point and two zeros)

$$\frac{1}{4} = \begin{array}{r} .25 \\ 4\overline{)1.00} \\ -8 \\ \hline 20 \\ -20 \\ \hline \end{array}$$

(Finish problem)

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

Look at another example:

$\frac{1}{2} = 2\overline{)1}$ (Divide top number by bottom number)

$\frac{1}{2} = 2\overline{)1.00}$ (Add decimal point and two zeros)

$$\frac{1}{2} = \begin{array}{r} .50 \\ 2\overline{)1.00} \\ -1\,0 \\ \hline 0 \end{array}$$

(Complete problem)

$\frac{1}{2} = .50$

Sometimes your decimal equivalent goes to three places following the decimal point.

Example:

$\frac{3}{8} = 8\overline{)3}$ (Divide top by bottom number)

$\frac{3}{8} = 8\overline{)3.00}$ (Add decimal point and two zeros)

$$\frac{3}{8} = \begin{array}{r} .37 \\ 8\overline{)3.00} \\ -2\,4 \\ \hline 60 \\ -56 \\ \hline 4 \end{array}$$

(Now you must complete problem. We do not want to have a remainder, so add another zero.)

$$\frac{3}{8} = \begin{array}{r} .37 \\ 8\overline{)3.000} \\ -2\,4 \\ \hline 60 \\ -56 \\ \hline 4 \end{array}$$

Complete problem by yourself!

Try some by yourself. If problem does not come out even, add an extra zero and have 3 decimal places in your answer.

1) $\frac{3}{4} =$ 2) $\frac{1}{5} =$

3) $\frac{5}{8} =$ 4) $\frac{1}{2} =$

5) $\frac{7}{8} =$ 6) $\frac{1}{8} =$

7) $\frac{1}{3} =$ (Look out for this one) 8) $\frac{2}{16} =$

On these problems, change the fraction to its decimal equivalent before completing the problem. Give all the answers as decimal numbe

1)
$$\begin{array}{r} 5\frac{1}{4} \\ +\ 3 \\ \hline \end{array} = \begin{array}{r} 5. \\ +\ 3. \\ \hline \end{array}$$

2)
$$\begin{array}{r} [illegible]\frac{1}{2} \\ \frac{1}{4} \\ \hline \end{array} = \begin{array}{r} 6. \\ -\ 4. \\ \hline \end{array}$$

3)
$$\begin{array}{r} 172 \\ \times\ 2\frac{1}{2} \\ \hline \end{array} \qquad \begin{array}{r} 172 \\ \times\ . \\ \hline \end{array}$$

4) $\frac{1}{2}\overline{)450} = .\overline{)450}$

5) $1\frac{1}{2} + 2\frac{1}{4} + 6.35$

6) Subtract $6\frac{1}{4}$ from $8\frac{5}{8}$

7) Multiply $7\frac{1}{4}$ by 6

8) Divide $9\frac{1}{2}$ by 5

9) $4\frac{3}{8} \times 100$

10) $\frac{5}{8} + \frac{1}{2} + \frac{1}{4} + 4$

Now many times we find that we have a percent with a fraction in it. For example, interest paid by a savings bank very often has fractional percents.

Example: Change 4¼% to its decimal equivalent.

Now remember that your number will be **less than one,** so put in the decimal point correctly! Start by changing the whole number in the percentage first.

4¼% = .04+

Now add your decimal equivalent of the fraction to the RIGHT of that number.

4¼% = .0425

The reason for this is that ¼% means, ¼ of 1% and not ¼ of 1 whole thing.

Compare ½ and ½%
½ = .50
½% = 0½% = .0050 or .005

Compare 2¾ and 2¾%
2¾ = 2.75
2¾% = .0275 That decimal point is important!

Let us try some problems.

A. Give the decimal equivalent of these:

1) 5½%	2) 10¼%
3) 15½%	4) 4¾%
5) $90\frac{1}{8}\%$	6) $10\frac{1}{3}\%$
7) 25¼%	8) 2½%
9) $3\frac{1}{3}\%$	10) $6\frac{2}{3}\%$

B. 1) 5½% of $150 =

2) 3¼% of 60 =

3) 4¾% of $400 =

4) 8½% of $25,000 =

5) _____% of 600 = 15

(You may need some help from your teacher on the last steps of this problem.)

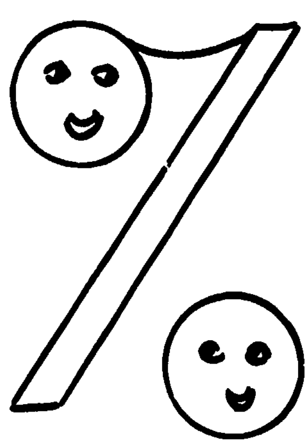
6) ___% of 200 is 9 ?

7) 5¼% of $225 =

8) Find 6¾% of $900.

9) Find 4½% of 10,000.

10) What percent of 300 is 10?



Now let's see how well you can do with the problems on the next pages.

1. Joe bought two sport shirts at $2.95 each. The next week, Mark bought two sport shirts on sale for $5.00.
   How much money did Mark save buying on sale? $__________
   What percent of the original price was the sale price? ____ %

2. Grace Marie wanted three head bands that cost 75¢ each, but in another store she saw the same head bands on sale at 3 for $1.75.
   How much money did she save buying the 3 on sale at the second store? $______
   Is that about a 33% or 22% or 3% savings on the price at the first store?_______%

3. George's family pays $25 a month for a TV set that cost $200. What percent are they paying each month? _____%

4. What percent of $200 is $10? _____ %

5. A businessman had sales of $250,000 last year. This year sales are about 10% higher. By the end of the year, how much will his sales amount to? $___________

1. If an air conditioner had a price tag of $359.50, which would you want – $60 off or 25% off?__________

2. Bruce's aunt bought a building lot in the Pocono Mountains for $7,500. She sold it a year later for $10,000.
How much money did she make? $__________
What percent of the sale price was her profit?_____%

3. When a new car is bought, it becomes a used car, and it is not worth as much as a new car. It "depreciates" 10% as soon as you buy it. If your new car cost $2,395.00, how much is it worth the next day? $__________
If it depreciates 25% the first year, how much is it worth a year later ? $________

4. A store owner had a parking lot 10,000 square feet in area. If he decided to put up another building to cover 30% of the lot, how many square feet was the new building?__________
If the new building will be 50 feet wide, how long will it be?__________

Can you handle the money problems on the next page?

John and Anne are married now and between the two of them they bring home $400 every month. Below is what they spend each month. What percent of their pay do they spend for each item?

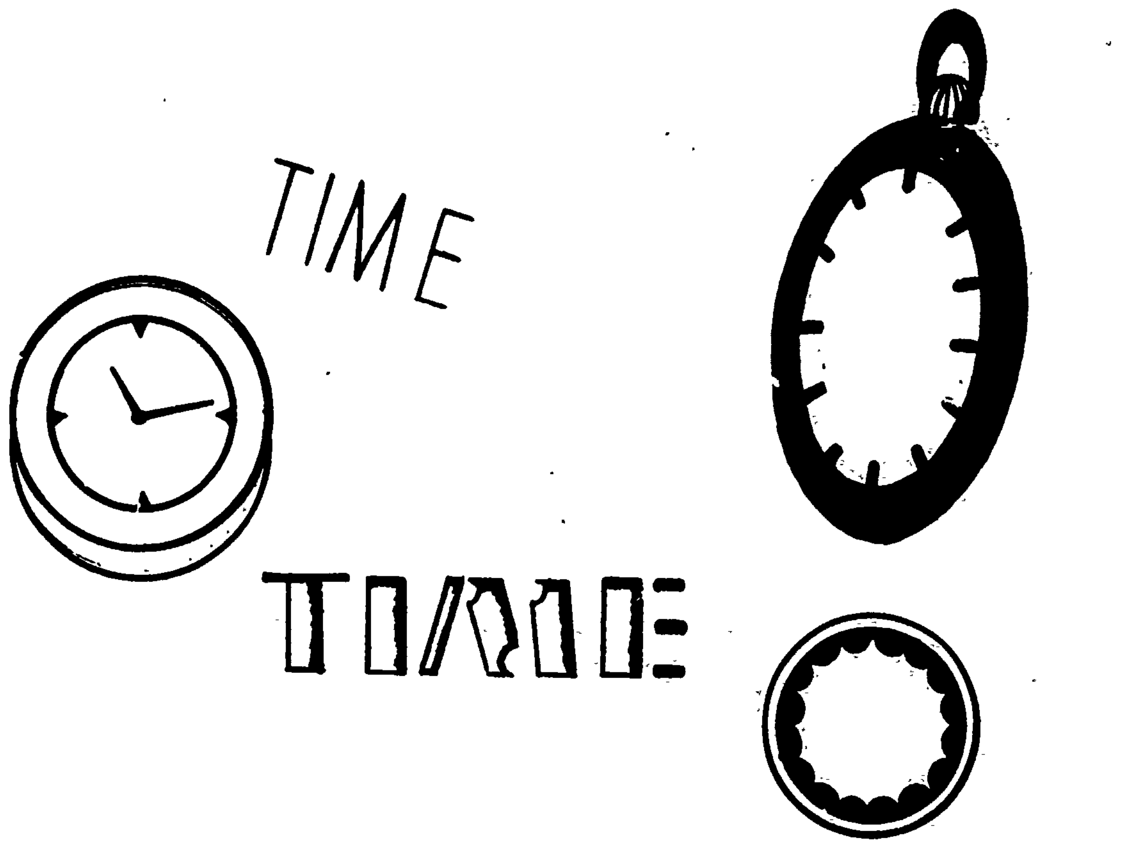
Food	$ 80.00	=	%
Rent	$120.00	=	%
Car payments	$ 64.00	=	%
Furniture payments	$ 56.00	=	%
Gas and oil	$ 28.00	=	%
Electricity	$ 16.00	=	%
Total	$______		____%

Left over to save or spend $ __________ = __________%

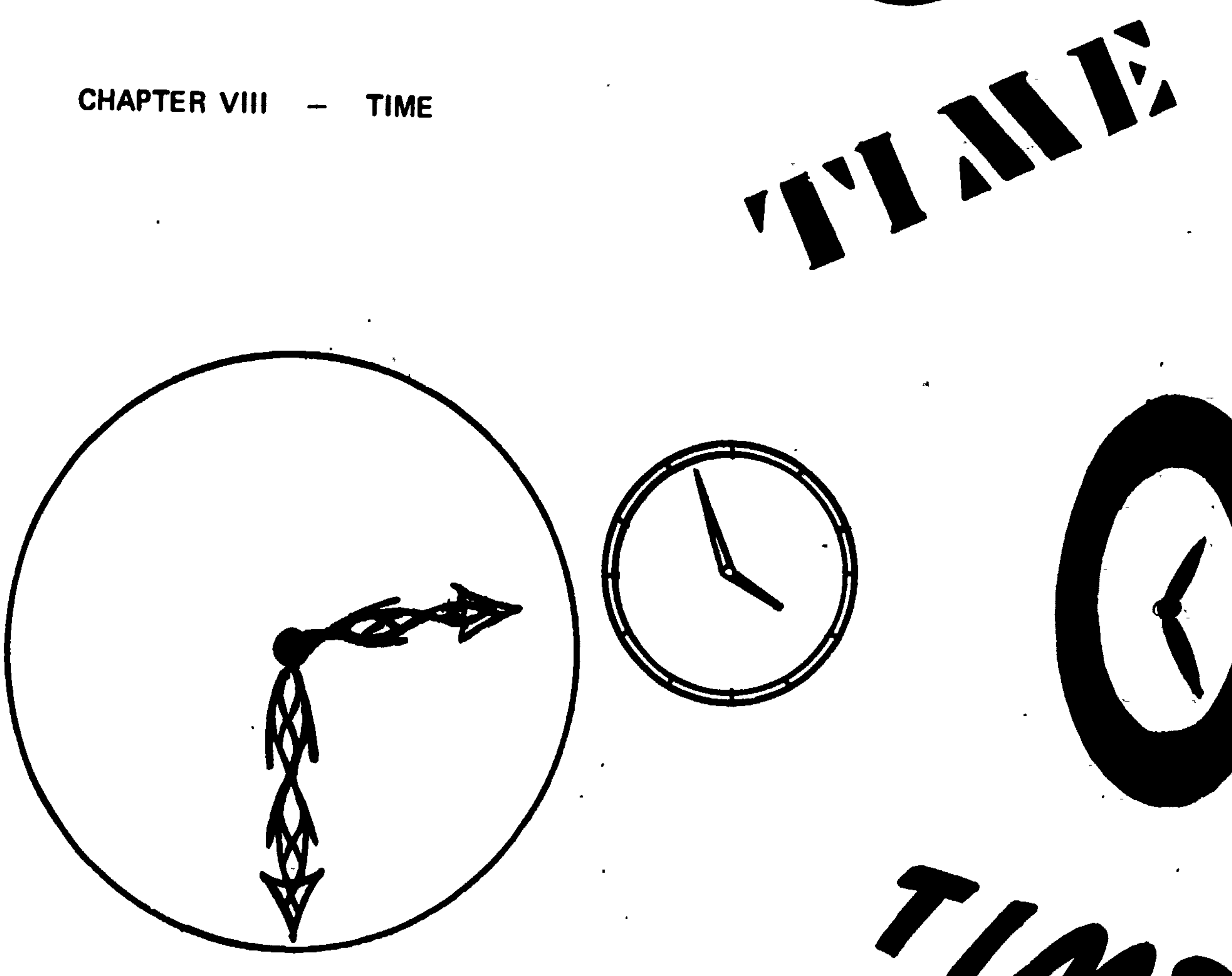
Bill's father's take-home pay after taxes is $580.00 a month. Bill's father has worked out a percent "budget" for the expenses he has to pay. How much money does he expect to spend for each item each month?

Housing costs	25%	=	
Food costs	22½%	=	
Clothing	12%	=	
Transportation	10%	=	
Savings and Insurance	9%	=	
Health Care	8%	=	
Recreation	7½%	=	
Church and other gifts	6%	=	
Total =	%		$

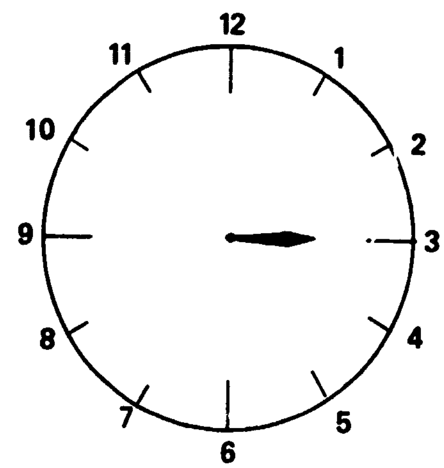
Time to halt again! Are you sure you understand the problems you have just completed? If so, you can begin the next chapter on TIME.



CHAPTER VIII — TIME

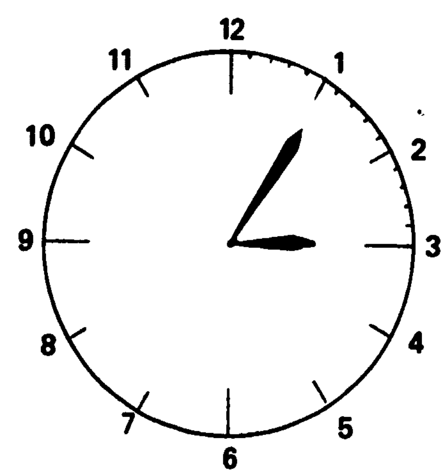


TELLING TIME



Each clock can measure 12 hours or ½ of a day.

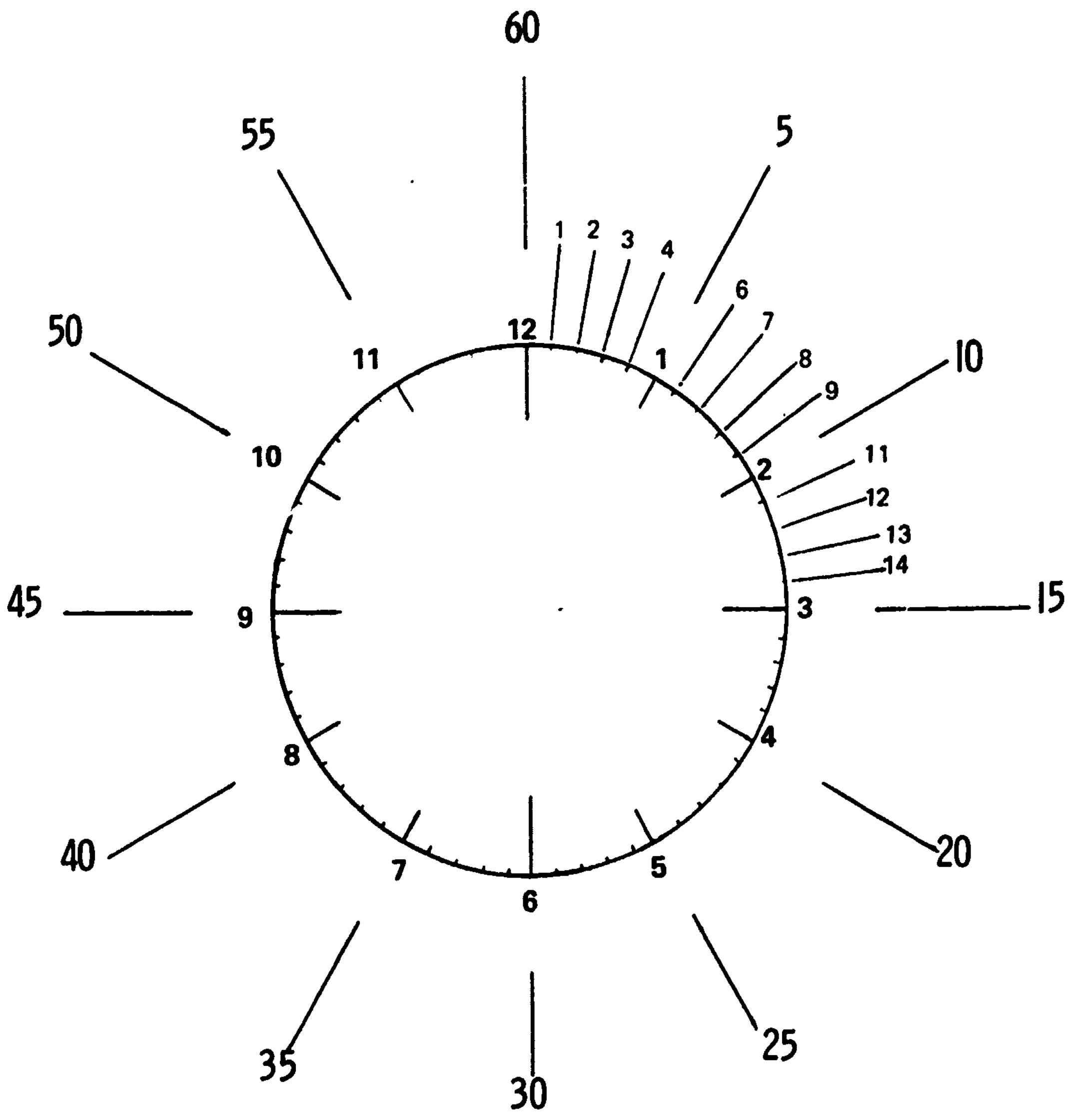
The small "hand" or **hour hand** points to the hour.

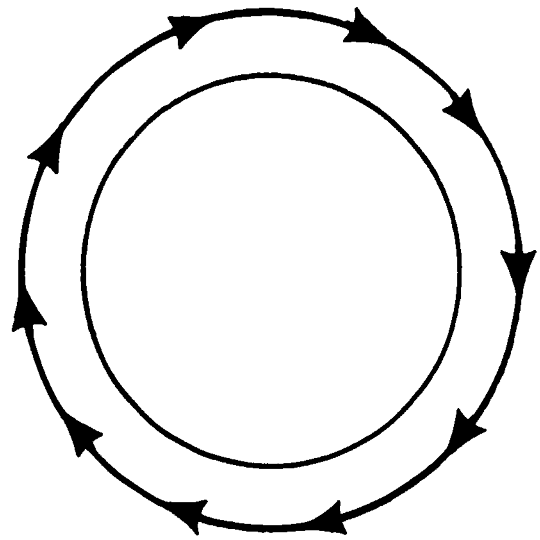


Each clock can measure 60 minutes or 1 hour.

The large "hand" or **minute hand** points to the minute.

The clock is divided into 12 parts of five minutes each. This makes a total of 60 minutes or one hour.

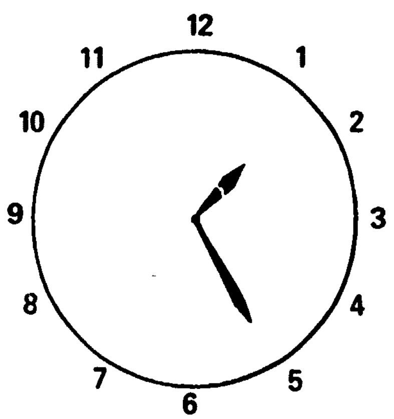




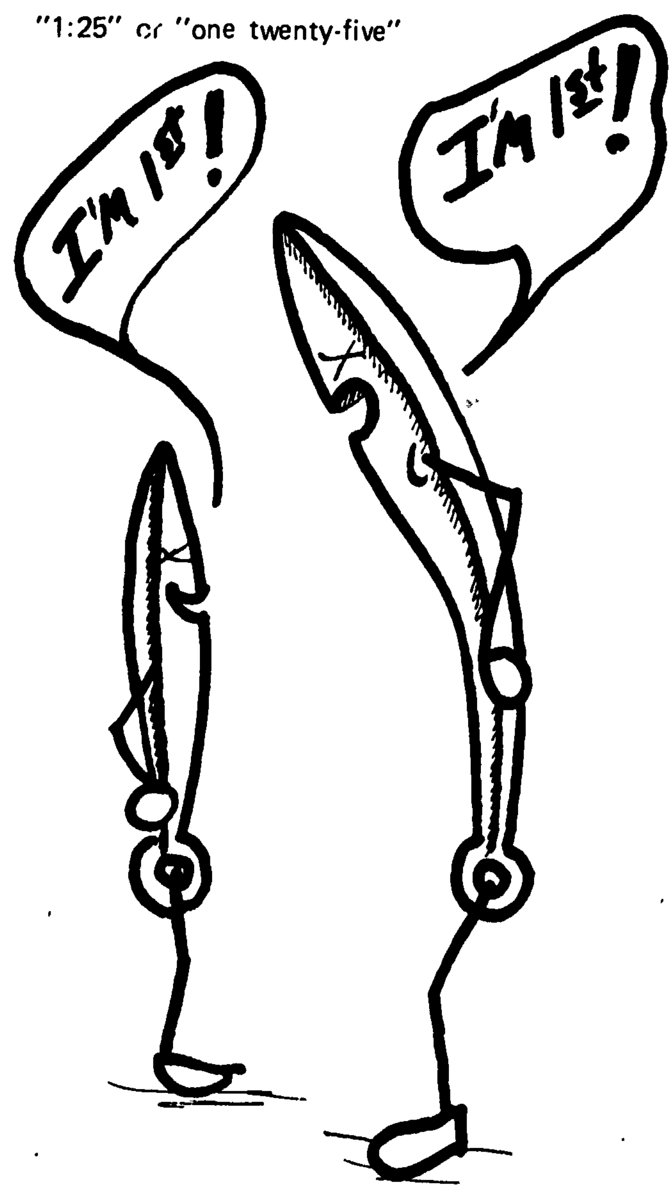
We always "tell" or "read" time in this direction.

This is known as "clockwise."

There are two ways of "telling" time. The first way is to "read" the hour hand first and the minute hand last.



"1:25" or "one twenty-five"



The other way is to read the minute hand first and the hour hand last. This way of telling time is usually spoken and not written, except in story books.

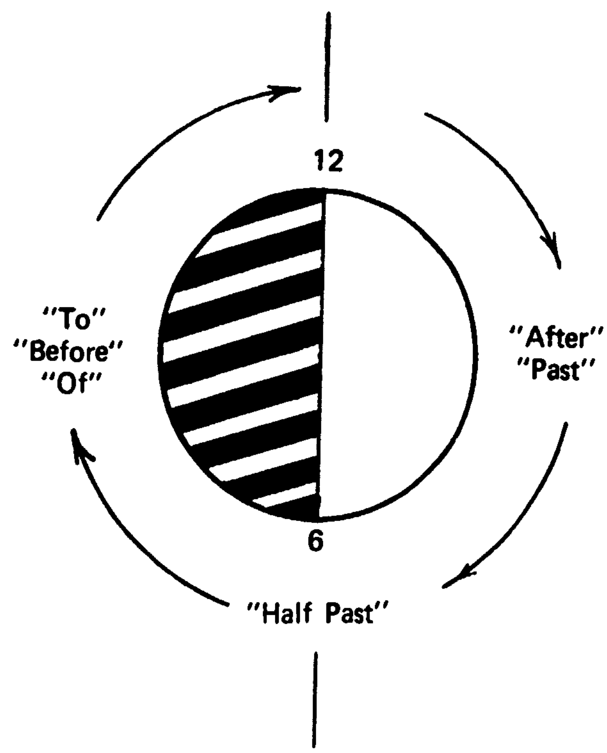
For the clock above, you would say "twenty-five minutes after 1."

When we tell the time to someone, we often say:

"It's ten of . . ."
"It's half past . . ."
"It's twenty after . . ."

Divide your clock in half and it will be easy.

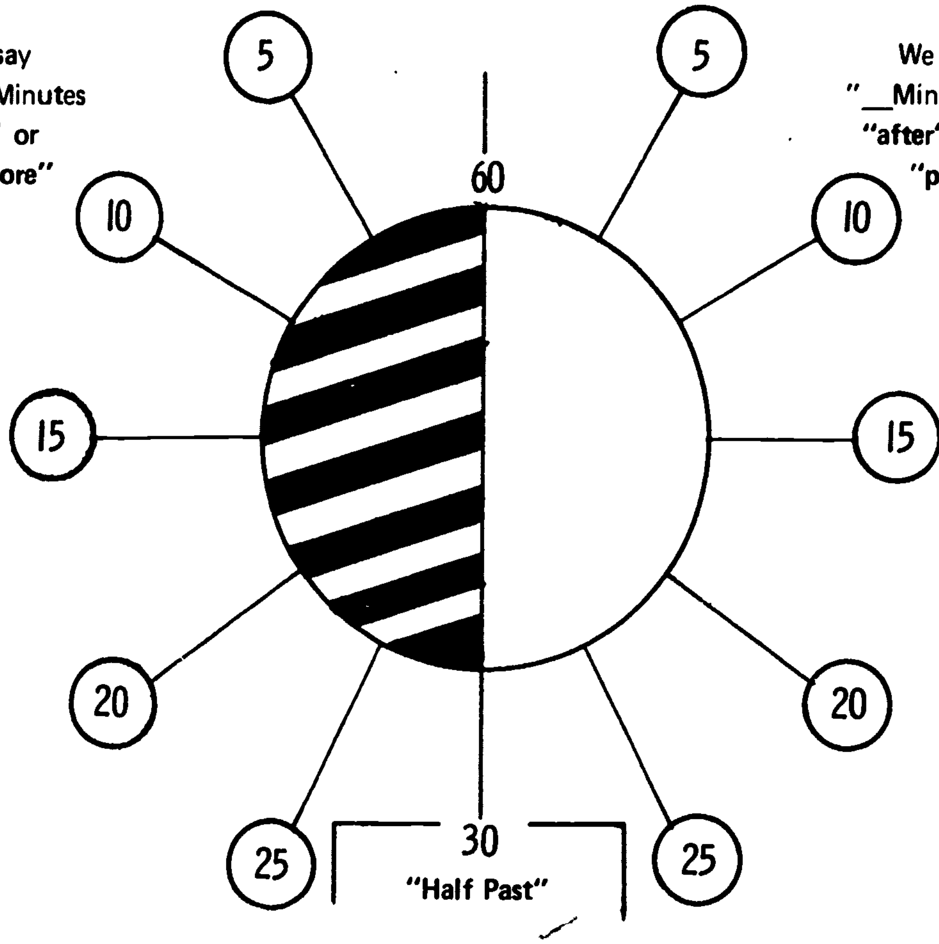
These are the words you need when the minute hand is in this half.



These are the words you need when the minute hand is in this half.

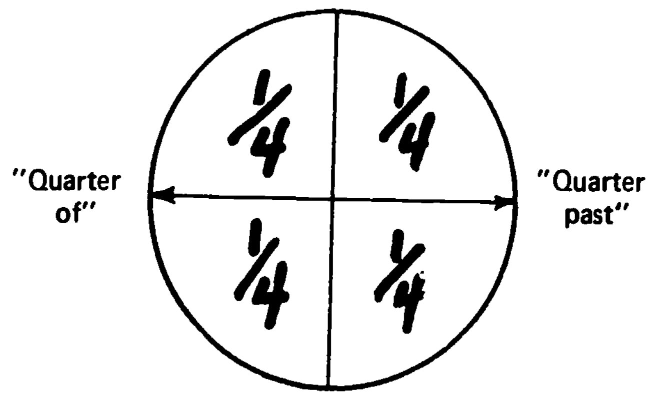
We say "__Minutes "to" or "before"

We say "__Minutes "after" or "past"



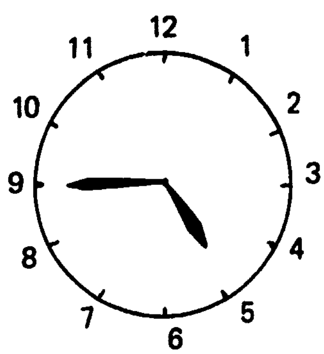
We divide the clock into quarters too.

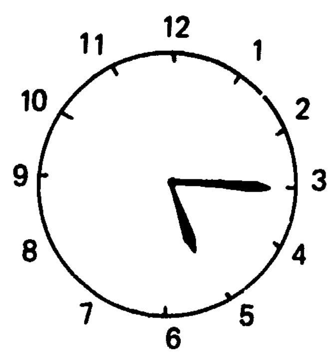
Each quarter is 15 minutes long.



Example:

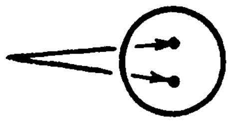
"Quarter of five"





"Quarter Past five"

When you write time, or when you add, subtract and multiply time, you must remember to keep the hour and the minutes separated with these two

marks. 

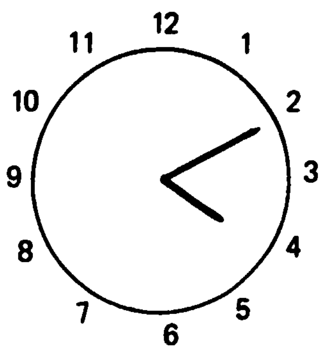
Always put the hour first when you write time.

Examples:

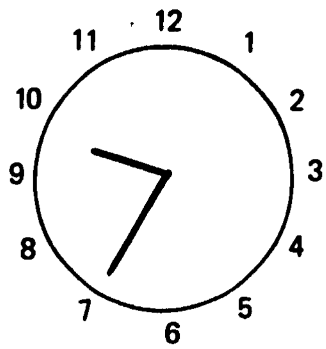
1:15, 3:30, 12:12

2:20 means: twenty minutes **past** two o'clock.
7:45 means forty-five minutes **past** seven o'clock.

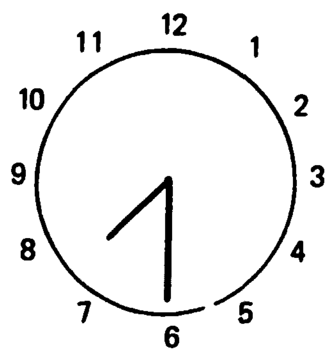
Let's practice what we have learned. Write the time:



___ : ___



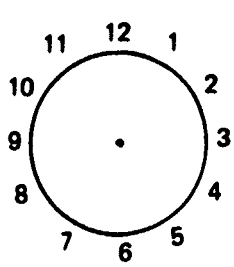
___ : ___



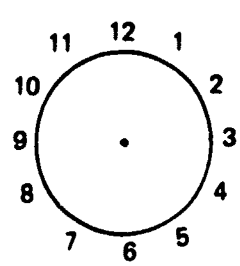
___ : ___

Draw the "hands" on the clock.

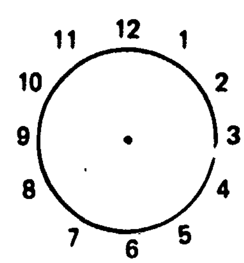
9:15



6:55



10:45



There are 24 hours in each day, but our clocks measure only 12 hours or ½ of a day. How do we know if we are talking about morning, afternoon or night? A long time ago someone added A.M. and P.M. to our time. "A.M." is the time from 12:00 midnight to 12:00 noontime. We call this time MORNING.

"P.M." is the time from 12:00 noontime to 12:00 midnight. This time has several names.

P.M.
- AFTERNOON – The time from noon to evening (12:00 to about 6:00).
- EVENING – The time from sunset to dark (about 6:00 to 8 or 8:30).
- NIGHT – The time of darkness (about 9:00 to 12:00).

Sometimes we think of NIGHT as starting when we go to bed until we wake up in the morning. "Did you sleep well all night?" "Wasn't it cold last night!"

When we talk like this, we mean "night" as being from darkness to sunrise.

Let's see if you can hit a "home run" when you do the quiz on the next page.

QUIZ

1. How many minutes in ¼ of an hour?

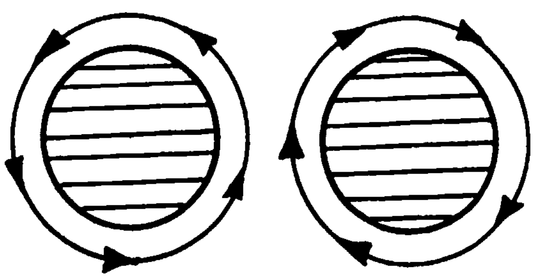
2. "Half past six" is how many minutes past six o'clock?

3. How many minutes can a clock measure?

4. What time of the day is A.M.?

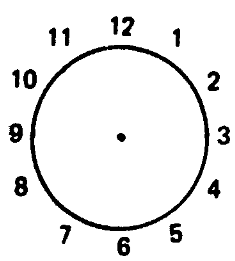
5. "Evening" is the same as P.M. / A.M. (Cross out the wrong answer.)

6. Which of these pictures shows the meaning of the word "clockwise"? (Cross out the wrong picture.)

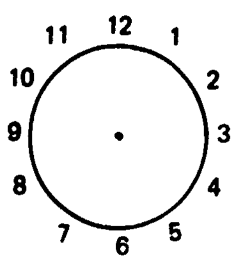


Draw the minute hand to show the right time.

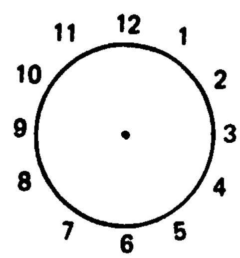
7. Half Past



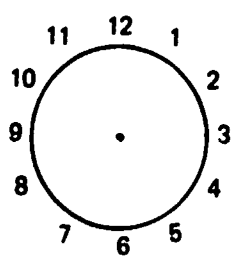
8. Ten After

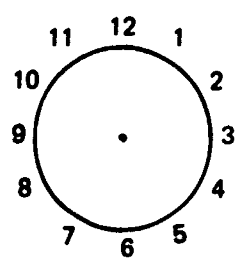


9. Twenty Of



10. Five To





11. Ten Before

Someday you will have a job. You will want to know how much time you work on the job. If you understand all of the information you have just read, it will be easy.

The most important thing to remember is to keep the hour and the minutes separated.

Remember these two marks? : USE THEM! To add and subract time, keep these marks **under each other and in line.**

Examples:

$$\begin{array}{r} 2:15 \\ +\ 3:10 \\ \hline 5:25 \end{array} \qquad\qquad \begin{array}{r} 11:20 \\ -\ 7:12 \\ \hline 4:08 \end{array}$$

The next important thing to remember is that **morning** is from 12:00 midnight to 12:00 noon. Any time you want to know how many hours you have worked in a morning, subtract your starting time from 12:00 noon.

Example:

$$\begin{array}{rl} 12:00 & \text{(noon)} \\ -\ 7:00 & \text{(starting time)} \\ \hline 5:00 & \text{(hours you have worked)} \end{array}$$

If your starting time is not "on the hour," change 12:00 to 11:60, which is the same as 12:00. (60 minutes is the same as one hour; therefore, 11 hours and 60 minutes is the same as 12 hours.)

Examples (A):

$$\begin{array}{rl} 11:60 & \text{(noon)} \\ -8:30 & \text{(starting time)} \\ \hline 3:30 & \text{(hours worked)} \end{array} \qquad\qquad \begin{array}{rl} 11:60 & \text{(noon)} \\ -\ 7:27 & \text{(starting time)} \\ \hline 4:33 & \text{(hours worked)} \end{array}$$

To figure how many hours you work in an afternoon, you subtract your starting time from your stopping time.

Examples(B):

$$\begin{array}{rl} 5:30 & \text{(stopping time)} \\ -\ 1:15 & \text{(starting time)} \\ \hline 4:15 & \text{(hours worked)} \end{array} \qquad\qquad \begin{array}{rl} 4:55 & \text{(stopping time)} \\ -\ 3:08 & \text{(starting time)} \\ \hline 1:47 & \text{(hours worked)} \end{array}$$

To find out how many hours you work in a day, find your morning hours and then add your stopping time to your morning hours.

Example (C):

$$\begin{array}{rl} & 11{:}60 \text{ (noon)} \\ - & \underline{8{:}30} \text{ A.M. (starting time)} \\ & 3{:}30 \text{ (hours worked in the morning)} \\ + & \underline{5{:}00} \text{ P. M. (stopping time)} \\ & 8{:}30 \text{ (hours worked in a day)} \end{array}$$

Notice that this way is different in the afternoon from Example B.

Let's try a few more.

1. You start work at 7:30 A.M. and work to 4:00 P.M. How many hours have you worked?

(Find your morning hours first.)

$$\begin{array}{rl} & 11{:}60 \text{ (noon)} \\ - & \underline{7{:}30} \text{ (starting time)} \\ & 4{:}30 \\ \text{(Add your stopping time.)} + & \underline{4{:}00} \text{ (stopping time)} \\ & 8{:}30 \text{ (total hours)} \end{array}$$

2. You start work at 9:00 A.M. and leave work at 5:00 P.M. How many hours have you worked?

$$\begin{array}{rl} & 12{:}00 \text{ (noon)} \\ - & \underline{9{:}00} \text{ (starting time)} \\ & 3{:}00 \\ + & \underline{5{:}00} \text{ (stopping time)} \\ & 8{:}00 \text{ (total hours)} \end{array}$$

If you are paid by the hour, you must remember that you are not paid for your lunch time. Be sure to subtract your lunch time from your "total hours."

Example: If, in your problem # 1, you had a 30-minute lunch hour, you would subtract that from your total hours.

$$\begin{array}{rl} & 8{:}30 \text{ (Total hours)} \\ - & \underline{:30} \text{ (Lunch time)} \\ & 8{:}00 \text{ (Hours worked)} \end{array}$$

Remember, the important thing is to keep the hours and minutes separate. But sometimes we must change our minutes to hours. This is easy if you remember that 60 minutes (00:60) is the same as 1 hour (1:00).

Example:

```
   2:30
+  1:30
   ----
   3:60
```

Since :60 is the same as 1:, we subtract :60 and add $\boxed{1:}$.

```
   3 : 60
+ [1]: -60
  ---------
   4 : 00 (Total hours)
```

Example:

```
   4 : 55
+  2 : 15
  --------
   6 : 70
+ [1]: -60
  --------
   7 : 10
```

Every time you subtract :60 you must add $\boxed{1:}$.

To be sure we understand, let's try some more problems.

```
    3 : 35
    4 : 15
+   5 : 28
  ---------
   12 : 78 (Answer)
+ [1] : - 60 (Change to hours)
  ---------
   13 : 18 (Total hours and minutes)
```

PROBLEM

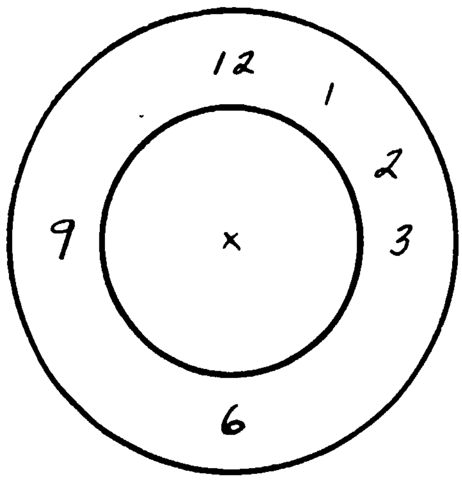
How many hours did you work if you worked 8½ hours on Monday, 7½ on Tuesday, 8 on Wednesday, 8¼ on Thursday, and 7¾ hours on Friday? (If your answer is :60 minutes or higher, subtract :60)

```
Mon.     8:30
Tues.    7:30
Wed.     8:00
Thurs.   8:15
Fri.     7:45
        ------
        38:120 (Answer)
       + 1:-60
        ------
        39: 60
       + 1:-60 (Change)
        ------
        40: 00 (Total hours)
```

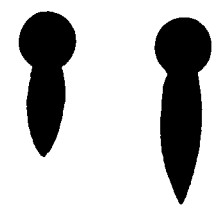
Isn't it easier to understand if you say, "I worked forty hours," than to say, "I worked thirty-eight hours and one hundred and twenty minutes"? This is why we try to change minutes to hours.

THINGS TO DO

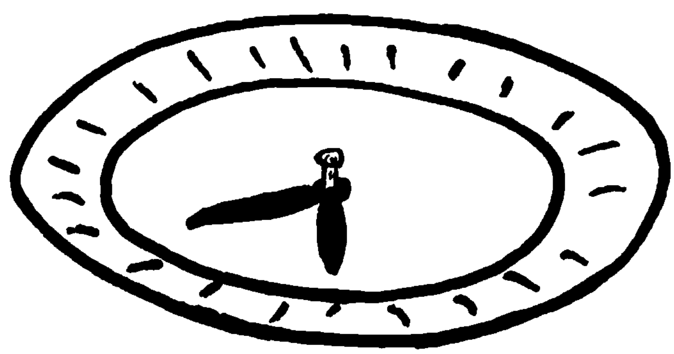
Take a paper plate. Find the center and make a small "X". Work carefully and mark a clock face on the edge, using regular numbers. Start with 12 and 6. Then 9 and 3. Fill in the other numbers as you go.



Now make a pair of "hands" out of paper.



With a "paper punch," punch a hole in the round part of the hands. Then with a brass "paper fastener" (round head, ¾"), fasten the hands together on the clock, right on the "X".



Be sure that the hands can turn easily.

Using this clock, practice telling time. Play a game with the person seated near you. You move the hands, he tells the time. I am sure you will be able to think up many other games using this clock.

THINGS TO DO

Keep a record of your time for one week. Make a record like this one.

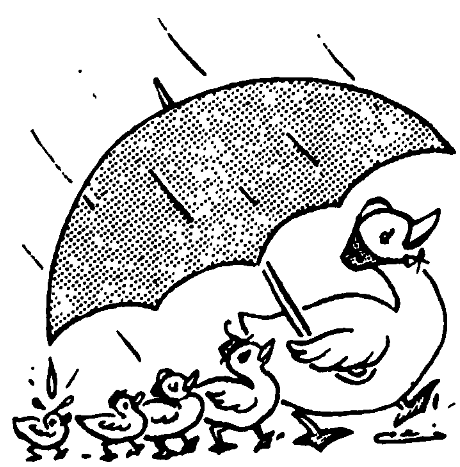
	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.	Total
Clean up Bedroom,etc.								
School A.M.								
School P.M.								
Meals Breakfast								
Meals Lunch								
Meals Dinner								
Gym or Sports								
Spare Time								
T. V.								
Snack Bar								
Reading								
"Talking"								
Sleeping								

WHERE do you spend most of your time?

WHAT are you doing most of the time?

WHEN do you think you work the hardest?

Now follow these ducks
to the next page and
do the quiz.



QUIZ

1. MORNING is from __:00 to __:00.

2. 11:60 is the same as __:__.

3. You started work at 8:00 A.M. and worked until noontime. How many hours did you work?__________

4. You started work at 1:30 P.M. and worked to 7:35 P. M. How long did you work?__________

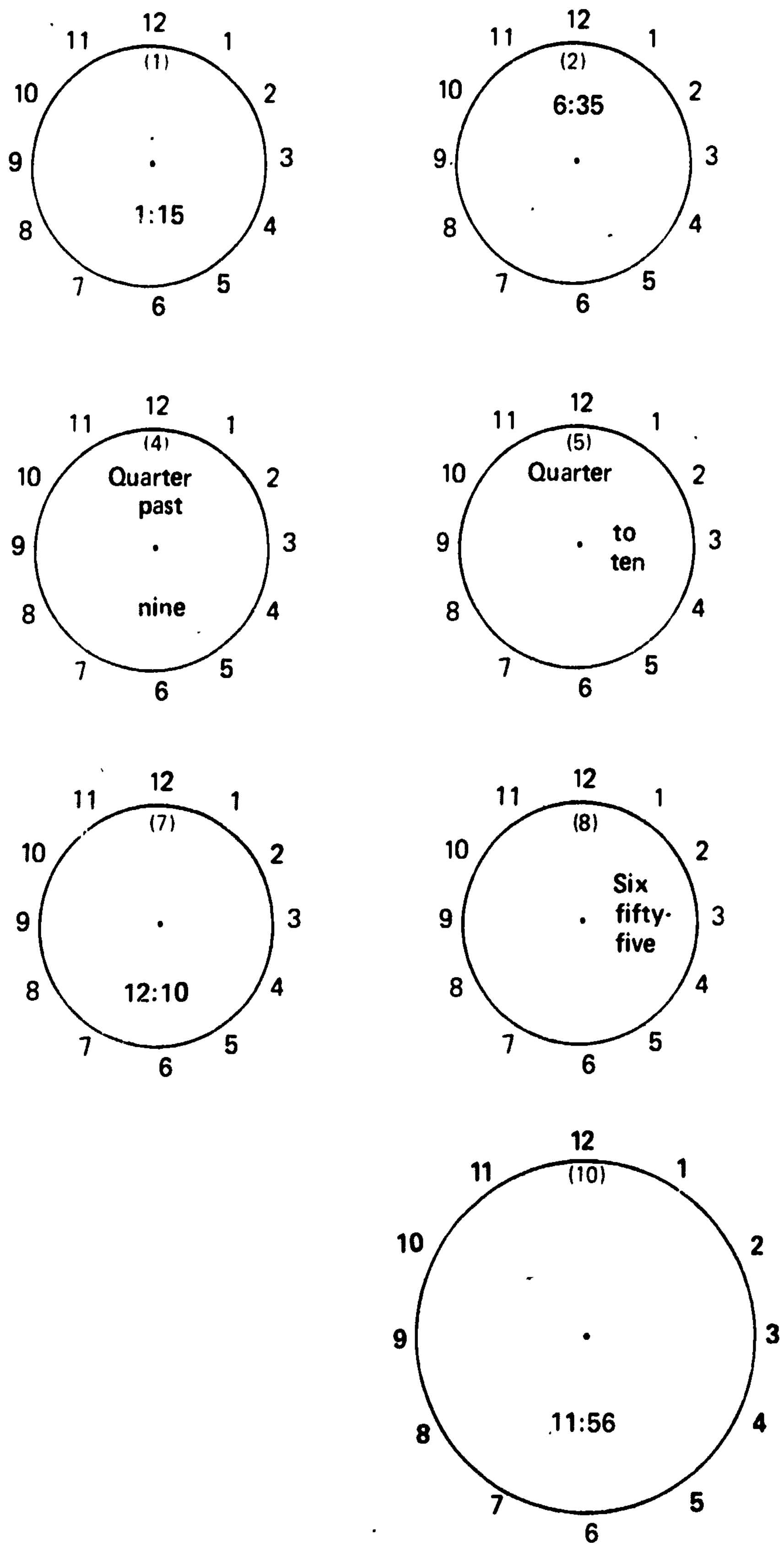
5. You started work at 7:45 in the morning and stopped working at 4:30. How long did you work?__________

6. You started work at 8:15 A.M. and worked to 5:00. How long did you work?__________
   If you had a half-hour lunch that you were not paid for, how many hours will you get paid for?__________

7. You started work at 6:15 A.M. and stopped at 5:55 P. M. How many hours did you work?__________

PROBLEMS

Draw "hands" on these clock faces to show the time.

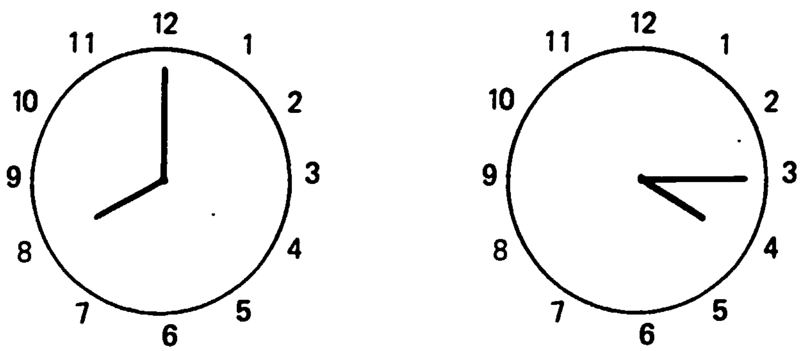


PROBLEMS

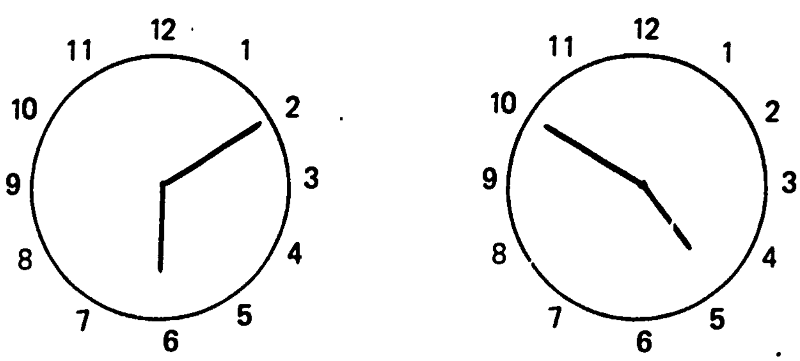
How many hours?

	FROM	TO	HOURS
1.	7:30 A.M.	1:15 P.M.	
2.	6:45 A.M.	12:05 P.M.	
3.	8:00 A.M.	4:30 P.M.	
4.	9:15 A.M.	3:45 P.M.	
5.	7:08 A.M.	4:19 P.M.	

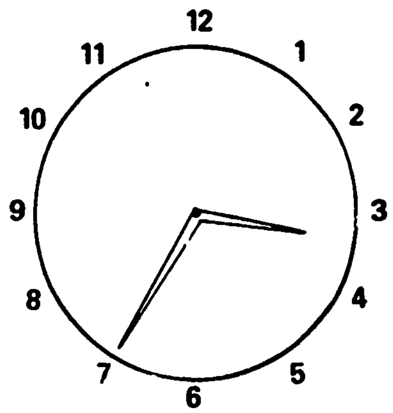
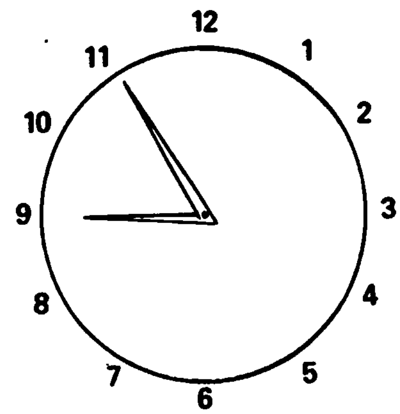
	A. M.	P. M.	HOURS
6.	Twenty past eight	Four fifteen	
7.	Quarter of nine	Half past four	
8.	Ten minutes to ten	Three thirty	
9.	Half past five	Twenty before four	
10.	Quarter after six	Five fifty-five	



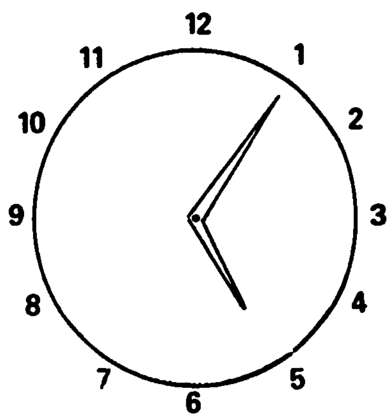
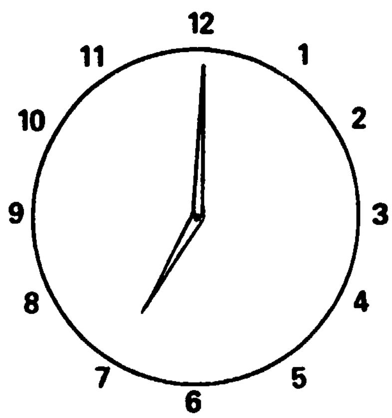
From__:__to__:__ is ___ hours and __ minutes.



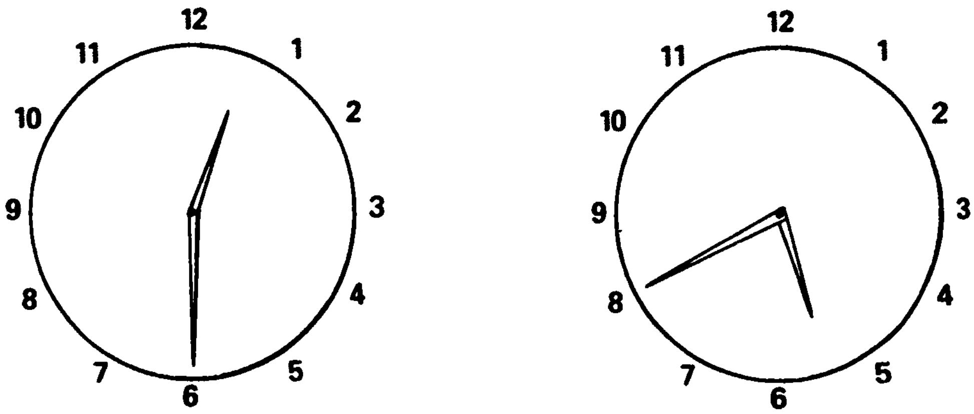
From__ :__ to__ : __ is ___hours and __ minutes.

From ____:____to____ :____ is ____ hours and ____ minutes.

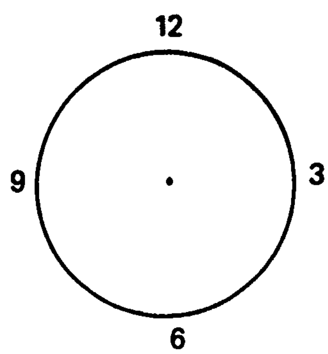
From ___: ___ to___ :___ is___ hours and____ minutes.



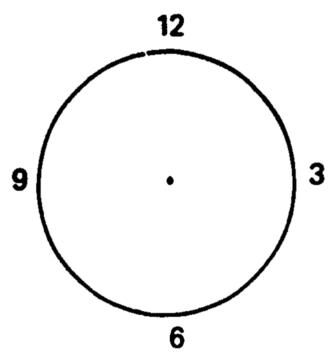
From ___ : ___ to ___ : ___ is ___ hours and ___ minutes.

Draw hands to show the time.

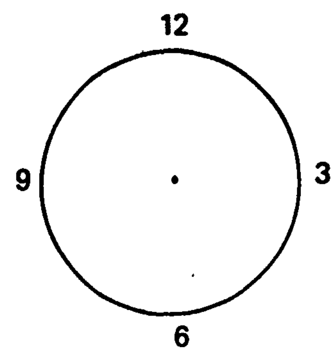
12:05



1:15



6:55



1. If your boss pays you $1.75 an hour and you work 8 hours a day, how much do you earn a day? $________

2. If you are paid $1.56 an hour and you work forty hours a week, how much do you earn a week? $________

3. You are paid $1.85 an hour. You worked 6 hours on Monday, 7 on Tuesday, 8 each on Wednesday and Thursday, and 5½ on Friday. How much did you earn this week? $________

4. Your boss pays you $14 for an 8-hour working day. If you work 48 hours a week, how much does your boss pay you? $________

5. A boy lived and worked on a farm for the summer. He was paid $1.10 an hour. How much was he paid if he worked 8 hours a day for 86 days? $_____

These problems will interest girls.

1. Muffins are baked in an oven set at 400° for 25 minutes. If you put the muffins in the oven at 2:35, what time would they be finished? ____ : ____

2. Vanilla pudding should be chilled in the refrigerator for 15 minutes before serving. If you placed the pudding in the refrigerator at 5:30, what time would the pudding be ready to serve? ____ : ____

3. Lemon drop cookies will bake in a 375° oven in 12 minutes. If you baked three groups of cookies for 12 minutes each, how many minutes would you be using the oven?__________

4. To make cream puffs, you first bake them in a 450° oven for 15 minutes. You then reduce the oven to 350° and bake them 25 minutes longer. If you start baking at 1:15 P.M.,

   a. at what time do you reduce the oven to 350°?___ : ____

   b. at what time should the "puffs" be finished? ____ : ____

These problems will interest girls.

1. To prepare an apple pie takes 45 minutes. You then bake it for 15 minutes at 450° and then for 30 more minutes at 350°. How long does it take you to prepare and bake an apple pie?__________

2. When you prepare stuffed peppers, you first parboil the peppers for 10 minutes. You then stuff the peppers, which takes 5 minutes. Then bake for 25 minutes. If you started boiling the peppers at 3:45, at what time should they be ready to serve?__________

3. A casserole should be served hot. It takes forty minutes for a macaroni casserole to bake. At what time should you put the casserole into the oven to bake if you plan to serve it at 6:45?

4. A pot roast is simmered over a low flame for three hours. If you start the roast at 12:30, at what time would the roast be done? ___ : ___

   You add vegetables 40 minutes before the roast is done. At what time would you do this? ___ : ___

These problems will interest boys.

Refinishing a Fender

1. It takes about 30 minutes to sand a fender, and about 25 minutes to "mask" with tape and paper before you prime-paint the fender. How long does it take you to get this fender ready to prime? __________

2. Now to prime-paint. It takes about 12 minutes to prime the fender, 9 minutes to clean your spray gun, and 45 minutes to sand the fender again to make it ready for the painting of the color coats. If you started to spray the primer coat of paint at 10:45, what time will it be when the car is ready for the color coats?
_____ : _____

3. You start to paint the color coats at 12:30 P.M. The first light coat takes 5 minutes. The second, medium coat takes 7 minutes to spray and 4 minutes to set. The third coat takes 7 minutes to spray and 6 minutes to set. The final wet coat takes 8 minutes of spraying. While you are cleaning your spray gun – 11 minutes – the paint dries. Then you take off the paper and tape in 4 minutes.

   How long does all of this work take?__________

   What time is it when you finish taking off the tape?__________

These problems will interest boys.

1. It took George 10 minutes to stain a bookcase. He allowed a half hour for the stain to set and then rubbed off the stain in 5 minutes. How many minutes did George work on the bookcase?__________

2. The next day, George sprayed the bookcase with lacquer. It took him 20 minutes to get ready and 4 minutes to spray. He waited 15 minutes and then sprayed again for 4 minutes. Then he spent 17 minutes cleaning up. How long did it take George to set up, spray, and clean up?__________

3. If the boss pays George $1.75 an hour, how much did it cost the boss to have George stain and spray this bookcase?__________

4. An astronaut made six orbits around the earth before starting his engine to take off for the moon. Each orbit was 88 minutes long. If he started the first orbit at 9:35 A.M., what time was it when he started the engine for the trip to the moon?
_____:_____

1. Gordon works 40 hours a week in an upholstery shop. If he is paid $2.20 an hour, how much does he earn a week? __________

2. If it took him 16 hours to reupholster a couch, how much pay did Gordon receive for that couch? $_____

3. If Gordon works 50 weeks a year, how much money does he earn in a year? $__________

4. If Gordon's boss pays him a salary next year of $95.00 a week, how much more money will he earn next year? $ __________

5. Gordon's boss got an order to upholster some new chairs. If he can do two chairs a day, 5 days a week, how many chairs can he make in three months (13 weeks)?

____

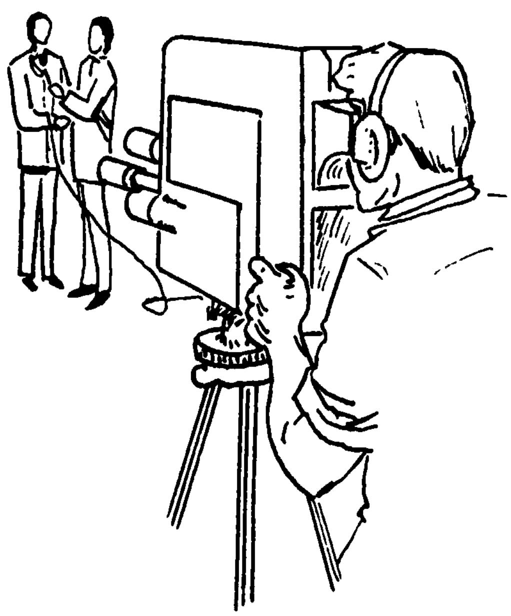
6. At $35 a chair, how much are all these chairs worth? $__________

1. A carpenter did a repair job for which he furnished the materials costing $73.18. He worked 4½ days, eight hours a day. He was paid $5.50 an hour. How much did the repair job cost altogether?__________

2. One of our Seniors works after school and is paid $1.40 an hour. What were his earnings the first four weeks of this year if he worked: first week, 10½ hours; second week, 8¼ hours; third week, 9¾ hours, and the fourth week, 6½ hours?____

3. A married couple just rented an apartment for $125 a month. How much will this cost them for a year? $ ______ For five years? $ __________

4. A popular television show costs the sponsor $5,640 a day. How much does the show cost in a year if it is telecast five days a week for the whole year? ________



ROMAN NUMERALS

Clock faces have numbers on them. We all know this because they tell us what time it is when we look at a clock. We all know the numbers 1, 2, 3, 4, 5 and so on, but some of us do not always understand numbers like these — II, IV, X.

These numbers are called Roman Numerals. As you can guess, they were used by the "Romans" of Italy many, many years ago. Clocks are not the only place Roman Numerals are used. Many times the chapters in books are numbered in this way.

Here are some Roman Numerals for large numbers:

C = 100
M = 1,000
D = 500
L = 50

Since we are discussing time, we will learn only the numerals from 1 to 12, or from I to XII.

Study this table:

1	2	3	4	5	6	7	8	9	10	11	12
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII

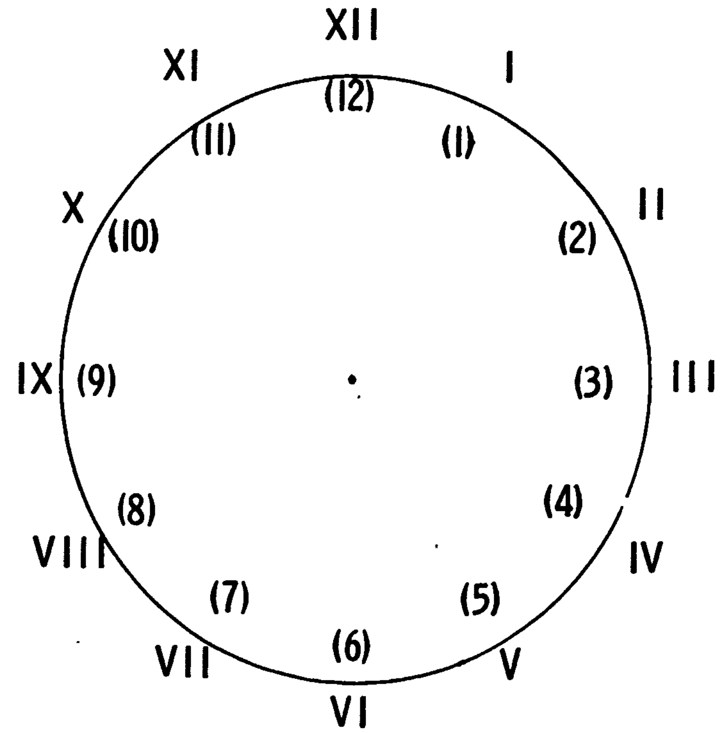
Each number has the Roman Numeral under it that means the same thing.

Examples:

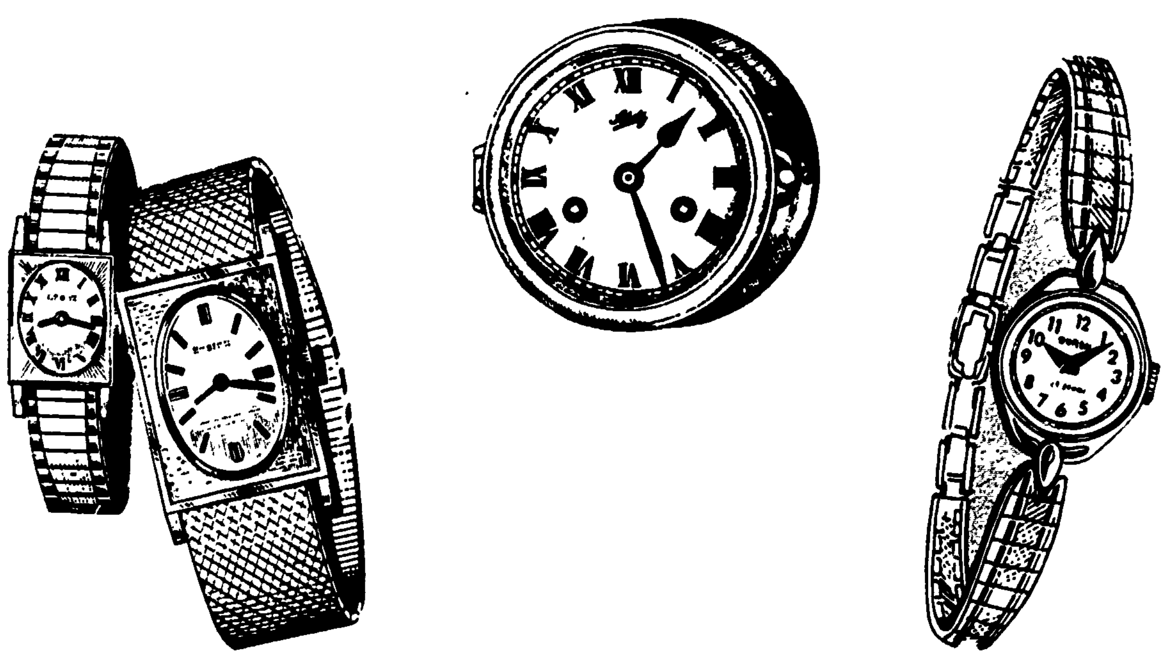
V is the Roman Numeral for 5.
X is the Roman Numeral for 10.

Sometimes the 4 is written IIII instead of IV.

Now let's put the numbers and Roman Numerals on a clock and see how they look.



When you see a clock face with Roman Numerals, you still tell time the same way. The only thing that has changed is that the "numbers" are changed to "numerals."



PROBLEMS

I	II	III	IV	V	VI	VII	VIII	IX	X
1	2	3	4	5	6	7	8	9	10
XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX
11	12	13	14	15	16	17	18	19	20

Write the number for each Roman Numeral.

1.	I=___	II=___	IV=___
4.	VI=___	V=___	VII=___
7.	IX=___	XI=___	X=___
10.	XII=___	VIII=___	III=___
13.	XX=___	XI=___	XIII=___
16.	XII=___	XXI=___	XIX=___
19.	XVIII=___	XVII=___	XXII=___
22.	XV=___	XVI=___	XXIV=___
25.	XXX=___	XXXVII=___	XXIII=___
28.	XXXII=___	XXXI=___	XXXIV=___
31.	XXVII=___	XXV=___	XXVI=___
34.	XXXIX=___	XIV=___	XXXIII=___
37.	XXIX=___	XXXV=___	XXVII=___
40.	XXVIII=___	XXVI=___	XXIV=___
43.	XIII=___	XXXVIII=___	XXXI=___
46.	XXIX=___	XXXII=___	XXXVI=___

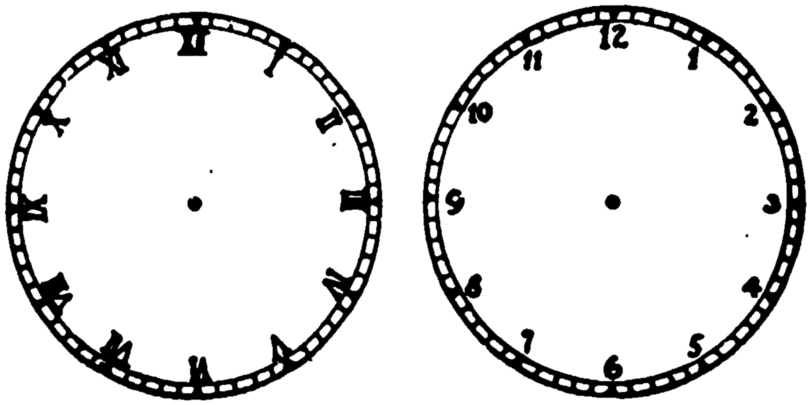
Write the Roman Numeral for each number.

49.	1=________	5=________	10=________
52.	2=________	20=________	30=________
55.	3=________	8=________	18=________
58.	4=________	9=________	19=________
61.	6=________	11=________	16=________

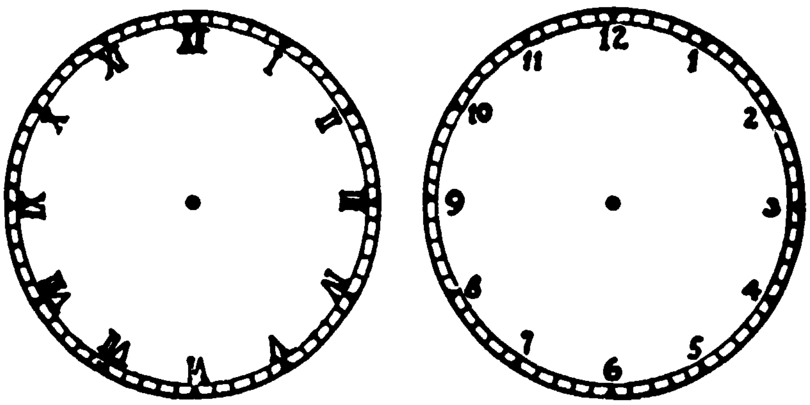
PROBLEMS

Draw "hands" on the clock faces to show the times listed below:

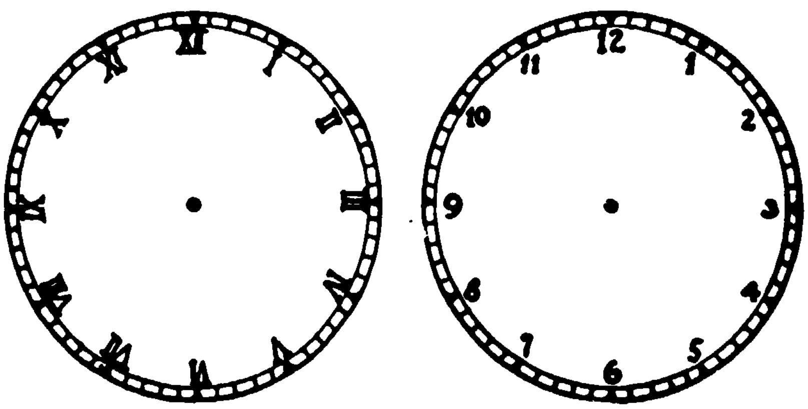
9:15



7:30



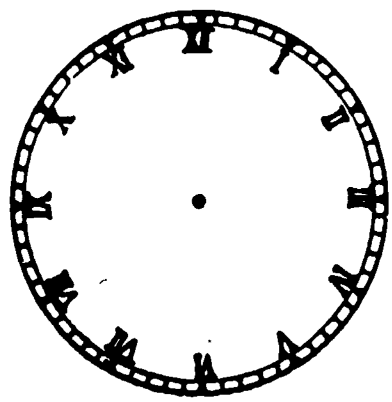
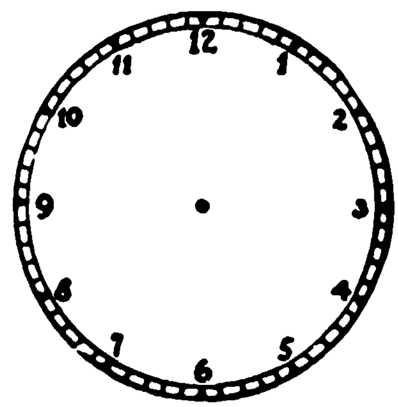
3:20



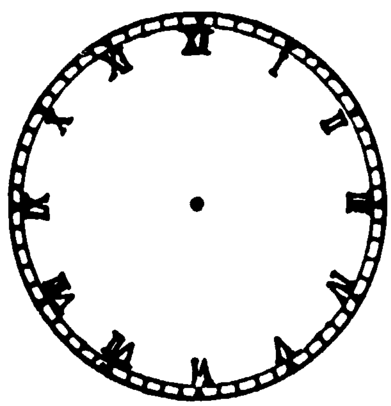
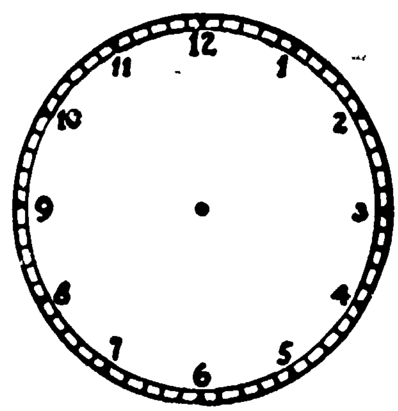
PROBLEMS

Draw "hands" on the clock faces to show the time listed below:

1:45

12:17

8:43