Mental Arithmetic.

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FRACTIONS, ETC.

When pupils have learned to add and subtract fractions by the ordinary method, they will be much interested in a simple artifice by which the operation may be performed by a rapid mental solution.

Place upon the board a few questions in addition:

$$\frac{1}{3} + \frac{1}{4}$$
 $\frac{1}{6} + \frac{1}{7}$ $\frac{1}{73} + \frac{1}{10}$

Ask the pupils to add these by the ordinary methods. They of course get the answers $\frac{7}{18}$, $\frac{13}{180}$. How is 7 obtained from 3 and 4? How is 12 obtained from 3 and 4? How is 13 obtained from 6 and 7 How is 42 obtained from 6 and 7? How is 23 obtained from 13 and 10? How is 130 obtained from 13 and 10? When the pupils clearly see that the numerator of the sum is found by adding the denominators, and the denominator of the sum by multiplying, place many such questions upon the board, asking for "hands up" to supply answers.

 $\frac{1}{1^{1}} + \frac{1}{9} = ?$ $\frac{1}{9^{0}} + \frac{1}{7} = ?$ $\frac{1}{3^{0}} + \frac{1}{11} = ?$

It will be observed that these fractions have denominators which are prime to each other; but even when not prime, the operation can be performed more quickly by this method than by finding the "least common denominator."

Thus
$$\frac{1}{4} + \frac{1}{6} = \frac{6+4}{24} = \frac{10}{24} = \frac{5}{12}$$

 $\frac{1}{9} + \frac{1}{12} = \frac{12+9}{108} = \frac{21}{108} = \frac{7}{36}$

All these steps can be readily kept "in mind," so that a pupil, after a little practice, will infer the answer at a glance.

When the numerators are greater than unity, as

 $\frac{4}{7} + \frac{3}{10}$, $\frac{2}{3} + \frac{5}{11}$, $\frac{7}{9} + \frac{1}{2}$, lead the pupils to observe that the results are:

$$+\frac{3}{10} = \frac{4 \times 10 + 3 \times 7}{70} = \frac{61}{70}, \frac{2}{3} + \frac{5}{11} = \frac{22 + 15}{33} = \frac{37}{33}$$

The brightest pupils will add three fractions almost as readily:

$$\frac{1}{1} + \frac{1}{2} + \frac{1}{3} = \frac{2 \times 5 + 3 \times 2 + 3 \times 5}{30} = \frac{10 + 6 + 15}{30} = \frac{31}{30}$$

In subtraction:

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$$\frac{1}{4} - \frac{1}{7} = \frac{7 - 4}{28} = \frac{3}{28}$$

$$\frac{3}{4} - \frac{9}{3} = \frac{3 \times 3 - 4 \times 2}{12} = \frac{9 - 8}{12} = \frac{1}{12}$$

$$\frac{5}{6} - \frac{3}{4} = \frac{20 - 18}{24} = \frac{9}{24} = \frac{1}{12}$$

RAPID MULTIPLICATION.

My pupils are much interested in certain forms of rapid multiplication which will apply to a great variety of numbers. The simplest of these are:

- What part of 100 is 50? Then: $48 \times 50 = \frac{1}{2}$ of $48 = 24 \times 100 = 2400$ $64 \times 50 = \frac{1}{2}$ of $64 = 32 \times 100 = 3200$
- What part of 100 is 25? Then: $48 \times 25 = \frac{1}{4}$ of $48 = 12 \times 100 = 1200$ $64 \times 25 = \frac{1}{4}$ of $64 = 16 \times 100 = 1600$
- What part of 100 is 75? Then: $48 \times 75 = \frac{3}{4}$ of $48 = \frac{36}{100} = \frac{3600}{64} = \frac{3600}{48}$
- What part of 100 is $12\frac{1}{2}$? Then: $48 \times 12\frac{1}{2} = \frac{1}{8}$ of $48 = 6 \times 100 = 600$ $64 \times 12\frac{1}{2} = \frac{1}{8}$ of $64 = 8 \times 100 = 800$
- How much is 99 less than 100? Then: $35 \times 99 = 3500 - 35 = 3465$ $85 \times 99 = 8500 - 85 = 8415$
- How much is 98 less than 100? Then: $35 \times 98 = 3500 - 2 \times 35 = 3430$ $85 \times 98 = 8500 - 2 \times 85 = 8330$

How much is 49 less than 50? Then: $48 \times 49 = 2400 - 48 = 2352$ $64 \times 49 = 3200 - 64 = 3136$

- Mow much is 51 more than 50? Then: $48 \times 51 = 2400 + 48 = 2448$ $64 \times 51 = 3200 + 64 = 3264$
- How much is 52 more than 50? Then: $48 \times 52 = 2400 + 96 = 2496$ $64 \times 52 = 3200 + 128 = 3328$
- How much is 26 more than 25? Then: $48 \times 26 = 1200 + 48 = 1248$ $64 \times 26 = 1600 + 64 = 1664$

How much is 24 less than 25? Then: $48 \times 24 = 1200 - 48 = 1152$ $64 \times 24 = 1600 - 64 = 1536$

The teachers will observe that this entire operation can be readily performed by a mental solution, and after some practice very large numbers may be used which makes the exercise the more attractive to the pupils.

The Doukhobor migration of eight thousand persons from Southern Russia to Canada in 1899 was the greatest modern exodus of a whole people.