

Mental Math

Tips and Tricks: Know Your Fractions

$$\frac{1}{1} = 1$$

$$\frac{1}{2} = 0.5$$

$$\frac{1}{3} = 0.\bar{3}$$

$$\frac{1}{4} = 0.25$$

$$\frac{1}{5} = 0.20$$

$$\frac{1}{6} = 0.1\bar{6}$$

$$\frac{1}{7} = 0.142857$$

$$\frac{1}{8} = 0.125$$

$$\frac{1}{9} = 0.\bar{1}$$

$$\frac{1}{10} = 0.10$$

$$\frac{1}{7} = 0.142857$$

$$\frac{2}{7} = 0.285714$$

$$\frac{3}{7} = 0.428571$$

$$\frac{1}{11} = 0.0\bar{9}$$

$$\frac{1}{12} = 0.08\bar{3}$$

$$\frac{1}{13} \approx 0.077$$

$$\frac{1}{14} = 0.0714285$$

$$\frac{1}{15} = 0.0\bar{6}$$

$$\frac{1}{16} = 0.0625$$

$$\frac{1}{17} \approx 0.059$$

$$\frac{1}{18} = 0.0\bar{5}$$

$$\frac{1}{19} \approx 0.0525$$

$$\frac{1}{20} = 0.05$$

$$\frac{4}{7} = 0.571428$$

$$\frac{5}{7} = 0.714285$$

$$\frac{6}{7} = 0.857142$$

$$\frac{1}{9} = 0.\bar{1}$$

$$\frac{2}{9} = 0.2\bar{2}$$

$$\frac{7}{9} = 0.\bar{7}$$

$$\frac{1}{11} = 0.09\bar{0}$$

$$\frac{2}{11} = 0.1\bar{8}$$

$$\frac{7}{11} = 0.6\bar{3}$$

Tips and Tricks: Know How to Add Quickly

18

$$\begin{array}{r}
 375 \\
 882 \\
 201 \\
 504 \\
 \hline
 1962
 \end{array}$$

$$\begin{array}{r}
 300 \\
 800 \\
 200 \\
 500 \\
 \hline
 1800
 \end{array}$$

Add left to right

addition is commutative
 order doesn't matter

$$\begin{array}{r}
 662 \\
 468 \\
 101 \\
 876 \\
 \hline
 2107
 \end{array}$$

$$\begin{array}{r}
 472 \\
 691 \\
 307 \\
 682 \\
 \hline
 2152
 \end{array}$$

$$\begin{array}{r}
 496 \\
 420 \\
 199 \\
 239 \\
 \hline
 1354
 \end{array}$$

Tips and Tricks: Multiplication Approximations

$$21 \times 19 = 399$$

$$23 \times 27 = 621$$

$$48 \times 52 = 2496$$

$$38 \times 42 = 1596$$

$$(20+1)(20-1) = 400-1$$

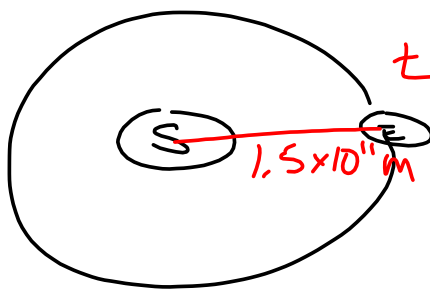
$$(a+b)(a-b) = a^2 - b^2$$

$$36 \times 44 = 1584$$

$$65 \times 11 = 715 \quad 11 \times 15 = 165$$

$$42 \times 11 = 462 \quad 53 \times 11 = 583$$

$$27 \times 11 = 297$$



$$t = 3.16 \times 10^7 \text{ s}$$

$$1.5 \times 10^{\square}$$

2 numbers

$$1.5 \times 10^{\square}$$

3 numbers

$$v = \frac{d}{t} = \frac{2\pi r}{t}$$

$$= \frac{2(3.14)(1.5 \times 10^{-11} \text{ m})}{3.16 \times 10^7 \text{ s}}$$

$$= 3 \times 10^{-4} \frac{\text{m}}{\text{s}} = \frac{30 \text{ km}}{\text{s}}$$

$$= 29.8 \frac{\text{km}}{\text{s}}$$

EXP

EE

$\times 10^{\square}$

1.5 EXP 11

$1.5 \times 10^{\square}$

1 number

9.8 is 2% less than 10

$$g \approx 9.8 \text{ m/s}^2$$

$$12 \times g = 12 \times 9.8 = 12 \times 10 - 2\%(120)$$

$$\frac{12}{9.8} = 1.2 + 2\%$$

$$= 1.224$$

$$= 117.6$$

$$= 117.6$$

Tips and Tricks: Estimation (Remember Enrico Fermi!)

How many piano tuners in Toronto?

$$\begin{array}{r}
 3,000,000 \text{ people} \\
 \div 4 \text{ people/household} \\
 \hline
 750,000 \text{ homes} \\
 20\% \text{ with pianos} \\
 \hline
 150,000 \text{ pianos} \\
 \times 1 \text{ tuning/year} \\
 \hline
 150,000 \text{ tunings/yr.} \\
 250 \text{ days/yr} \\
 \hline
 600 \text{ tunings/day} \\
 \div 2.5 \text{ tunings/dm} \\
 \hline
 \underline{240 \text{ piano tuners}}
 \end{array}$$

So Who Cares??? We Have Calculators!

A water tower story and some lab stories. . .all true!