1. Express as a whole number or ratio of whole numbers.

$10^2 = 100$ $\quad 2^2 = 4$

$10^1 = 10$ $\quad 2^1 = 2$

$10^0 = 1$ $\quad 2^0 = 1$

$10^{-1} = \frac{1}{10^1} = \frac{1}{10}$ $\quad 2^{-1} = \frac{1}{2^1} = \frac{1}{2}$

$10^{-2} = \frac{1}{10^2} = \frac{1}{100}$ $\quad 2^{-2} = \frac{1}{2^2} = \frac{1}{4}$

$10^{-3} = \frac{1}{10^3} = \frac{1}{1000}$ $\quad 2^{-3} = \frac{1}{8}$

$10^{-4} = \frac{1}{10,000}$ $\quad 2^{-4} = \frac{1}{16}$

$10^{-5} = \frac{1}{100,000}$ $\quad 2^{-5} = \frac{1}{32}$

$10^{-6} = \frac{1}{10^6} = \frac{1}{1,000,000}$ $\quad 2^{-6} = \frac{1}{64}$

2. Simplify.

$(10^2)(10^{-2}) = 10^2 \cdot \frac{1}{10^2} = \frac{10^2}{10^2}$ $\quad (2^2)(2^{-2}) = \frac{2^2}{2^2} = 1$

$= 10^{2+(-2)} = 10^0 = 1$ $\boxed{=1}$

$(10^1)(10^{-1}) = 1$ $\quad (2^1)(2^{-1}) = 1$

$(10^6)(10^{-6}) = \frac{10^6}{10^6} = \boxed{1}$ $\quad (2^6)(2^{-6}) = 1$

3. Simplify into a ratio of whole numbers.

$\left(\frac{1}{10}\right)\left(\frac{1}{10}\right) = \frac{1 \cdot 1}{10 \cdot 10} = \frac{1}{100}$

$\left(\frac{1}{2}\right)\left(\frac{1}{2}\right) = \frac{1 \cdot 1}{2 \cdot 2} = \frac{1}{4}$ $1\frac{1}{4}$

$\left(\frac{5}{10}\right)\left(\frac{1}{10}\right) = \frac{5 \cdot 1}{10 \cdot 10} = \frac{1}{20}$

$\left(\frac{5}{2}\right)\left(\frac{1}{2}\right) = \frac{5 \cdot 1}{2 \cdot 2} = \boxed{\frac{5}{4}}$

$\left(\frac{1}{10}\right)\left(\frac{6}{10}\right) = \frac{1 \cdot 6}{10 \cdot 10} = \frac{3}{50}$

$\left(\frac{1}{2}\right)\left(\frac{6}{2}\right) = \frac{1 \cdot 6}{2 \cdot 2} = \frac{3}{2}$

$\left(\frac{5}{10}\right)\left(\frac{6}{10}\right) = \frac{5 \cdot 6}{10 \cdot 10} = \frac{3}{10}$

$\left(\frac{5}{2}\right)\left(\frac{6}{2}\right) = \frac{5 \cdot 6}{2 \cdot 2} = \frac{15}{2}$

$\left(\frac{2}{10}\right)\left(\frac{5}{10}\right) = \frac{2 \cdot 5}{10 \cdot 10} = \frac{1}{10}$

$\left(\frac{2}{2}\right)\left(\frac{5}{2}\right) = \frac{2 \cdot 5}{2 \cdot 2} = \frac{10}{4} = \frac{5}{2}$

$\left(\frac{7}{10}\right)\left(\frac{3}{10}\right) = \frac{7 \cdot 3}{10 \cdot 10} = \frac{21}{100}$

$\left(\frac{7}{2}\right)\left(\frac{3}{2}\right) = \frac{7 \cdot 3}{2 \cdot 2} = \frac{21}{4}$

3. Simplify into a ratio of whole numbers.

$\left(\frac{1}{10}\right)\left(\frac{1}{10}\right) = \frac{1\cdot 1}{10\cdot 10} = \frac{1}{100}$ $\left(\frac{1}{2}\right)\left(\frac{1}{2}\right) = \frac{1\cdot 1}{2\cdot 2} = \boxed{\frac{1}{4}}$

$1\frac{1}{4}$

$\left(\frac{5}{10}\right)\left(\frac{1}{10}\right) = \frac{5\cdot 1}{10\cdot 10} = \frac{\cancel{5}^{1}}{\cancel{100}_{20}} = \boxed{\frac{1}{20}}$ $\left(\frac{5}{2}\right)\left(\frac{1}{2}\right) = \frac{5\cdot 1}{2\cdot 2} = \boxed{\frac{5}{4}}$

$\left(\frac{1}{10}\right)\left(\frac{6}{10}\right) = \frac{1\cdot 6}{10\cdot 10} = \frac{\cancel{6}^{3}}{\cancel{100}_{50}} = \boxed{\frac{3}{50}}$ $\left(\frac{1}{2}\right)\left(\frac{6}{2}\right) = \frac{1\cdot 6}{2\cdot 2} = \frac{\cancel{6}^{3}}{\cancel{4}_{2}} = \boxed{\frac{3}{2}}$

$\left(\frac{5}{10}\right)\left(\frac{6}{10}\right) = \frac{5\cdot 6}{10\cdot 10} = \frac{\cancel{30}}{\cancel{100}} = \boxed{\frac{3}{10}}$ $\left(\frac{5}{2}\right)\left(\frac{6}{2}\right) = \frac{5\cdot 6}{2\cdot 2} = \frac{\cancel{30}^{15}}{\cancel{4}_{2}} = \boxed{\frac{15}{2}}$

$\left(\frac{2}{10}\right)\left(\frac{5}{10}\right) = \frac{2\cdot 5}{10\cdot 10} = \frac{\cancel{10}}{\cancel{100}} = \boxed{\frac{1}{10}}$ $\left(\frac{2}{2}\right)\left(\frac{5}{2}\right) = \frac{\cancel{2}\cdot 5}{\cancel{2}\cdot 2} = \boxed{\frac{5}{2}}$

$\left(\frac{7}{10}\right)\left(\frac{3}{10}\right) = \frac{7\cdot 3}{10\cdot 10} = \boxed{\frac{21}{100}}$ $\left(\frac{7}{2}\right)\left(\frac{3}{2}\right) = \frac{7\cdot 3}{2\cdot 2} = \boxed{\frac{21}{4}}$

4. Simplify into a ratio of whole numbers.

$\frac{1}{\frac{1}{2}} = \frac{1 \cdot 2}{1} = \frac{2}{1} = \boxed{2}$ $\quad \frac{3}{\frac{1}{2}} = \frac{3 \cdot 2}{1} = 6$ $\quad \frac{\frac{4}{1}}{\frac{1}{2}} = \frac{2 \cdot 4}{1} = 8$

$\frac{\frac{1}{2}}{1} = \frac{1}{2 \cdot 1} = \frac{1}{2}$ $\quad \frac{\frac{1}{2}}{3} = \frac{1}{2 \cdot 3} = \frac{1}{6}$ $\quad \frac{\frac{1}{2}}{4} = \frac{1}{2 \cdot 4} = \frac{1}{8}$

$\frac{\frac{1}{2}}{\frac{3}{4}} = \frac{1 \cdot 4}{3 \cdot 2} = \frac{\cancel{4}^{2}}{\cancel{6}_{3}} = \boxed{\frac{2}{3}}$ $\quad \frac{\frac{2}{3}}{\frac{4}{5}} = \frac{2 \cdot 5}{4 \cdot 3} = \frac{\cancel{10}^{5}}{\cancel{12}_{6}} = \boxed{\frac{5}{6}}$ $\quad \frac{\frac{3}{4}}{\frac{5}{6}} = \frac{3 \cdot 6}{5 \cdot 4} = \frac{18}{20} = \frac{9}{10}$

5. Is each statement true or false? Cross-multiply.

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

$1 \cdot 10 = 10 \cdot 1$

$10 = 10$

T

$\frac{1}{4} = \frac{4}{16}$

$1 \cdot 16 = 4 \cdot 4$

$16 = 16$

T

$\frac{3}{5} \neq \frac{6}{15}$

$3 \cdot 15 \neq 5 \cdot 6$

$45 \neq 30$

F

$\frac{2}{3} \neq \frac{6}{8}$

$2 \cdot 8 \neq 3 \cdot 6$

$16 \neq 18$

F

$\frac{-3}{5} = \frac{-6}{10}$

$-3 \cdot 10 = 5 \cdot -6$

$-30 = -30$

T

$\frac{-3}{5} \neq \frac{-6}{-10}$

$-3 \cdot -10 \neq 5 \cdot -6$

$30 \neq -30$

F

6. Simplify into a ratio of whole numbers.

$$\frac{3}{3}\left(\frac{1}{2}\right) + \left(\frac{1}{3}\right)\frac{2}{2} =$$

$$\frac{3\cdot1}{3\cdot2} + \frac{1\cdot2}{3\cdot2} = \frac{3}{6} + \frac{2}{6} = \boxed{\frac{5}{6}}$$

$$\frac{7}{7}\left(\frac{4}{5}\right) + \left(\frac{6}{7}\right)\frac{5}{5} = \frac{7\cdot4}{7\cdot5} + \frac{6\cdot5}{7\cdot5}$$

$$= \frac{28}{35} + \frac{30}{35} = \boxed{\frac{58}{35}}$$

$$\frac{4}{4}\left(\frac{1}{2}\right) + \left(\frac{3}{4}\right)\frac{2}{2} = \frac{4\cdot1}{4\cdot2} + \frac{3\cdot2}{4\cdot2}$$

$$= \frac{4}{8} + \frac{6}{8} = \frac{\overset{5}{\cancel{10}}}{\cancel{8}4} = \boxed{\frac{5}{4}}$$

$$\frac{8}{8}\left(\frac{1}{2}\right) + \left(\frac{3}{8}\right)\frac{2}{2} =$$

$$= \frac{8\cdot1}{8\cdot2} + \frac{3\cdot2}{8\cdot2}$$

$$= \frac{8}{16} + \frac{6}{16} = \frac{14}{16} = \boxed{\frac{7}{8}}$$