Learning Enhancement Team

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STUDENT SUPPORT SERVICE

Model Answers: Multiplying and Dividing Fractions

Multiplying and Dividing Fractions study guide

1. When you multiply together fractions, to find the numerator of the answer you multiply the numerators in the question and to find the denominator of the answer you multiply the denominators in the question. It is useful to do an extra step and explicitly write the multiplications before you perform them to help with any cancelling down you may have to do (see question 3).

(a) $\frac{1}{2}\times\frac{1}{3}=\frac{1\times1}{2\times3}=\frac{1}{6}$

(b) $\frac{2}{5}\times\frac{1}{7}=\frac{2\times1}{5\times7}=\frac{2}{35}$

(c) $\frac{2}{3}\times\frac{5}{7}=\frac{2\times5}{3\times7}=\frac{10}{21}$

(d) $\frac{1}{4}\times\frac{7}{9}=\frac{1\times7}{4\times9}=\frac{7}{36}$

2. When you divide two fractions the method is to invert (turn upside down) the second fraction and then multiply the resulting fractions together. The method for multiplying is described in question 1.

(a) $\frac{1}{2}\div\frac{1}{3}=\frac{1}{2}\times\frac{3}{1}=\frac{1\times3}{2\times1}=\frac{3}{2}$

(b) $\frac{2}{5}\div\frac{1}{7}=\frac{2}{5}\times\frac{7}{1}=\frac{2\times7}{5\times1}=\frac{14}{5}$

(c) $\frac{2}{3}\div\frac{5}{7}=\frac{2}{3}\times\frac{7}{5}=\frac{2\times7}{3\times5}=\frac{14}{15}$

(d) $\frac{1}{4}\div\frac{7}{9}=\frac{1}{4}\times\frac{9}{7}=\frac{1\times9}{4\times7}=\frac{9}{28}$

3. In these questions you will see how you can use the extra step to help you cancel fractions down. Where appropriate composite numbers are broken down into their prime factors. If you find this difficult or confusing then read the study guides: *Prime Factors* and *Cancelling Down Fractions*.

(a) $\frac{1}{4}\times\frac{2}{3}=\frac{1\times 2}{4\times 3}=\frac{1\times \cancel{2}}{\cancel{2}\times 2\times 3}=\frac{1}{6}$

(b) $\frac{5}{6}\times\frac{3}{10}=\frac{5\times 3}{6\times 10}=\frac{\cancel{5}\times\cancel{3}}{2\times\cancel{3}\times 2\times\cancel{5}}=\frac{1}{4}$

Remember that if you cancel down all the factors in a numerator or denominator then the result is 1 and not 0.

(c) $\frac{2}{3}\times\frac{4}{5}=\frac{2\times 4}{3\times 5}=\frac{2\times 2\times 2}{3\times 5}=\frac{8}{15}$

No common factors in the numerator and denominator and so no cancelling down possible.

(d) $\frac{3}{4}\times\frac{8}{15}=\frac{3\times 8}{4\times 15}=\frac{\cancel{3}\times 2\times\cancel{4}}{\cancel{4}\times\cancel{3}\times 5}=\frac{2}{5}$

(e) $\frac{1}{5}\times\frac{2}{5}=\frac{1\times 2}{5\times 5}=\frac{2}{25}$

No common factors in the numerator and denominator and so no cancelling down possible.

(f) $\frac{2}{3}\times\frac{4}{10}=\frac{2\times 4}{3\times 10}=\frac{\cancel{2}\times 4}{3\times\cancel{2}\times 5}=\frac{4}{15}$

(g) $\frac{4}{7}\times\frac{21}{40}=\frac{4\times 21}{7\times 40}=\frac{\cancel{4}\times 3\times\cancel{7}}{\cancel{7}\times\cancel{4}\times 10}=\frac{3}{10}$

(h) $\frac{12}{41}\times\frac{7}{12}=\frac{\cancel{12}\times 7}{41\times\cancel{12}}=\frac{7}{41}$ You can cancel here without prime factorisation.

(i) $\frac{3}{100}\times\frac{4}{9}=\frac{3\times 4}{100\times 9}=\frac{\cancel{3}\times\cancel{4}}{\cancel{4}\times 25\times\cancel{3}\times 3}=\frac{1}{75}$

(j) $\frac{3}{4}\times\frac{2}{3}\times\frac{1}{6}=\frac{3\times 2\times 1}{4\times 3\times 6}=\frac{\cancel{6}\times 1}{4\times 3\times\cancel{6}}=\frac{1}{12}$

4. Follow the methods highlighted in questions 2 and 3.

(a) $\frac{2}{3} \div \frac{1}{3} = \frac{2}{3} \times \frac{3}{1} = \frac{2 \times \cancel{3}}{\cancel{3} \times 1} = \frac{2}{1} = 2$

Remember that any number divided by 1 is itself.

(b) $\frac{5}{6} \div \frac{5}{6} = \frac{5}{6} \times \frac{6}{5} = \frac{\cancel{5} \times \cancel{6}}{\cancel{6} \times \cancel{5}} = \frac{1}{1} = 1$

Remember that any number divided by 1 is itself.

(c) $\frac{2}{7} \div \frac{4}{7} = \frac{2}{7} \times \frac{7}{4} = \frac{2 \times 7}{7 \times 4} = \frac{\cancel{2} \times \cancel{7}}{\cancel{7} \times \cancel{2} \times 2} = \frac{1}{2}$

(d) $\frac{2}{5} \div \frac{1}{10} = \frac{2}{5} \times \frac{10}{1} = \frac{2 \times 10}{5 \times 1} = \frac{2 \times 2 \times \cancel{5}}{\cancel{5} \times 1} = \frac{4}{1} = 4$

Remember that any number divided by 1 is itself.

(e) $\frac{3}{4} \div \frac{3}{8} = \frac{3}{4} \times \frac{8}{3} = \frac{3 \times 8}{4 \times 3} = \frac{\cancel{3} \times 2 \times \cancel{4}}{\cancel{4} \times \cancel{3}} = \frac{2}{1} = 2$

Remember that any number divided by 1 is itself.

(f) $\frac{8}{9} \div \frac{4}{5} = \frac{8}{9} \times \frac{5}{4} = \frac{8 \times 5}{9 \times 4} = \frac{2 \times \cancel{4} \times 5}{9 \times \cancel{4}} = \frac{10}{9}$

(g) $\frac{2}{11} \div \frac{5}{22} = \frac{2}{11} \times \frac{22}{5} = \frac{2 \times 22}{11 \times 5} = \frac{2 \times 2 \times \cancel{11}}{\cancel{11} \times 5} = \frac{4}{5}$

(h) $\frac{8}{9} \div \frac{2}{27} = \frac{8}{9} \times \frac{27}{2} = \frac{8 \times 27}{9 \times 2} = \frac{\cancel{2} \times 4 \times 3 \times \cancel{9}}{\cancel{9} \times \cancel{2}} = \frac{12}{1} = 12$

(i) $\frac{3}{100} \div \frac{1}{10} = \frac{3}{100} \times \frac{10}{1} = \frac{3 \times 10}{100 \times 1} = \frac{3 \times \cancel{10}}{\cancel{10} \times 10 \times 1} = \frac{3}{10}$

(j) $\frac{2}{3} \div \frac{1}{4} = \frac{2}{3} \times \frac{4}{1} = \frac{2 \times 4}{3 \times 1} = \frac{8}{3}$ No cancelling down possible here.

(k) $\frac{50}{1000} \div \frac{500}{1000} = \frac{50}{1000} \times \frac{1000}{500} = \frac{50 \times 1000}{1000 \times 500} = \frac{\cancel{50} \times \cancel{1000}}{\cancel{1000} \times \cancel{50} \times 10} = \frac{1}{10}$

5. In these questions you should remember that you can change a whole number into a fraction dividing it by one. Once you have replace the whole number by the appropriate fraction you should proceed as in the previous questions.

For example $5=\frac{5}{1}$, $8=\frac{8}{1}$ and so on.

It is a common error to multiply numerator and denominator by the whole number but this is not correct.

(a) $2\times\frac{2}{3}=\frac{2}{1}\times\frac{2}{3}=\frac{2\times2}{1\times3}=\frac{4}{3}$

(b) $8\times\frac{3}{10}=\frac{8}{1}\times\frac{3}{10}=\frac{8\times3}{1\times10}=\frac{\cancel{2}\times4\times3}{1\times\cancel{2}\times5}=\frac{12}{5}$

(c) $\frac{2}{3}\times4=\frac{2}{3}\times\frac{4}{1}=\frac{2\times4}{3\times1}=\frac{8}{3}$

(d) $\frac{3}{4}\times8=\frac{3}{4}\times\frac{8}{1}=\frac{3\times8}{4\times1}=\frac{3\times2\times\cancel{4}}{\cancel{4}\times1}=\frac{6}{1}=6$

(e) $2\div\frac{1}{3}=\frac{2}{1}\div\frac{1}{3}=\frac{2}{1}\times\frac{3}{1}=\frac{2\times3}{1\times1}=\frac{6}{1}=6$

(f) $8\div\frac{4}{5}=\frac{8}{1}\div\frac{4}{5}=\frac{8}{1}\times\frac{5}{4}=\frac{8\times5}{1\times4}=\frac{2\times\cancel{4}\times5}{1\times\cancel{4}}=\frac{10}{1}=10$

(g) $\frac{2}{11}\div5=\frac{2}{11}\div\frac{5}{1}=\frac{2}{11}\times\frac{1}{5}=\frac{2\times1}{11\times5}=\frac{2}{55}$

(h) $\frac{8}{9}\div2=\frac{8}{9}\div\frac{2}{1}=\frac{8}{9}\times\frac{1}{2}=\frac{8\times1}{9\times2}=\frac{\cancel{2}\times4\times1}{9\times\cancel{2}}=\frac{4}{9}$

(i) $2\times\frac{1}{2}=\frac{2}{1}\times\frac{1}{2}=\frac{2\times1}{1\times2}=\frac{2}{2}=1$ as two halves are 1.

(j) $8\times\frac{3}{8}=\frac{8}{1}\times\frac{3}{8}=\frac{\cancel{8}\times3}{1\times\cancel{8}}=\frac{3}{1}=3$

(k) $\frac{2}{3}\div2=\frac{2}{3}\div\frac{2}{1}=\frac{2}{3}\times\frac{1}{2}=\frac{\cancel{2}\times1}{3\times\cancel{2}}=\frac{1}{3}$

(l) $\frac{3}{4}\div6=\frac{3}{4}\div\frac{6}{1}=\frac{3}{4}\times\frac{1}{6}=\frac{3\times1}{4\times6}=\frac{\cancel{3}\times1}{4\times2\times\cancel{3}}=\frac{1}{8}$