

## Multiplication and division

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### Introduction

Fractions involving symbols occur very frequently in engineering mathematics. It is necessary to be able to multiply and divide them. On this leaflet we revise how these processes are carried out. It will be helpful if you have already seen leaflet *1.1 Fractions*.

### 1. Multiplication and division of fractions

Multiplication of fractions is straightforward. We simply multiply the numerators to give a new numerator, and multiply the denominators to give a new denominator.

#### Example

Find

$$\frac{4}{7} \times \frac{a}{b}$$

#### Solution

Simply multiply the two numerators together, and multiply the two denominators together.

$$\frac{4}{7} \times \frac{a}{b} = \frac{4a}{7b}$$

#### Example

Find

$$\frac{3ab}{5} \times \frac{7}{6a}$$

#### Solution

$$\frac{3ab}{5} \times \frac{7}{6a} = \frac{21ab}{30a}$$

which, by cancelling common factors, can be simplified to  $\frac{7b}{10}$ .

Division is performed by inverting the second fraction and then multiplying.

#### Example

Find  $\frac{3}{2x} \div \frac{6}{5y}$ .

### Solution

$$\begin{aligned}\frac{3}{2x} \div \frac{6}{5y} &= \frac{3}{2x} \times \frac{5y}{6} \\ &= \frac{15y}{12x} \\ &= \frac{5y}{4x}\end{aligned}$$

### Example

Find  $\frac{3}{x+1} \div \frac{x}{(x+1)^2}$ .

### Solution

$$\begin{aligned}\frac{3}{x+1} \div \frac{x}{(x+1)^2} &= \frac{3}{x+1} \times \frac{(x+1)^2}{x} \\ &= \frac{3(x+1)^2}{x(x+1)} \\ &= \frac{3(x+1)}{x}\end{aligned}$$

### Exercises

1. Find a)  $\frac{1}{3} \times \frac{x}{2}$ ,    b)  $\frac{2}{x+1} \times \frac{x}{x-3}$ ,    c)  $-\frac{1}{4} \times \frac{3}{5}$ ,    d)  $\left(-\frac{1}{x}\right) \times \left(\frac{2}{5y}\right)$ ,    e)  $\frac{x+1}{2(x+3)} \times \frac{8}{x+1}$ .

2. Simplify

$$\frac{3}{x+2} \div \frac{x}{2x+4}$$

3. Simplify

$$\frac{x+2}{(x+5)(x+4)} \times \frac{x+5}{x+2}$$

4. Simplify

$$\frac{3}{x} \times \frac{3}{y} \times \frac{1}{z}$$

5. Find  $\frac{4}{3} \div \frac{16}{x}$ .

### Answers

1. a)  $\frac{x}{6}$ ,    b)  $\frac{2x}{(x+1)(x-3)}$ ,    c)  $-\frac{3}{20}$ ,    d)  $-\frac{2}{5xy}$ ,    e)  $\frac{4}{x+3}$ .

2.  $\frac{6}{x}$ ,    3.  $\frac{1}{x+4}$ ,    4.  $\frac{9}{xyz}$ ,    5.  $\frac{x}{12}$ .