

Division

Division can be described as the opposite process of multiplication. The process used for multiplication can be reversed when using division. When dividing, a group is **split or shared into equal parts**. The most common symbol used for division is the division sign ($\div$).

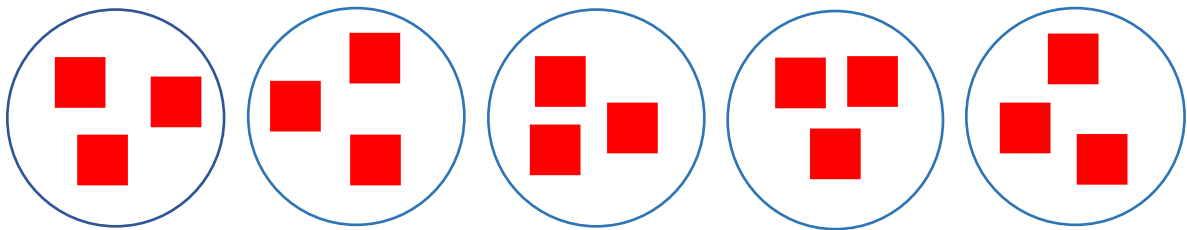
Example: 5 groups of 3 make 15

$$5 \times 3 = 15$$

Oppositely

15 can be shared into 5 groups of 3

$$15 \div 5 = 3$$



The process of adding groups of 3 for 5 times

is reversed when 5 equal groups of 3 are subtracted from 15 until nothing is left (the remainder is 0).

$$\begin{array}{rcl} 15 - 3 & = & 12 \\ 12 - 3 & = & 9 \\ 9 - 3 & = & 6 \\ 6 - 3 & = & 3 \\ 3 - 3 & = & 0 \end{array}$$

$$3 + 3 + 3 + 3 + 3 = 15$$

5 equal groups of 3

Dividing 15 into 5 equal groups will give 3 in each group.

$$\begin{array}{l} 15 \div 5 = 3 \\ 15 \div 3 = 5 \end{array}$$

The first number is the **dividend**.

The second number is the **divisor**.

The result or answer of the division is the **quotient**.

Both 5 and 3 are factors of 15

A number can never be divided by 0

Trying to share any number into 0 equal parts does not make any sense.

Division

Dividing by repeating subtraction

The repeated subtraction method can be used to work out divisions. The divisor (smaller group) is repeatedly subtracted from the dividend (larger group) until the remainder is zero. The number of times the divisor can be subtracted from the dividend is the quotient (answer of the division).

Example 1: $18 \div 6 = 3$

$$\begin{array}{r} 3 \\ 6 \overline{)18} - \\ \underline{6} \\ 12 - \\ \underline{6} \\ 6 - \\ \underline{6} \\ 0 \end{array}$$

It is possible to subtract the divisor (6) three (3) times from the dividend (18).

For larger numbers, multiples of the divisor can be subtracted from the dividend in order to avoid repeating too many subtractions.

Example 2: $90 \div 6 = 15$

$$\begin{array}{r} 15 \\ 6 \overline{)90} - \\ \underline{60} \longrightarrow 6 \times 10 \\ 30 \longrightarrow 6 \times 5 \\ \underline{30} \\ 0 \end{array}$$

The divisor (6) can be subtracted fifteen (15) times from (90).

$10 + 5 = 15$

10 groups of 6 and another 5 groups of 6 were subtracted from 90

Division

If the dividend is not a multiple of the divisor, quantities cannot be shared equally or split into equal groups. What is left over is called the **remainder**.

Example 1: $16 \div 5 = 3 \text{ r } 1$

5 is not a multiple of 16

3 r 1

5 $\overline{)16}$ –

5 –

11 –

5 –

6 –

5 –

1

16 can be shared into 5 groups of 3

It is possible to subtract the divisor (5) three (3) times from the dividend (15) but 1 is left over.

Detailed description: This diagram shows the long division of 16 by 5. The quotient is 3 with a remainder of 1. Annotations include arrows pointing from the text '16 can be shared into 5 groups of 3' to the divisor 5 and the quotient 3. Another set of arrows points from 'It is possible to subtract the divisor (5) three (3) times from the dividend (15) but 1 is left over.' to the subtraction steps: 16 minus 5 equals 11, 11 minus 5 equals 6, and 6 minus 5 equals 1.

Example 2: $125 \div 7 = 17 \text{ r } 6$

7 is not a multiple of 125

17 r 6

7 $\overline{)125}$ –

70 –

55 –

49 –

6

7 x 10

7 x 7

It is possible to subtract (7) for (17) times from the dividend (125) with a remainder of 6

The remainder is less than 7

Detailed description: This diagram shows the long division of 125 by 7. The quotient is 17 with a remainder of 6. Annotations include arrows pointing from the text 'It is possible to subtract (7) for (17) times from the dividend (125) with a remainder of 6' to the multiplication steps: 7 times 10 equals 70, and 7 times 7 equals 49. Another arrow points from 'The remainder is less than 7' to the final remainder 6.

Example 2: $700 \div 8 = 87 \text{ r } 4$

8 is not a multiple of 700

87 r 4

8 $\overline{)700}$ –

640 –

60 –

56 –

4

8 x 80

8 x 7

It is possible to subtract (8) for (87) times from the dividend (700) with a remainder of 4

The remainder is less than 8

Detailed description: This diagram shows the long division of 700 by 8. The quotient is 87 with a remainder of 4. Annotations include arrows pointing from the text 'It is possible to subtract (8) for (87) times from the dividend (700) with a remainder of 4' to the multiplication steps: 8 times 80 equals 640, and 8 times 7 equals 56. Another arrow points from 'The remainder is less than 8' to the final remainder 4.

Division

Repeated subtractions can also be used when dividing by a two digit number. Subtracting multiples of the two digit divisor will significantly decrease the number of subtractions needed until zero or a number smaller than the divisor is left.

Example 1: $432 \div 24 = 18$

The diagram shows the long division of 432 by 24. The quotient 18 is written above the dividend. The process involves subtracting multiples of 24 from 432: 240 (24 x 10), 120 (24 x 5), and 72 (24 x 3). A red oval highlights the multipliers 10, 5, and 3. Arrows point from these multipliers to a text box explaining that the divisor (24) is subtracted 18 times from the dividend without any remainder.

$$\begin{array}{r} 18 \\ 24 \overline{) 432} - \\ \underline{240} \longrightarrow 24 \times 10 \\ 192 - \\ \underline{120} \longrightarrow 24 \times 5 \\ 72 - \\ \underline{72} \longrightarrow 24 \times 3 \\ \underline{0} \end{array}$$

The divisor (24) is subtracted (18) times from the dividend without any remainder.

Example 2: $995 \div 32 = 31 \text{ r } 3$

The diagram shows the long division of 995 by 32. The quotient 31 is written above the dividend. The process involves subtracting multiples of 32 from 995: 960 (32 x 30) and 32 (32 x 1). A red oval highlights the multipliers 30 and 1. Arrows point from these multipliers to a text box explaining that the divisor (32) is subtracted 31 times from the dividend with a remainder of 3.

$$\begin{array}{r} 31 \\ 32 \overline{) 995} - \\ \underline{960} \longrightarrow 32 \times 30 \\ 35 - \\ \underline{32} \longrightarrow 32 \times 1 \\ \underline{3} \end{array}$$

The divisor (32) is subtracted (31) times from the dividend with a remainder of 3

Dividing decimals by 10

A decimal number will get 10 times smaller when divided by 10. The decimal point moves one place to the left when divided by 10.

Examples:

$$2.5 \div 10 = 0.25$$

$$78.3 \div 10 = 7.83$$

Division Worksheet

Work out the following multiplications to find the missing quotient:

- a) $9 \div 3 = \underline{\quad}$ b) $10 \div 5 = \underline{\quad}$ c) $48 \div 6 = \underline{\quad}$
d) $16 \div 4 = \underline{\quad}$ e) $81 \div 9 = \underline{\quad}$ f) $24 \div 8 = \underline{\quad}$

Use repeated subtractions to work out the following as shown in the example:

$\begin{array}{r} 21 \\ 6 \overline{) 126} \\ \underline{60} \longrightarrow 6 \times 10 \\ 66 \\ \underline{60} \longrightarrow 6 \times 10 \\ 6 \\ \underline{6} \longrightarrow 6 \times 1 \\ 0 \end{array}$	$\begin{array}{r} \\ 4 \overline{) 92} \\ \underline{} \longrightarrow 4 \times 10 \\ 52 \\ \underline{} \longrightarrow 4 \times 10 \\ \\ \underline{12} \longrightarrow 4 \times 3 \\ 0 \end{array}$
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Use repeated subtractions to work out the following:

$180 \div 6 = \underline{\quad}$	$186 \div 8 = \underline{\quad}$
$294 \div 14 = \underline{\quad}$	$325 \div 27 = \underline{\quad}$

Division Answer sheet

Work out the following multiplications to find the missing quotient:

- a) $9 \div 3 = \underline{3}$ b) $10 \div 5 = \underline{2}$ c) $48 \div 6 = \underline{8}$
 d) $16 \div 4 = \underline{4}$ e) $81 \div 9 = \underline{9}$ f) $24 \div 8 = \underline{3}$

Use repeated subtractions to work out the following as shown in the example:

$ \begin{array}{r} 21 \\ 6 \overline{) 126} - \\ \underline{60} \longrightarrow 6 \times 10 \\ 66 - \\ \underline{60} \longrightarrow 6 \times 10 \\ 6 - \\ \underline{6} \longrightarrow 6 \times 1 \\ \underline{0} \end{array} $	$ \begin{array}{r} 13 \\ 4 \overline{) 92} - \\ \underline{40} \longrightarrow 4 \times 10 \\ 52 - \\ \underline{40} \longrightarrow 4 \times 10 \\ 12 - \\ \underline{12} \longrightarrow 4 \times 3 \\ \underline{0} \end{array} $
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Use repeated subtractions to work out the following:

$180 \div 6 = \underline{30}$ $ \begin{array}{r} 30 \\ 6 \overline{) 180} - \\ \underline{180} \longrightarrow 6 \times 30 \\ \underline{0} \end{array} $	$186 \div 8 = \underline{22 \text{ r } 4}$ $ \begin{array}{r} 22 \text{ r } 4 \\ 8 \overline{) 180} - \\ \underline{160} \longrightarrow 8 \times 20 \\ 20 - \\ \underline{16} \longrightarrow 8 \times 2 \\ \underline{4} \end{array} $
$294 \div 14 = \underline{21}$ $ \begin{array}{r} 21 \\ 14 \overline{) 294} - \\ \underline{140} \longrightarrow 14 \times 10 \\ 154 - \\ \underline{140} \longrightarrow 14 \times 10 \\ 14 - \\ \underline{14} \longrightarrow 14 \times 1 \\ \underline{0} \end{array} $	$325 \div 27 = \underline{12 \text{ r } 1}$ $ \begin{array}{r} 12 \text{ r } 1 \\ 27 \overline{) 325} - \\ \underline{270} \longrightarrow 27 \times 10 \\ 55 - \\ \underline{54} \longrightarrow 27 \times 2 \\ \underline{1} \end{array} $