

# Quotient

The *quotient* is the result of a division, so  $a/b$  is called the *quotient* of  $a$  by  $b$ .

Sometimes, one is interested in the number of times one thing can be divided 'exactly' into another, giving a quotient and a *remainder*.

For example, when working in the integers, 13 divided by 3 has a quotient of 4 and a remainder of 1.

As another example,  $x^4 + x^2 - x$  divided by  $x^2 + 3$  has a quotient of  $x^2 - 2$  and a remainder of  $-x + 6$ .

If  $a$  divided by  $b$  has a quotient of  $q$  and a remainder of  $r$ , then  $a = bq + r$ . Normally, one requires  $r$  to be 'smaller' than  $b$  in some sense. When dividing integers, we require  $0 \leq r < |b|$ . When dividing polynomials, we require  $r = 0$  or the degree of  $r$  to be less than the degree of  $b$ .

The remainder of a division is 0 if and only if  $b$  is a factor of  $a$ .