

Divisor, dividend, quotient and remainder: the four words, the layout, the check and the divisibility rules

The four words

Word	Means	In $17 \div 5 = 3 \text{ R } 2$	In $20 \div 4 = 5$
dividend	the number being divided (shared out)	17	20
divisor	the number it is divided by	5	4
quotient	the answer: how many times the divisor fits	3	5
remainder	what is left over; always smaller than the divisor	2	0

dividend $\div$ divisor = quotient, remainder r. The divi-DEND is the one that gets divided and ends in pieces; the divi-SOR does the dividing. In a fraction $17/5$ the top is the dividend and the bottom the divisor.

Where each word sits in long division

```

      1 4 2 <- quotient
divisor -> 7 ) 1 0 0 0 <- dividend
      - 7
      ----
        3 0
        - 2 8
        ----
          2 0
          - 1 4
          ----
            6 <- remainder
    
```

THE CHECK: divisor $\times$ quotient + remainder = dividend. $7 \times 142 + 6 = 994 + 6 = 1,000$. If the remainder is as big as the divisor or bigger, the quotient is too small.

What the remainder means

50 children, buses hold 12: $50 \div 12 = 4 \text{ R } 2$	round UP: 5 buses
50 cookies, 12 in a box	4 full boxes, 2 left over
50 dollars shared by 12 people	\$4 each and \$2 left, or \$4.17 each (divide the remainder too)
Is 50 divisible by 12?	no: the remainder is not 0

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Divisors as factors, the divisibility rules, and practice

The second meaning: a divisor of a number is a factor

A divisor of 12 is any whole number that divides it exactly: 1, 2, 3, 4, 6, 12. To list all divisors, test from 1 up and write each with its partner, stopping at the square root: $36 \rightarrow 1 \& 36, 2 \& 18, 3 \& 12, 4 \& 9, 6 \& 6$: nine divisors. To COUNT them, factorise into primes, add 1 to each exponent, multiply: $36 = 2^2 \times 3^2 \rightarrow (2+1)(2+1) = 9$; $60 = 2^2 \times 3 \times 5 \rightarrow 3 \times 2 \times 2 = 12$. Greatest common divisor (highest common factor) of 36 and 60: 12, which simplifies $36/60$ to $3/5$ in one step.

The divisibility rules

By	Rule	Example
2	last digit 0, 2, 4, 6 or 8	3,578
3	the digits add to a multiple of 3	4,521 ($4+5+2+1 = 12$)
4	last two digits divide by 4	7,316 (16)
5	last digit 0 or 5	2,345
6	both the 2 and 3 rules pass	4,518
7	double the last digit, subtract from the rest, repeat; result divides by 7	672: $67 - 4 = 63 = 7 \times 9$
8	last three digits divide by 8	5,120 ($120 = 8 \times 15$)
9	the digits add to a multiple of 9	7,281 (18)
10	last digit 0	980
11	alternately add and subtract the digits; result 0 or a multiple of 11	2,728 ($2 - 7 + 2 - 8 = -11$)
12	both the 3 and 4 rules pass	3,336

Practice

- [] 1. In $45 \div 6 = 7 \text{ R } 3$, name the dividend, divisor, quotient and remainder.
- [] 2. $93 \div 8$: quotient and remainder? Check it.
- [] 3. $1,000 \div 9$: quotient and remainder?
- [] 4. Divisor 7, quotient 12, remainder 5: what is the dividend?
- [] 5. 125 children, 8 to a table: how many tables?
- [] 6. List the divisors of 48.
- [] 7. How many divisors has 100?
- [] 8. Is 5,238 divisible by 3? By 4? By 6?
- [] 9. Is 9,185 divisible by 5? By 9? By 11?
- [] 10. The greatest common divisor of 24 and 60?
- [] 11. Which numbers from 1 to 20 have exactly two divisors?
- [] 12. The smallest number with exactly six divisors?

Answers

1) 45, 6, 7, 3 2) 11 R 5; $8 \times 11 + 5 = 93$ 3) 111 R 1 4) 89 5) 15 R 5, so 16 tables 6) 1, 2, 3, 4, 6, 8, 12, 16, 24, 48 7) $2^2 \times 5^2 \rightarrow 9$ 8) yes (18), no (38), no 9) yes, no (23), yes ($9-1+8-5 = 11$) 10) 12 11) the primes 2, 3, 5, 7, 11, 13, 17, 19 12) 12