

Compatible numbers: estimating sums, differences, products and quotients

Compatible numbers are easy to work with mentally AND suit the operation: they add to a round total, multiply to a known fact, or divide exactly. Replace, compute, and you have an estimate. Rounding is a rule; compatible numbers are a choice.

Operation	Choose numbers that...	Example	Estimate	Exact
Addition	make tens, hundreds, easy totals	$26 + 73 \rightarrow 25 + 75$	100	99
		$318 + 487 \rightarrow 300 + 500$	800	805
Subtraction	differ by an easy amount	$82 - 39 \rightarrow 80 - 40$	40	43
Multiplication	multiply to a known fact	$23 \times 48 \rightarrow 25 \times 48$	1,200	1,104
		$19 \times 31 \rightarrow 20 \times 30$	600	589
Division	dividend a multiple of the divisor	$47 \div 6 \rightarrow 48 \div 6$	8	7.8
		$712 \div 9 \rightarrow 720 \div 9$	80	79.1
		$3,268 \div 8 \rightarrow 3,200 \div 8$	400	408.5
	two-digit divisor: round it too	$2,750 \div 42 \rightarrow 2,800 \div 40$	70	65.5
Decimals	whole numbers, then place the point	$4.8 \times 6.1 \rightarrow 5 \times 6$	30	29.3
Fractions	round to 0, $\frac{1}{2}$ or 1	$\frac{7}{8} + \frac{3}{8} \rightarrow 1 + \frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{4}$
Percents	use 10%, 25%, 50%	24% of 81 $\rightarrow$ 25% of 80	20	19.4

Division: the three steps

- [] Look at the divisor (round a two-digit one to one digit: $42 \rightarrow 40$)
- [] Run through its multiples to one near the dividend ($8: 8 \times 4 = 32$, so $3,268 \rightarrow 3,200$)
- [] Divide. The estimate also gives the number of digits in the quotient, the check that catches a misplaced digit in long division

High or low?

- [] A number made bigger in an addition or multiplication: estimate HIGH (25×48 above 23×48)
- [] Dividend made bigger: HIGH ($48 \div 6$ above $47 \div 6$). Divisor made bigger: LOW ($2,750 \div 50$ below $2,750 \div 42$)
- [] One up and one down (20×50 for 23×48): unclear

Method	$47 \div 6$	$26 + 73$	Best for
Rounding (fixed rule)	$50 \div 6$: no easier	$30 + 70 = 100$	adding
Compatible numbers (a choice)	$48 \div 6 = 8$	$25 + 75 = 100$	division and multiplication
Front-end (leading digits, then adjust)	$40 \div 6$: poor	$20 + 70 = 90$, +9	long sums of money

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Worked examples and a practice set

Problem	Compatible numbers	Estimate	Exact
$38 + 64$	$40 + 60$	100	102
$153 + 249 + 97$	$150 + 250 + 100$	500	499
$91 - 28$	$90 - 30$	60	63
$4,012 - 1,988$	$4,000 - 2,000$	2,000	2,024
7×59	7×60	420	413
32×28	30×30	900	896
51×19	50×20	1,000	969
$65 \div 9$	$63 \div 9$	7	7.2
$238 \div 4$	$240 \div 4$	60	59.5
$5,230 \div 7$	$4,900 \div 7$ (or $5,600 \div 7$)	700 (800)	747
$1,856 \div 31$	$1,800 \div 30$	60	59.9
28 boxes of 36	30×36 (or 25×40)	1,080 (1,000)	1,008

Mistakes

- [] Rounding both numbers in a division by the rule and getting a harder problem ($50 \div 6$)
- [] Changing the divisor so much the estimate is useless ($47 \div 6 \rightarrow 50 \div 10$)
- [] Giving the exact answer when the question says estimate; not writing the numbers chosen
- [] Losing the decimal point (4.8×6.1 is about 30, not 300)

Practice: estimate, write the numbers you chose, say high or low

- $44 + 37$
- $683 - 297$
- 8×49
- 42×19
- $53 \div 9$
- $614 \div 7$
- $4,170 \div 6$
- $3,890 \div 48$
- 6.9×4.2
- 49% of 61
- A theatre has 38 rows of 52 seats. About how many seats?
- 2,635 marbles shared equally among 9 children. About how many each?

Answers

(Other sensible choices are fine.) 1. $45 + 35 = 80$ (81). 2. $680 - 300 = 380$ (386). 3. $8 \times 50 = 400$ (392), high. 4. $40 \times 20 = 800$ (798). 5. $54 \div 9 = 6$ (5.9), high. 6. $630 \div 7 = 90$ (87.7), high. 7. $4,200 \div 6 = 700$ (695), high. 8. $4,000 \div 50 = 80$ (81.0). 9. $7 \times 4 = 28$ (29.0), low. 10. 50% of 60 = 30 (29.9). 11. $40 \times 50 = 2,000$ (1,976), high. 12. $2,700 \div 9 = 300$ (292.8), high.