

17. Add/Subtract Fractions: Proof

a) Today we prove: how to add/subtract fractions with like denominators

What We Want to Prove

$$A/B + C/B = (A+C)/B$$

Adding like-denominator fractions: add numerators, denominator stays

Tools We Already Know

- ① Fraction definition: A/B is the number which, multiplied by B , equals A
- ② Lesson 14 proven: $A/B = (A \times C)/(B \times C)$
- ③ Reciprocal definition: $b \times (1/b) = 1$ ($b \neq 0$)
- ④ Distributive law: $(A+B) \times C = A \times C + B \times C$

Key Insight

Fraction A/B is really $A \times (1/B)$

Because A/B multiplied by B gives A , and $A \times (1/B)$ also multiplied by B gives A

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b) Proof: $A/B + C/B = (A+C)/B$

Step 1 Write each fraction as **numerator $\times$ (1/denominator)**:

$$A/B = A \times (1/B)$$

$$C/B = C \times (1/B)$$

Step 2 Substitute into the sum:

$$A/B + C/B = A \times (1/B) + C \times (1/B)$$

Step 3 Factor out **(1/B)**:

$$= (A + C) \times (1/B)$$

(distributive law: $A \times X + C \times X = (A+C) \times X$)

Step 4 Write **(A+C) $\times$ (1/B)** back as a fraction:

$$= (A+C)/B$$

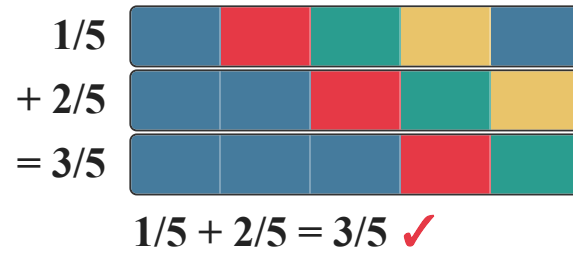
Conclusion $A/B + C/B = (A+C)/B$

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c) Verify with the Proven Formula

$$1/5 + 2/5 = (1+2)/5 = 3/5$$

$$5/8 - 2/8 = (5-2)/8 = 3/8$$



Practice: Calculate Using the Formula

d) $2/7 + 3/7 = (\text{ } + \text{ })/7 = \text{ }/7$

e) $4/9 + 3/9 = (\text{ } + \text{ })/9 = \text{ }/9$

f) $7/12 - 4/12 = (\text{ } - \text{ })/12 = \text{ }/12$