Adding and Subtracting Fractions and Mixed Numbers

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Learning Objectives

- Use prime factorization to find the LCD and simplify fractions
- Add and subtract fractions using the butterfly method and common denominators
- Operate with mixed fractions and negative fractions
- Compare fractions and evaluate expressions using PEMDAS

Simplify each expression completely and express all answers as fully reduced fractions or mixed numbers.

1. Find the prime factorization of the given number.

84

Answer: _____

2. Use prime factorization to find the least common denominator (LCD) of the two fractions.

$\frac{5}{12}$ and $\frac{7}{18}$

Answer: _____

3. Add the fractions using the butterfly method.

$\frac{2}{3} + \frac{1}{4}$

Answer: _____

4. Subtract the fractions using the butterfly method.

$\frac{5}{6} - \frac{3}{8}$

Answer: _____

5. Add the fractions, paying careful attention to signs.

$-\frac{3}{5} + \frac{1}{2}$

Answer: _____

6. Simplify the fraction completely.

$\frac{24}{36}$

Answer: _____

Scan to watch

7. Add the mixed fractions and express the answer as a mixed number in simplest form.

$2\frac{1}{3} + 1\frac{3}{4}$

Answer: _____

8. Subtract the mixed fractions and express the answer as a mixed number in simplest form.

$5\frac{1}{4} - 2\frac{2}{3}$

Answer: _____

9. Compare the two fractions using the symbol <, >, or =.

dfrac 3 5 ; square ; dfrac 4 7

Answer: _____

10. Evaluate the expression using the order of operations (PEMDAS).

$\frac{1}{2} + \frac{2}{3} \cdot \frac{3}{4}$

Answer: _____

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ANSWER KEY & SOLUTIONS

This worksheet covers prime factorization, fraction operations review, the butterfly method, adding and subtracting fractions (including negatives), simplifying fractions in special cases, mixed fractions, fraction inequalities, and applying PEMDAS to fraction expressions.

Solutions

1. Find the prime factorization of the given number.

84

→ *Divide 84 by 2 to get 42.*
→ *Divide 42 by 2 to get 21.*
→ *Divide 21 by 3 to get 7, which is prime.*
→ *Write the result as a product of prime factors.*

Answer: $2^2 \cdot 3 \cdot 7$

2. Use prime factorization to find the least common denominator (LCD) of the two fractions.

$\frac{5}{12}$ and $\frac{7}{18}$

→ *Factor 12 as 2 times 2 times 3.*
→ *Factor 18 as 2 times 3 times 3.*
→ *Take the highest power of each prime: two squared and three squared.*
→ *Multiply four by nine to get 36.*

Answer: 36

3. Add the fractions using the butterfly method.

$\frac{2}{3} + \frac{1}{4}$

→ *Cross multiply two by four to get eight and one by three to get three.*
→ *Add the cross products to get eleven for the numerator.*
→ *Multiply the denominators three and four to get twelve.*
→ *The result eleven over twelve is already in simplest form.*

Answer: $\frac{11}{12}$

4. Subtract the fractions using the butterfly method.

$\frac{5}{6} - \frac{3}{8}$

→ *Cross multiply five by eight to get forty and three by six to get eighteen.*
→ *Subtract forty minus eighteen to get twenty-two for the numerator.*
→ *Multiply the denominators six and eight to get forty-eight.*
→ *Simplify twenty-two over forty-eight by dividing both by two to get eleven over twenty-four.*

Answer: $\frac{11}{24}$

Scan to watch

5. Add the fractions, paying careful attention to signs.

$$-\frac{3}{5}+\frac{1}{2}$$

→ *Find a common denominator of ten.*
→ *Rewrite negative three-fifths as negative six over ten and one-half as five over ten.*
→ *Add the numerators: negative six plus five equals negative one.*
→ *The result is negative one over ten.*

Answer: $-\frac{1}{10}$

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6. Simplify the fraction completely.

$$\frac{24}{36}$$

→ *Find the greatest common factor of 24 and 36, which is 12.*
→ *Divide the numerator 24 by 12 to get 2.*
→ *Divide the denominator 36 by 12 to get 3.*
→ *Write the simplified fraction as two-thirds.*

Answer: $\frac{2}{3}$

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7. Add the mixed fractions and express the answer as a mixed number in simplest form.

$$2\frac{1}{3}+1\frac{3}{4}$$

→ *Convert two and one-third to seven over three and one and three-fourths to seven over four.*
→ *Find a common denominator of twelve and rewrite as twenty-eight over twelve and twenty-one over twelve.*
→ *Add the numerators to get forty-nine over twelve.*
→ *Convert back to a mixed number: four and one-twelfth.*

Answer: $4\frac{1}{12}$

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8. Subtract the mixed fractions and express the answer as a mixed number in simplest form.

$$5\frac{1}{4}-2\frac{2}{3}$$

→ *Convert five and one-fourth to twenty-one over four and two and two-thirds to eight over three.*
→ *Find a common denominator of twelve: sixty-three over twelve minus thirty-two over twelve.*
→ *Subtract the numerators to get thirty-one over twelve.*
→ *Convert back to a mixed number: two and seven-twelfths.*

Answer: $2\frac{7}{12}$

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9. Compare the two fractions using the symbol <, >, or =.

dfrac 3 5 ; square ; dfrac 4 7

→ *Cross multiply three by seven to get twenty-one on the left side.*
→ *Cross multiply four by five to get twenty on the right side.*
→ *Since twenty-one is greater than twenty, the left fraction is larger.*
→ *Therefore three-fifths is greater than four-sevenths.*

Answer: $\frac{3}{5}>\frac{4}{7}$

10. Evaluate the expression using the order of operations (PEMDAS).

$$\frac{1}{2}+\frac{2}{3}\cdot\frac{3}{4}$$

→ *Apply multiplication before addition: multiply two-thirds by three-fourths to get six over twelve.*
→ *Simplify six over twelve to one-half.*
→ *Add one-half plus one-half to get two-halves.*
→ *Simplify two-halves to one.*

Answer: 1