Operations with mixed numbers. Professor Luis Fernández

Recall:

- To convert a mixed number to a fraction: $a\dfrac{b}{c} = \dfrac{a \cdot c + b}{c}$.

- To convert a fraction (say $\dfrac{n}{d}$ to a mixed number, divide the numerator by the denominator.

  Say you get quotient q with remainder r. Then $\dfrac{n}{d} = q\dfrac{n}{d}$.

- Also **remember** that $a\dfrac{b}{c}$ **really means** $a + \dfrac{b}{c}$ (the '+' sign is, usually and unfortunately, not written).

Multiplication and division of mixed numbers

The only way to multiply mixed numbers is:

1. Convert the mixed numbers to fractions.
2. Multiply or divide (whatever it is) the fractions.
3. Convert them back to mixed numbers. Remember to simplify the fractional part if possible.

Example: $\left(1\dfrac{3}{5}\right) \cdot \left(2\dfrac{1}{3}\right) = \dfrac{8}{5} \cdot \dfrac{7}{3} = \dfrac{56}{15} = 3\dfrac{11}{15}$.

Example: $\left(3\dfrac{1}{4}\right) \cdot \left(\dfrac{2}{5}\right) = \dfrac{13}{4} \cdot \dfrac{2}{5} = \dfrac{26}{20} = 1\dfrac{6}{20} = 1\dfrac{3}{10}$.

Example: $\left(2\dfrac{4}{5}\right) \div \left(3\dfrac{3}{4}\right) = \dfrac{14}{5} \div \dfrac{15}{4} = \dfrac{14}{5} \cdot \dfrac{4}{15} = \dfrac{56}{75}$

Exercises: Multiply or divide, as indicated.

1. $\left(1\dfrac{2}{3}\right) \cdot \left(2\dfrac{1}{3}\right) =$

2. $\left(1\dfrac{2}{3}\right) \div \left(2\dfrac{1}{3}\right) =$

3. $\left(3\dfrac{1}{2}\right) \div \left(2\dfrac{1}{3}\right) =$

4. $\left(2\dfrac{5}{6}\right) \div \left(1\dfrac{4}{5}\right) =$

5. $\left(3\dfrac{1}{2}\right) \cdot \left(2\dfrac{1}{3}\right) =$

6. $\left(1\dfrac{1}{2}\right) \div \left(4\dfrac{2}{3}\right) =$

7. $\left(3\dfrac{1}{5}\right) \div \left(2\dfrac{3}{4}\right) =$

8. $\left(2\dfrac{3}{4}\right) \cdot \left(2\dfrac{1}{3}\right) =$

9. $\left(4\dfrac{4}{5}\right) \cdot \left(5\dfrac{4}{5}\right) =$

10. $\left(3\dfrac{2}{7}\right) \cdot \left(2\dfrac{3}{5}\right) =$

11. $\left(2\dfrac{5}{6}\right) \cdot \left(6\dfrac{1}{3}\right) =$

12. $\left(3\dfrac{4}{5}\right) \div \left(5\dfrac{3}{4}\right) =$

Addition and subtraction of mixed numbers

Method 1 (easy to remember, but bigger numbers)

1. Convert the mixed numbers to fractions.
2. Add or subtract (whatever it is) the fractions.
3. Convert them back to mixed numbers. Remember to simplify the fractional part if possible.

Example: $\left(1\dfrac{3}{4}\right) + \left(2\dfrac{1}{3}\right) = \dfrac{7}{4} + \dfrac{7}{3} = \dfrac{21}{12} + \dfrac{28}{12} = \dfrac{49}{12} = 4\dfrac{1}{12}$.

Example: $\left(3\dfrac{1}{3}\right) - \left(1\dfrac{2}{5}\right) = \dfrac{10}{3} - \dfrac{7}{5} = \dfrac{50}{20} - \dfrac{21}{20} = \dfrac{29}{20} = 1\dfrac{9}{20}$.

Exercises: Add or subtract, as indicated.

13. $\left(3\dfrac{2}{3}\right) - \left(2\dfrac{1}{3}\right) =$

14. $\left(2\dfrac{2}{3}\right) + \left(1\dfrac{1}{3}\right) =$

15. $\left(2\dfrac{1}{2}\right) + \left(3\dfrac{1}{3}\right) =$

16. $\left(1\dfrac{5}{6}\right) + \left(2\dfrac{4}{5}\right) =$

17. $\left(5\dfrac{1}{2}\right) - \left(4\dfrac{1}{3}\right) =$

18. $\left(3\dfrac{1}{2}\right) + \left(2\dfrac{2}{3}\right) =$

19. $\left(5\dfrac{1}{5}\right) + \left(1\dfrac{3}{4}\right) =$

20. $\left(3\dfrac{3}{4}\right) - \left(3\dfrac{1}{3}\right) =$

21. $\left(1\dfrac{4}{5}\right) + \left(5\dfrac{4}{5}\right) =$

22. $\left(2\dfrac{2}{7}\right) - \left(1\dfrac{3}{5}\right) =$

23. $\left(4\dfrac{5}{6}\right) - \left(3\dfrac{1}{3}\right) =$

24. $\left(5\dfrac{4}{5}\right) - \left(5\dfrac{3}{4}\right) =$

<u>Method 2</u> (more complicated, but smaller numbers - we do it only for addition, although it also works for subtraction but it is more complicated)

1. Add the whole parts and the fractional parts of the two numbers separately.
2. Convert the resulting fractional part to a mixed number.
3. Add the results.

Example: $\left(1\dfrac{3}{4}\right) + \left(2\dfrac{1}{3}\right) = (1+2) + \left(\dfrac{3}{4} + \dfrac{1}{3}\right) = 3 + \left(\dfrac{9}{12} + \dfrac{4}{12}\right) = 3 + \dfrac{13}{12} = 3 + 1 + \dfrac{1}{12} = 4\dfrac{1}{12}$

Example: $\left(3\dfrac{1}{3}\right) + \left(1\dfrac{4}{5}\right) = (3+1) + \left(\dfrac{1}{3} + \dfrac{4}{5}\right) = 4 + \left(\dfrac{5}{15} + \dfrac{12}{15}\right) = 4 + \dfrac{17}{15} = 4 + 1 + \dfrac{2}{15} = 5 + \dfrac{2}{15}.$

<u>Exercises</u>: Add using method 2.

25. $\left(7\dfrac{2}{3}\right) + \left(9\dfrac{1}{3}\right) =$

26. $\left(12\dfrac{2}{3}\right) + \left(6\dfrac{1}{3}\right) =$

27. $\left(21\dfrac{1}{2}\right) + \left(10\dfrac{1}{3}\right) =$

28. $\left(11\dfrac{5}{6}\right) + \left(20\dfrac{4}{5}\right) =$

<u>Exercises</u>: **Review (mixed) exercises for operations with fractions and mixed numbers.**

29. $\left(4\dfrac{3}{5}\right) - \left(2\dfrac{1}{3}\right) =$

30. $\left(2\dfrac{5}{6}\right) \div \left(1\dfrac{4}{5}\right) =$

31. $\dfrac{3}{5} - \dfrac{1}{3} + \dfrac{7}{10} =$

32. $\dfrac{5}{8} + \dfrac{1}{10} - \dfrac{4}{5} =$

33. $\dfrac{3}{5} \cdot \dfrac{1}{3} =$

34. $\dfrac{5}{8} + \dfrac{1}{10} =$

35. $\dfrac{3}{5} - \dfrac{1}{3} =$

36. $\dfrac{5}{8} \div \dfrac{1}{10} =$

37. $\dfrac{1}{15} + \dfrac{7}{20} =$

38. $\dfrac{4}{7} \cdot \dfrac{7}{5} =$

39. $\left(1\dfrac{3}{10}\right) + \dfrac{7}{20} =$

40. $6 \cdot \dfrac{7}{5} =$

41. $\left(1\dfrac{2}{3}\right) \div 5 =$

42. $6 \div \dfrac{7}{5} =$

43. $\dfrac{1}{3} + \dfrac{1}{4} + \dfrac{1}{5} =$

44. $\left(1\dfrac{1}{5}\right) \cdot \left(3\dfrac{3}{4}\right) =$

45. $\dfrac{7}{6} \cdot \dfrac{2}{9} =$

46. $\dfrac{7}{6} - \dfrac{2}{9} =$

47. $\dfrac{7}{6} + \dfrac{2}{9} =$

48. $\dfrac{7}{6} \div \dfrac{2}{9} =$

49. $\left(7\dfrac{2}{3}\right) + \left(5\dfrac{1}{3}\right) =$

50. $\left(7\dfrac{2}{3}\right) \cdot \left(5\dfrac{1}{3}\right) =$