MATH 020 Support 1: Operations with Real Numbers

Fractions

Multiplying Fractions: \( \frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd} \)

Dividing Fractions: \( \frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c} \) (division means multiply by the reciprocal)

To add or subtract fractions, you need a common denominator.

Adding Fractions: \( \frac{a}{b} + \frac{c}{b} = \frac{a+c}{b} \)

Subtracting Fractions: \( \frac{a}{b} - \frac{c}{b} = \frac{a-c}{b} \)

Exponents

Exponents are used to represent repeated multiplication. For example, \( 5^3 = 5 \cdot 5 \cdot 5 \). In this exponential expression, the base is 5 and the exponent is 3.

Operations with Real Numbers

Adding Real Numbers with the Same Sign: Add the absolute value of the numbers and keep the sign.

Adding Real Numbers with Opposite Signs: Subtract the smaller absolute value from the larger absolute value, and keep the sign of the larger absolute value.

Subtracting Real Numbers: If \( a \) and \( b \) are real numbers, \( a - b = a + (-b) \). Subtractions means adding the opposite.

Multiplying Real Numbers: The product of two numbers with the same sign is positive. The product of two numbers with opposite signs is negative.

Dividing Real Numbers: The quotient of two numbers with the same sign is positive. The quotient of two numbers with opposite signs is negative.

Order of Operations

1. Parentheses/grouping symbols
2. Exponents
3. Multiply & Divide in order from left to right
4. Add & Subtract in order from left to right
Examples

Simplify the fraction.
1. \( \frac{3}{12} \)

2. \( \frac{55}{25} \)

Perform the indicated operation. Simplify all answers.
3. \( \frac{3}{8} \cdot \frac{5}{7} \)
4. \( \frac{4}{15} \cdot \frac{1}{2} \)
5. \( \left( \frac{3}{4} \right)^2 \)
6. \( \frac{3}{2} \div \frac{7}{5} \)
7. \( \frac{5}{2} \div 10 \)
8. \( \frac{12}{3} \div \frac{4}{3} \)
9. \( \frac{0}{5} \)
10. \( \frac{5}{0} \)
11. \( \frac{1}{2} + \frac{1}{2} \)
12. \( \frac{8}{15} - \frac{2}{15} \)
13. \( \frac{1}{2} + \frac{1}{4} \)
14. \( \frac{1}{2} - \frac{1}{3} \)
15. \( -3(7) \)
16. \( 2(3 - 5) \)

17. \( -\frac{15}{5} \)

18. \(-6 + 10\)

19. \(2 \cdot 3 - 4 \cdot 5\)

20. \(-6 + 6\)

21. \(14 - 20\)

22. \(5^2\)

23. \(-5^2\)

24. \((-5)^2\)

25. \(2 \cdot 3^2\)

26. \((-10) + 4 \cdot 2\)

27. \(8 - 3 \cdot 2 + 2^3\)

28. \(\sqrt{16}\)
29. Evaluate the expression $x^2 - y$ when $x = 2$ and $y = 3$.

30. Evaluate the expression $y^2 - 4xy$ when $x = 2$ and $y = 3$. 