

Study Guide for Final

Decimals

1. Know the representations of decimals.
 - (a) Units, strips, and mats
 - (b) Base 10 blocks
 - (c) Dollars, dimes, and pennies
2. Be able to explain why and how we teach expanded exponential form.
3. Understand the difference between a terminating decimal and a repeating decimal. Be able to convert these to fractions.
4. Know the definition of an irrational number.
5. Be able to add, subtract, multiply, and divide with decimals.
6. Understand how to write a number in scientific notation with a given number of significant digits.
7. Be able to convert from fractions to decimals, fractions to percents, decimals to percents, and vice versa.
8. Write and solve word problems involving ratios, including similar triangles and compound interest problems. Be able to solve these in more than one way.
9. Know how to order a set of decimals and/or fractions.

Sets

1. Be able to describe sets with word descriptions, listing in braces, and set builder notation.
2. Be able to set up and solve problems with Venn diagrams.

Conceptual Models for Addition, Subtraction, Multiplication, and Division

You will need to be able to identify each different model, be able to formulate problems which illustrate each model, and be able to discuss benefits and drawbacks.

1. Set Model
2. Measurement Model
3. Take-away
4. Missing Addend
5. Comparison
6. Number-line (Measurement)
7. Repeated Addition
8. Array Model
9. Rectangular Area
10. Multiplication Tree
11. Cartesian Product
12. Repeated-Subtraction
13. Partition
14. Missing Factor

Algorithms

You will need to demonstrate a clear understanding of Exchange. You need to understand how each step in the development of the algorithm works and how they lead to the final algorithm.

1. Addition Algorithm
 - Units, Strips, and Mats
 - Place-Value Cards

- Instructional Algorithm
- Final Algorithm

2. Subtraction Algorithm

- Units, Strips, and Mats
- Place-Value Cards
- Instructional Algorithm
- Final Algorithm

3. Multiplication Algorithm

- Units, Strips, and Mats
- Place-Value Cards
- Expanded Form
- Instructional Algorithm
- Final Algorithm

4. Division Algorithm

- Scaffold
- Standard Algorithm

Problem Solving Strategies

Know Polya's Problem Solving Strategies. Given a problem, be able to tell me which of the above strategies you used to solve the problem. Be able to create and solve a problem using a particular strategy I give you.

1. Guess and Check
2. Make an orderly list
3. Draw a Diagram
4. Look for a Pattern
5. Make a Table
6. Use a Variable

7. Consider Special Cases
8. Solve an Equivalent Problem
9. Solve an Easier Similar Problem
10. Argue from Special Cases
11. Work Backward
12. Eliminate Possibilities
13. The Pigeonhole Principle
14. Use Inductive Reasoning
15. Use Deductive Reasoning

Divisibility of Natural Numbers

1. Be able to use a factor tree or division to find the prime factors of a number.
2. Know how to write a number in its prime-power representation.
3. Be able find all factors of a number. Know how many there should be.
4. Be able to quickly check if a number is divisible by 2, 3, 5, 6, 7, 8, 9, 10, 11, and 13. Be able to explain or write out each of the rules for the above numbers. You do not need to prove that they are true.

Greatest Common Factor and Least Common Multiple

1. Use Set Intersection to find $\text{GCD}(a,b)$ and $\text{LCM}(a,b)$.
2. Use Prime-power representation to find $\text{GCD}(a,b)$ and $\text{LCM}(a,b)$.
3. Use the Euclidean Algorithm to find $\text{GCD}(a,b)$ and $\text{LCM}(a,b)$.

Representation and Operations for Integers

1. Be able to use them to following methods to represent integers
 - (a) “Drops” of Colored Counters

- (b) Mail-Time
- (c) Number-Line

2. Be able to write and solve word problems using the representations above for a given equation.

Clock Arithmetic

1. Be able to add, subtract, multiply, and divide in 12-hour clock arithmetic.
2. Be able to add and subtract in clock arithmetic with a base other than 12.

Fractions and Rational Numbers

1. Be able to explain what the “unit” is in any situation.
2. Models for Fractions - Be able to use these models to illustrate a given fraction.
 - (a) Colored Regions
 - (b) Set Model
 - (c) Fraction Strips
 - (d) Number-Line
3. Be able to simplify fractions.
4. Be able to find (least) common denominators.
5. Be able to order and compare rational numbers.
6. For the operations, addition, subtraction, multiplication, and division, be able to create and solve word problems using the models above and the new ones below:
 - (a) Area Measurement Model
 - (b) Sharing Model
 - (c) Missing Factor Model
 - (d) Invert and Multiply Algorithm

Other

1. Be able to do conversions from base ten to base n and vice versa. Be able to add and subtract in bases other than ten.
2. Understand Absolute Value