Fraction conceptualizations learning progression (LP)

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| LP Level | Student Characteristics | Item Responses |
| **4. Multiply & Divide** | **Understands that:**   * Multiplying a value by a fraction results in a value that is ths of the original value * Understands the difference between multiplying and dividing fractions | **Is able to:**   * Use multiplication to find a portion of a value * Determine that multiplying a value by a fraction with magnitude less than 1 will result in a value with smaller magnitude and multiplying by an improper fraction will result in a value with larger magnitude, and vice versa for division, without performing the calculations * Divide a value by a fraction   **Common Errors:**   * May not understand the conceptualization of a fraction as a ratio * May have diffculty understand practical applications of fractions in solving real-world problems |
| **3. Represent on Line** | **Understands that:**   * Fractions represent unique numerical values (real numbers) * Two fractions are equivalent if they represent the same numerical value * Fractional values can be converted to decimals or percentages while maintaining their numerical value * Improper fractions may be rewritten as mixed numbers and vice versa * Fractions with different denominators may be readily compared, added, or subtracted once they are put into the same units   **May not yet understand that:**   * Fractions may be written as ratios and may represent part-part relationships or rates | **Is able to:**   * Create and identify equivalent fractions, including converting between improper fractions and mixed numbers * Order fractions and mixed numbers with different numerators and different denominators * Add and subtract fractions and mixed numbers with different denominators   **Common Errors:**   * May not understand the conceptualization of a fraction as a ratio * May have diffculty understand practical applications of fractions in solving real-world problems |
| **2. Understanding Unit Fractions (Finding Fair Shares)** | **Understands that:**   * Fractional parts must be equal (“fair shares”) but may not appear the same * The fraction represents the division of by * Unit fractions can be iterated to reproduce the original whole or part of the whole * Dividing the same whole into more parts (larger denominator) results in smaller unit pieces   **May not yet understand that:**   * A fraction has its own specific value that can be uniquely placed on a number line. * The same fractional value may be represented in multiple ways | **Is able to:**   * “Share” a whole between a specified number of groups * Identify unit fractions * Use unit fractions to reproduce composite fractions , including the whole * Compare fractions with the same numerator and different denominators * Add and subtract composite fractions with the same denominator   **Common Errors:**   * Misplacing a fraction on a number line * Incorrectly comparing two fractions with different numerators and different denominators * Not recognizing improper fractions as valid |
| **1. See Part-Whole** | **Understands that:**   * A fraction represents a specified number of parts out of the total number of parts   **May not yet understand that:**   * A whole must be partitioned equally   All parts of the whole must be used when partitioning | **Is able to:**   * Identify the number of specified and total parts in an area model or in a described situation. * Compare fractions with the same denominator and different numerators   **Common Errors:**   * Making unequal parts or fail to exhaust the whole when attempting an equipartitioning task * Treating the numerator and denominator of a fraction as unrelated values |