**Vertical Progression: Computational Fluency**

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| * 1. **The student will**
1. **estimate and determine the sum or difference of two whole numbers; and**
2. **create and solve single-step and multistep practical problems involving sums or differences of two whole numbers, each 9,999 or less.**

***Essential Knowledge and Skills:*** * Determine whether an estimate or an exact answer is an appropriate solution for practical addition and subtraction problems involving single-step and multistep problems. (a, b)
* Estimate the sum of two whole numbers with sums to 9,999. (a)
* Estimate the difference of two whole numbers, each 9,999 or less. (a)
* Apply strategies, including place value and the properties of addition, to add two whole numbers with sums to 9,999. (a, b)
* Apply strategies, including place value and the properties of addition, to subtract two whole numbers, each 9,999 or less. (a, b)
* Use inverse relationships between addition and subtraction facts to solve practical problems. (b)

Create and solve single-step and multistep practical problems involving the sum or difference of two whole numbers, each 9,999 or less. (b) | **4.4 The student will**1. demonstrate fluency with multiplication facts through 12 × 12, and the corresponding division facts;\*
2. estimate and determine sums, differences, and products of whole numbers;\*
3. estimate and determine quotients of whole numbers, with and without remainders;\* and
4. create and solve single-step and multistep practical problems involving addition, subtraction, and multiplication, and single-step practical problems involving division with whole numbers.

\*On the state assessment, items measuring this objective are assessed without the use of a calculator**.*****Essential Knowledge and Skills:*** * Demonstrate fluency with multiplication through 12 × 12, and the corresponding division facts. (a)
* Estimate whole number sums, differences, products, and quotients, with and without context. (b, c)
* Apply strategies, including place value and the properties of addition to determine the sum or difference of two whole numbers, each 999,999 or less. (b)
* Apply strategies, including place value and the properties of multiplication and/or addition, to determine the product of two whole numbers when both factors have two digits or fewer. (b)
* Apply strategies, including place value and the properties of multiplication and/or addition, to determine the quotient of two whole numbers, given a one-digit divisor and a two- or three-digit dividend, with and without remainders. (c)
* Refine estimates by adjusting the final amount, using terms such as *closer to, between*, and *a little more than*. (b, c)
* Create and solve single-step and multistep practical problems involving addition, subtraction, and multiplication with whole numbers. (d)
* Create and solve single-step practical problems involving division with whole numbers. (d)
* Use the context in which a practical problem is situated to interpret the quotient and remainder. (d)
 | **5.4 The student will create and solve single-step and multistep practical problems involving addition, subtraction, multiplica-tion, and division of whole numbers.*****Essential Knowledge and Skills:*** * Create single-step and multistep practical problems involving addition, subtraction, multiplication, and division of whole numbers, with and without remainders.
* Estimate the sum, difference, product, and quotient of whole numbers.
* Apply strategies, including place value and application of the properties of addition and multiplication, to solve single-step and multistep practical problems involving addition, subtraction, multiplication, and division of whole numbers, with and without remainders, in which:
* sums, differences, and products do not exceed five digits;
* factors do not exceed two digits by three digits;
* divisors do not exceed two digits; or
* dividends do not exceed four digits.
* Use the context of a practical problem to interpret the quotient and remainder.
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| **3.4** **The student will** 1. **represent multiplication and division through 10 × 10, using a variety of approaches and models;**
2. **create and solve single-step practical problems that involve multiplication and division through 10 × 10;**
3. **demonstrate fluency with multiplication facts of 0, 1, 2, 5, and 10; and**

**d) solve single-step practical problems involving multiplication of whole numbers, where one factor is 99 or less and the second factor is 5 or less.*****Essential Knowledge and Skills:*** * Represent multiplication using a variety of approaches and models (e.g., repeated addition, equal-sized groups, arrays, equal jumps on a number line, skip counting). (a)
* Represent division using a variety of approaches and models (e.g., repeated subtraction, equal sharing, equal groups). (a)
* Write three related equations (fact sentences) when given one equation (fact sentence) for multiplication or division (e.g., given 6 x 7 = 42, write 7 x 6 = 42, 42 ÷ 7 = 6, and 42 ÷ 6 = 7. (a)
* Create practical problems to represent a multiplication or division fact. (b)
* Use multiplication and division basic facts to represent a given situation, using a number sentence. (b)
* Recognize and use the inverse relationship between multiplication and division to solve practical problems. (b)
* Solve single-step practical problems that involve multiplication and division of whole numbers through 10 × 10. (b)
* Demonstrate fluency with multiplication facts of 0, 1, 2, 5, and 10. (c)
* Solve single-step practical problems involving multiplication of whole numbers, where one factor is 99 or less and the second factor is 5 or less. (d)
* Apply strategies, including place value and the properties of multiplication and/or addition when multiplying and dividing whole numbers. (a, b, c, d)
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Resource: VDOE, 2016 *Mathematics Curriculum Frameworks*