

Whole Number Multiplication & Division Progressions K-5

For progressions of multiplication and division with fractions and decimals, see the Fractions Progressions K-5.

| | Understanding the Operations | Strategies & Properties | Fluency |
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| K | <ul style="list-style-type: none"> ● Count to 100 by ones and tens | | |
| 1 | <ul style="list-style-type: none"> ● Count to 120 by ones and tens | | |
| 2 | <ul style="list-style-type: none"> ● Use repeated addition to find the total number of objects in arrays with equal rows and groups <ul style="list-style-type: none"> ○ Work with arrays of up to 5 rows and 5 columns ○ Given a total number of objects, construct the array ○ Given the dimensions, determine the number of objects in the array ○ Write an equation to express the total as a sum of equal addends (repeated addition) ● Skip count within 1000 by 5's and 10's ● Solve one- and two-step word problems involving coin and dollar values (see Measurement Progressions) | | |
| 3 | <ul style="list-style-type: none"> ● Interpret products of whole number whole numbers as the total number of objects in equal groups of objects <ul style="list-style-type: none"> ○ Use concrete materials to directly model various multiplication situations ○ Identify the number of groups, and the number in each group ○ Connect concrete models to pictorial representations, and representations to equations/expressions ● Interpret whole number quotients of whole number shared or partitioned into equal groups <ul style="list-style-type: none"> ○ Use concrete materials to directly model various division situations ○ Identify information from the problem, including determining whether the missing information is the number of groups, or number in each group ○ Connect concrete models to pictorial representations, and representations to equations/expressions ○ Distinguish between the two distinct meanings of division as partitive (fair share) or measurement (repeated subtraction) ● Use multiplication and division within 100 to solve word problems involving arrays, equal groups, and measurement quantities <ul style="list-style-type: none"> ○ Use concrete materials, drawings and equations to represent the problems ○ Match or write equations including using a symbol to represent the unknown number ○ Use mathematical symbols to represent the problem (see Algebraic Progressions) ○ Identify information given in a problem, including using multiplication and division vocabulary (groups, total, factors, product, number of groups, number in each group) ● Multiply one-digit whole numbers by multiples of 10 within 10-90 <ul style="list-style-type: none"> ○ Extend understanding of the meaning of multiplication to model examples | <ul style="list-style-type: none"> ● Use multiplication and division within 100 to solve word problems involving arrays, equal groups, and measurement quantities <ul style="list-style-type: none"> ○ Use concrete materials, drawings and equations to represent the problems ● Apply properties of operations (no more than two at a time) as strategies to multiply and divide <ul style="list-style-type: none"> ○ Use concrete materials, including objects and arrays, to model specific situations ○ Write equations for the examples they have modeled ○ Explain and justify strategies involving the properties of operations ○ Does not need to name specific properties ● Understand division as an unknown-factor problem <ul style="list-style-type: none"> ○ Apply the inverse relationship of multiplication and division to solve division problems using known multiplication facts ○ Justify and reason about using missing factor problems to solve division problems | <ul style="list-style-type: none"> ● Fluently multiply and divide within 100 <ul style="list-style-type: none"> ○ Apply all prior strategies, based on properties, relationships, and patterns, to automatically recall facts |

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| | <ul style="list-style-type: none"> ○ Solve word problems ○ Identify patterns within the place values of the numbers, and relate to multiplication of one-digit factors, e.g. understanding 5×60 results in 5 groups of 6 tens, or 30 tens ● Determine the unknown whole number in a multiplication or division equation, relating three whole numbers (see Algebraic Progressions) ● Identify arithmetic patterns and explain them using properties or operations (see Algebraic Progressions) ● Solve two-step word problems using the four operations <ul style="list-style-type: none"> ○ Represent and solve these problems using models, pictures, words and equations ○ Justify reasonableness of answers using estimation strategies ● Solve problems involving masses or volumes, using the four operations (see Measurement Progressions) ● Relate area to the operation of multiplication (see Measurement Progressions) ● Draw a scaled picture or bar graph (see Data Progressions) | <ul style="list-style-type: none"> ● Relate area to the operation of multiplication (see Measurement Progressions) <ul style="list-style-type: none"> ○ Use an area model to represent the distributive property | |
| 4 | <ul style="list-style-type: none"> ● Interpret and solve multiplicative comparison problem situations and equations (interpret within factors of 10 x 10 and solve within 1-digit x 2-digit or 1-digit by multiple of 10) <ul style="list-style-type: none"> ○ Recognize two different sets are being compared, one is a multiple of the other, e.g. Mary has \$5, Sue has 4 times as much as Mary ○ Write and identify expressions/equations and statements for the comparisons ● Write or match multiplicative comparison situations to equations with a letter symbol representing the unknown ● Multiply whole number factors (up to 4-digits by 1-digit and two 2-digit factors) <ul style="list-style-type: none"> ○ Make connections between models/strategies and written equations ○ Problem situations may be used to build meaning of multiplication ● Find whole number quotients and remainders with up to 4-digit dividends and 1-digit divisors <ul style="list-style-type: none"> ○ Make connections between models/strategies and written equations ○ Problem situations may be used to build meaning of division ● Solve multistep (up to 3-steps) word problems with whole numbers, using the four operations <ul style="list-style-type: none"> ○ Use and explain their problem-solving process using models, or pictures or numbers and words ○ Multiply within 2-digit by 1-digit, or multiples of 10 and 1-digit ○ Divide within 2-digit by 1-digit, including work with remainders | <ul style="list-style-type: none"> ● Multiply whole number factors (up to 4-digits by 1-digit and two 2-digit factors) <ul style="list-style-type: none"> ○ Use a variety of models including arrays and area models ○ Use a variety of strategies based on place value and applying the properties of operations including the distributive property and partial products ● Find whole number quotients and remainders with up to 4-digit dividends and 1-digit divisors <ul style="list-style-type: none"> ○ Use strategies based on place value, properties of operations, and the inverse relationship of multiplication and division ○ Use a variety of models including arrays and area models | <ul style="list-style-type: none"> ● |

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| | <ul style="list-style-type: none"> ○ Interpret and/or use the remainder with respect to the context ● Determine the unknown whole number in equations involving four numbers using comparative relational thinking and determine if equations are true or false (see Algebraic Progressions) ● Connect factors and multiples to make generalizations about prime and composite number values (see Algebraic Progressions) ● Given a rule, generate or extend a number or shape pattern (see Algebraic Progressions) ● Understand a digit in one place represents 10 times the value as the place to its right, and 1/10 the value to the left (see Number Sense Progressions) ● Connect multiplicative comparison reasoning to measurement situations (see Measurement Progressions) ● Apply understanding of whole number multiplication to multiply a fraction by a whole number (see Fraction Progressions) ● Convert larger measurement units to smaller units within one system of measure (see Measurement Progressions) ● Solve word problems involving distances, time intervals, liquid volumes, masses of objects and money, using the four operations (see Measurement Progressions) ● Apply the formula for area in real world measurement problems (see Measurement Progressions) | | |
| 5 | <ul style="list-style-type: none"> ● Find whole number quotients of whole numbers (up to four digit dividends and two digit divisors) including in division problem situations <ul style="list-style-type: none"> ○ Connect previous experience with division meaning to divide by multiples of 10 ○ Use place value and estimation to determine reasonableness of answers ○ Reason and justify solutions using pictures, words, and numbers ● Students are not expected to use a standard algorithm ● Extend whole number work with multiplication and division to situations involving fractions and decimals, including work with all problem situations (see Fractions Progressions) ● Translate numerical expressions into words, and mathematical expressions in words into numerical expressions (see Algebraic Progressions) ● Convert among different sized standard measurement units (see Measurement Progressions) ● Extend multiplication work to finding volumes of prisms (see Measurement Progressions) | <ul style="list-style-type: none"> ● Find whole number quotients of whole numbers (up to four digit dividends and two digit divisors) including in division problem situations <ul style="list-style-type: none"> ○ Apply properties of operations, and inverse relationship between multiplication and division ○ Illustrate and explain using equations, arrays, and area models ○ Connect models to use of compatible numbers, partial products, and partial quotients | <ul style="list-style-type: none"> ● Fluently multiply multi-digit whole numbers (up to five digits by two digits) <ul style="list-style-type: none"> ○ Connect previous work on the meaning of multiplication to solve problem situations ○ Determine reasonability of answers by estimating ○ Connect previous place value knowledge to understand and use the traditional algorithm ○ Reason and explain use of the standard algorithm using the properties of multiplication and place value |