**This Learning Progression begins at Foundation Level of the Victorian Curriculum and concludes at Level 4. Seven progressions are provided in this span.**

*Description:* This Learning Progression describes how a student becomes increasingly able to use multiplicative strategies in computation. The coordination of units multiplicatively involves using the values of one unit applied to each of the units of the other, the multiplier. This process of coordinating units is equally relevant to problems of division. Although multiplication of whole numbers can be achieved by repeated addition, this isn’t necessarily the best way to think of multiplication. To determine how many shoes are in 100 pairs of shoes it is possible (but not practical) to add 100 lots of 2. Coordinating ‘100’ as one unit, as well as ‘2’ as a unit, leads to appreciating a multiplicative relationship between the quantities. Recognising that 100 lots of 2 is the same as 2 lots of 100 is an important multiplicative strategy. This same understanding relates to seeing the two forms of division as being equivalent.

In the *sharing* model of division, the divisor indicates a whole number of equal groups and the quotient, the result of division, is the size of each part. In 12 ÷ 3 = 4, twelve is *shared* into 3 equal groups and there are 4 in each group. An over-reliance on the sharing model of division can contribute to misconceptions about division with decimals.This model is inadequate when the division has a divisor that is less than one. In the *measurement* division model, the divisor indicates the size of the subset (number in each group) and the quotient is the number of equal-sized subsets. For 12 ÷ 3 = 4, 12 is divided into groups of 3, and 4 is the number of groups of 3. The measurement division model is sometimes described as quotitive division.

*Related Numeracy Learning Progressions*: Multiplicative strategies are used in the sub-elements *Operating with decimals, Operating with percentages* and *Interpreting fractions*.

*Details of progression provide nuanced and detailed descriptions of student learning – what students can say, do, make or write. Examples of student learning in each step are not hierarchical, nor are they to be used as a checklist.*

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| **Victorian Curriculum Foundation Level** | |  | | | | | **Victorian Curriculum Level 4** | |
| **Forming equal groups**  The student:   * shares collections equally by dealing (that is, distributing items one to one until they are exhausted) * makes equal groups and counts by ones to find the total. | **Perceptual multiples**  The student:   * uses groups or multiples in perceptual counting and sharing (rhythmic or skip counting with all items visible). | | **Figurative (imagined units)**  The student:   * relies on perceptual markers to represent each group * uses equal grouping and counting without individual items visible but need to represent the groups before determining the total * counts by twos, fives and tens, matching the count to groups of the corresponding size. | **Repeated abstract composite units**  The student:   * uses composite units in repeated addition and subtraction using the unit a specified number of times * uses skip counting and may use fingers to keep track of the number of groups as the counting occurs * determines the total or number of equal groups where the individual items cannot be seen. | **Coordinating composite units**    The student:   * coordinates two composite units (mentally) as an operation (that is, both the number of groups and the number in each group are treated as composite units) * represents multiplication in various ways (arrays, factors, ‘for each’) * represents division as sharing division and measurement or grouping division. | **Flexible strategies for multiplication**  The student:   * draws on the structure of multiplication to use known multiples in calculating related multiples (uses multiples of 4 to calculate multiples of 8) * uses known single-digit multiplication facts (7 boxes of 6 donuts is 42 donuts altogether because 7 x 6 = 42) * applies known facts and strategies for multiplication to mentally calculate (3 sixes is ‘double 6’ plus 1 more row of 6, 5 x 19 is half of 10 x 19 or 5 x 19 is 5 x 20 take away 5) * uses commutative properties of numbers (5 x 6 is the same as 6 x 5). | | **Flexible number properties**  The student:   * uses multiplication and division as inverse operations * uses factors of a number to carry out multiplication and division (to multiply a number by 72, first multiply by 12 and then multiply the result by 6) * uses knowledge of distributive property of multiplication over addition (7 x 83 equals 7 x 80 plus 7 x 3) * uses decomposition into hundreds, tens and ones to calculate using partial products with numbers of any size (327 x 14 is equal to 4 x 327 plus 10 x 327) * uses estimation and rounding to check the reasonableness of products and quotients. |
| **Flexible strategies for division**  The student:   * applies known multiples and strategies for division to mentally calculate (to find 64 divided by 4, halves 64 then halves 32) * explains the idea of a remainder as an incomplete next row or multiple and determines what is ‘left over’ from the division. | |

Student learning in numeracy has links beyond Mathematics in the Victorian Curriculum F–10. Teachers are encouraged to identify links within their teaching and learning plans.