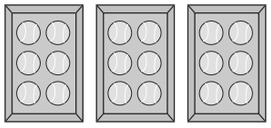
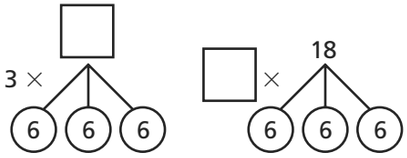
Multiplication and Division in Real-World Contexts

Students must recognize four common situations in which we use multiplication or division. They are listed below with examples. Multiplication and division are taught together so that students can see that one operation is the reverse of the other.

1. Equal Groups





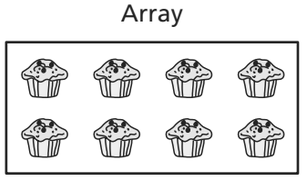
A sport shop sells tennis balls in boxes of 6.

Multiplication: Dana bought 3 boxes. How many balls did she buy?

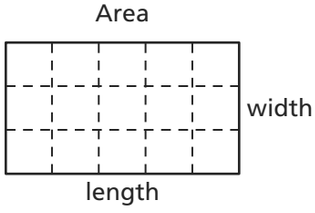
Division: Adam needs 18 balls. How many boxes should he buy?

2. Arrays and Area

An **array** is made of objects arranged in a rectangular shape. We can find the product by multiplying the number of columns by the number of rows.



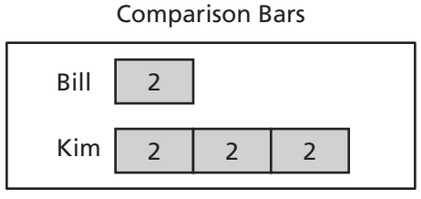
The **area** of a rectangle is an array of touching square units. The floor shown here is 5 yards long and 3 yards wide. To find the area, we multiply the length times the width.



In division situations, the product and a factor are known, and one solves to find the unknown factor.

3. Comparisons

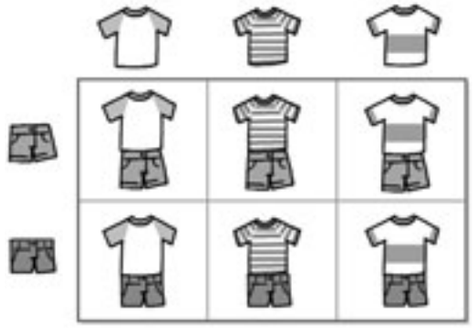
Some comparisons involve multiplication or division. Students are encouraged to draw simple "comparison bars" like the ones shown below to visualize the comparison.



Multiplication: Bill has 2 apples. Kim has 3 times as many apples as Bill. How many apples does Kim have?

Division: Kim has 6 apples. Bill has $\frac{1}{3}$ as many apples as Kim. How many apples does Bill have? *(Divide 6 by 3.)*

4. Combinations



Multiplication: Joel is taking 3 shirts and 2 pairs of shorts to camp. How many outfits can he make?

To help students understand that the answer to this problem is 6 (3 × 2) rather than 5 (3 + 2), students make a table with all the possible combinations.

Division: Joel is taking 6 outfits to camp. He has 2 pairs of shorts and some shirts. How many shirts does Joel have?

Algebraic Equations: Students' methods for representing and solving multiplication and division situations are extended by the introduction of simple algebraic equations such as $4n = 32$ and $5n + 2 = 47$. Gradually students begin to use these algebraic equations to solve complex word problems such as the one shown below:

A truck carried 6 chairs and a table weighing 40 pounds. Altogether the chairs and table weigh 100 pounds. How much does each chair weigh?

$$\begin{aligned} 60c + 40 &= 100 \text{ pounds} \\ 6c &= 60 \text{ pounds} \\ c &= 10 \text{ pounds} \end{aligned}$$

Students do not use formal algebraic solution methods because their informal reasoning is sufficient. But they do move to using correct algebraic notation ($6c$ instead of $6 \times c$).

Multiplication Patterns and Multiplication/Division Fluency

Count-By Patterns: Learning multiplication and division can be facilitated by making students aware of predictable patterns for certain numbers. With some multiplication count-bys, the pattern is obvious, as with the 10s (10, 20, 30, 40, etc.), the 5s (5, 10, 15, 20, etc.), and the 2s (2, 4, 6, 8, etc.)

With other count-bys, students may need help seeing the pattern, as with the 9s shown at the right. Because of our 10-based number system, the 9s form a sequence of 10 minus 1, 20 minus 2, 30 minus 3, etc. Students examine patterns for all of the multiplication count-bys, including patterns within the multiplication table across different products.

Nines

1	11	21	31	41	51	61	71	81	91
2	12	22	32	42	52	62	72	82	92
3	13	23	33	43	53	63	73	83	93
4	14	24	34	44	54	64	74	84	94
5	15	25	35	45	55	65	75	85	95
6	16	26	36	46	56	66	76	86	96
7	17	27	37	47	57	67	77	87	97
8	18	28	38	48	58	68	78	88	98
9	19	29	39	49	59	69	79	89	99
10	20	30	40	50	60	70	80	90	100

Multiplication and Division Practice: At some point, of course, students need to practice until multiplication and division become automatic. Because students at this grade level vary greatly in their mastery of these operations, a variety of practice methods are used and can be adapted to the needs of your students.

Students work in groups with board games such as Factor the Footprints and The Factor Field, as well as with special Division Cards. They work individually with Scrambled Multiplication Tables and Factor Puzzles. A special tool called the Target enables individuals to focus on just the multiplications and divisions that they need to practice, with multiplication tables containing their targeted products. A description of all fluency materials is on page 163J.