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**Addition Properties**

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In this unit, students use a two-pan balance to compare and measure the mass of objects. They also learn to use the balance to compare quantities and represent a balanced relationship in an equivalent number sentence or equation.

Students use this context to further represent and explore the associative and commutative properties of addition.

These properties of addition are essential to problem solving, algebraic reasoning, and computational fluency. The two-pan balance provides students with a way to verify that different partitions of the same number are equal, and that quantities can be added in different orders and still remain equal.

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**Notes on Mass vs. Weight**

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In conversational speech, we talk about the weight of an object rather than its mass. These words are not synonymous. Technically, weight and mass are distinct concepts. In scientific terms, the **mass** of an object is the amount of matter in the object. In elementary grades we use a two-pan balance to measure mass. The **weight** of an object is the measure of the pull of gravity on an object. A bathroom scale is used to measure weight.

Children and adults usually talk about one object weighing more than another. During this unit you will probably hear students say they are “weighing” an object rather than “massing” it. It is acceptable for students to use these terms interchangeably. However, encourage your students to use the proper language for mass. For example, guide students to say that something “has a mass of 110 grams,” rather than “weighs 110 grams.”

Since students are already familiar with space travel, use this context to explain the difference between mass and weight. Many children know that the pull of gravity varies on different planets and that there is essentially no gravity in outer space. Tell them to imagine they are astronauts traveling to the moon. Once they reach their destination, they decide to check the change in their weight and mass. They discover they weigh less on the moon, but their masses stay the same.

Since the moon’s gravity is weaker than Earth’s, the pull on an individual object is less. Therefore, students would weigh less on the moon than on Earth. In contrast, the mass of an object remains constant regardless of space travel because gravity does not influence mass. Since a two-pan balance is used to measure mass, both sides of the scale are equally affected by gravity. For example, an 11-gram pencil balances one 1-gram and two 5-gram standard masses on Earth and it will balance those same masses on the moon.

For further information on mass, refer to the TIMS Tutor: *The Concept of Mass* in the *Professional Development Resource Guide*.

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**Math Facts and Mental Math**

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**Addition Facts.** Daily Practice and Problems items in this unit can be used to assess students’ fluency with the addition facts in Group F ( $8 + 6$ ,  $9 + 6$ ,  $9 + 7$ ,  $10 + 4$ ,  $10 + 5$ ,  $10 + 6$ ,  $10 + 7$ ,  $10 + 8$ ,  $9 + 8$ ,  $9 + 9$ ). The make-ten strategy and the use-ten strategy are commonly used to solve these facts.

**Related Subtraction Facts.** Students have been connecting addition to subtraction and using the addition facts to solve subtraction problems. Students proficient with their addition facts can also find the related subtraction facts. Daily Practice and Problems items in this unit can be used to assess students’ abilities to use the addition facts to solve the related subtraction problems for each fact in Group F.