| Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers (Standards 7.NS.1–3) |
|---|
| **Standard 7.NS.1:** Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.<br>**a.** Describe situations in which opposite quantities combine to make 0. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.*<br>**b.** Understand $p + q$ as the number located a distance $\|q\|$ from $p$ in the positive or negative direction, depending on whether $q$ is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.<br>**c.** Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.<br>**d.** Apply properties of operations as strategies to add and subtract rational numbers. |
| Concepts and Skills to Master |
| • Understand, apply, and explain the additive inverse property, including using situations with context.<br>• Model addition and subtraction of rational numbers, including integers, decimals, and fractions, on a number line.<br>• Add and subtract rational numbers, including integers, decimals, and fractions.<br>• Use strategies such as making zero pairs. For example, 6 + (-8) is the same as 6 + (-6) + (-2) **or** $\frac{1}{5} + \left(\frac{-3}{5}\right)$ is the same as $\frac{1}{5} + \left(\frac{-1}{5}\right) + (\frac{-2}{5})$ |

| Related Standards: Current Course | Related Standards: Future Courses |
|---|---|
| 7.NS.2, 7.NS.3, 7.EE.1, 7.EE.3, 7.EE.4, 7.SP.5 | 8.NS.1, 8.EE.2, IH.N.VM.10, II.N.RN.3, III.A.APR.7, P.N.VM.10 |

## Support for Teachers

| Critical Background Knowledge (Access background knowledge) |
|---|
| • Apply properties of operations as strategies to add and subtract (making a ten, composing/decomposing numbers) (1.OA.3 and 1.OA.6)<br>• Build fractions from unit fractions by joining/separating parts referring to the same whole (4.NF.3) and use benchmark fractions (5.NF.2)<br>• Represent positive and negative numbers in context (6.NS.5)<br>• Recognizing opposite signs of numbers as indicating locations on opposite sides of zero on the number line (6.NS.6)<br>• Finding and positioning rational numbers on a number line (6.NS.6)<br>• Understand, interpret and compare the absolute value of rational numbers (6.NS.7) |
| Academic Vocabulary |
| Integer, rational number, additive inverse, commutative property, associative property |
| |
| Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5170#71302 |

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers (Standards 7.NS.1–3)

**Standard 7.NS.2:** Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

- **a.** Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.
- **b.** Understand that integers can be divided, provided the divisor is not zero, and that every quotient of integers (with non-zero divisor) is a rational number. If *p* and *q* are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts.
- **c.** Apply properties of operations as strategies to multiply and divide rational numbers.
- **d.** Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

Concepts and Skills to Master

- Multiply and divide rational numbers and use properties of arithmetic to model multiplication and division of rational numbers.
- Understand the rules for multiplying and dividing signed numbers.
- Understand that every quotient of integers is a rational number (given the divisor is not zero).
- Use long division to change a fraction into a terminating or repeating decimal.
- Interpret products and quotients of rational numbers in real-world contexts.

| Related Standards: Current Course | Related Standards: Future Courses |
|---|---|
| 7.NS.3, 7.EE.1, 7.EE.3, 7.EE.4, 7.G.1, 7.SP.1 | 8.NS.1, 8.NS.2, 8.EE.1, 8.EE.4, IH.N.VM.9, II.N.RN.2, II.N.RN.3, II.N.CN.1, II.N.CN.2, III.A.REI.2, III.A.APR.6, III.A.APR.7, IIH.S.CP.8, P.N.VM.9, P.S.CP.8 |

Support for Teachers

Critical Background Knowledge

- Apply previous understanding of multiplication to multiply a fraction by a whole number(4.NF.4, 5.NF.4) or a fraction by a fraction (5.NF.4)
- Interpret multiplication as scaling (5.NF.5)
- Solve real-world problems involving multiplication of fractions and mixed numbers (5.NF.6) and division of whole numbers leading to answers in the form of fractions or mixed numbers using models (5.NF.3)
- Interpret and compute quotients of fractions (6.NS.1) and multi-digit decimals (6.NS.3)

Academic Vocabulary

Integer, terminating decimal, rational number, commutative property, associative property, distributive property

Resources:

Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5170#71302

| Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers (Standards 7.NS.1–3) | |
|---|---|
| **Standard 7.NS.3:** Solve real-world and mathematical problems involving the four operations with rational numbers. Computations with rational numbers extend the rules for manipulating fractions to complex fractions. | |
| Concepts and Skills to Master | |
| • Model and solve real world problems involving the four operations with rational numbers.<br>• Model and solve real world problems involving complex fractions. | |
| Related Standards: Current Course | Related Standards: Future Courses |
| 7.RP.2, 7.NS.1, 7.NS.2, 7.EE.1, 7.EE.3, 7.EE.4 | SMP.4, 8.NS.1, 8.NS.2, 8.EE.4, IH.N.VM.9, II.N.RN.2, II.N.RN.3, II.N.CN.1, II.N.CN.2, IIH.S.CP.8, III.A.REI.2, III.A.APR.6, III.A.APR.7, P.N.VM.9, P.S.CP.8 |

Support for Teachers

| Critical Background Knowledge (Access Background Knowledge) |
|---|
| • Apply previous understanding of multiplication to multiply a fraction by a whole number (4.NF.4, 5.NF.4) or a fraction by a fraction (5.NF.4)<br>• Build fractions from unit fractions by joining/separating parts referring to the same whole (4.NF.3) and use benchmark fractions (5.NF.2)<br>• Solve real-world problems involving multiplication of fractions and mixed numbers (5.NF.6) and division of whole numbers leading to answers in the form of fractions or mixed numbers using models (5.NF.3)<br>• Interpret and compute quotients of fractions (6.NS.1) and multi-digit decimals (6.NS.3)<br>• Use order of operations (6.EE.2)<br>• Represent positive and negative numbers in context (6.NS.5) |
| Sum, difference, product, quotient, difference |
| Resources: |
| Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5170#71302 |