Math Objectives

- Students will explore equivalent expressions.
- Students will use the Calculator application to verify equivalence with fractions, decimals, factors, exponents, and order of operations.
- Students will use appropriate tools strategically (CCSS Mathematical Practices).
- Students will attend to precision (CCSS Mathematical Practices).

Vocabulary

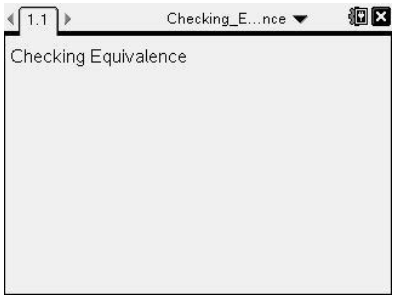
- equivalent expressions
- factor
- order of operations

About the Lesson

- This lesson involves students investigating equivalent expressions.
- As a result, students will:
  - Create equivalent expressions.
  - Check that the expressions they create are equivalent using TI-Nspire.

TI-Nspire™ Navigator™ System

- Use Screen Capture to monitor students' progress.
- Use Quick Poll to quickly assess understanding.



TI-Nspire™ Technology Skills:

- Create a TI-Nspire document
- Open a document
- Move between pages

Tech Tips:

- Make sure the font size on your TI-Nspire handheld is set to Medium.
- You can hide the function entry line by pressing ctrl G.

Lesson Materials

- *Checking_Equivalence_Student*.pdf
- *Checking_Equivalence_Student*.doc

Visit www.mathnspired.com for lesson updates and tech tip videos.

Discussion Points and Possible Answers

Here are some possible responses to the questions in the Checking Equivalence Student Activity.

Part 1

Step 4

3. What is one way to obtain $\frac{58}{80}$ from $\frac{29}{40}$?

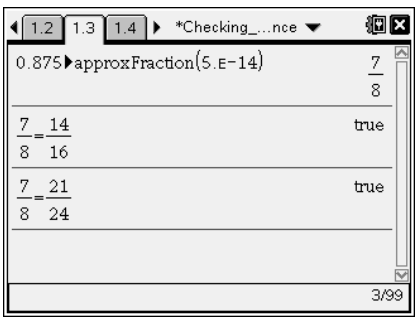
   Sample answer: $\frac{29}{40}=\frac{29\cdot 2}{40\cdot 2}=\frac{58}{80}$

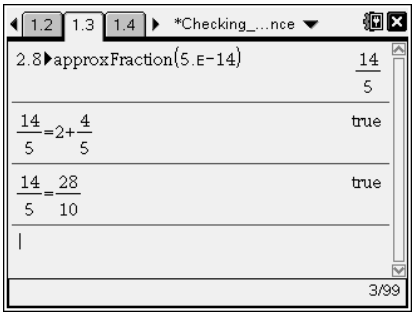
4. Find two other fractions that are equivalent to 0.725 and test the truth value.

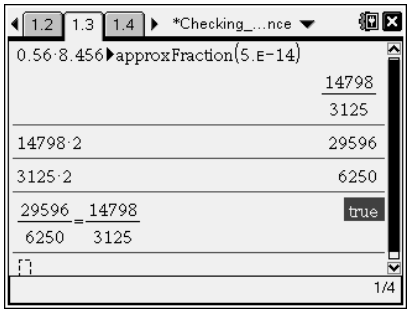
   Sample answer: $\frac{29}{40}=\frac{290}{400}$; $\frac{29}{40}=\frac{145}{200}$ Many answers are possible.

5. Find two other equivalent fractions and test the truth value in the calculator application.

   0.875 2.8 $(0.56\cdot 8.456)$

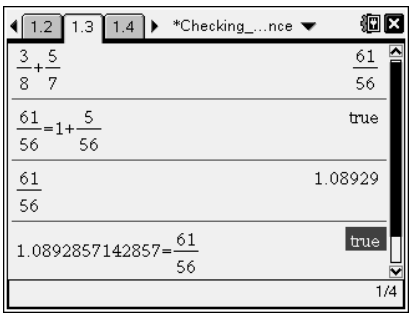


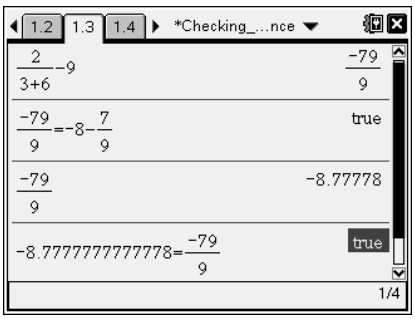


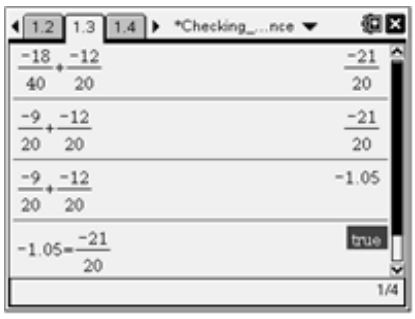


6. Perform the following operations with fractions, and then find both a decimal and a fraction that are equivalent to your result.

   $\frac{3}{8}+\frac{5}{7}$ $\frac{2}{3+6}-9$ $-\frac{18}{40}+\left(-\frac{12}{20}\right)$

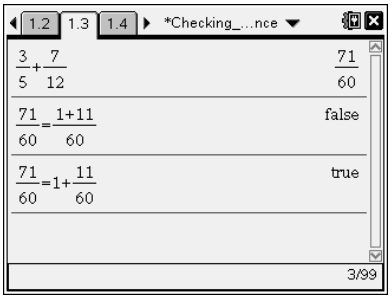






TI-Nspire Navigator Opportunity: *Screen Capture*
See Note 1 at the end of this lesson.

7. Mike tried to find an expression equivalent to $\frac{71}{60}$.



Correct his work so that the equivalence is true.

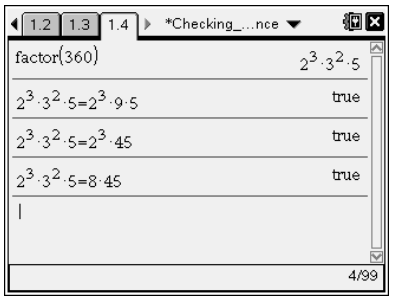
Note: Students might have a difficult time if they choose to rewrite an improper fraction as a mixed number. Many students don't realize that a mixed number written $1\frac{1}{2}$ has the value of $1+\frac{1}{2}$.

Thus, to correct Mike's work, see the screen to the right.

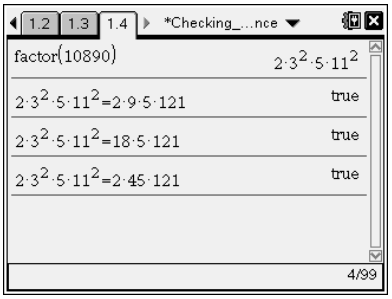
Part 2

4. Use the Calculator application to check your equivalent expressions. Here are some possible student answers.

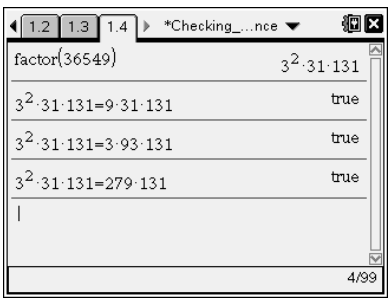
360



10890



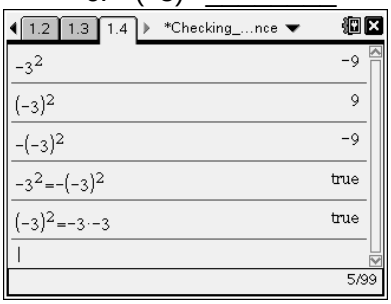
36549



Part 3

5. Predict the value of each of the following. Create an equivalent expression, and test it.

a. -3^2 _____ b. $(-3)^2$ _____ c. $-(-3)^2$ _____



Teacher Tip: Students might need to be reminded that after entering an exponent, they must use ▶ (the right arrow) to move the cursor out of the exponent field.

Note: In order to answer questions 5, 6, and 7 correctly, students will need to show knowledge of the laws of exponents, distributive property, and order of operations; otherwise, the output generated by the handheld is the numerical value, not written in exponential form.

6. Simplify each of the following without using the calculator application. Leave the result in exponential form. Check each of the simplifications and rewrite as another true statement.

a. $5^3 \cdot 5^7$ b. $(5^2 + 5^5)^2$ c. $(5^2)^4$ d. $\frac{5^6}{5^8}$

5^{10}, $(5^5)^2$ **$5^{10} + 2(5^7) + 5^4$, $(5^2 + 5^5)(5^2 + 5^5)$** **5^8, $5^3 \cdot 5^5$** **5^{-2}, $5^6 \cdot 5^{-8}$**

Part 4

7. Are the following equal? If not, change the right-hand side of the equation to create true statements.

a. $4 + 3(6) = 7(6)$ b. $24 \div 6 \cdot 2 = 24 \div 12$ c. $-3 \cdot 36 - (-3) \cdot 54 = -3(36 + 54)$

True **False; $24 \div 6 \cdot 2 = 24 \div 3$** **False; $-3 \cdot 36 - (-3) \cdot 54 = -3(36 - 54)$**

TI-Nspire Navigator Opportunity: *Quick Poll*
See Note 2 at the end of this lesson.

Wrap Up

Upon completion of the discussion, the teacher should ensure that students understand:

- What equivalence means, for fractions, decimals, and other expressions.
- How to use TI-Nspire to check if expressions are equivalent.

Assessment

1. Have students provide 2 fractions that are equivalent to 0.625.
   Sample answer: $\frac{5}{8}, \frac{10}{16}$

2. Is $-5^2 = 25$? Explain why or why not.
   Sample answer: Yes. $-5^2 = -5(-5)$, and the product of two negative numbers is always positive.

TI-Nspire Navigator

Note 1

Questions 1 and 2, *Screen Capture*: As students proceed through questions 1 and 2, take Screen Captures periodically to monitor their progress.

Note 2

End of lesson, *Quick Poll*: Using the Open Response Question Type feature ask students to submit their answers to the following:

1. Simplify: -6^2 **Answer:** -36
2. Submit one equivalent fraction to $\frac{7}{12}$.
   Sample answers: $\frac{14}{24}; \frac{21}{36}; \frac{70}{120}$. Discuss correct and incorrect responses.