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## The Right Combination

ID: 11616

Time required  
*45 minutes*

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### Activity Overview

*In this activity, students use the order of operations and number properties to create a unique expression from a set of numbers that must equal another number. Then they will place parenthesis in a number statement to make it true. Students will also identify properties commonly used evaluating expressions.*

### Topic: Numbers and Operations

- *Understand meanings of operations and how they relate to one another.*
- *Use the associative and commutative properties of addition and multiplication and the distributive property of multiplication over addition to simplify computations with integers, fractions, and decimals*

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### Teacher Preparation and Notes

- *TI-Navigator is not required for this activity, but an extension is given for those teachers that would like to use it.*
- ***To download the student worksheet and navigator file, go to [education.ti.com/exchange](http://education.ti.com/exchange) and enter “11616” in the quick search box.***

### Associated Materials

- *MGAct11\_RightCombo\_worksheet\_TI73.doc*
- *MGAct11\_LrnChk\_TI73.edc*

### Suggested Related Activities

*To download the activity listed, go to [education.ti.com/exchange](http://education.ti.com/exchange) and enter the number in the quick search box.*

- *Roll of the Dice (TI-73 Explorer with TI-Navigator) — 6679*
- *Real Number Properties (TI-84 Plus family) — 1632*

**Problem 1 – The Right Combination**

Students may or may not have prior experience with the Commutative and Associative Properties of Addition and Multiplication. They may solve the problems with trial and error, as long as they are following correct order of operations.

Questions 1–4

Operations can be performed on the Home screen to verify student results. Using an overhead projector, the whole class can see different approaches to solving the same problem.

For example, to evaluate Exercise 1, press  $6 \div 6 + 2 + 1$ . If you wish, insert parentheses around division to ensure students understand that it needs to be performed first. This becomes more important as students work with more complex entries later.

If needed, generate additional examples to use with students. To quickly generate 4 numbers between 1 and 6, use the **dice(** command. Press **MATH**  $\rightarrow$   $\rightarrow$  to PRB and select number **7**, **dice(**. On the home screen, then enter the quantity of numbers you would like generated. For example, to generate 4 numbers, enter **dice(4)** and press **ENTER**.

A calculator screen showing the expression  $6 \div 6 + 2 + 1$  and the result  $4$ .

A calculator screen showing the command **dice(4)** and the result  $\{3\ 3\ 5\ 4\}$ .

Question 5

Students may have arrived at different answers to the problems. Make sure they can show how their answer is correct.

Question 6

Have students explain verbally what the calculator is doing in the entry Sarah used. Then, have someone enter the correct problem and see the answer.

The key presses for the problem to the right are  $4 \times (4 \div 2)$ .

A calculator screen showing the expression  $4 * 1 + (4 \div 2)$  and the result  $6$ .

Question 7

Have students explain verbally what the calculator is doing in the entries Steven and Jalil used. When students enter these expressions into the calculator, they will see that the both equal 4 because  $12/4$  and  $6/2$  both equal 3.

A calculator screen showing two expressions:  $(6 + 6) \div 4 + 1$  and  $6 \div (6 - 4) + 1$ , both resulting in  $4$ .

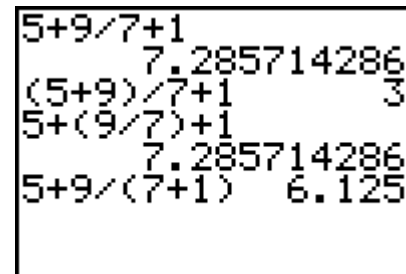
**Problem 2 – Where Have All the Parentheses Gone?**

Questions 9–12

Students need to pay close attention to the order of operations. Have students determine which solutions, if any, are correct just by following the order of operations and actually need no parentheses.

Questions 13–18

Again, some of the exercises would evaluate correctly just by following the order of operations. However, students should begin learning to group calculations together to ensure they are performing the actual calculation desired, to result in a correct answer. Using an overhead calculator or emulator software, the problem could be displayed in different manners (placing parentheses in different locations). Have students explain what you have “told” the calculator to do.



**Problem 3 – Identifying Properties**

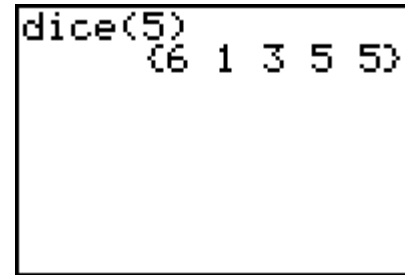
Questions 19–24

After using the different properties in solving problems earlier, this is an opportunity for students to correctly identify which properties are being used.

**Extension – TI-Navigator™**

1. Ask one student to exit out of **NavNet** so he or she can work on the TI-73 Home screen.

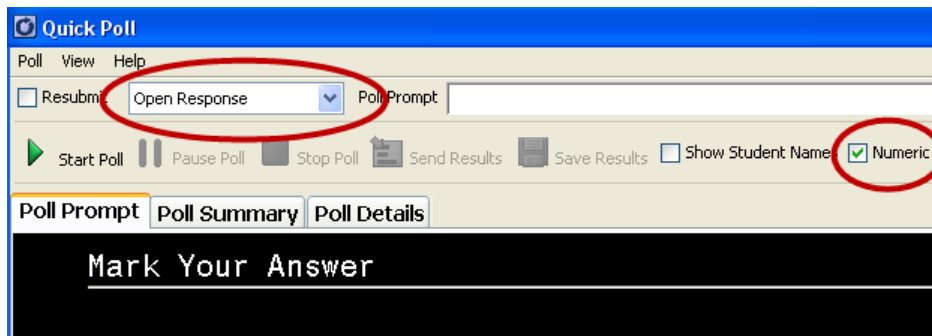
Have this student use the dice function to simulate rolling a single die five times by pressing **MATH** **▸** **▸** to PRB and select number **7**, **dice**(. Enter **5** and press **ENTER**.



Use **Screen Capture** to display the result.

2. Tell the class to create an expression using the first four numbers so that it equals the fifth number. This will be just like Questions 1–4 on the student worksheet. This can generate additional practice or can be used as a challenge. Increase to 5 or 6 numbers in each problem.
3. Challenge students to come up with an expression they think no one else will come up with. When everyone is ready, use **Quick Poll** (with Open Response) to collect their expressions. Make sure that the **Numeric** check box is selected.

If all students submit a correct expression, the histogram on the Poll Summary window will have only one bar, representing the fifth number. Therefore, you will immediately see if any students were not able to find a solution. Now uncheck the Numeric check box. This will reveal individual student responses. If needed, have volunteers explain why certain responses are correct.



4. Have students create a set of five numbers that they think is impossible to solve. Use **Quick Poll** to collect their numbers, and challenge other students disprove
5. Use the LearningCheck™ document **MGAct11\_LrnChk\_TI73.edc** to assess student understanding of adding and subtracting integers.

**Solutions – Student Worksheet**
Problem 1

1.  $\frac{6}{6} + 2 + 1 = 4$

2.  $\frac{3+2}{5} \times 2 = 2$

3.  $\frac{6}{3} + 2 \times 1 = 5$

4.  $2 - \frac{2+3}{5} = 1$

5. Answers will vary. Students should verify that each approach, if different, arrives at the same result.
6. No, she will not. The parentheses need to be around  $(4/2)$  instead.
7. Yes, they are both correct. Both number sentences evaluate to 4.
8. Yes, all four number sentences evaluate to the same number. She has just used the Commutative Property and parentheses to reorder or rearrange the addends.

Problem 2

9. No parenthesis needed

10.  $(4 \times 1) - (6 \div 6)$

11.  $(6 \div 6) \times 4 - 1$

 12.  $6 - 6 + 4 - 1$ ; This makes it easier to see that  $6 - 6$  is 0 and  $4 - 1$  is 3.

13.  $(5 + 9) \div 7 + 1 = 3$

14.  $2 \times (10 + 6) - 3 \times (6 \div 2) = 23$

15.  $(15 \div 5) + (30 \div 6) \times 2 = 13$

16.  $(32 \div (2 + 6)) + 6 = 10$

17.  $12 \div (4 + 2) \times 8 = 16$

18.  $(24 \div (2 + 4)) \div 2 = 2$

Problem 3

19.  $3 + 5 + 2$

20.  $5 \times 12$

21.  $5 + (3 + 2)$

22.  $6 \times 4 + 6 \times 1$

23.  $(7 \times 2) \times 6$



**Problem 1 – The Right Combination**

Use the first four numbers given, with the 4 operations (+, −, ×, ÷) and parentheses, to arrive at the given answer.

1. 6 6 2 1 Answer: 4

2. 3 2 2 5 Answer: 2

3. 3 6 1 2 Answer: 5

4. 2 3 5 2 Answer: 1

5. With a partner, compare the number sentences for Exercises 1–4. Did you come up with the same sentence? If not, are both correct? \_\_\_\_\_

\_\_\_\_\_

6. Sarah is given the numbers 4, 1, 2, and 4 to make 6. She has entered the following number sentence on her calculator. Will she get the expected 6? If not, how can she correct her mistake? \_\_\_\_\_

\_\_\_\_\_

$4+(1+4)/2$

7. Steven and Jalil are discussing their results. For the numbers 6, 6, 4, and 1, they are supposed to create a result of 4. Steven has entered the first line and Jalil entered the second line. Is either correct? Explain. \_\_\_\_\_

\_\_\_\_\_

$(6+6)/4+1$   
 $6/(6-4)+1$

8. Ayana was given the numbers 4, 1, 5, and 5 to total 3. She thinks all the following are possible number sentences. Do you agree? Explain.

$(5+4)-5-1 = 3$

$(5-5)+(4-1)$

$5-5+4-1$

$5+4-5-1$

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



**Problem 2 – Where Have all the Parentheses Gone?**

Given, 6, 4, 1, 6 to make 3, Jason, Rosie, and Khemal have all solved this problem differently. Place parenthesis, if needed, to make their number sentence correct.

9. Jason:  $6 + 4 - 6 - 1$  Correct sentence: \_\_\_\_\_

10. Rosie:  $4 \times 1 - 6 \div 6$  Correct sentence: \_\_\_\_\_

11. Khemal:  $6 \div 6 \times 4 - 1$  Correct sentence: \_\_\_\_\_

12. Use the Associate Property to make it easier to see that the answer to Jason's number sentence in Exercise 9 is 3. \_\_\_\_\_

In the following, insert parentheses to make each statement true. Use your calculator to verify.

13.  $5 + 9 \div 7 + 1 = 3$

14.  $2 \times 10 + 6 - 3 \times 6 \div 2 = 23$

15.  $15 \div 5 + 30 \div 6 \times 2 = 13$

16.  $32 \div 2 + 6 + 6 = 10$

17.  $12 \div 4 + 2 \times 8 = 16$

18.  $24 \div 2 + 4 \div 2 = 2$

**Problem 3 – Using Properties**

Complete each equation using the given property. Use the calculator to check your answers.

19. Commutative Property of Addition

$5 + 3 + 2 =$  \_\_\_\_\_

20. Commutative Property of Multiplication

$12 \times 5 =$  \_\_\_\_\_

21. Associative Property of Addition

$(5 + 3) + 2 =$  \_\_\_\_\_

22. Distributive Property

$6 \times (4 + 1) =$  \_\_\_\_\_

23. Associative Property of Multiplication

$7 \times (2 \times 6) =$  \_\_\_\_\_