

## **Title: Pardon My Expression**

### **Brief Overview:**

This unit introduces the concept of order of operations and its application in evaluating both numeric and algebraic expressions. Students will learn that an expression is a value obtained as a combination of numbers, symbols, and mathematical operations. During the three lessons, students will progress from applying the order of operations with two or more operations, to evaluating one-operation numeric expressions, and finally evaluating algebraic expressions with two or more operations.

### **NCTM Content Standard/National Science Education Standard:**

- Represent and analyze mathematical situations and structures using algebraic symbols
- Represent the idea of a variable as an unknown quantity using a letter or a symbol
- Use symbolic algebra to represent situations and to solve problems, especially those that involve linear relationships

### **Grade/Level:**

Grades 5-6

### **Duration/Length:**

Three class sessions, approximately 60-65 minutes per session

### **Student Outcomes:**

Students will:

- Write and identify expressions
- Determine the value of algebraic expressions with one unknown and one operation
- Use parenthesis to evaluate a numeric expression
- Evaluate numeric expressions using the order of operations
- Evaluate an algebraic expression

### **Materials and Resources:**

Day 1

- Class set of dry erase boards
- Class list recording sheet
- Exploration Activity (Teacher Resource 1)
- Picture of “Aunt Sally”(Teacher Resource 2) (Sample picture available at: <http://www.fotosearch.com/photos-images/old-women.html>, photo paa143000025)
- Order of Operations (Teacher Resource 3; Student Resource 1)

- Vocabulary cards (Teacher Resource 4) – cut apart
- Sorting Cards (Student Resource 2)
- Sorting Cards Answers (Teacher Resource 5)
- Websites for additional practice:  
[http://www.homeschoolmath.net/online/four\\_operations.php](http://www.homeschoolmath.net/online/four_operations.php)  
<http://www.shodor.org/interactivate/activities/ArithmeticFour/>

#### Day 2

- Class set of dry erase boards
- Class list recording sheet
- Pinch cards (Student Resource 3)
- Transparency of Teacher Resource 6
- Vocabulary cards (Teacher Resource 4)
- What's the Expression? (Student Resource 4)
- Answer for What's the Expression? (Teacher Resource 7)
- Transparency of Teacher Resource 8
- Sets of Match It for pairs of students (Student Resource 5A-F)

#### Day 3

- Class set of dry erase boards
- Class list recording sheet
- Directions for Relay Race (Teacher Resource 9A)
- Transparency of Relay Race (Teacher Resource 9B)
- Answers to Relay Race (Teacher Resource 9C)
- Tic-Tac-Toe Game (Student Resource 6)
- Numbers 4 All (Student Resource 7)
- Numbers 4 All answers (Teacher Resource 10)
- Reteach (Student Resource 8 and Student Resource 9)
- Summative Assessment (Student Resource 10 and Teacher Resource 11)

### Development/Procedures:

#### Day 1

- Pre-assessment  
 Distribute a dry erase board to each student. Write the expression  $100 - 3 \times 25$  where students can see it. Have students evaluate the expression on their dry erase boards. Circulate to observe students as they work.  
  
 Record names of students who are incorrect on a class list. During Exploration and Application, target these students for possible reteaching.
- Engagement  
 Tell the students that you are thinking of a number between 20 and 40. The sum of the digits is 6. The difference between the two digits is 2. [24]

- Exploration  
Display Exploration Activity (Teacher Resource 1). Use think, pair, share strategy. Students will first think about the problem on their own, then share with a partner, and finally their thoughts will be shared with the class. Accept all answers at this time.

- Explanation  
Say: There are sets of rules everyone follows. An example is rules of the road. When a stoplight turns red, what should a driver do?? (Stop.) What would happen if someone didn't follow the rules? (Elicit several responses from the class such as hit another car, get a ticket, etc.) We can see the results would not be good.

Say: We also have sets of rules in math. There is nothing magic about these rules. People realized there was a problem if we couldn't be sure of the answer. So mathematicians got together and agreed on what to do first, next, and so on. They call this Order of Operations. This set of rules helps so when you are solving a problem you can all arrive at the same solution.

Show Teacher Resource 2 (or a picture of your own Aunt Sally). Say: I have an aunt who I just love, and I'm lucky because she lives close by. Her name is Sally, and she is a wonderful person. I can always count on her to help me whenever I call her. But sometimes she is in such a hurry to help, she just runs out of the house without thinking. It can be pretty embarrassing, because one time she ran outside in her pajamas (without her bathrobe), and one time she ran outside in her curlers! So even though I need her help, I do get a little embarrassed. So I decided to talk to our neighbors so they know that she means well, even if she doesn't always look right. So I went to each of my neighbors, [knock on student's desk, as if knocking on a door] and said, "Pardon my dear Aunt Sally. Sometimes she doesn't look right, but believe me, she is all right!" [repeat this for several students].

Say: Well, Aunt Sally helps me when I work on math. She's really good at finding little tricks to help me remember something, or how to do something. So when I have to do a problem with Order of Operations, I just remember my Aunt Sally.

Mathematicians agree on a specific order in which the operations are calculated.

- Parentheses - do all of the operations inside the parentheses ( ) first.
- Multiplication and Division are completed next in order from left to right.
- Addition and Subtraction are completed last in order from left to right.

Tell the students we can use the first letters to help us remember the correct order of operations. To help us remember these steps in order, many people use this mnemonic (memory device) to help them:

Parentheses  
Multiplication  
Addition

Division  
Subtraction

Pardon  
My Dear  
Aunt Sally

Show Teacher Resource 3. Distribute Student Resource 1. (In place of giving students this resource, you can have them write the mnemonic in a math journal.) Say: Now that we've looked at the set of math rules known as Order of Operations, we're going to use this knowledge to do some math. Display vocabulary words (Teacher Resource 4A-D) with definitions. Stress to the students that an expression *never* has an equal sign. If there is an equal sign, it is an equation. Expressions are evaluated to find a value (a particular number).

Model how to evaluate a numeric expression, applying the correct order of operations. Underline the numbers and operations you will do in each step. Refer to the Teacher Resource 3 and Student Resource 1 as you evaluate the following expression. Stress that the key to evaluating an expression using the order of operations is to show each step. Example:

|                             |  |
|-----------------------------|--|
| $5 + 8 \cdot 3$             | Ask students which operation you should do first |
| $5 + \underline{8 \cdot 3}$ | Multiplication comes before addition             |
| $\underline{5 + 24}$        | Find the sum of these two addends                |
| 29                          | This is the value of this expression             |

In essence you are breaking operations down to the most basic level. Practice with several numeric expressions together, always underlining each step to evaluate.

- Application  
Students will be sorting numeric expression cards (Student Resource 2A-B) into two groups – Evaluated Correctly and Evaluated Incorrectly. Model how to sort the cards. Depending on your class, have the students do the sort independently or in pairs. Circulate to check on student progress. Answers are on Teacher Resource 5. Stop to discuss students' findings with them.
- Differentiation
  - Reteach  
This can be done during the activity if you observe students having difficulty. If necessary, pull these students into a small group to work with you. Give them simpler expressions using only addition and subtraction. For students still having difficulty remembering which step goes first, have them highlight each new step with a bright color.
  - Enrich  
Give students more complex numeric expressions focusing on subtraction before addition and division before multiplication.

- Assessment  
Students will choose one incorrect card from the Application Activity to evaluate on a sheet of paper. Collect papers as students finish.

## Day 2

- Engagement  
Distribute pinch cards (Student Resource 3) to students. Display Teacher Resource 6 problem #1 on the overhead. Instruct students to show their answers using their pinch cards.

Ask: Which operation will you do first? Students justify their answers, using the order of operations as support. Continue to display each question, one at a time. Students continue to identify the first operation to be completed.

Answers:

- 1) multiplication
- 2) division
- 3) division
- 4) addition

- Exploration  
Distribute dry erase boards. Ask: Do you think the local office supply store sells the same number of pencils every month? (No) When would they sell more? (answers will vary, but *in time for back-to-school* is an example)

Write  $12b$  on the board. Explain: The expression  $12b$  represents the number of pencils in a box when we don't know how many boxes there are. So 12 is the number of pencils in a box, and  $b$  is the number of boxes. If a store sells 5 boxes, how many pencils do they sell? [60] Students solve on their dry erase boards.

- Explanation  
Ask 2 students to share their answers and justify.

Ask: What if  $b = 3$ ? How many pencils did the store sell? [36] Students solve on their boards and display their answers. Say: What happened to  $b$  in the second problem? (It changed.) When something changes, we say it **varies**, so we call letter,  $b$ , a **variable**.

If students have learned the scientific method and are familiar with variables, ask: When have you heard the term variable? Answers may vary, but could be included in science, with independent, dependent variables – it means something changes. Display vocabulary card (Teacher Resource 4), and define variable as a letter that stands for a number. This number or value can be changed. In our example, our variable was  $b$ . The first value of  $b$  was 5, and then we changed the value of  $b$  to 3.

Say: When we have a number, a variable, operations, and/or grouping symbols  $[\ ]$  we call that an algebraic expression. Display vocabulary card (Teacher Resource 4C). An algebraic expression is a mathematical phrase that combines numbers, letters or symbols, operations  $(+, -, \times, \div)$ , and/or grouping symbols.

Say: When we have a number right next to a variable, it means to multiply. So the expression  $12b$  means 12 times  $b$ . When we evaluated  $12b$ , we replaced  $b$  with 5, so we evaluated  $12 \cdot 5$ . We write this as an expression, so there is still no equal sign.

$$\begin{array}{r} 12 \cdot b \\ 12 \cdot 5 \\ 60 \end{array}$$

NOTE: Continue to reinforce that when evaluating expressions, work vertically, instead of using an equal sign.

So  $12b$  is 60 when  $b = 5$ . What did we do when  $b$  changed to 3? (evaluated  $12b$  as  $12 \cdot 3$ )

$$\begin{array}{r} 12 \cdot b \\ 12 \cdot 3 \\ 36 \end{array}$$

Ask: Is  $b$  the only letter we can use as a variable? [No, almost any letter can be used, but  $x, y$  are used most often. That is another reason to write  $12x$ , not  $12 \times x$ ]

Ask: What does the expression  $6x$  mean? [6 times a number] To evaluate  $6x$  when  $x = 7$ . Replace  $x$  with 7, then perform the operation. [ $6 \times 7 = 42$ ].

Write  $15 - y$  on the board. Say: What does the  $15 - y$  mean? (15 minus a number. To evaluate  $15 - y$  when  $y = 5$ , replace  $y$  with 5, then perform the operation [ $15 - 5 = 10$ ]).

Distribute Student Resource 4, and have students work with a partner. (Answers are on Teacher Resource 7) Discuss the answers.

- Application  
Display Teacher Resource 8 on a transparency, one problem at a time. Direct students to respond on dry erase boards. Make anecdotal notes on class list.
- Differentiation  
Consider using a dot system to identify each set. 1 dot for Reteach, 2 dots for on-grade level, 3 dots for Enrichment.
  - Reteach  
Directions for Match It can be found on Teacher Resource 5A. Student Resource 5B and 5C focus on problems with addition and subtraction. Practice for multiplication and division on can be found on 5C and 5D.

- Enrich
  - Use Student Resource 5eF and 5G (each on a different color) for enrichment.
- Assessment
  - Student Resource 5A-E. Create sets of cards for each pair of students. Copy Expressions (Student Resource 5B and 5D) on one color, and Outcomes (5C and 5E) on a different color.

### Day 3

- Engagement
  - Divide class into equal teams, sitting in a row. Distribute one dry erase board to each team. Display transparency of Relay Race Directions (Teacher Resource 9A) and go over directions. Stress the need to complete one step at a time. Display transparency of Teacher Resource 9B, one problem at a time. Discuss answers as needed (Teacher Resource 9C).
- Exploration
  - Distribute dry erase boards to each student. Display the expression  $y + (3 \cdot 4)$  when  $y = 6$ , on chalkboard, and have students evaluate on their dry erase boards.
- Explanation
  - Students solve on boards, then ask selected students to share their answers and justify. [18] Explain that the order of operations is followed, even in an *algebraic expression* (refer to vocabulary card introduced in lesson 2).

Display the following expressions and have students evaluate on dry erase boards, and discuss the outcome:

$$8 + x \div 4 \quad \text{when } x = 16 \quad [12]$$

$$\frac{24}{y} + 1 \quad \text{when } y = 4 \quad [7]$$

Divide the class into two groups and have each group evaluate one of the following expressions and discuss:

$$2y + 5 \quad \text{when } y = 9 \quad [23]$$

$$2(y + 5) \quad \text{when } y = 9 \quad [28]$$

- Application
  - Distribute Tic-Tac-Toe game (Student Resource 6). Students take turns evaluating algebraic expressions written on cards (outcome on the back of the card). If correct, students mark X or O on the game board. If incorrect, students should discuss error, and the next player takes a turn. All work should be completed on notebook paper and collected at the end of class.
- Differentiation
  - Reteach
    - Possible student errors may include:

- Following Order of Operations – additional practice on Student Resource 8
- Completing only one step of expression – two-step worksheet provided on Student Resource 9
- Enrich  
Numbers 4 All (Student Resource 7) (Teacher Resource 10 for answers)

**Summative Assessment:**

This summative assessment consists of three selected response questions and a BCR. Students will demonstrate their knowledge of order of operations as applied to both numeric and algebraic expressions. Distribute Student Resource 10. This assessment should be completed independently. See answer key on Teacher Resource 11.

**Authors:**

Madlyn Kroll  
Summit Park Elementary School  
Baltimore County Public Schools

Karen Yoho  
Tuscarora Elementary School  
Frederick County Public Schools

Complete the table below:

|    | Letter | Mnemonic | Math Operation |
|----|--------|----------|----------------|
| 1  | P      |          | Parentheses    |
| 2* | M      | My       |                |
|    | D      |          |                |
| 3* | A      | Aunt     |                |
|    | S      |          |                |

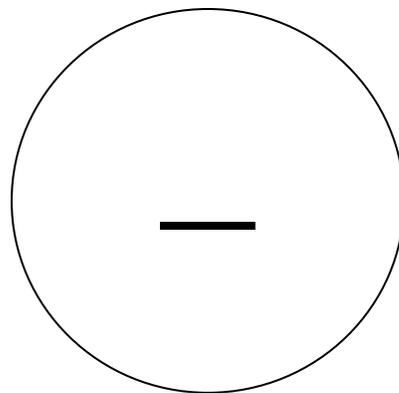
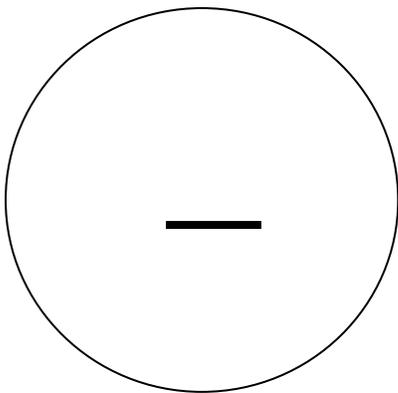
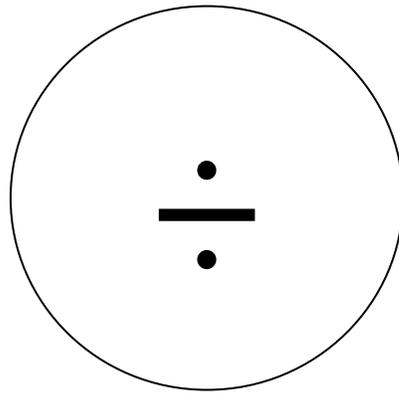
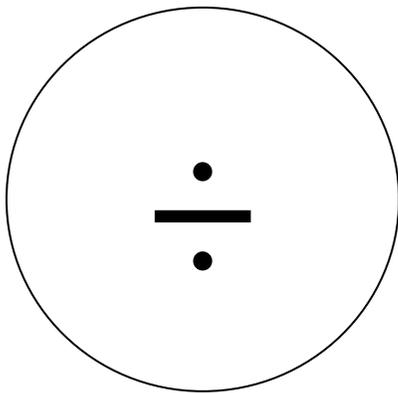
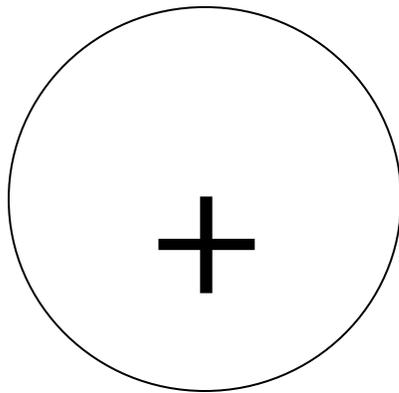
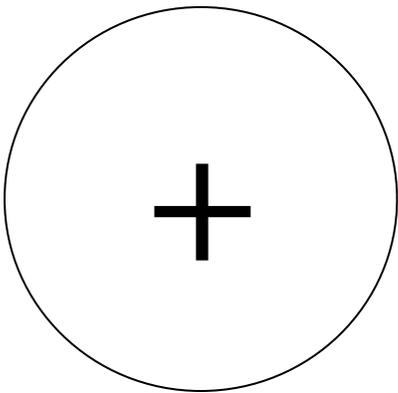
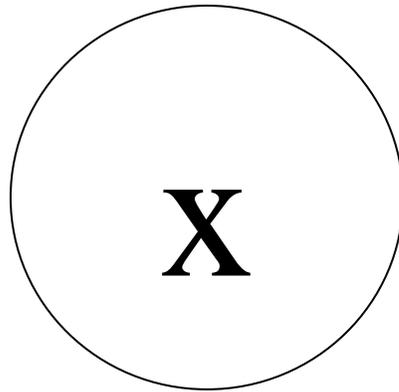
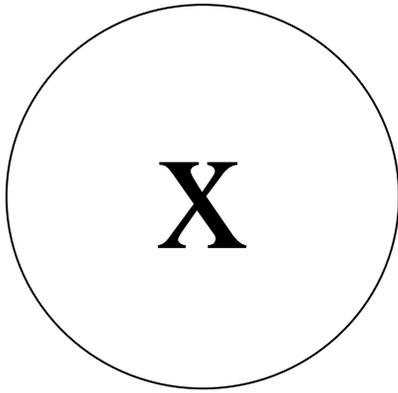
\* whichever comes first from left to right

|    | Letter | Mnemonic | Math Operation |
|----|--------|----------|----------------|
| 1  | P      |          | Parentheses    |
| 2* | M      | My       |                |
|    | D      |          |                |
| 3* | A      | Aunt     |                |
|    | S      |          |                |

\* whichever comes first from left to right

|   |  |
|---|--|
| $\begin{array}{r} \underline{(3 + 4)} + 5 \times 5 \\ 7 + \underline{5 \times 5} \\ 7 + \underline{25} \\ 32 \end{array}$ <p style="text-align: right;">①</p>   | $\begin{array}{r} \underline{5 + 2} \times 7 \\ \underline{7 \times 7} \\ 49 \end{array}$ <p style="text-align: right;">②</p>  |
| $\begin{array}{r} \underline{24 \div (4 \times 2)} \\ \underline{6 \times 2} \\ 12 \end{array}$ <p style="text-align: right;">③</p>   | $\begin{array}{r} \underline{(15 - 9)} \times 4 + (8 - 5) \div 3 \\ 6 \times 4 + \underline{(8 - 5)} \div 3 \\ \underline{6 \times 4} + 3 \div 3 \\ 24 + \underline{3 \div 3} \\ \underline{24 + 1} \\ 25 \end{array}$ <p style="text-align: right;">④</p> |
| $\begin{array}{r} 2 + \underline{15 \div 3} \\ \underline{2 + 5} \\ 7 \end{array}$ <p style="text-align: right;">⑤</p>  | $\begin{array}{r} \underline{40 \div 5} \times 6 - 2 \\ 8 \times \underline{6 - 2} \\ \underline{8 \times 4} \\ 32 \end{array}$ <p style="text-align: right;">⑥</p>  |
| $\begin{array}{r} 25 \div \underline{(3 + 2)} \times 16 \div (4 + 4) \\ 25 \div 5 \times 16 \div \underline{(4 + 4)} \\ \underline{25 \div 5} \times 16 \div 1 \\ 5 \underline{16 \div 1} \\ \underline{80 \div 1} \\ 80 \end{array}$ <p style="text-align: right;">⑦</p> | $\begin{array}{r} 3 + \underline{2 \times 4} \\ \underline{3 + 8} \\ 11 \end{array}$ <p style="text-align: right;">⑧</p>   |

|  |  |
|--|--|
| $\begin{array}{r} \underline{6 \times (4 + 3) - 2} \\ 24 + \underline{3 - 2} \\ \underline{24 + 1} \\ 25 \end{array}$ <p style="text-align: right;">(9)</p>              | $\begin{array}{r} \underline{(15 - 9) \times 4 + (8 - 5) \div 3} \\ 6 \times 4 + \underline{(8 - 5) \div 3} \\ 6 \times 4 + \underline{3 \div 3} \\ 6 \times \underline{4 + 1} \\ \underline{6 \times 5} \\ 30 \end{array}$ <p style="text-align: right;">(10)</p> |
| $\begin{array}{r} 8 + \underline{2 \times 6} \div 4 \\ 8 + \underline{12 \div 4} \\ \underline{8 + 3} \\ 11 \end{array}$ <p style="text-align: right;">(11)</p>          | $\begin{array}{r} \underline{10 - 2} + 4 \times 3 \div 2 \\ \underline{8} + 4 \times 3 \div 2 \\ \underline{12 \times 3} \div 2 \\ \underline{36 \div 2} \\ 18 \end{array}$ <p style="text-align: right;">(12)</p>   |
| $\begin{array}{r} \underline{40 \div 5} \times 2 - 6 \\ \underline{8 \times 2} - 6 \\ \underline{16 - 6} \\ 10 \end{array}$ <p style="text-align: right;">(13)</p>       | $\begin{array}{r} 32 \div \underline{(4 + 4)} \\ \underline{32 \div 8} \\ 4 \end{array}$ <p style="text-align: right;">(14)</p>  |
| $\begin{array}{r} \underline{4 + 12} \div 2 \times 2 \\ 16 \div \underline{2 \times 2} \\ \underline{16 \div 4} \\ 4 \end{array}$ <p style="text-align: right;">(15)</p> | $\begin{array}{r} \underline{42 \div 6} + 3 \times (5 - 2) \\ \underline{7 + 3} \times (5 - 2) \\ 10 \times \underline{(5 - 2)} \\ \underline{10 \times 3} \\ 30 \end{array}$ <p style="text-align: right;">(16)</p>   |



# What's the Expression?

Match each algebraic expression in the box to the appropriate meaning.

|                |                 |
|----------------|-----------------|
| $6 + y$        | $y - 81$        |
| $\frac{12}{y}$ | $3y$ $y \div 2$ |

\_\_\_\_\_ 3 times a number

\_\_\_\_\_ 6 plus a number

\_\_\_\_\_ a number minus 81

\_\_\_\_\_ 12 divided by a number

\_\_\_\_\_ a number divided by 2

# Match It

Object of the game: To make the most matches of each algebraic expression to its outcome.

Directions:

1. Place each set of cards face down.
2. Turn over one card with an algebraic expression, and evaluate.
3. Choose one card from the second set.
4. If correct, collect both cards. Take another turn.
5. If incorrect, turn both cards back over. Your turn is over.
6. Continue until all sets of cards are collected

## Expressions

$$83 - x$$

when  $x = 3$

$$22 - y$$

when  $y = 9$

$$x - 20$$

when  $x = 45$

$$620 - x$$

when  $x = 100$

$$x + 50$$

when  $x = 45$

$$114 + x$$

when  $x = 18$

$$100 - y$$

when  $y = 70$

$$x + 28$$

when  $x = 16$

## Expressions

$$8x$$

when  $x = 3$

$$\frac{36}{y}$$

when  $y = 9$

$$7y$$

when  $y = 8$

$$\frac{y}{9}$$

when  $y = 72$

$$11x$$

when  $x = 9$

$$48 \div y$$

when  $y = 8$

$$200x$$

when  $x = 3$

$$x \div 4$$

when  $y = 84$

Outcomes

80

25

95

30

13

520

132

44

Outcomes

24

4

56

8

99

6

600

21

## Expressions

$$6.5x$$

when  $x = 4$

$$\frac{360}{y}$$

when  $y = 10$

$$4x$$

when  $x = 3.1$

$$14.8 + y$$

when  $y = 8.2$

$$x - 11.5$$

when  $x = 30$

$$101.5 - x$$

when  $x = 28.5$

Outcomes

26

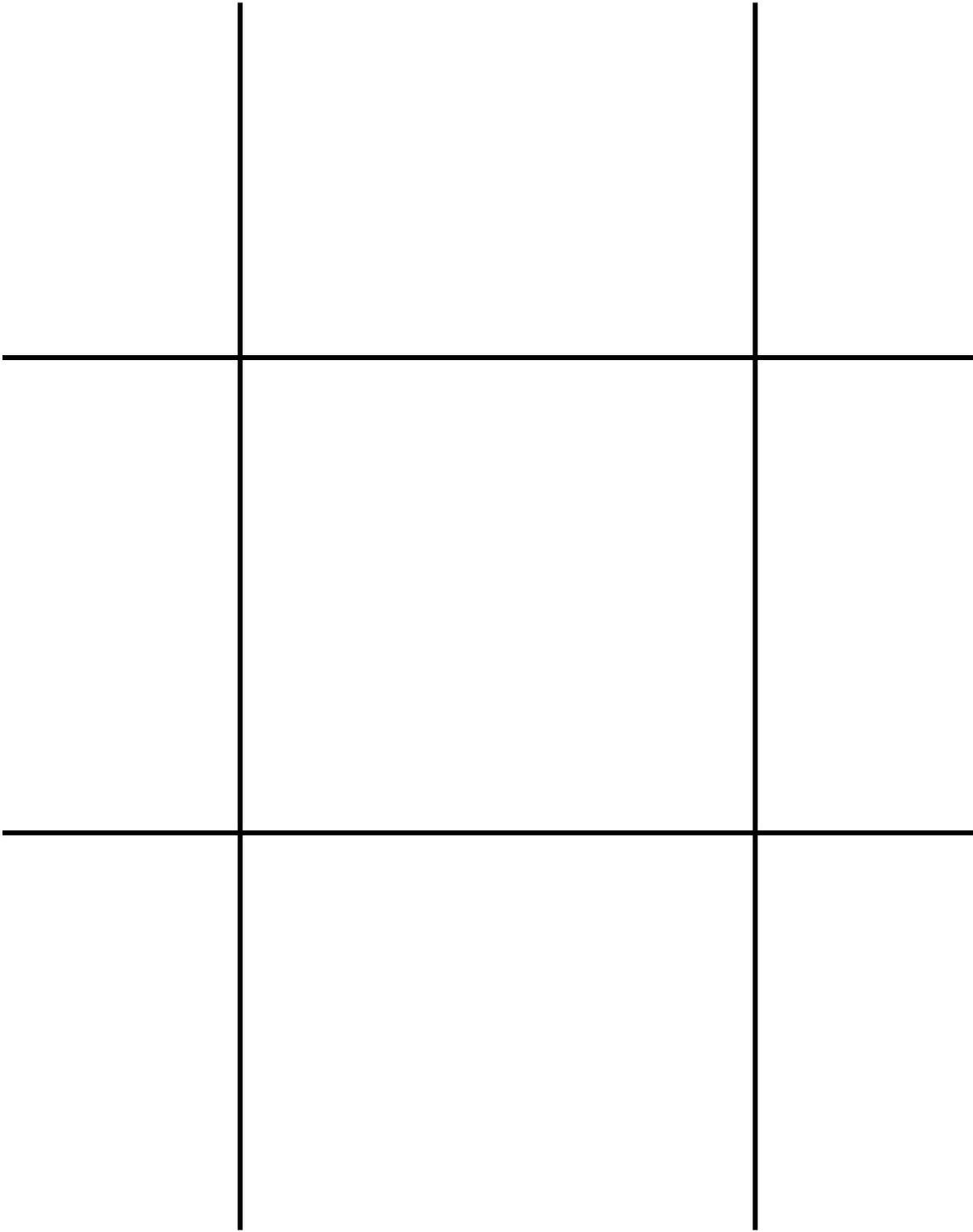
36

12.4

23

18.5

73



## Tic-Tac-Toe Game Cards

$$15 - 40 \div x$$

$$\text{when } x = 5$$

$$60 - 10x$$

$$\text{when } x = 4$$

$$x - 6 \div 2$$

$$\text{when } x = 14$$

$$(x - 6) \div 2$$

$$\text{when } x = 14$$

$$5 \cdot 2 + x$$

$$\text{when } x = 7$$

$$5 \cdot (2 + x)$$

$$\text{when } x = 7$$

$$29 + 2x$$

$$\text{when } x = 3$$

$$24 \div (6 + x)$$

$$\text{when } x = 2$$

Tic-Tac-Toe Game Cards

20

7

4

11

45

17

3

35

## Tic-Tac-Toe Game Cards

$$32 \div x \cdot 7$$

$$\text{when } x = 4$$

$$6 + \frac{15}{x}$$

$$2x + 6 \div 2$$

$$\text{when } x = 9$$

$$(2x + 6) \div 2$$

$$\text{when } x = 9$$

$$8(4 + x) + 2$$

$$\text{when } x = 2$$

$$\frac{25}{x} + 20$$

$$x$$

$$\text{when } x = 5$$

$$3 + 11x$$

$$\text{when } x = 4$$

$$2 \div 6 + x$$

$$\text{when } x = 2$$

Tic-Tac-Toe Game Cards

9

56

12

21

25

5025

6

47

# Numbers 4 All

Use exactly 4 fours and any of the operations (+, -, x or ÷) to write an expression for each of the numbers from 0 to 10.

0: \_\_\_\_\_

1: \_\_\_\_\_

2: \_\_\_\_\_

3: \_\_\_\_\_

4: \_\_\_\_\_

5: \_\_\_\_\_

6: \_\_\_\_\_

7: \_\_\_\_\_

8: \_\_\_\_\_

9: \_\_\_\_\_

10: \_\_\_\_\_

1)  $6 \times (3 + 5)$

---

---

---

2)  $(12 - x) \div 5$  when  $x = 2$

---

---

---

3)  $3x \div 4$  when  $x = 8$

---

---

---

4)  $5 + x \div 5$  when  $x = 20$

---

---

---

|        |                    |
|--------|--------------------|
| 1)     | $6 \times (3 + 5)$ |
| Step 1 | <hr/> <hr/>        |
| Step 2 | <hr/> <hr/>        |

|        |                                |
|--------|--------------------------------|
| 2)     | $(12 - x) \div 5$ when $x = 2$ |
| Step 1 | <hr/> <hr/>                    |
| Step 2 | <hr/> <hr/>                    |

|        |                          |
|--------|--------------------------|
| 3)     | $3x \div 4$ when $x = 8$ |
| Step 1 | <hr/> <hr/>              |
| Step 2 | <hr/> <hr/>              |

|        |                              |
|--------|------------------------------|
| 4)     | $5 + x \div 5$ when $x = 20$ |
| Step 1 | <hr/> <hr/>                  |
| Step 2 | <hr/> <hr/>                  |

Name \_\_\_\_\_

Choose the best response for each question.

1. Evaluate the numeric expression.

$$8 \times (4 + 2) + 2$$

- (A) 36      (B) 48      (C) 50      (D) 64

2. Evaluate the algebraic expression.

$$20x + 5 \quad \text{for } x = 5$$

- (A) 25      (B) 100      (C) 105      (D) 200

3. Evaluate the algebraic expression.

$$3(x - 9) \quad \text{for } x = 20$$

- (A) 11      (B) 33      (C) 51      (D) 60

4.

Step A

Evaluate  $12 - 2y$  when  $y = 4$

---

Step B

Explain how you determined your answer. Use what you know about evaluating expressions and order of operations in your explanation. Use words, numbers, and/or symbols in your explanation.

---

---

---

---

---

Juan evaluated this expression:

$$100 - 3 \times 25$$

The value he got was 2,425

Ingrid evaluated the same expression:

$$100 - 3 \times 25$$

But her value was 25

- Which one is correct?
- Why?
- Think - Pair - Share



**P**arentheses

**M**ultiplication

**D**ivision

Do  
the  
one  
that  
comes  
first,  
left to  
right

**A**ddition

**S**ubtraction

Do  
the  
one  
that  
comes  
first,  
left to  
right

# Evaluate

to determine the  
value of an  
expression

# Numeric Expression

A mathematical phrase  
that combines numbers,  
operations (+, -,  $\times$ ,  $\div$ ),  
and/or grouping symbols

# Algebraic Expression

A mathematical phrase that combines numbers, letters, operations (+, -,  $\times$ ,  $\div$ ), and/or grouping symbols ( )

# Variable

A letter that stands for  
a number

1)  $4 + 5 \cdot 8$

2)  $\frac{20}{5} + 7$

3)  $24 \div 2 \cdot 6$

4)  $2(3+5)$

1)  $4 + 5 \cdot 8$

2)  $\frac{20}{5} + 7$

3)  $24 \div 2 \cdot 6$

4)  $2(3+5)$

# What's the Expression?

1. Match each algebraic expression in the box to the appropriate meaning.

|                |                 |
|----------------|-----------------|
| $6 + y$        | $y - 81$        |
| $\frac{12}{y}$ | $3y$ $y \div 2$ |

     $3y$           3 times a number

     $6 + y$           6 plus a number

     $y - 81$           a number minus 81

     $\frac{12}{y}$           12 divided by a number

     $y \div 2$           a number divided by 2

1)  $6 \times (3 + 5)$

---

---

---

2)  $(12 - x) \div 5$  when  $x = 2$

---

---

---

3)  $3x \div 4$  when  $x = 8$

---

---

---

4)  $5 + x \div 5$  when  $x = 20$

---

---

---

## Relay Race Directions

1. A numeric expression will be displayed; player 1 copies the expression on the dry erase board and completes one step of the problem. Player 1 passes the board to the next player.
2. Players take turns completing one step of the problem.
3. If a step needs to be corrected, pass the board back to the student and discuss the work.
  - a. If this discussion is only the answer, without an explanation, the team will be disqualified.
4. The first team to follow directions to complete the evaluation will win a point. The team with the most points wins.

## Relay Race

(1)  $30 \div (2 \times 3) - 1$

---

---

---

(2)  $24 \div 4 \times 3 + 2$

---

---

---

(3)  $11 \times 2 + 6 \times 3 \div 9$

---

---

---

(4)  $(15 - 9) \times 4 + (8 - 5) \div 3$

---

---

---

## Relay Race – Answers

$$(1) \quad 30 \div (2 \times 3) - 1$$

$$\quad \underline{30 \div 6} - 1$$

$$\quad \quad \underline{5 - 1}$$

$$\quad \quad \quad 4$$

$$(2) \quad \underline{24 \div 4} \times 3 + 2$$

$$\quad \underline{6 \times 3} + 2$$

$$\quad \quad \underline{18 + 2}$$

$$\quad \quad \quad 20$$

$$(3) \quad \underline{11 \times 2} + 6 \times 3 \div 9$$

$$\quad 22 + \underline{6 \times 3} \div 9$$

$$\quad \quad 22 + \underline{18 \div 9}$$

$$\quad \quad \quad \underline{22 + 2}$$

$$\quad \quad \quad \quad 24$$

$$(4) \quad \underline{(15 - 9)} \times 4 + (8 - 5) \div 3$$

$$\quad 6 \times 4 + \underline{(8 - 5)} \div 3$$

$$\quad \quad \underline{6 \times 4} + 3 \div 3$$

$$\quad \quad \quad 24 + \underline{3 \div 3}$$

$$\quad \quad \quad \quad \underline{24 + 1}$$

$$\quad \quad \quad \quad \quad 25$$

# Numbers 4 All

Use exactly 4 fours and any of the operations (+, -, × or ÷) to write an expression for each of the numbers from 0 to 10.

*Note: This is a set of solutions, but there are many more correct solutions.*

0:  $\underline{44-44 \quad 4-4+4-4 \quad 4+4-4-4}$

1:  $\underline{44 \div 44 \quad 4 \div 4 + 4 - 4}$

2:  $\underline{4 \div 4 + 4 \div 4}$

3:  $\underline{(4+4+4) \div 4 \quad (4 \times 4 - 4) \div 4}$

4:  $\underline{4 \times (4 - 4) + 4 \quad (4 - 4) \times 4 + 4}$

5:  $\underline{(4 \times 4 + 4) \div 4}$

6:  $\underline{4 \times .4 + 4.4 \quad 4 + (4 + 4) \div 4 \quad 4 - 4 \div 4 +}$

7:  $\underline{44 \div 4 - 4 \quad 4 + 4 - (4 \div 4) \quad (4 + 4) - 4 + 4}$

8:  $\underline{4 + 4.4 - .4 \quad 4 + 4 + 4 - 4}$

9:  $\underline{4 + 4 + 4 \div 4}$

10:  $\underline{(44 - 4) \div 4 \quad 44 \div 4.4}$

- 1) C
- 2) C
- 3) B
- 4) Step A answer is 4

An exemplary answer for Step B is as follows:

- $$\begin{array}{r} 12 - 2y \\ 12 - 2 \cdot 4 \\ \hline 12 - 8 \\ 4 \end{array}$$

Although not necessary, explanations may include some of the following ideas:

- Explanation of expressions as values (I substituted 4 for the value of the variable  $y$ ).
- Explanation of order of operations (I know that mathematicians have rules for which operation comes first so that we all get the same answer. Students may reference Pardon My Dear Aunt Sally in some form).
- Application of order of operations (first I multiplied 2 times 4 and got 8, then I subtracted that from 12 and got 4 as the value)