"Transform Obstacles into Opportunities"

# MCCS Middle and High Summer Packet

**NAME:** _____ **Subject:** 8th Grade Pre-Algebra

**Directions:**

- Please complete this packet over the summer.
- It will be collected by your Math teacher during the first day of school, on August 20th, 2018.
- You will be given a GRADE based on the work you complete over the summer.
- All work must be shown to receive credit.
- After reviewing the summer packet in class, a QUIZ will be administered on each of the essential topics.

The teacher will need to see all of your work. Check (x) off each one as you use it. Be sure to include the following:

- ☐ Pictures, charts, graphs, or t-tables that support your explanation
- ☐ A written explanation with detailed sentences
- ☐ The equation or number sentence
- ☐ The answer (Ask yourself: Is my answer reasonable? Why or why not?)
- ☐ The solution in more than one way or related to other situations

# The Tale of the Scale

Some family friends have asked you to plan a rafting expedition. A rafting company has agreed to take your group down the Babbling River (it's actually a little smaller than a river, more like a brook).

The rafting company has given you specific details on how much weight a raft can hold. A raft can safely carry the weight of 24 babies. As everyone knows, the weight of 12 babies is exactly equal to the weight of 4 teenagers; the weight of 6 teenagers is exactly equal to the weight of 3 adults.

What is the least number of rafts needed for a trip with 11 adults, 5 teenagers, and 21 babies? (Supervision of the babies is not necessary).

# The Height Dilemma

I just found this picture of my parents. Cute, aren't they? I remember my Dad saying that he is 6'2" tall, but I can't remember how tall my Mom is! Mathematically determine how tall my Mom is. Convince me that your strategy and reasoning are mathematically sound. Make any connections and/or generalizations that you can.

# Lenny the Lazy Lawn Mower

Lazy Lenny mows lawns in the summer for extra money. He wondered how he could mow a lawn with the least amount of walking. So one week, on a 50' X 50' lawn, he mowed the grass in parallel rows (see figure 1). The next week he mowed the same lawn in diagonal rows (see figure 2). The week following, he mowed the lawn in a spiral pattern (see figure 3). His mower cuts a strip about 26" wide.

Which mowing method required the least amount of walking?
Defend your solution mathematically.

# Math Wizard

You have been completing great work in math class this year.

Your average quiz score is 85! You have completed nine quizzes for the marking period. When putting the scores in order from least to greatest, the middle score of your quizzes is an 80, the most frequent score is a 75, and the lowest and highest scores have a difference of 30 points.

What were your scores for the marking period?

Student-led conferences are coming up, and you need to explain to your parent(s) what your scores really mean. Produce a visual to represent your scores.

What would you say about your math progress based on these scores?

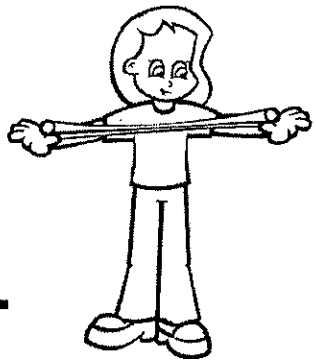
A **power** is the product of multiplying a number by itself. It is represented as a **base number** and an **exponent**.
The **base number** indicates what number is being multiplied, and the **exponent** indicates how many times the base number is to be multiplied.

$10^5 = 10 \times 10 \times 10 \times 10 \times 10 = 100{,}000$

exponent → $10^5$

base number ← $10^5$

$10 \times 10 \times 10 \times 10 \times 10$ → factors



Write the factors, then find the value.

A. $5^2 =$ $7^3 =$ $9^3 =$ $3^4 =$ $2^3 =$

$5 \times 5 = 25$

B. $10^6 =$ $10^4 =$ $5^4 =$ $6^6 =$ $3^5 =$

Write the value.

C. $7^2 = 49$ $9^5 =$ $4^4 =$ $2^5 =$ $1^9 =$

D. $8^1 =$ $3^2 =$ $2^7 =$ $3^4 =$ $8^2 =$

Write the value using **exponents**.

E. $5 \times 5 \times 5 \times 5 \times 5 =$ $10 \times 10 \times 10 \times 10 =$ $6 \times 6 \times 6 \times 6 =$ $2 \times 2 =$

F. $4 \times 4 \times 4 \times 4 =$ $7 \times 7 \times 7 =$ $2 \times 2 \times 2 \times 2 \times 2 =$ $3 \times 3 \times 3 =$

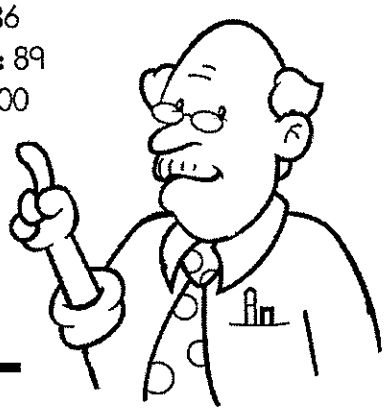
G. $10 \times 10 \times 10 =$ $5 \times 5 =$ $8 \times 8 \times 8 =$ $10 \times 10 =$

Fill in the missing numbers.

| | Product | Number to Given Power | Standard Notation |
|---|---|---|---|
| H. | $8 \times 8 \times 8$ | $8^3$ | 512 |
| I. | $5 \times 5$ | | |
| J. | **$12 \times 12 \times 12$** | | |
| K. | $2 \times 2 \times 2 \times 2 \times 2$ | | |

| Test Scores | | | | | | | |
|---|---|---|---|---|---|---|---|
| 100 | 87 | 70 | 95 | 88 | 90 | 60 | 100 |

**Mean:** 86
**Median:** 89
**Mode:** 100



**Mean** is another word for average.

**Median** is the middle number in a group of numbers in numerical order. **NOTE: FOR EVEN SETS OF NUMBERS, TAKE THE AVERAGE OF THE MIDDLE TWO NUMBERS.**

Test scores: 60 70 87 88 **89** 90 95 100 100

**Mode** is the number that appears the most often.

Find the **mean**, **median**, and **mode** for each.

| Basketball Points | | | | |
|---|---|---|---|---|
| 6 | 22 | 12 | 36 | 19 |

| Golf Scores | | | | | |
|---|---|---|---|---|---|
| 93 | 70 | 90 | 90 | 68 | 75 |

1. **Mean:** _____
   **Median:** _____
   **Mode:** _____

2. **Mean:** _____
   **Median:** _____
   **Mode:** _____

| | Data | mean | median | mode |
|---|---|---|---|---|
| A. | 10, 17, 10, 14, 19 | | | |
| B. | 18, 19, 64, 19, 32, 60, 61 | | | |
| C. | 11, 38, 13, 38, 40 | | | |
| D. | 12, 15, 11, 15, 13, 10, 15 | | | |
| E. | 87, 81, 95, 79, 83, 79 | | | |
| F. | 96, 62, 97, 100, 96, 87, 85 | | | |

**Tip:**
The first two letters in **mode** are **mo** = **m**ost **o**ften. Also, **median** means middle – the median of a highway separates traffic in the middle.

# Equations with 2 Variables

**Determine the value of the unknown variable in each equation.**

$10 + a = b$

$a = 7,\ b =$ _____

$g - 2 = h$

$g = 10,\ h =$ _____

$12n = m$

$n =$ _____, $m = 36$

$\frac{16}{v} = w$

$v = 2,\ w =$ _____

$e + 9 = f$

$e =$ _____, $f = 17$

| $x + 14 = y$ | | | | | |
|---|---|---|---|---|---|
| $x$ | 4 | | 9 | | |
| $y$ | | 20 | | 25 | 30 |

| $5y = z$ | | | | | |
|---|---|---|---|---|---|
| $y$ | 2 | | 6 | | 12 |
| $z$ | | 20 | | 45 | |

| $a - 6 = b$ | | | | | |
|---|---|---|---|---|---|
| $a$ | 12 | 15 | | 28 | |
| $b$ | | | 18 | | 50 |

| $\frac{r}{2} = s$ | | | | | |
|---|---|---|---|---|---|
| $r$ | | 4 | 8 | 14 | |
| $s$ | 1 | | | | 11 |

| $\frac{50}{n} = m$ | | | | | |
|---|---|---|---|---|---|
| $n$ | 2 | | 10 | 25 | |
| $m$ | | 10 | | | 1 |

| $9 - x = y$ | | | | | |
|---|---|---|---|---|---|
| $x$ | 0 | 3 | 5 | | 9 |
| $y$ | | | | 1 | |

# Basic Algebra Review

**Evaluate each expression. Let a = 24. Let b = 2.**

$34 - b$ _____ $\frac{a}{3}$ _____ $9b$ _____

$a + b$ _____ $2a$ _____ $\frac{24}{a}$ _____

**Rewrite each phrase as an algebraic expression.**

subtract 7 from $c$ _____ 30 divided by $d$ _____

the product of 5 and $e$ _____ the sum of 8 and $f$ _____

**Determine the value of the variable in each equation.**

$14 + g = 26$ $12h = 60$ $\frac{28}{i} = 4$

$g =$ _____ $h =$ _____ $i =$ _____

**Determine the value of the unknown variable in each equation.**

$11j = k$ $\frac{16}{m} = n$ $p + 7 = q$

$j =$ _____, $k = 110$ $m = 4$, $n =$ _____ $p =$ _____, $q = 19$

**Complete the tables.**

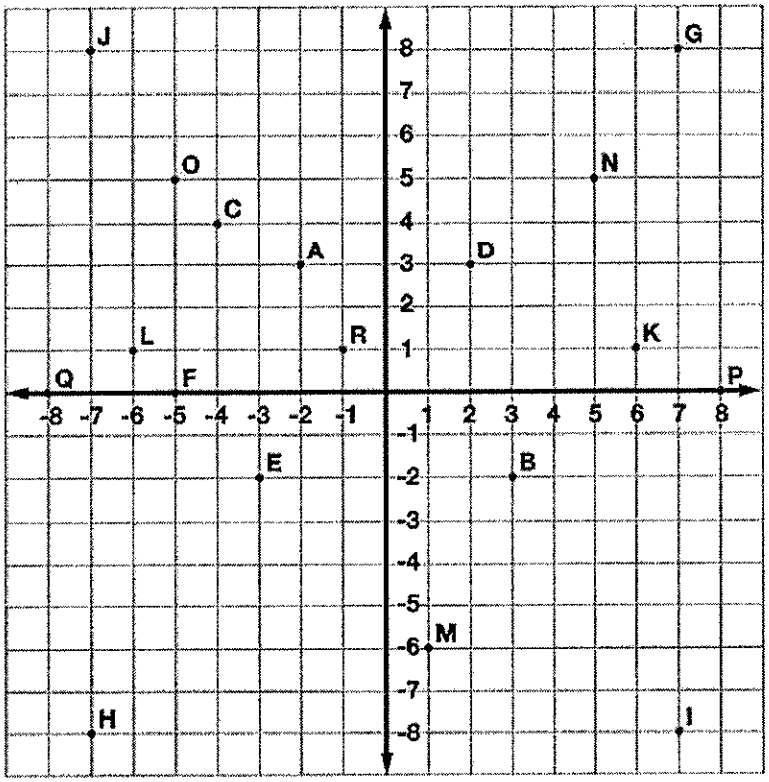
$\frac{40}{r} = s$

| $r$ | 2 | | 5 | 8 | |
|---|---|---|---|---|---|
| $s$ | | 10 | | | 1 |

$13 - x = y$

| $x$ | | | 5 | 9 | |
|---|---|---|---|---|---|
| $y$ | 0 | 11 | | | 1 |

# Ordered Pairs




**Tell what point is located at each ordered pair.**

1. **(3,-2)** _____
2. **(2,3)** _____
3. **(-5,5)** _____
4. **(-7,-8)** _____
5. **(-4,4)** _____
6. **(-5,0)** _____

**Write the ordered pair for each given point.**

7. **E** _____
8. **M** _____
9. **P** _____
10. **G** _____
11. **Q** _____
12. **N** _____

**Plot the following points on the coordinate grid.**

13. **S (-6,-3)**
14. **T (2,-4)**
15. **U (5,8)**

**Multiply.**

1. $7 \times 8$
2. $-5 \times 7$
3. $4 \times (-8)$
4. $-8 \times (-2)$
5. $11 \times (-6)$
6. $-7 \times 6$
7. $-8 \times (-8)$
8. $10 \times 4$
9. $21 \times 13$
10. $-15 \times 12$
11. $-25 \times (-14)$
12. $10 \times (-25)$

**For Exercises 13–18, find the missing number.**

13. $3 \times \square = -6$
14. $4 \times \square = -4$
15. $\square \times (24) = -8$
16. $-3 \times \square = 9$
17. $-9 \times (-2) = \square$
18. $\square \times (-2) = -18$

19. Your teacher purchases 24 pastries for a class celebration, at \$2 each. What integer expresses the amount he paid?

20. Temperatures have been falling steadily at 5°F each day. What integer expresses the change in temperature in degrees 7 days from today?

21. A submarine starts at the surface of the Pacific Ocean and descends 60 feet every hour. What integer expresses the submarine's depth in feet after 6 hours?

22. A skydiver falls at approximately 10 meters per second. Write a number sentence to express how many meters he will fall in 40 seconds.

**Simplify each expression.**

**1.** $-2 + (-3)$

**2.** $8 - 7 + 4$

**3.** $8 + (-5)$

**4.** $15 + (-3)$

**5.** $-16 + 8$

**6.** $7 + (-10)$

**7.** $-9 + (-5)$

**8.** $-12 + 14$

**9.** $8 + 7$

**10.** $9 + (-4)$

**11.** $-6 + (-8)$

**12.** $8 + (-14)$

**13.** $9 + (-17)$

**14.** $-15 + (-11)$

**15.** $-23 + 18$

# Skill: Subtracting Integers

Accent

**Find each difference.**

**1.** $9 - 26$

**2.** $-4 - 15$

**3.** $21 - (-7)$

**4.** $27 - (-16)$

**5.** $-16 - (-43)$

**6.** $47 - 19$

**7.** $-156 - 98$

**8.** $-192 - 47$

**9.** $0 - (-51)$

**10.** $-63 - 89$

**11.** $-12 - (-21)$

**12.** $92 - (-16)$

**13.** $72 - 15$

**14.** $-86 - (-19)$

**15.** $17 - (-46)$

**16.** $-78 - (-53)$

**17.** $-19 - (-12)$

**18.** $-16 - (-21)$

## Skill: Order of Operations With Integers

Investi

Accentuate the

**Find the value of each expression.**

**1.** $(8 + 2) \times 9$ **2.** $5 - 1 \div 4$ **3.** $(6 + 3) \div 18$ **4.** $80 - 6 \times 7$

**5.** $4 \times 6 + 3$ **6.** $4 \times (6 + 3)$ **7.** $35 - 6 \times 5$ **8.** $8 \div 3 + 6$

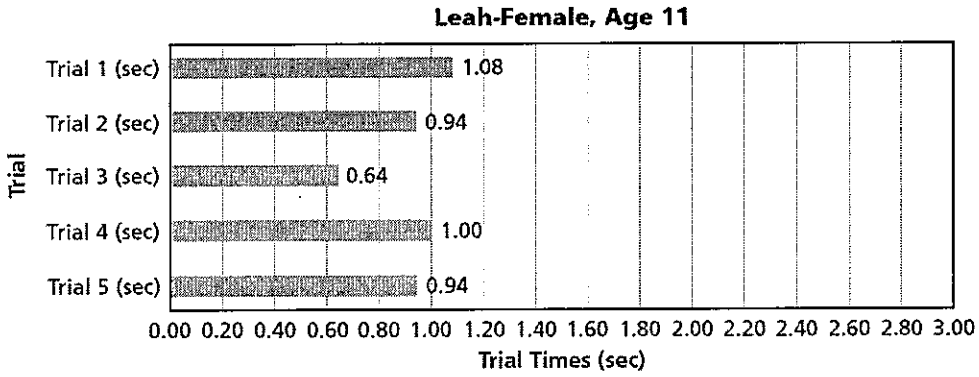
**9.** $(-4)^2 + 10 \cdot 2$ **10.** $-4^2 + 10 \cdot 2$ **11.** $(5 \cdot 3)^2 + 8$

**12.** $5 \cdot 3^2 + 8$ **13.** $9 + (7 - 4)^2$ **14.** $-9 + 7 - 4^2$

**15.** $(-6)^2 + 3^3 - 7$ **16.** $-6^2 + 3^3 - 7$ **17.** $2^3 + (8 - 5) \cdot 4 - 5^2$

**18.** $(2^3 + 8) - 5 \cdot 4 - 5^2$ **19.** $2^3 \cdot 3 - 5 \cdot 5^2 + 8$ **20.** $2^3 \cdot 3 - 5(5^2 + 8)$

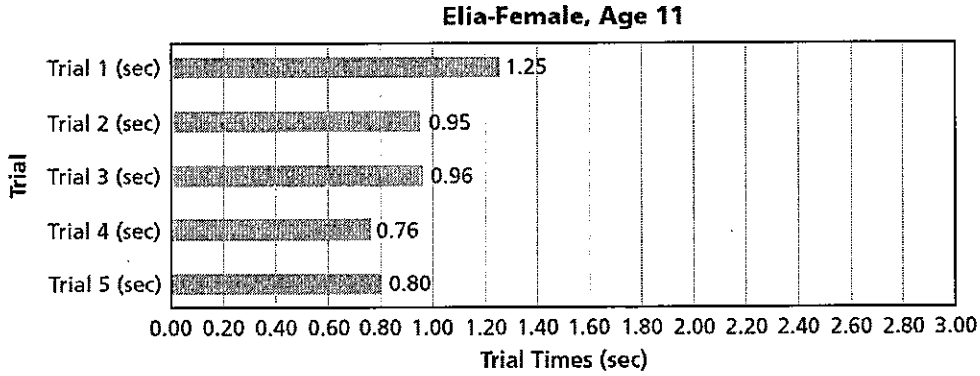
1. Write three different statements that describe the variability in Leah's reaction times from the value bar graph.




2. Below is a value bar graph showing data about Ella's reaction times. Compare Ella's reaction times to Leah's reaction times.
   a. Determine statistics for each student: means, medians, and ranges.

   b. Is one student quicker than the other student? Explain your reasoning.

   c. Is one student more consistent than the other student? Explain.



## Skill: Measures of Center

**Each student in a class has taken five tests. The teacher allows the students to pick the mean, median, or mode of each set of scores to be their average. Which measure of center should each student pick in order to have the highest average?**

**1.** 100, 87, 81, 23, 19

**2.** 90, 80, 74, 74, 72

**3.** 80, 80, 70, 67, 68

**4.** 75, 78, 77, 70, 70

**5.** 100, 47, 45, 32, 31

# Skill: Variables, Tables, and Graphs

**Complete each table given the rule.**

Rule: Output = Input · 5

1.

| Input | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Output | 5 | 10 | 15 | | |

Rule: Output = Input · 2

2.

| Input | 10 | 20 | 30 | 40 | 50 |
|---|---|---|---|---|---|
| Output | 20 | 40 | 60 | | |

Rule: Output = Input + 3

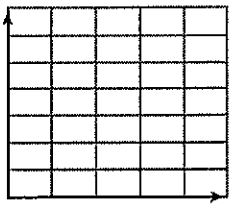
3.

| Input | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|
| Output | 6 | 7 | 8 | | |

**Graph the data in each table.**

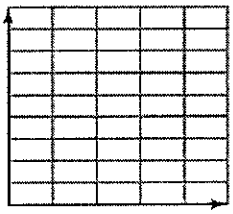
4.

| Hours | Wages |
|---|---|
| 1 | $15 |
| 2 | $30 |
| 3 | $45 |
| 4 | $60 |

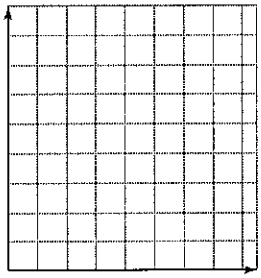


5.

| Gallons | Quarts |
|---|---|
| 1 | 4 |
| 2 | 8 |
| 3 | 12 |
| 4 | 16 |



6. A parking garage charges $3.50 per hour to park. The equation $c = 3.5\,h$ shows how the number of hours $h$ relates to the parking charge $c$. Graph this relationship.



**Use the expression to complete each table.**

7.

| $x$ | $x + 7$ |
|---|---|
| 2 | 9 |
| 5 | 12 |
| 8 | |
| 11 | |
| | 21 |

8.

| $x$ | $5x$ |
|---|---|
| 3 | |
| 6 | |
| 9 | |
| 12 | |
| | 75 |

9.

| $x$ | $125 - x$ |
|---|---|
| 15 | |
| 30 | |
| 45 | |
| 60 | |
| | 50 |

**10.** A cellular phone company charges a $49.99 monthly fee for 600 free minutes. Each additional minute costs $0.35. This month you used 750 minutes. How much do you owe?

**Write a rule for the relationship between the variables represented in each table.**

**11.**

| $x$ | $y$ |
|---|---|
| 1 | 6 |
| 2 | 7 |
| 3 | 8 |
| 4 | 9 |

**12.**

| $x$ | $y$ |
|---|---|
| 1 | 4 |
| 2 | 8 |
| 3 | 12 |
| 4 | 16 |

**13.**

| $x$ | $y$ |
|---|---|
| 1 | 4 |
| 2 | 7 |
| 3 | 10 |
| 4 | 13 |

**14.** A typist types 45 words per minute.

**a.** Write a rule to represent the relationship between the number of typed words and the time in which they are typed.

**b.** How many words can the typist type in 25 minutes? Write and solve an equation to answer this.

15. a. Yolanda and Yoko ran in a 100-yd dash. When Yolanda crossed the finish line in 15 seconds, Yoko was 10 yards behind her. The girls then repeated the race, with Yolanda starting 10 yards behind the starting line. If each girl ran at the same rate as before, who won the race? By how many yards?

    b. Assume the girls run at the same rate as before. How far behind the starting line should Yolanda be in order for the two to finish in a tie?

16. During the breaststroke competitions of a recent Olympics, Nelson Diebel swam 100 meters in 62 seconds, and Mike Bowerman swam 200 meters in 130 seconds. Who swam at a faster rate?

17. During a vacation, the Vasquez family traveled 174 miles in 3 hours on Monday, and 290 miles in 5 hours on Tuesday. Write an equation relating miles $m$ traveled to hours $h$.