Name: _____
Date: _____

DARNELL-COOKMAN
MIDDLE/HIGH SCHOOL
SoMA
SCHOOL OF THE MEDICAL ARTS

Summer Math Packet Summer of 2024

For 7th grade students taking 7th grade Accelerated Math during 2024-2025 School Year

Over summer students are encouraged to practice their math. This improves student learning by helping students to maintain the skills they will need in the fall. To that end, students should complete this Summer Math Packet.

Students should have this packet completed no later than the end of the second week of school.

- At the teacher's discretion, this packet may be collected for a quiz grade. If collected, the teacher may grade all of it or just select parts of it.
- At the teacher's discretion, this packet may be graded for extra credit.

While completing this summer math packet, students should adhere to the following.

- Complete this packet in order.
- Show all work on either the packet itself or on separate sheets of paper.
- Number all problems and label all parts when using separate sheets of paper.
- Show all steps used to arrive at the final answer.
- Box your final answers.
- All work must be neat and legible.
- Do not use a calculator. Calculators will not be allowed on the quiz that will based on this packet.
- If you get stuck on a problem, you may use the resources mentioned below.
  www.khanacademy.org www.aplusmath.com www.funbrain.com
  www.aaamath.com www.math.com www.purplemath.com
- Students may also use the "Virtual Nerd" mobile app (requires iOS 6.0 or later). This app is free.
- Students may also get help from their parents, guardians, family, and friends. However, students should remember that they must master the material themselves as they won't have any help on the quiz.
- Lastly, students should not wait until the last minute to complete this packet. Ideally, students would spread the work out over the entire summer. Students should use their time wisely!

Have a wonderful (and productive) summer!

Darnell-Cookman Mathematics Department

Operations on Integers

Items 1–20: Add or subtract as indicated.

1. $-9 - 7 =$

2. $-4 + 7 =$

3. $-10 - 2 =$

4. $-43 + 36 =$

5. $-4 + 3 =$

6. $-36 + 15 =$

7. $1 - 3 =$

8. $0 - 15 =$

9. $52 + 29 =$

10. $-12 - 6 =$

11. $-22 + 20 =$

12. $2 - 3 =$

13. $-11 - 0 =$

14. $14 - 21 =$

15. $-7 - 7 =$

16. $-5 + 11 =$

17. $6 + 8 - 9 =$

18. $-2 - 3 - 8 =$

19. $-11 + 15 - 14$

20. $5 - 8 - 9 - 2 =$

Items 21–40: Multiply or divide as indicated.

21. $6 \bullet (-7) =$

22. $-32 \div (-16) =$

23. $\dfrac{-64}{8} =$

24. $(-5)(6) =$

25. $28 \div 2 =$

26. $17 \div 0 =$

27. $0 \bullet (-10) =$

28. $-8 \bullet (-9) =$

29. $\dfrac{24}{-12} =$

30. $11(-5) =$

31. $-7 \bullet 7 =$

32. $-15(-1) =$

33. $(-23)(1) =$

34. $-39 \div 3 =$

35. $80 \div (-20) =$

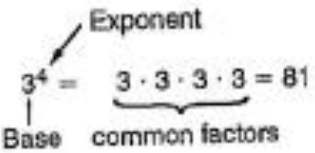
36. $\dfrac{-120}{-40} =$

37. $(-7)(-3) =$

38. $9 \bullet 0 =$

39. $48 \div 24 =$

40. $0 \div (-6) =$



The **exponent** tells you how many times to use the **base** as a factor.

EXAMPLE 1 **Write 6^3 as a product of the same factor.**

The base is 6. The exponent 3 means that 6 is used as a factor 3 times.
$6^3 = 6 \cdot 6 \cdot 6$

EXAMPLE 2 **Evaluate 5^4.**

$5^4 = 5 \cdot 5 \cdot 5 \cdot 5$
$= 625$

EXAMPLE 3 **Write $4 \cdot 4 \cdot 4 \cdot 4 \cdot 4$ in exponential form.**

The base is 4. It is used as a factor 5 times, so the exponent is 5.
$4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 = 4^5$

EXERCISES

Write each power as a product of the same factor.

1. 7^3
2. 2^7
3. 9^2
4. 15^4

Evaluate each expression.

5. 3^5
6. 7^3
7. 8^4
8. 5^3

Write each product in exponential form.

9. $2 \cdot 2 \cdot 2 \cdot 2$
10. $7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7$
11. $10 \cdot 10 \cdot 10$
12. $9 \cdot 9 \cdot 9 \cdot 9 \cdot 9$
13. $12 \cdot 12 \cdot 12$
14. $5 \cdot 5 \cdot 5 \cdot 5$
15. $6 \cdot 6 \cdot 6 \cdot 6 \cdot 6$
16. $1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1$

Use the **order of operations** to evaluate numerical expressions.

1. Do all operations within grouping symbols first.
2. Evaluate all powers before other operations.
3. Multiply and divide in order from left to right.
4. Add and subtract in order from left to right.

EXAMPLE 1 **Evaluate $(10 - 2) - 4 \cdot 2$.**

$(10 - 2) - 4 \cdot 2 = 8 - 4 \cdot 2$ Subtract first since $10 - 2$ is in parentheses.
$= 8 - 8$ Multiply 4 and 2.
$= 0$ Subtract 8 from 8.

EXAMPLE 2 **Evaluate $8 + (1 + 5)^2 \div 4$.**

$8 + (1 + 5)^2 \div 4 = 8 + 6^2 \div 4$ First, add 1 and 5 inside the parentheses.
$= 8 + 36 \div 4$ Find the value of 6^2.
$= 8 + 9$ Divide 36 by 4.
$= 17$ Add 8 and 9.

EXERCISES

Evaluate each expression.

1. $(1 + 7) \times 3$

2. $28 - 4 \cdot 7$

3. $5 + 4 \cdot 3$

4. $(40 \div 5) - 7 + 2$

5. $35 \div 7(2)$

6. 3×10^3

7. $45 \div 5 + 36 \div 4$

8. $42 \div 6 \times 2 - 9$

9. $2 \times 8 - 3^2 + 2$

10. $5 \times 2^2 + 32 \div 8$

11. $3 \times 6 - (9 - 8)^3$

12. 3.5×10^2

You can use the following properties to solve addition and subtraction equations.

- *Addition Property of Equality* - If you add the same number to each side of an equation, the two sides remain equal.
- *Subtraction Property of Equality* - If you subtract the same number from each side of an equation, the two sides remain equal.

EXAMPLE 1 **Solve $w + 19 = 45$. Check your solution.**

$w + 19 = 45$	Write the equation.
$w + 19 - 19 = 45 - 19$	Subtract 19 from each side.
$w = 26$	$19 - 19 = 0$ and $45 - 19 = 26$. w is by itself.

Check

$w + 19 = 45$	Write the original equation.
$26 + 19 \stackrel{?}{=} 45$	Replace w with 26. Is this sentence true?
$45 = 45$ ✓	$26 + 19 = 45$

EXAMPLE 2 **Solve $h - 25 = -76$. Check your solution.**

$h - 25 = -76$	Write the equation.
$h - 25 + 25 = -76 + 25$	Add 25 to each side.
$h = -51$	$-25 + 25 = 0$ and $-76 + 25 = -51$. h is by itself.

Check

$h - 25 = -76$	Write the original equation.
$-51 - 25 \stackrel{?}{=} -76$	Replace h with -51. Is this sentence true?
$-76 = -76$ ✓	$-51 - 25 = -51 + (-25)$ or -76

EXERCISES

Solve each equation. Check your solution.

1. $s - 4 = 12$ **2.** $d + 2 = 21$ **3.** $h + 6 = 15$

4. $x + 5 = -8$ **5.** $b - 10 = -34$ **6.** $f - 22 = -6$

7. $17 + c = 41$ **8.** $v - 36 = 25$ **9.** $y - 29 = -51$

10. $19 = z - 32$ **11.** $13 + t = -29$ **12.** $55 = 39 + k$

13. $62 + b = 45$ **14.** $x - 39 = -65$ **15.** $-56 = -47 + n$

You can use the following properties to solve multiplication and division equations.

- *Multiplication Property of Equality* - If you multiply each side of an equation by the same number, the two sides remain equal.
- *Division Property of Equality* - If you divide each side of an equation by the same nonzero number, the two sides remain equal.

EXAMPLE 1 **Solve $19w = 104$. Check your solution.**

$19w = 114$ Write the equation.

$\frac{19w}{19} = \frac{114}{19}$ Divide each side of the equation by 19.

$1w = 6$ $19 \div 19 = 1$ and $114 \div 19 = 6$.

$w = 6$ Identity Property; $1w = w$

Check

$19w = 114$ Write the original equation.

$19(6) \stackrel{?}{=} 114$ Replace w with 6.

$114 = 114$ ✓ This sentence is true.

EXAMPLE 2 **Solve $\frac{d}{15} = -9$. Check your solution.**

$\frac{d}{15} = -9$

$\frac{d}{15}(15) = -9(15)$ Multiply each side of the equation by 15.

$d = -135$

Check

$\frac{d}{15} = -9$ Write the original equation.

$\frac{-135}{15} \stackrel{?}{=} -9$ Replace d with -135.

$-9 = -9$ ✓ $-135 \div 15 = -9$

EXERCISES

Solve each equation. Check your solution.

1. $\frac{r}{6} = 6$
2. $2d = 12$
3. $7h = -21$
4. $-8x = 40$
5. $\frac{f}{8} = -6$
6. $\frac{x}{-10} = -7$
7. $17c = -68$
8. $\frac{h}{-11} = 12$
9. $29t = -145$
10. $125 = 5z$
11. $13t = -182$
12. $117 = -39k$

To multiply fractions, multiply the numerators and multiply the denominators.

EXAMPLE 1 **Find $\frac{3}{8} \cdot \frac{4}{11}$. Write in simplest form.**

$$\frac{3}{8} \cdot \frac{4}{11} = \frac{3}{\cancel{8}_{2}} \cdot \frac{\cancel{4}^{1}}{11}$$ Divide 8 and 4 by their GCF, 4.

$$= \frac{3 \cdot 1}{2 \cdot 11}$$ Multiply the numerators and denominators.

$$= \frac{3}{22}$$ Simplify.

To multiply mixed numbers, first rewrite them as improper fractions.

EXAMPLE 2 **Find $-2\frac{1}{3} \cdot 3\frac{3}{5}$. Write in simplest form.**

$$-2\frac{1}{3} \cdot 3\frac{3}{5} = -\frac{7}{3} \cdot \frac{18}{5}$$ $-2\frac{1}{3} = -\frac{7}{3}$, $3\frac{3}{5} = \frac{18}{5}$

$$= -\frac{7}{\cancel{3}_{1}} \cdot \frac{\cancel{18}^{6}}{5}$$ Divide 18 and 3 by their GCF, 3.

$$= -\frac{7 \cdot 6}{1 \cdot 5}$$ Multiply the numerators and denominators.

$$= -\frac{42}{5}$$ Simplify.

$$= -8\frac{2}{5}$$ Write the result as a mixed number.

EXERCISES

Multiply. Write in simplest form.

1. $\frac{2}{3} \cdot \frac{3}{5}$
2. $\frac{4}{7} \cdot \frac{3}{4}$
3. $-\frac{1}{2} \cdot \frac{7}{9}$
4. $\frac{9}{10} \cdot \frac{2}{3}$
5. $\frac{5}{8} \cdot \left(-\frac{4}{9}\right)$
6. $-\frac{4}{7} \cdot \left(-\frac{2}{3}\right)$
7. $2\frac{2}{5} \cdot \frac{1}{6}$
8. $-3\frac{1}{3} \cdot 1\frac{1}{2}$
9. $3\frac{3}{7} \cdot 2\frac{6}{8}$
10. $-1\frac{7}{8} \cdot \left(-2\frac{2}{5}\right)$
11. $-1\frac{3}{4} \cdot 2\frac{1}{5}$
12. $2\frac{2}{3} \cdot 2\frac{3}{7}$

Two numbers whose product is 1 are **multiplicative inverses**, or **reciprocals**, of each other.

EXAMPLE 1 **Write the multiplicative inverse of $-2\frac{3}{4}$.**

$-2\frac{3}{4} = -\frac{11}{4}$ Write $-2\frac{3}{4}$ as an improper fraction.

Since $-\frac{11}{4}\left(-\frac{4}{11}\right) = 1$, the multiplicative inverse of $-2\frac{3}{4}$ is $-\frac{4}{11}$.

To divide by a fraction or mixed number, multiply by its multiplicative inverse.

EXAMPLE 2 **Find $\frac{3}{8} \div \frac{6}{7}$. Write in simplest form.**

$\frac{3}{8} \div \frac{6}{7} = \frac{3}{8} \cdot \frac{7}{6}$ Multiply by the multiplicative inverse of $\frac{6}{7}$, which is $\frac{7}{6}$.

$= \frac{\frac{1}{3}}{8} \cdot \frac{7}{\frac{6}{2}}$ Divide 6 and 3 by their GCF, 3.

$= \frac{7}{16}$ Simplify.

EXERCISES

Write the multiplicative inverse of each number.

1. $\frac{3}{5}$
2. $-\frac{8}{9}$
3. $\frac{1}{10}$
4. $-\frac{1}{6}$
5. $2\frac{3}{5}$
6. $-1\frac{2}{3}$
7. $-5\frac{2}{5}$
8. $7\frac{1}{4}$

Divide. Write in simplest form.

9. $\frac{1}{3} \div \frac{1}{6}$
10. $\frac{2}{5} \div \frac{4}{7}$
11. $-\frac{5}{6} \div \frac{3}{4}$
12. $1\frac{1}{5} \div 2\frac{1}{4}$
13. $3\frac{1}{7} \div \left(-3\frac{2}{3}\right)$
14. $-\frac{4}{9} \div 2$
15. $\frac{6}{11} \div (-4)$
16. $5 \div 2\frac{1}{3}$

Fractions that have different denominators are called **unlike fractions**. To add or subtract unlike fractions, first rewrite the fractions with a common denominator. Then add or subtract and simplify, if necessary.

EXAMPLE 1 **Find $\frac{3}{5} + \frac{2}{3}$. Write in simplest form.**

$$\frac{3}{5} + \frac{2}{3} = \frac{3}{5} \cdot \frac{3}{3} + \frac{2}{3} \cdot \frac{5}{5}$$ The LCD is $5 \cdot 3$ or 15.

$$= \frac{9}{15} + \frac{10}{15}$$ Rename each fraction using the LCD.

$$= \frac{9 + 10}{15}$$ Add the numerators. The denominators are the same.

$$= \frac{19}{15} \text{ or } 1\frac{4}{15}$$ Simplify.

EXAMPLE 2 **Find $-3\frac{1}{2} - 1\frac{5}{6}$. Write in simplest form.**

$$-3\frac{1}{2} - 1\frac{5}{6} = -\frac{7}{2} - \frac{11}{6}$$ Write the mixed numbers as improper fractions.

$$= -\frac{7}{2} \cdot \frac{3}{3} - \frac{11}{6}$$ The LCD is $2 \cdot 3$ or 6.

$$= -\frac{21}{6} - \frac{11}{6}$$ Rename $\frac{7}{2}$ using the LCD.

$$= \frac{-21 - 11}{6}$$ Subtract the numerators.

$$= -\frac{32}{6} \text{ or } -\frac{16}{3} \text{ or } -5\frac{1}{3}$$ Simplify.

EXERCISES

Add or subtract. Write in simplest form.

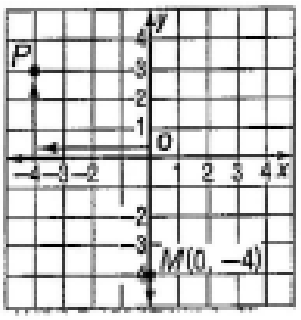
1. $\frac{2}{5} + \frac{3}{10}$
2. $\frac{1}{3} + \frac{2}{9}$
3. $\frac{5}{9} + \left(-\frac{1}{6}\right)$
4. $-\frac{3}{4} - \frac{5}{6}$
5. $\frac{4}{5} - \left(-\frac{1}{3}\right)$
6. $1\frac{2}{3} - \left(-\frac{4}{9}\right)$
7. $-\frac{7}{10} - \left(-\frac{1}{2}\right)$
8. $2\frac{1}{4} + 1\frac{3}{8}$
9. $3\frac{3}{4} - 1\frac{1}{3}$
10. $-1\frac{1}{5} - 2\frac{1}{4}$
11. $-2\frac{4}{9} - \left(-1\frac{1}{3}\right)$
12. $3\frac{3}{5} - 2\frac{2}{3}$

The **coordinate plane** is used to locate points. The horizontal number line is the ***x*-axis**. The vertical number line is the ***y*-axis**. Their intersection is the **origin**.

Points are located using **ordered pairs**. The first number in an ordered pair is the ***x*-coordinate**; the second number is the ***y*-coordinate**.

The coordinate plane is separated into four sections called **quadrants**.

EXAMPLE 1 **Name the ordered pair for point P. Then identify the quadrant in which P lies.**



- Start at the origin.
- Move 4 units left along the x-axis.
- Move 3 units up on the y-axis.

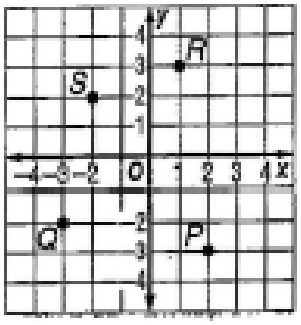
The ordered pair for point P is $(-4, 3)$.
P is in the upper left quadrant or quadrant II.

EXAMPLE 2 **Graph and label the point $M(0, -4)$.**

- Start at the origin.
- Move 0 units along the x-axis.
- Move 4 units down on the y-axis.
- Draw a dot and label it $M(0, -4)$.

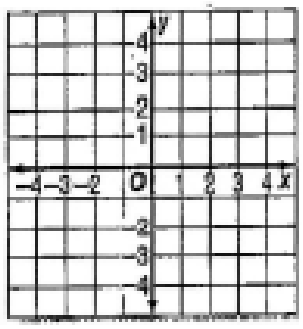
EXERCISES

Name the ordered pair for each point graphed at the right. Then identify the quadrant in which each point lies.



1. P
2. Q
3. R
4. S

Graph and label each point on the coordinate plane.



5. $A(-1, 1)$
6. $B(0, -3)$
7. $C(3, 2)$
8. $D(-3, -1)$
9. $E(1, -2)$
10. $F(1, 3)$

Measures of Central Tendency	• The **mean** is the sum of the data divided by the number of items in the data set. • The **median** is the number in the middle when you order the data from least to greatest. When there are two middle numbers, the median is the mean of those two. • The **mode** is the number or numbers that occur most often.

EXAMPLE

Find the mean, median, and mode of the data. 11, 23, 47, 11, 25, 54

Find the total. Then divide by 6. $\frac{171}{6} = 28.5$

The mean is 28.5.

To find the median, arrange the data in order. 11, 11, 23, 25, 47, 54

There are two middle numbers, 23 and 25. The mean of 23 and 25 is $\frac{23 + 25}{2}$ *or 24. The median of the data is 24.*

The number that appears most often is 11, which appears twice.
The mode is 11.

Try These Together

1. Find the mean, median, and mode of the data. 17, 15, 15, 12, 16
   HINT: Find the total and divide by 5 to find the mean. Arrange in order to find the median.

2. Find the mean, median, and mode of the data. 3, 2, 3, 2, 3, 9, 5, 6, 4, 5, 2
   HINT: There are two modes.

PRACTICE

Find the mean, median, and mode of each set of data. Round to the nearest tenth if necessary.

3. 58, 63, 57, 52, 58, 52, 52, 64
4. 110, 150, 142, 120, 113, 110, 123
5. 35, 35, 36, 32, 34, 33, 32, 31
6. 500, 1,000, 700, 1,000, 1,000, 1,200

7. **Employment** Kezia conducted a study to find out what the average wage was for high school students who were employed. The data she gathered is shown below. Find the mean, median, and mode of her data. Round to the nearest cent.

   $5.50 $6.75 $5.25 $5.75 $6.25 $5.75 $6.75 $5.50 $5.25 $5.25

8. **Standardized Test Practice** The high temperatures in New York, NY, for one week in the summer were 80°F, 78°F, 80°F, 81°F, 85°F, 82°F, and 79°F. What was the median high temperature?

   A 79°F **B** 80°F **C** 81°F **D** 85°F

The spread of data is called the **variation**. One way to measure it is with the **range**, the difference between the greatest and least numbers in the set. With large sets of data, it is often helpful to separate the data into four equal parts called **quartiles**.

EXAMPLE

Find the range, median, upper and lower quartiles, and interquartile range for this set of data.

12, 12, 16, 14, 13, 13, 11, 15, 13, 15

Arrange the data in order and divide it into halves.

11, 12, 12, 13, 13, 13, 14, 15, 15, 16

The range is the difference between the greatest and least values.
16 − 11 = 5
The range is 5.

There are 2 middle numbers, 13 and 13, so the median is 13.

The median of the upper half of the data is 15, so 15 is the upper quartile.
The median of the lower half of the data is 12, so 12 is the lower quartile.
To find the interquartile range, subtract the lower quartile from the upper quartile. The difference is 15 − 12, or 3. The interquartile range is 3.

Try These Together

1. Find the range, median, and upper and lower quartiles for this set of data.
   0, 5, 3, 3, 2, 5, 6, 4, 6, 9, 6
   HINT: First arrange the data in order.
2. Find the interquartile range for the set of data in Exercise 1.
   HINT: Subtract the quartiles.

PRACTICE

Find the range, median, upper and lower quartiles, and interquartile range for each set of data.

3. 9, 2, 3, 8, 6, 1, 4, 6
4. 41, 45, 42, 42, 45, 46, 41, 43, 43
5. 75, 85, 75, 75, 85, 95, 96, 130, 78
6. 32, 16, 12, 21, 29, 19, 30, 25, 25, 26

7. **Standardized Test Practice** What is the interquartile range for a set of data whose upper quartile is 5.5 and whose lower quartile is 1.8?

   A 7.3 **B** 9.9 **C** 3.7 **D** 1.9

A **box-and-whisker plot** uses a number line to show the distribution of a set of data. The box is drawn around the quartile values, and the whiskers extend from each quartile to the extreme data points that are not outliers.

Drawing a Box-and-Whisker Plot	1. Draw a number line that includes the least and greatest number in the data. 2. Mark the extremes, the median, and the upper and lower quartile above the number line. If the data has an outlier, mark the greatest value that is not an outlier. 3. Draw the box and the whiskers.

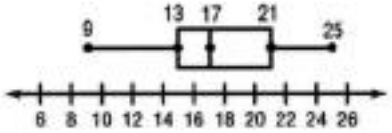
EXAMPLE

Draw a box-and-whisker plot for this data: 18, 19, 16, 23, 25, 9, 10, 16

Arrange the data in order from least to greatest (9, 10, 16, 16, 18, 19, 23, 25). Draw a number line that includes the least and greatest numbers (9 and 25).

Mark the extremes (9 and 25), the median (17), the upper quartile (21), and the lower quartile (13) above the number line.

Draw the box and the whiskers.

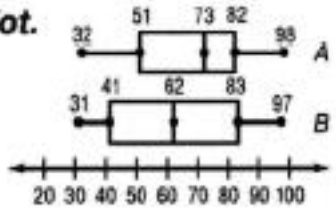


PRACTICE

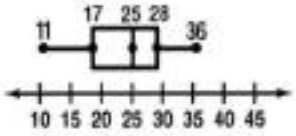
Draw a box-and-whisker plot for each set of data.

1. 283, 251, 225, 281, 290, 273, 204, 267
2. 102, 105, 80, 15, 90, 95, 106, 87, 80, 80, 105, 87, 85, 86
3. 27, 40, 30, 14, 19, 25, 27, 35, 31, 36, 39, 18, 30, 30, 35, 14

For Exercises 4–7, use the following box-and-whisker plot.



4. Which set of data is more spread out?
5. What is the interquartile range of class A's test scores?
6. Twenty-five percent of the students in class B scored below what average?
7. In general, which class scored higher on the test?
8. **Standardized Test Practice** Use the box-and-whisker plot at the right. Fifty-percent of the data are found between what two values?



A 25 and 36 **B** 28 and 36 **C** 11 and 28 **D** 17 and 36