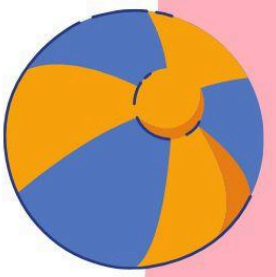


SUMMER MATH PACKET

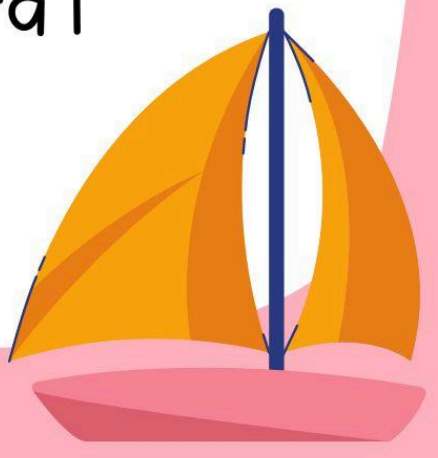


For students entering

8th Grade Algebra I





For Students Entering Algebra 1

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Fractions Operations

Hints/Guides:

When adding and subtracting fractions, we need to be sure that each fraction has the same denominator, then add or subtract the numerators together. For example,

$$\frac{1}{8} + \frac{3}{4} = \frac{1}{8} + \frac{6}{8} = \frac{1+6}{8} = \frac{7}{8}$$

In this example, we see that only the fraction with a denominator of 4 needs to be changed to have a new denominator of 8. What if it's not so apparent? For example, $\frac{7}{12} + \frac{8}{15} = ?$

For this example, we must find the Lowest Common Denominator (LCD) for the two denominators, 12 and 15.

Multiples of 12 are 12, 24, 36, 48, 60, 72, 84,... & Multiples of 15 are 15, 30, 45, 60, 75, 90, 105,...

The LCD of 12 and 15 is 60.

So, $\frac{7}{12} + \frac{8}{15} = \frac{35}{60} + \frac{32}{60} = \frac{32+35}{60} = \frac{67}{60} = 1\frac{7}{60}$.

***Note, be sure that answers are always in simplest terms**

To multiply fractions, we multiply the numerators together and the denominators together, and then simplify the product. To divide fractions, we find the reciprocal of the second fraction (keep - change - flip). And then multiply the two together. For example,

Multiplication: $\frac{2}{3} \bullet \frac{1}{4} = \frac{2}{12} = \frac{1}{6}$ **&** **Division:** $\frac{2}{3} \div \frac{3}{4} = \frac{2}{3} \bullet \frac{4}{3} = \frac{8}{9}$

Exercises: Perform the indicated operation. SHOW ALL WORK! If needed, use a separate sheet of paper and staple to this packet. NO CALCULATORS!

1. $\frac{6}{7} + \frac{2}{3} =$

2. $\frac{8}{9} + \frac{3}{4} =$

3. $\frac{9}{11} - \frac{2}{5} =$

4. $\frac{5}{7} - \frac{5}{9} =$

5. $\frac{6}{11} \bullet \frac{2}{3} =$

6. $\frac{7}{8} \bullet \frac{3}{5} =$

7. $\frac{6}{7} \div \frac{1}{5} =$

8. $\frac{7}{11} \div \frac{3}{5} =$

9. $\left[\frac{2}{3} - \frac{5}{9}\right] \div \left[\frac{4}{7} + \frac{1}{6}\right]$

10. $\frac{3}{4} + \frac{4}{5}\left[\frac{5}{9} + \frac{9}{11}\right] =$

Decimal Operations

Hints/Guide:

When adding and subtracting decimals, the key is to line up the decimals above each other, add zeros as placeholders so all of the numbers have the same place value length, then use the sale rules as adding and subtracting whole numbers.

The answer will have a decimal point in line with the problem. For example,

$34.5 + 6.72 + 9.045 =$

$$\begin{array}{r} 34.500 \\ 6.720 \\ +\ 9.045 \\ \hline 50.265 \end{array}$$

To multiply decimals, the rules are the same as multiplying whole numbers, until the product is determined and the decimal point must be located. The decimal point is placed the same number of digits in from the right side of the product as the number of decimal place values in the numbers being multiplied.

For example, $8.54 \bullet 17.2$**, since** $854 \bullet 172 = 146888$**, then we count the number of decimal places in the factors (3) and move in from the right three places, so the final product is 146.888.**

To divide decimals by a whole number, the division process is the same as for whole numbers, but the decimal points are lined up in the dividend and the quotient. For example,

To divide 51.06 by 3, the process is the same as if the problem were 5,106 divided by 3, with the decimal point from the quotient moving up into the quotient to create the final answer of 17.02.

$$3\overline{)51.06}$$
$$17.02$$

Exercises: Perform the indicated operation. SHOW ALL WORK! If needed, use a separate sheet of paper and staple to this packet. NO CALCULATORS!

1. $15.709 + 2.34 + 105.56 =$

2. $64.308 + 164.18 + 1005.7 =$

3. $87.4 - 56.09 =$

4. $500.908 - 4.72 =$

5. $6108.09 - 2004.704 =$

6. $9055.3 - 242.007 =$

7. $63 \cdot 0.04 =$

8. $0.87 \cdot 0.23 =$

9. $8.904 \cdot 2.1 =$

10. $33\overline{)70.35}$

11. $14\overline{)50.512}$

12. $23\overline{)74.888}$

Add and Subtract Mixed Numbers

Hints/Guide:

When adding mixed numbers, we can add the whole numbers and the fractions separately, then simplify the answer. For example,

$$4\frac{1}{3} + 2\frac{3}{4} = 4\frac{8}{24} + 2\frac{18}{24} = 6\frac{26}{24} = 6 + 1\frac{2}{24} = 7\frac{2}{24} = 7\frac{1}{12}$$

When subtracting mixed numbers, we subtract the whole numbers and the fractions separately, then simplify the answer. For example,

$$7\frac{3}{4} - 2\frac{15}{24} = 7\frac{18}{24} - 2\frac{15}{24} = 5\frac{3}{24} = 5\frac{1}{8}$$

$$5\frac{1}{4} - 3\frac{3}{8} = 5\frac{2}{8} - 3\frac{3}{8} = 4\frac{10}{8} - 3\frac{3}{8} = 1\frac{5}{8}$$

Note: Regrouping needed in order to subtract!

Exercises: Solve in simplest form. SHOW ALL WORK! If needed, use a separate sheet of paper and staple to this packet. NO CALCULATORS!

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

2. $6\frac{17}{25} + 8\frac{4}{7} =$

3. $6\frac{2}{3} + 9\frac{7}{9} =$

4. $8\frac{3}{10} - 6\frac{7}{9} =$

5. $9\frac{7}{15} - 2\frac{7}{12} =$

6. $12\frac{8}{9} - 7\frac{3}{4} =$

Multiply and Divide Mixed Numbers

Hints/Guide:

To multiply mixed numbers, we can first convert the mixed number into improper fractions. This is done by multiplying the denominator by the whole number part of the mixed number and then adding the numerator to this product. This sum is the numerator of the improper fraction. The denominator of the improper fraction is the same as the denominator of the mixed number.

For example: $3\frac{2}{5}$ **leads to** $3 \cdot 5 + 2 = 17$, **so** $3\frac{3}{5} = \frac{17}{5}$.

Once the mixed numbers are converted into improper fractions, we multiply and simplify just as with regular fractions.

For example, $5\frac{1}{5} \cdot 3\frac{1}{2} = \frac{26}{2} \cdot \frac{7}{2} = \frac{182}{10} = 18\frac{2}{10} = 18\frac{1}{5}$

To divide mixed numbers, we must convert to improper fractions then multiply by the reciprocal of the second fraction and simplify.

For example, $2\frac{1}{2} \div 3\frac{1}{3} = \frac{5}{2} \div \frac{10}{3} = \frac{5}{2} \bullet \frac{3}{10} = \frac{15}{20} = \frac{3}{4}$

Exercises: Solve in simplest form. SHOW ALL WORK! If needed, use a separate sheet of paper and staple to this packet. NO CALCULATORS!

1. $6\frac{2}{3} \bullet 7\frac{3}{7} =$

2. $3\frac{1}{3} \bullet 6\frac{4}{5} =$

3. $7\frac{1}{8} \bullet 6 =$

4. $4\frac{1}{4} \div \frac{5}{7} =$

5. $3\frac{2}{3} \div 4\frac{3}{7} =$

6. $\frac{3}{4} \div 2\frac{3}{11} =$

7. $6\frac{1}{5} \div 8\frac{2}{5} =$

8. $8\frac{2}{7} \div 7\frac{8}{9} =$

9. $6\frac{4}{7} \div 3\frac{3}{5} =$

Laws of Exponents

Hints/Exercises:

There are certain rules when dealing with exponents that we can use to simplify problems. They are:

Adding Powers	$a^m a^n = a^{m+n}$
Multiplying Powers	$(a^m)^n = a^{mn}$
Subtracting Powers	$\frac{a^m}{a^n} = a^{m-n}$
Negative Powers	$a^{-n} = \frac{1}{a^n}$
To the zero power	$a^0 = 1$

Here are some examples of problems simplified using the above powers:

$4^3 \bullet 4^5 = 4^8$ $\quad (4^3)^3 = 4^9$ $\quad 4^5 \div 4^3 = 4^2$ $\quad 4^{-4} = \frac{1}{4^4} = \frac{1}{256}$ $\quad 4^0 = 1$

Exercises: Simplify the following problems using exponents (do not multiply out).

1. $5^2 5^4 =$

2. $7^{-3} 7^5 =$

3. $(12^4)^3 =$

4. $(6^5)^2 =$

5. $5^9 \div 5^4 =$

6. $10^3 \div 10^{-5} =$

7. $7^{-3} =$

8. $3^{-4} =$

9. $124^0 =$

10. $-9^0 =$

11. $5^3 \bullet 5^4 \div 5^7 =$

Integers I

Hints/Guides:

To add integers with the same sign (both positive or both negative), add their absolute values and use the same sign. To add integers of opposite signs, find the difference of their absolute values and then take the sign of the larger absolute value for your final answer.

To subtract integers, add its additive inverse (aka, subtraction means add the opposite). For example, $6 - 11 = 6 + (-11) = -5$

Exercises: Solve the following problems. NO CALCULATORS!

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

2. $-9 - (-2) =$

3. $6 - (-9) =$

4. $(-6) - 7 =$

5. $7 - (-9) =$

6. $15 - 24 =$

7. $(-5) + (-8) =$

8. $-15 + 8 - 8 =$

9. $14 + (-4) - 8 =$

10. $14.5 - 29 =$

11. $-7 - 6.85 =$

12. $-8.4 - (-19.5) =$

13. $29 - 16 + (-5) =$

14. $-15 + 8 - (-19.7) =$

15. $45.6 - (-13.5) + (-14) =$

16. $-15.98 - 6.98 - 9 =$

17. $-7.24 + (-6.28) - 7.3 =$

18. $29.45 - 56.009 - 78.2 =$

Integers II

Hints/Guides:

The rules for multiplying integers are:

positive • positive = positive **negative • negative = positive**

positive • negative = negative **negative • positive = negative**

The rules for dividing integers are the SAME as multiplying integers.

Exercises: Solve the following problems. NO CALCULATORS!

1. $(4) \cdot (-3) \cdot 6 =$

2. $5(-12) \cdot (-4) =$

3. $(4)(-2)(-3) =$

4. $\frac{(-5)(-6)}{-2} =$

5. $\frac{6(-4)}{8} =$

6. $\frac{-56}{2^3} =$

7. $6(-5-(-6)) =$

8. $8(-4-6) =$

9. $-6(9-11) =$

10. $\frac{-14}{2} + 7 =$

11. $8 - \frac{-15}{-3} =$

12. $-3 + \frac{-12 \cdot (-5)}{4} =$

13. $\frac{-6-(-8)}{-2} =$

14. $-7 + \frac{4+(-6)}{-2} =$

15. $45 - 14(5-(-3)) =$

16. $(-4+7)(-16+3) =$

17. $16 - (-13)(-7+5) =$

18. $\frac{4+(-6)-5-3}{-6+4} =$

Solving Equations I

Hints/Guide:

The key in solving an equation is to isolate the variable, to get the letter by itself. In one-step equations, we merely undo the operation (perform the inverse) - addition is the opposite of subtraction and multiplication is the opposite of division. Remember the golden rule of equation solving: IF we do something to one side of the equation, we MUST do the exact same thing to the other side.

Examples:

Equation with Addition	Equation with Subtraction	Equation with Multiplication	Equation with Division
$x + 5 = 6$ $-5 \quad -5$ $x = 1$	$t - 6 = 7$ $+6 \quad +6$ $t = 13$	$\frac{4x}{4} = \frac{16}{4}$ $x = 4$	$6 \bullet \frac{r}{6} = 12 \bullet 6$ $r = 72$
Check: $1 + 5 = 6$ $6 = 6$	**Check:** $13 - 6 = 7$ $7 = 7$	**Check:** $4(4) = 16$ $16 = 16$	**Check:** $72 \div 6 = 12$ $12 = 12$

Exercises: **Solve the following problems. SHOW ALL WORK! If needed, use a separate piece of paper and attach. NO CALCULATORS!**

1. $x + 8 = -13$

2. $t - (-9) = 4$

3. $-4t = -12$

4. $\frac{r}{4} = 12$

5. $y - 4 = -3$

6. $h + 8 = -5$

7. $\frac{p}{8} = -16$

8. $-5k = 20$

9. $-9 - y = 17$

Solving Equations II

Hints/Guides:

The key to solving equations is to isolate the variable, to get the letter by itself. In two-step equations, we must undo addition and subtraction first, then multiplication and division. Remember the golden rule of equation solving: IF we do something to one side of the equation, we MUST do the exact same thing to the other side.

Examples:

$4x - 6 = 14$ $+6 \quad +6$ $\frac{4x}{4} = \frac{8}{4}$ $x = -2$	$\frac{x}{-6} - 4 = -8$ $+4 \quad +4$ $-6 \bullet \frac{x}{-6} = -4 \bullet -6$ $x = 24$
Check: $4(-2) - 6 = -14$ $-8 - 6 = -14$ $-14 = -14$	**Check:** $(24/-6) - 4 = -8$ $-4 - 4 = -8$ $-8 = -8$

Exercises: **Solve the following problems. SHOW ALL WORK! If needed, use a separate piece of paper and attach. NO CALCULATORS!**

1. $-4t - 6 = 22$

2. $\frac{m}{-5} + 6 = -4$

3. $-4r + 5 = -25$

4. $\frac{x}{-3} + (-7) = 6$

5. $5g + (-3) = -12$

6. $\frac{y}{-2} + (-4) = 8$

Solving Equations III

Hints/Guides:

When solving equations that include basic mathematical operations, we must simplify the mathematics first, then solve the equations. For example:

$5(4 - 3) + 7x = 4(9 - 6)$

$5(1) + 7x = 4(3)$

$5 + 7x = 12$

$-5 \qquad -5$

$\frac{7x}{7} = \frac{7}{7}$

$x = 1$

Check: $5(4 - 3) + 7(1) = 4(9 - 6)$

$5 + 7 = 4(3)$

$12 = 12$ ✓

Exercises: **Solve the following equations using the rules listed on previous pages. SHOW ALL WORK! If needed, use a separate piece of paper and attach. NO CALCULATORS!**

1. $4x + 8 - 6 = 2(9 - 2)$

2. $\frac{t}{5} - 7 + 31 = 8(6 - 4)$

3. $5(t - 4) = 9(7 - 3)$

4. $9 - 5(4 - 3) = -16 + \frac{x}{3}$

5. $6t - 9 - 3t = 8(7 - 4)$

6. $7(6 - (-8)) = \frac{t}{-4} + 2$

7. $7(3 - 6) = 6(4 + t)$

8. $4r + 5r - 6r = 15 + 6$

Equations - Variables on Both Sides

Hints/Guides:

As we know, the key in equation solving is to isolate the variable. In equations with variables on each side of the equal sign, we must combine the variables first by adding or subtracting the amount of one variable on each side of the equation to have a variable term on one side of the equation. Then, we must undo the addition and subtraction, then multiplication and division. Remember the golden rule of equation solving.

Examples:

$8x - 6 = 4x + 5$	$5 - 6t = 24 + 4t$
$-4x \quad -4x$	$+6t \quad +6t$
$4x - 6 = 5$	$5 = 24 + 10t$
$+6 \quad +6$	$-24 \quad -24$
$\frac{4x}{4} = \frac{11}{4}$	$\frac{-19}{10} = \frac{10t}{10}$
$x = 2\frac{3}{4}$	$-1\frac{9}{10} = t$

Exercises: **Solve the following problems. SHOW ALL WORK! If needed, use a separate piece of paper and attach. NO CALCULATORS!**

1. $4r - 7 = 8r + 13$

2. $14 + 3t = 5t - 12$

3. $4x - 5 = 3x - 3$

4. $6y + 5 = 4y - 13$

5. $5x - 8 = 6 - 2x$

6. $7p - 8 = -4p + 6$

Inequalities

Hints/Guides:

In solving inequalities, the solution process is very similar to solving equations. The goal is still to isolate the variable, to get the letter by itself. However, the one difference between equations and inequalities is that when solving inequalities, when we multiply or divide by a negative number, we must change the direction of inequalities. Also, since an inequality has many solutions, we can represent the solution of an inequality by a set of numbers or by the numbers on a number line.

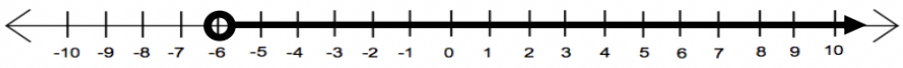
Inequality - a statement combining one of the following symbols:

< is less than **> is greater than**

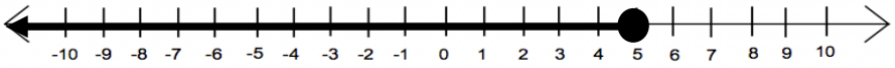
≤ is less than OR equal to (bubble on graph is shaded in) **≥ is greater than OR equal to (bubble on graph is shaded in)**

Examples:

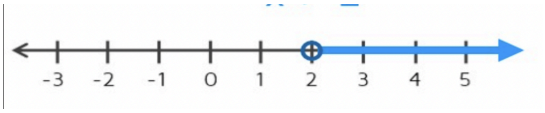
1. **All integers greater than -6.**



2. **All integers less than or equal to 5.**

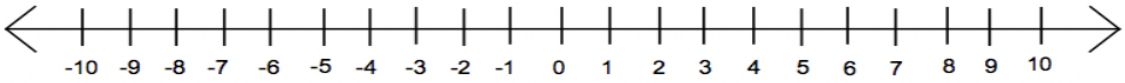


3. **To solve an inequality $-4x < -8$, you must divide BOTH sides by -4. The inequality you would graph (aka your final answer would be: $x > 2$. Since you divided both sides by a negative integer (-4), you must flip the direction of the inequality. This rule applies to multiplying by a negative integer as well.**

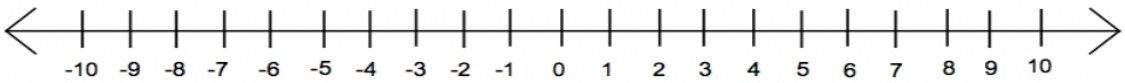


Exercises: Solve the following problems. NO CALCULATORS!

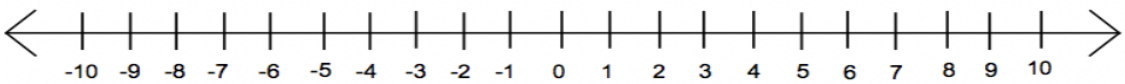
1. $4x > 9$



2. $-5t \geq -15$

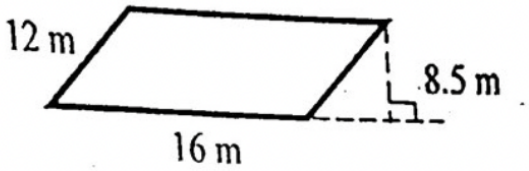


3. $\frac{x}{2} \geq 3$



Geometry

1. **Find the area and perimeter of the figure to the right.**



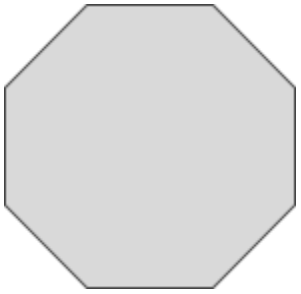
Area:

Perimeter:

2. **Find the area and circumference of a circle with radius of 16 meters. Use $\pi = 3.14$. Round to the nearest tenth.**

3. **Find the area and circumference of a circle with a diameter of 22 feet. Use $\pi = 3.14$. Round to the nearest tenth,**

4. **Using the polygon shown,**



   a. **Name of figure:** _____

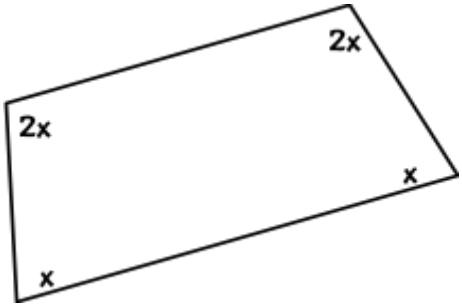
   b. **Find the sum of the interior angles:** _____

   c. **Find the measure of one exterior angle:** _____

5. a. **Identify the polygon shown.** _____

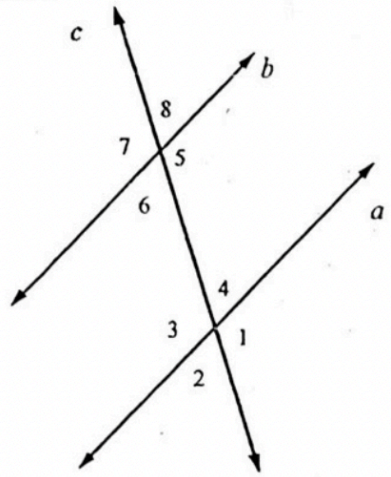
   b. **If each side is 12.5 cm long, find the perimeter.** _____

6. **Find the missing angles (solve for *x*).**



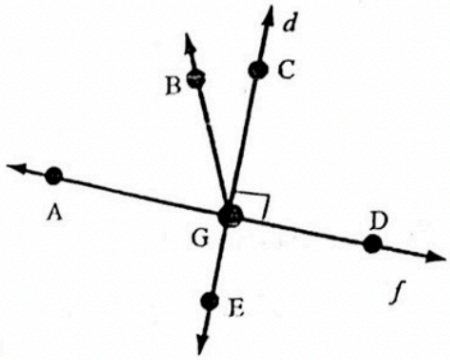
Refer to the diagrams below to answer the following:

Diagram 1



$a \| b$

Diagram 2



$d \perp f$

Refer to Diagram 1.

1. What is the geometric name for line *c*? _____

2. Name the sets of angles that form:

   vertical angles: _____

   alternate interior angles: _____

   alternate exterior angles: _____

   corresponding angles: _____

   supplementary angles: _____

3. If $m\angle 1 = 127^\circ$, find the measure of angles 2–8.

   $m\angle 2$ = _____ $m\angle 6$ = _____

   $m\angle 3$ = _____ $m\angle 7$ = _____

   $m\angle 4$ = _____ $m\angle 8$ = _____

   $m\angle 5$ = _____

Refer to Diagram 2.

4. What does $d \perp f$ mean? _____

5. State the names of two complementary angles. _____

6. If $m\angle CBG = 28°$, find $m\angle AGB$. _____

7. If $m\angle CBG = x°$ and $m\angle AGB = 2.75x°$, find the $m\angle AGB$ and $m\angle CGB$.

_____

8. If $m\angle BGD = 2m\angle AGB$, find the $m\angle AGB$ and $m\angle CGD$. _____

9. Name 4 congruent angles in diagram 2. _____

10. What is formed points B and G? _____

11. Name two geometric objects formed by points A and G. _____