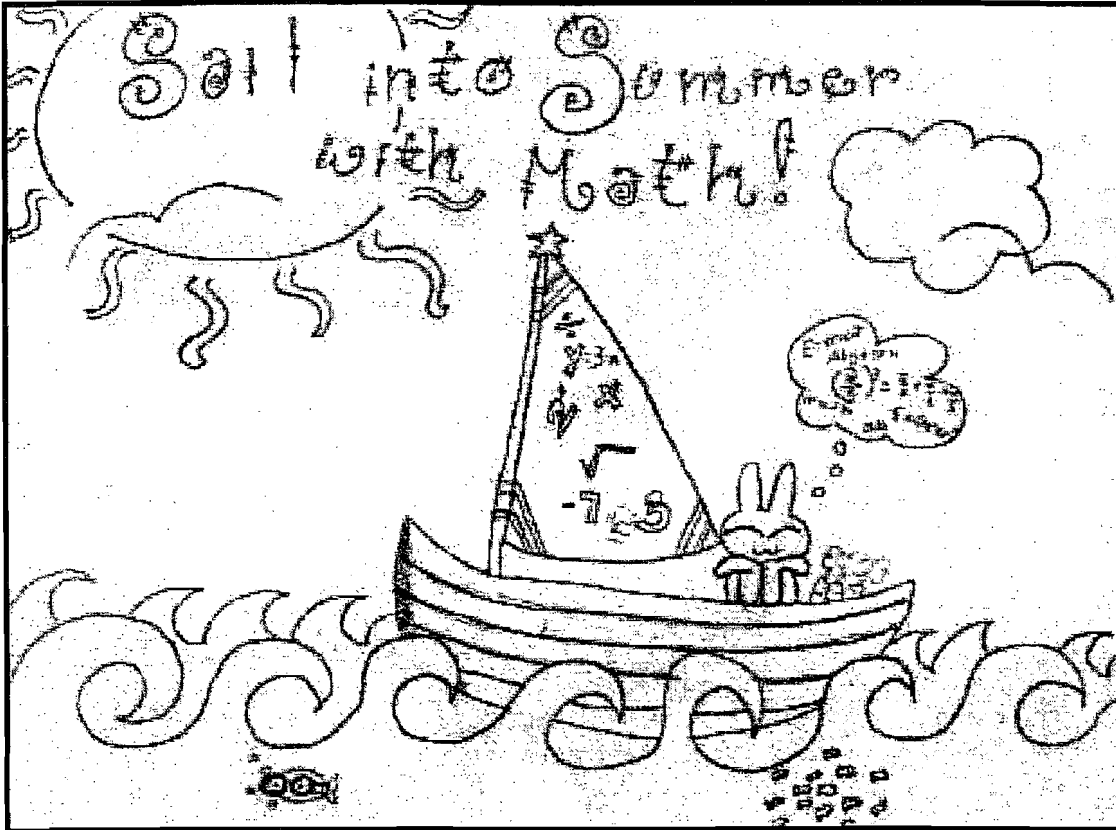


Sail into Summer with Math!



For Students Entering Algebra 1

This summer math booklet was developed to provide students in kindergarten through the eighth grade an opportunity to review grade level math objectives and to improve math performance.

Summer 2007

Sail into Summer with Math!

One goal of Gaithersburg Middle School is to promote math performance at all grade levels. Completing the summer math booklet allows each school, student, and parent within the clusters to work together to achieve this goal.

Students who complete the summer math booklet will be able to:

- Increase retention of math concepts,
- Improve and raise the level of math MSA and HSA performance,
- Work toward closing the gap in student performance,
- Apply math concepts to performance tasks, and
- Successfully complete Algebra 1 by the end of eighth grade.

Student Responsibilities

Students will be able to improve their own math performance by:

- Completing the summer math booklet
- Reviewing math skills throughout the summer, and
- **Returning the math booklet to next year's math teacher.**



Student Signature

Grade

Date

Parent Responsibilities

Parents will be able to promote student success in math by:

- Supporting the math goal of the cluster of schools,
- Monitoring student completion of the summer math booklet,
- Encouraging student use of math concepts in summer activities, and
- **Insuring the return of the math booklet to school in the fall.**



Fraction Operations

Hints/Guide:

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:

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

That was easy because it was easy to see what the new denominator should be, but what about if it was not so apparent? For example: $\frac{7}{12} + \frac{8}{15} =$

For this example, we must find the Lowest Common Denominator (LCM) 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 LCM of 12 and 15 is 60

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

Note: Be sure that answers are always in lowest terms

To multiply fractions, we multiply the numerators together and denominators together, and then simplify the product. To divide fractions, we find the reciprocal of the second fraction (flip the numerator and the denominator) and then multiply the two together. For example:

$$\frac{2}{3} \cdot \frac{1}{4} = \frac{2}{12} = \frac{1}{6} \quad \text{and} \quad \frac{2}{3} \div \frac{3}{4} = \frac{2}{3} \cdot \frac{4}{3} = \frac{8}{9}$$

Exercises: Perform the indicated operation

No Calculators!

SHOW ALL WORK. Use a separate sheet of paper (if needed) and staple to this page.

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. $\frac{6}{11} \cdot \frac{2}{3} =$

Rename Fractions, Percents, and Decimals

Hints/Guide:

To convert fractions into decimals, we start with a fraction, such as $\frac{3}{5}$, and divide the numerator (the top number of the fraction) by the denominator (the bottom number of the fraction). So:

$$5 \overline{)3.0} \quad \text{and the fraction } \frac{3}{5} \text{ is equivalent to the decimal } 0.6$$

To convert a decimal to a percent, we multiply the decimal by 100 (percent means a ratio of a number compared to 100). A short-cut is sometimes used of moving the decimal point two places to the right (which is equivalent to multiplying a number by 100), so $0.6 \cdot 100 = 60$ and $\frac{3}{5} = 0.6 = 60\%$.

To convert a percent to a decimal, we divide the percent by 100, 60% is the same as $60 \div 100$, which is 0.6, so $60\% = 0.6$

To convert a fraction into a percent, we can use proportions to solve, so

$$\frac{3}{5} = \frac{x}{100} \text{ and using cross products to solve, } 5x = 300 \text{ or } x = 60\%$$

Exercises: Complete the chart

	Fraction	Decimal	Percent
1.		0.04	
2.			125%
3.	$\frac{2}{3}$		
4.		1.7	
5.			0.6%
6.	$3\frac{1}{2}$		
7.		0.9	
8.			70%
9.	$\frac{17}{25}$		
10.		0.007	

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:

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

$$5\frac{1}{4} - 3\frac{3}{8} = 5\frac{2}{8} - 3\frac{3}{8} = 4\frac{10}{8} - 3\frac{3}{8} = 1\frac{5}{8} \quad \text{Note: regrouping needed in order to subtract}$$

Exercises: Solve in lowest terms.

No Calculators!

SHOW ALL WORK. Use a separate sheet of paper (if needed) and staple to this page.

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

Multiply and Divide Mixed Numbers

Hints/Guide:

To multiply mixed numbers, we can first convert the mixed numbers 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 $3\frac{2}{5} = \frac{17}{5}$.

Once the mixed numbers are converted into improper fractions, we multiply and simplify just as with regular fractions. For example: $5\frac{1}{5} \cdot 3\frac{1}{2} = \frac{26}{5} \cdot \frac{7}{2} = \frac{182}{10} = 18\frac{2}{10} = 18\frac{1}{5}$

To divide mixed numbers, we must convert to improper fractions then multiply by the reciprocal of the second fraction and simplify. For example: $2\frac{1}{2} \div 3\frac{1}{3} = \frac{5}{2} \div \frac{10}{3} = \frac{5}{2} \cdot \frac{3}{10} = \frac{15}{20} = \frac{3}{4}$

Exercises: Solve in lowest terms.

No Calculators!

SHOW ALL WORK. Use a separate sheet of paper (if needed) and staple to this page.

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

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

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

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

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

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

Squares and Square Roots

Hints/Guide:

Exponents are a way to represent repeated multiplication, so that 3^4 means 3 multiplied four times, or $3 \cdot 3 \cdot 3 \cdot 3$, which equals 81. In this example, 3 is the base and 4 is the power.

Roots are the base numbers that correspond to a given power, so the square (referring to the power of 2) root of 81 is 9 because $9 \cdot 9 = 81$ and the fourth root of 81 is 3 because $3 \cdot 3 \cdot 3 \cdot 3$ is 81.

$\sqrt[n]{x}$, where n is the root index and x is the radicand

Exercises: Evaluate.

1. $3^4 =$

2. $(-4)^3 =$

3. $-4^3 =$

4. $\sqrt{49} =$

5. $\sqrt{289} =$

6. $\sqrt{64} =$

Summer Mathematics Packet

Laws of Exponents

Hints/Guide:

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:

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

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

Find Percent of a Number

Hints/Guide:

To determine the percent of a number, we must first convert the percent into a decimal by dividing by 100 (which can be short-cut by moving the decimal point in the percentage two places to the left), then multiplying the decimal by the number. For example:

$$4.5\% \text{ of } 240 = 4.5\% \cdot 240 = 0.045 \cdot 240 = 10.8$$

Exercises: Solve for n.

You may use a calculator for these.

1. $305\% \text{ of } 450 = n$

2. $7.5\% \text{ of } 42 = n$

3. $120\% \text{ of } 321 = n$

4. $15\% \text{ of } 54 = n$

5. $0.65\% \text{ of } 320 = n$

6. $800\% \text{ of } 64 = n$

7. $95\% \text{ of } 568 = n$

Summer Mathematics Packet

Solve Problems Using Percents

Hints/Guide:

When solving percent problems, we apply the rules for finding percent of a number in realistic situations. For example, to find the amount of sales tax on a \$450.00 item if the tax rate is 5%, we find 5% of 450 ($.05 \cdot 450 = 22.5$), and then label our answer in dollars, getting \$22.50.

Exercises: Solve the following items.

SHOW ALL WORK. You may use a calculator to help you.

1. Susie has just bought a pair of jeans for \$49.95, a sweater for \$24.50, and a jacket for \$85.95. The sales tax is 5%. What is her total bill?
2. Jack bought a set of golf clubs for \$254.00 and received a rebate of 24%. How much was the rebate?
3. A construction manager calculates it will cost \$2,894.50 for materials for her next project. She must add in 12.5% for scrap and extras. What will be the total cost?
4. The regular price for a video game system is \$164.50 but is on sale for 30% off. What is the amount of the discount?

What is the sale price?
5. Cindy earns a 15% commission on all sales. On Saturday, she sold \$985.40 worth of merchandise. What was the amount of commission she earned on Saturday?

Integers I

Hints/Guide:

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.

To subtract integers, add its additive inverse. 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. $-8.4 - (-19.5) =$

Summer Mathematics Packet

Integers II

Hints/Guide:

The rules for multiplying integers are:

Positive · Positive = Positive

Positive · Negative = Negative

Negative · Negative = Positive

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

Solving Equations I

Hints/Guide:

The key in equation solving is to isolate the variable, to get the letter by itself. In one-step equations, we merely undo the operation - 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:

1. $x + 5 = 6$

$$\frac{-5 \quad -5}{ }$$

$$x = 1$$

Check: $1 + 5 = 6$

$$6 = 6$$

2. $t - 6 = 7$

$$\frac{+6 \quad +6}{ }$$

$$t = 13$$

Check: $13 - 6 = 7$

$$7 = 7$$

3. $\frac{4x}{4} = \frac{16}{4}$

$$x = 4$$

$$x = 4$$

Check: $4(4) = 16$

$$16 = 16$$

4. $6 \cdot \frac{r}{6} = 12 \cdot 6$

$$r = 72$$

Check: $72 \div 6 = 12$

$$12 = 12$$

Exercises: Solve the following problems:

No Calculators!

SHOW ALL WORK. Use a separate sheet of paper (if necessary) and staple to this page.

1. $x + 8 = -13$

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

3. $-4t = -12$

4. $\frac{r}{4} = 24$

5. $y - 4 = -3$

6. $h + 8 = -5$

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Solving Equations II

Hints/Guide:

The key in equation solving 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:

1. $4x - 6 = -14$

$$+6 \quad +6$$

$$\underline{4x} \quad = \underline{-8}$$

$$4 \quad 4$$

$$x = -2$$

Solve: $4(-2) - 6 = -14$

$$-8 - 6 = -14$$

$$-14 = -14$$

2. $\frac{x}{-6} - 4 = -8$

$$+4 \quad +4$$

$$-6 \cdot \frac{x}{-6} = -4 \cdot -6$$

$$x = 24$$

Solve: $(24/-6) - 4 = -8$

$$-4 - 4 = -8$$

$$-8 = -8$$

Exercises: Solve the following problems:

No Calculators!

SHOW ALL WORK. Use a separate sheet of paper (if necessary) and staple to this page.

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/Guide:

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

$$\begin{array}{r}
 5(4 - 3) + 7x = 4(9 - 6) \\
 5(1) + 7x = 4(3) \\
 5 + 7x = 12 \\
 -5 \qquad -5 \\
 \hline
 7x = 7 \\
 \frac{7x}{7} = \frac{7}{7} \\
 x = 1
 \end{array}
 \qquad
 \begin{array}{r}
 \text{Check: } 5(4 - 3) + 7(1) = 4(9 - 6) \\
 5 + 7 = 4(3) \\
 12 = 12
 \end{array}$$

Exercises: Solve the following equations using the rules listed on the previous pages:
 SHOW ALL WORK. Use a separate sheet of paper (if necessary) and staple to this page.

$$1. \quad 4x + 8 - 6 = 2(9 - 2) \qquad 2. \quad \frac{t}{5} - 7 + 31 = 8(6 - 4) \qquad 3. \quad 5(t - 4) = 9(7 - 3)$$

$$4. \quad 9 - 5(4 - 3) = -16 + \frac{x}{3} \qquad 5. \quad 6t - 9 - 3t = 8(7 - 4) \qquad 6. \quad 7(6 - (-8)) = \frac{t}{-4} + 2$$