ALL 9ᵗʰ GRADERS—September 11ᵗʰ
Regardless of which mathematics course you are taking as a 9ᵗʰ grader (Algebra 1, AlGeo, Geometry, or Algebra2/Pre-calc)you will do THIS MATHEMATICS PROJECT.

Name: _____ **Advisory #:** _____

YOUR PROJECT WILL BE GRADED USING THIS RUBRIC.

Guideline	Points Earned	Points Possible
Calculator Assignments (I, III, IV, V) (40 points total)		
Assignment I		10
Assignment III		10
Assignment IV		10
Assignment V		10
Non-Calculator Assignment (VI) (60 points total)		
Topic A (#1-20)—Answers and sufficient work		10
Topic E (#21-25)—Answers and sufficient work		10
Topic F (#26-32)—Answers and sufficient work		10
Topic G (#33-43)—Answers and sufficient work		10
Topic H (#44-62)—Answers and sufficient work		10
Topic I (#63-76)—Answers and sufficient work		10
TOTALS:		100

A GRAPHING CALCULATOR IS REQUIRED FOR THIS PROJECT AND FOR CARVER E&S CLASSES.

INFORMATION ABOUT GRAPHING CALCULATORS
- A TI-83 Plus or TI-84 is recommended.
- Graphing calculators are expensive, pricing from $90-$160.
- However, it is an investment that your child will use throughout high school and college.
- Graphing calculators are necessary for the PSAT, SAT, ACT, AP mathematics exams, and more. Many of your child's high school classes will require daily calculator use.
- Explore options like e-bay or amazon for cheaper, lightly used calculators. Be mindful that if you find a used calculator for an extremely low price, it might be "for parts only" meaning that it is not a functioning calculator. Check with the seller to be sure.

Basic Graphing Calculator Skills—(TI-83 Plus or TI-84 Required)

Part I: Entering Numbers and using PEMDAS

INSTRUCTION I:

Your calculator will always follow PEMDAS (Parentheses, Exponents, Multiplication, Division, Addition, Subtraction) when you enter numbers and letters. Therefore, it is very important that you understand how to communicate with your calculator in order to get the correct answers.

<u>Example I.1:</u> When entering $\dfrac{12+3}{5}$ into your calculator, you need to make sure that you give your calculator the correct information.

Because 12 + 3 is in the numerator, you are supposed to add them first and get 15. You are then supposed to divide 15 by 5 and get a final answer of 3. However, if you simply type what you were given into the calculator, you will get the incorrect answer.

Type 12 + 3 / 5 into your calculator. Your calculator always does PEMDAS, so it will do DIVISION before ADDITION. Thus your calculator would divide 3 by 5 and get .6. It would then add 12 + .6 and get a final answer of 12.6.

To fix this problem, remember that you knew the numerator addition should come first. To tell your calculator that the addition should be first, put it in parentheses. Thus, you should enter the following into your calculator:
(12 + 3) / 5

The safest way to deal with this problem is to always put the entire numerator and the entire denominator in parentheses when entering them into your calculator.

<u>Example I.2:</u> When entering $\dfrac{6+8}{4+3}$ into your calculator, remember that you would add 6 + 8 and 4 + 3 before you divide which would give you 14/7 which equals 2.

The incorrect method would be:
6 + 8 / 4 + 3 because your calculator would do the division first, yielding 6 + 2 + 3 = 11

The correct way to enter the fraction into your calculator is as follows:
(6+8)/(4+3) = 2

<u>ASSIGNMENT I</u>: List the incorrect and correct ways to enter each of the following into your calculator. Also, give both the incorrect and correct answers for each.

Problem	Incorrect Entry	Incorrect Answer	Correct Entry	Correct Answer
$\dfrac{6+5}{10+12}$				
$\dfrac{2-3}{5+1}$				
$\dfrac{4-10}{3}$				
$\dfrac{5}{8+17}$				
$\dfrac{1+2+3-4}{5+6+7-8}$				

Part II: Using the 2nd Key

<u>INSTRUCTION II</u>:

TI Calculators have more functions than they do buttons. To fix this problem, the calculators are equipped with a 2nd Key. To use a function that is on a key, simply press that key. To use a function that is written above a key, simply press the 2nd button and then that key.

Part III: Using the ALPHA Key

<u>INSTRUCTION III</u>:

TI Calculators also allow you to type using letters. To access a letter, press the ALPHA key and then select the key under the letter that you want. To write several letters in a row, you can use the A-LOCK function that will lock your calculator in ALPHA. Press the 2nd key and then the ALHPA key to use A-LOCK.

For example, to type "HSES" into my calculator, I would either use the ALPHA button for each letter or I would use the A-LOCK.

<u>Example III.1: (ALPHA)</u>

ALPHA

^ (this will give you an H)

ALPHA

LN (this will give you an S)

ALPHA

SIN (this will give you an E)

ALPHA

LN (this will give you an S)

<u>Example III.2: (A-LOCK)</u>

2nd

ALPHA

^ (this will give you an H)

LN (this will give you an S)

SIN (this will give you an E)

LN (this will give you an S)

ALPHA (this will turn off the A-Lock)

ASSIGNMENT III: In the columns provided, list the keystrokes required to type your name in the calculator. List the keystrokes required to type your first name into the calculator. You may use either the ALPHA method or the A-LOCK method.

_____   _____   _____

_____   _____   _____

_____   _____   _____

_____   _____   _____

_____   _____   _____

_____   _____   _____

_____   _____   _____

Part IV: Storing Numbers

INSTRUCTION IV:

Storing numbers is particularly useful when you are dealing will decimals. In long problems, you should not round until you reach your final answer.

8/19 ENT

.4210526316

STO->A

Until you reassign A to another number, A will equal .4210526316. Thus, you can use A instead of a rounded decimal to do accurate calculations. For example, if you rounded the number to the hundredths place, you would get .42.

$5(.42) = 2.10$

$5A = 2.105263158$ which rounds to 2.11

ASSIGNMENT IV:

The letters from A to T are listed in the chart below. In the column to the right are the numbers that you are to store in your calculator for those letters. Store all of these numbers and then proceed to the next part of the assignment.

LETTER	NUMBER
A	8/19
B	15/7
C	4/13
D	1
E	2
F	3
G	4
H	5
I	6
J	13/4

LETTER	NUMBER
K	2/15
L	11/2
M	-42/10
N	-3/5
O	0
P	15/4
Q	-1
R	-2
S	-3
T	6/15

Now that you have stored those twenty letters into your calculator, enter each of the following into your calculator. In the middle column, write how you entered it into your calculator (where you used parentheses, etc.) In the last column, write the answer. Don't forget to use parentheses when necessary to communicate the correct information to your calculator.

Problem	How it was entered	Answer (Round to the hundredths place)
Example: $\dfrac{D+E}{F}$	(D + E) / F	1
A+ B - C		
D − N + T		
$\dfrac{T+M}{N+T}$		
$\dfrac{C+S}{I}$		
$5Q+O-2P$		
$\dfrac{R}{4}+\dfrac{T}{E}$		
HSES		
MATH		
$\dfrac{HSES}{MATH}$		

Part V: Changing a Decimal to a Fraction

INSTRUCTION V:
You can change a decimal to a fraction by using the FRAC function on your calculator. To access the FRAC function, press MATH and then press ENT. This will give you the fractional equivalent in simplified form.

Example V.1: To change the decimal .54 into a fraction, use the following steps:
Type .54 into your calculator.
Press MATH.
Press ENT.
Your display should now show: .54>FRAC
Press ENT.
Your display should now show 27/50

Example V.2: You can also use this function to simplify fractions. To simplify 93/120
use the following steps:
Type 93/120 into your calculator and press ENT.
Your display should now say .775
Press MATH and press ENT.
Your display should now say Ans>Frac
Press ENT.
Your display should now say 31/40.
31/40 is the fully simplified fraction.

ASSIGNMENT V:
Using the steps listed in examples 1 and 2, write each of the following as a fully
simplified fraction. If the fraction is already fully simplified, simply rewrite the fraction.

A. 0.856	_____	K. 0.0625	_____
B. 14.78	_____	L. 0.026	_____
C. 0.0565	_____	M. 789/225	_____
D. 0.025	_____	N. 72/100	_____
E. 5.8	_____	O. 532/1600	_____
F. 0.6524	_____	P. 192/160	_____
G. 2.76	_____	Q. 16/54	_____
H. 0.64	_____	R. 123/456	_____
I. 5.231	_____	S. 9876/5432	_____
J. 0.125	_____	T. 1357/2468	_____

#	Answer and Sufficient Work (Attached papers if need)
1	
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A. Algebraic operations, grouping, evaluation:

To evaluate an expression, first calculate the powers, then multiply and divide in order from left to right, and finally add and subtract in order from left to right. Parentheses have preference.

example: $14 - 3^2 = 14 - 9 = 5$
example: $2 \cdot 4 + 3 \cdot 5 = 8 + 15 = 23$
example: $10 - 2 \cdot 3^2 = 10 - 2 \cdot 9 = 10 - 18 = -8$
example: $(10 - 2) \cdot 3^2 = 8 \cdot 9 = 72$

Problems 1-7: Find the value:

1. $2^3 =$
2. $-2^4 =$
3. $4 + 2 \cdot 5 =$
4. $3^2 - 2 \cdot 3 + 1 =$

5. $0^4 =$
6. $(-2)^4 =$
7. $1^5 =$

Problems 8-13: Find the value if $a = -3$, $b = 2$, $c = 0, d = 1$, and $e = -3$:

8. $a - e =$
9. $e^2 + (d - ab)c =$
10. $a - (bc - d) + e =$

11. $\frac{e}{d} + \frac{b}{a} - \frac{2d}{e} =$
12. $\frac{b}{e} =$
13. $\frac{d}{c} =$

Combine like terms when possible:

example: $3x + y^2 - (x + 2y^2)$
$\qquad = 3x - x + y^2 - 2y^2 = 2x - y^2$
example: $a - a^2 + a = 2a - a^2$

Problems 14-20: Simplify:

14. $6x + 3 - x - 7 =$
15. $2(3 - t) =$
16. $10r - 5(2r - 3y) =$
17. $x^2 - (x - x^2) =$

18. $3a - 2(4(a - 2b) - 3a) =$
19. $3(a + b) - 2(a - b) =$
20. $1 + x - 2x + 3x - 4x =$

E. Least common multiple (LCM):

The LCM of two or more integers is used to find the lowest common denominator of fractions in order to add or subtract them.

> To find the LCM:
>
> *example:* Find the LCM of 27 and 36.
>
> First factor into primes:
>
> $27 = 3^3$
>
> $36 = 2^2 \bullet 3^2$
>
> Make the LCM by taking each prime factor to its greatest power:
>
> $LCM = 2^2 \bullet 3^3 = 4 \bullet 27 = 108$

Problems 21-25: Find the LCM:

21. 6 and 15	24. 8 and 12
22. 4 and 8	25. 8, 12, and 15
23. 3 and 5	

F. Lowest common denominator (LCD):

> To find LCD fractions for two or more given fractions:
>
> *example:* Given $\frac{5}{6}$ and $\frac{8}{15}$
>
> First find LCM of 6 and 15:
>
> $6 = 2 \bullet 3$
>
> $15 = 3 \bullet 5$
>
> $LCM = 2 \bullet 3 \bullet 5 = 30 = LCD$
>
> So $\frac{5}{6} = \frac{25}{30}$ and $\frac{8}{15} = \frac{16}{30}$

Problems 26-32: Find equivalent fractions with the LCD:

26. $\frac{2}{3}$ and $\frac{2}{9}$	29. $\frac{1}{2}, \frac{2}{3}$, and $\frac{3}{4}$
27. $\frac{3}{8}$ and $\frac{7}{12}$	30. $\frac{7}{8}$ and $\frac{5}{8}$
28. $\frac{4}{5}$ and $\frac{2}{3}$	

31. Which is larger, $\frac{5}{7}$ or $\frac{3}{4}$? (Hint: find and compare LCD fractions)

32. Which is larger, $\frac{3}{8}$ or $\frac{1}{3}$?

#	Answer and Sufficient Work (Attached papers if need)
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G. Adding and subtracting fractions:

If denominators are the same, combine the numerators:

example: $\frac{7}{10} - \frac{1}{10} = \frac{7-1}{10} = \frac{6}{10} = \frac{3}{5}$

Problems 33-37: Find the sum or difference (reduce if possible):

33. $\frac{4}{7} + \frac{2}{7} =$

34. $\frac{5}{6} + \frac{1}{6} =$

35. $\frac{7}{8} - \frac{5}{8} =$

36. $3 + \frac{1}{2} =$

37. $1 - \frac{2}{3} =$

If the denominators are different, first find equivalent fractions with common denominators (preferably the LCD):

example: $\frac{4}{5} + \frac{2}{3} = \frac{12}{15} + \frac{10}{15} = \frac{22}{15} = 1\frac{7}{15}$

example: $\frac{1}{2} - \frac{2}{3} = \frac{3}{6} - \frac{4}{6} = \frac{3-4}{6} = \frac{-1}{6}$

Problems 38-43: Calculate:

38. $\frac{3}{5} - \frac{2}{3} =$

39. $\frac{5}{8} + \frac{1}{4} =$

40. $\frac{5}{2} + \frac{5}{4} =$

41. $2\frac{3}{4} + 5\frac{7}{8} =$

42. $\left(3\frac{1}{4} - \frac{3}{4}\right) + \frac{1}{2} =$

43. $4\frac{1}{3} - \left(3\frac{1}{2} - 3\right) =$

#	Answer and Sufficient Work (Attached papers if need)
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H. Multiplying and dividing fractions:

To multiply fractions, multiply the tops, multiply the bottoms, and reduce if possible:

example: $\frac{3}{4} \cdot \frac{2}{5} = \frac{3 \cdot 2}{4 \cdot 5} = \frac{6}{20} = \frac{3}{10}$

Problems 44-52: Calculate:

44. $\frac{2}{3} \cdot \frac{3}{8} =$ 49. $\left(2\frac{1}{2}\right)^2 =$

45. $\frac{1}{2} \cdot \frac{2}{3} =$ 50. $\frac{4}{5} \cdot 30 =$

46. $\frac{4}{5} \times 5 =$ 51. $8 \cdot \frac{3}{4} =$

47. $\left(\frac{3}{4}\right)^2 =$ 52. $\frac{15}{21} \times \frac{14}{25} =$

48. $\left(\frac{3}{2}\right)^2 =$

Divide fractions by making a compound fraction and then multiply the top and bottom (of the larger fraction) by the lowest common denominator (LCD) of both.

example: $\frac{3}{4} \div \frac{2}{3} = \dfrac{\frac{3}{4}}{\frac{2}{3}}$

The LCD is 12, so multiply by 12: $\dfrac{\frac{3}{4} \cdot 12}{\frac{2}{3} \cdot 12} = \dfrac{9}{8}$

example: $\dfrac{7}{\frac{2}{3} - \frac{1}{2}} = \dfrac{7 \cdot 6}{\left(\frac{2}{3} - \frac{1}{2}\right) \cdot 6}$

$= \dfrac{42}{\frac{2}{3} \cdot 6 - \frac{1}{2} \cdot 6} = \dfrac{42}{4 - 3} = \dfrac{42}{1} = 42$

Problems 53-62: Calculate:

53. $\frac{3}{2} \div \frac{1}{4} =$ 58. $\dfrac{2}{\frac{3}{4}} =$

54. $11\frac{3}{8} \div \frac{3}{4} =$ 59. $\dfrac{\frac{2}{3}}{4} =$

55. $\frac{3}{4} \div 2 =$ 60. $\frac{4}{5} \div 5 =$

56. $\dfrac{\frac{3}{4}}{\frac{2}{3}} =$ 61. $\frac{3}{8} \div 3 =$

57. $\dfrac{1 + \frac{1}{2}}{1 - \frac{3}{4}} =$ 62. $\dfrac{2\frac{1}{3} - \frac{1}{3}}{3\frac{2}{3} + 1\frac{1}{2}} =$

#	Answer and Sufficient Work (Attached papers if need)
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I. Comparing fractions:

example: Arrange small to large: $\frac{7}{9}$, $\frac{5}{7}$, and $\frac{3}{4}$

LCD is $2^2 \cdot 3^2 \cdot 7 = 252$

$\frac{7}{9} = \frac{7 \cdot 28}{9 \cdot 28} = \frac{196}{252}$

$\frac{5}{7} = \frac{5 \cdot 36}{7 \cdot 36} = \frac{180}{252}$

$\frac{3}{4} = \frac{3 \cdot 63}{4 \cdot 63} = \frac{189}{252}$

So the order is $\frac{5}{7}$, $\frac{3}{4}$, $\frac{7}{9}$

Fractions can also be compared by writing in decimal from and comparing the decimals.

Problems 63-65: Arrange small to large:

63. $\frac{15}{8}$, $\frac{11}{6}$

64. $\frac{7}{8}$, $\frac{5}{6}$, $\frac{11}{12}$

65. $\frac{2}{3}$, $\frac{7}{12}$, $\frac{5}{6}$, $\frac{25}{36}$

Word Problems:

66. How many 2's are in 8?

67. How many $\frac{1}{2}$'s are in 8?

68. Three fourths is equal to how many twelfths?

69. What is $\frac{3}{4}$ of a dozen?

70. Joe and Mae are decorating the gym for a dance. Joe has done $\frac{1}{3}$ of the work and Mae has done $\frac{2}{5}$. What fraction of the work still must be done?

71. The ratio of winning tickets to tickets sold is 2 to 5. If 3,500,000 are sold, how many tickets are winners?

72. An $11\frac{3}{8}$-inch wide board can be cut into how many strips of width $\frac{5}{8}$ inch, if each cut takes $\frac{1}{8}$ inch of the width? (Must the answer be a whole number?)

Problems 73-76: Inga and Lee each work for $4.60 per hour:

73. If Inga works $3\frac{1}{2}$ hours, what will her pay be?

74. If Lee works $2\frac{3}{4}$ hours, what will he be paid?

75. Together, what is the total time they work?

76. What is their total pay?

#	Answer and Sufficient Work (Attached papers if need)
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