Hello Mathletes, I am Mrs. Tazelaar-Ngo (Mrs. Taz) and I will be your GT Algebra 2 teacher for the 2023-2024 school year.

This summer assignment is meant to help you remember ALGEBRA ONE concepts that are crucial for GT Algebra 2. You will find that each section begins with examples and then has practice problems that should be completed.

**Part 1A: Solving Equations EXAMPLES**

I. **Solving Two-Step Equations**

A couple of hints:  
1. To solve an equation, UNDO the order of operations and work in the reverse order.  
2. REMEMBER! Addition is “undone” by subtraction, and vice versa. Multiplication is “undone” by division, and vice versa.

Ex. 1: \(4x - 2 = 30\)  
\[+2 \]  
\[4x = 32\]  
\[+4 \]  
\[x = 8\]

Ex. 2: \(-87 - 11x + 21\)  
\[+21 \]  
\[66 - 11x\]  
\[+11 \]  
\[-6 - x\]

II. **Solving Multi-step Equations With Variables on Both Sides of the Equal Sign**

When solving equations with variables on both sides of the equal sign, be sure to get all terms with variables on one side and all the terms without variables on the other side.

Ex. 3: \(8x + 4 = 4x + 28\)  
\[-4 \]  
\[8x = 4x + 24\]  
\[-4x \]  
\[4x = 24\]  
\[+4 \]  
\[x = 6\]

III. **Solving Equations that need to be simplified first**

In some equations, you will need to combine like terms and/or use the distributive property to simplify each side of the equation, and then begin to solve it.

Ex. 4: \(5(4x - 7) = 8x + 45 + 2x\)  
\[20x - 35 = 10x + 45\]  
\[+10x \]  
\[10x = 80\]  
\[+10 \]  
\[x = 8\]
Part 1B: Solving Equations PRACTICE PROBLEMS

Solve each equation. You must show all work.

1. \(5x - 2 = 33\)
2. \(140 = 4x + 36\)

3. \(8(3x - 4) = 196\)
4. \(45x - 720 + 15x = 60\)

5. \(132 - 4(12x - 9)\)
6. \(198 - 154 + 7x - 68\)

7. \(-131 - 5(3x - 8) + 6x\)
8. \(-7x - 10 - 18 + 3x\)

9. \(12x + 8 - 15 = -2(3x - 82)\)
10. \(-(12x - 6) = 12x + 6\)

Part 2A: Exponent Properties NOTES and EXAMPLES

Multiplication: Recall \((x^m)(x^n) = x^{(m+n)}\)

Ex: \((3x^4y^3)(4xy^5) = (3 \cdot 4)(x^4 \cdot x^1)(y^2 \cdot y^5) = 12x^5y^7\)

Division: Recall \(\frac{x^m}{x^n} = x^{(m-n)}\)

Ex: \(\frac{42m^5j^2}{-3m^3j} = \left(\frac{42}{-3}\right)\left(\frac{m^5}{m^3}\right)\left(\frac{j^2}{j^1}\right) = -14m^2j\)

Powers: Recall \((x^m)^n = x^{(mn)}\)

Ex: \((-2a^3b^4c^3)^3 = (-2)^3(a^3)^3(b^4)^3(c^3)^3 = -8a^9b^{12}c^{12}\)

Power of Zero: Recall \(x^0 = 1, x \neq 0\)

Ex: \(5x^0y^4 = (5)(1)(y^4) = 5y^4\)
Part 2B: Exponent Properties PRACTICE PROBLEMS

Fully/Completely simplify each expression.

1. \((c^3)(c)(c^2)\)
2. \(\frac{m^{15}}{m^3}\)
3. \((k^4)^5\)

4. \(d^0\)
5. \((p^4q^2)(p^7q^3)\)
6. \(\frac{45y^3z^{10}}{5y^5z}\)

7. \((-r^2)^3\)
8. \(3f^3g^0\)
9. \((4h^5k^3)(15k^2h^3)\)

Part 3A: Multiplying Binomials NOTES and EXAMPLES

I. Multiplying Binomials – the FOIL method

When multiplying two binomials (an expression with two terms), we use the “FOIL” method. The “FOIL” method uses the distributive property twice!

FOIL is the order in which you will multiply your terms.

First
Outer
Inner
Last

Ex. 1: \((x + 6)(x + 10)\)

\[
\begin{align*}
\text{First} & : x \cdot x & \longrightarrow x^2 \\
\text{Outer} & : x \cdot 10 & \longrightarrow 10x \\
\text{Inner} & : 6 \cdot x & \longrightarrow 6x \\
\text{Last} & : 6 \cdot 10 & \longrightarrow 60 \\
\end{align*}
\]

\(x^2 + 10x + 6x + 60\)

\(x^2 + 16x + 60\)  
(After combining like terms)
Recall: \(4^2 = 4 \cdot 4\)

\[x^2 = x \cdot x\]

Ex 2: \((x + 5)^2\)

\[(x + 5)^2 = (x + 5)(x + 5)\]

\[= x^2 + 5x + 5x + 25\]

\[= x^2 + 10x + 25\]

Now you can use the “FOIL” method to get a simplified expression.

**Part 3B: Multiplying Binomials PRACTICE PROBLEMS**

Multiply. Write your answer in simplest form.

1. \((x + 10)(x - 9)\)

2. \((x + 7)(x - 12)\)

3. \((x - 10)(x - 2)\)

4. \((x - 8)(x + 81)\)

5. \((2x - 1)(4x + 3)\)

6. \((-2x + 10)(-9x + 5)\)

7. \((-3x - 4)(2x + 4)\)

8. \((x + 10)^2\)

9. \((-x + 5)^2\)

10. \((2x - 3)^2\)
Part 4A: Factoring Polynomials NOTES and EXAMPLES

I. Factoring – Greatest Common Factor (GCF)
   Example: \(2x^2 - 10x\)  \(\rightarrow\) The GCF will be \(2x\)
   \(\rightarrow\) DIVIDE each term by the GCF
   \(2x(x - 5)\)  \(\rightarrow\) The answer “pulls out” the GCF and multiplies it by the remaining polynomial

II. Factoring Trinomials \((ax^2 + bx + c)\) using the Grouping Method
   This is difficult to show you an example on paper. Please go to the video below to see how this type of factoring is accomplished.

   NOTE: You should ALWAYS factor out a GCF first, if one exists.


Part 4B: Factoring Polynomials PRACTICE PROBLEMS

Factor each expression. The stars indicate more challenging problems.

1. \(3x^2 + 6x\)  
2. \(4a^2b^3 - 16ab^3 + 8ab^2c\)

* 3. \(x^2 - 25\)  
4. \(n^2 + 8n + 15\)

5. \(g^2 - 9g + 20\)  
6. \(a^2 + 3d - 28\)

7. \(z^2 - 7z - 30\)  
8. \(m^2 + 18m + 81\)

* 9. \(4y^3 - 36y\)  
* 10. \(5k^2 + 30k - 135\)
Carver Center Summer Assignment
for students entering GT Algebra 2

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A couple of hints:
1. To solve an equation, UNDO the order of operations and work in the reverse order.
2. REMEMBER! Addition is “undone” by subtraction, and vice versa. Multiplication is “undone” by division, and vice versa.

Ex. 1: \(4x - 2 = 30\)
- Add 2:
- \(4x = 32\)
- \(x = 8\)

Ex. 2: \(87 = -11x + 21\)
- Subtract 21:
- \(-11x = 66\)
- \(x = -6\)

II. Solving Multi-step Equations With Variables on Both Sides of the Equal Sign

- When solving equations with variables on both sides of the equal sign, be sure to get all terms with variables on one side and all the terms without variables on the other side.

Ex. 3: \(8x + 4 = 4x + 28\)
- Subtract 4:
- \(8x = 4x + 24\)
- Subtract 4x:
- \(4x = 24\)
- \(x = 6\)

III. Solving Equations that need to be simplified first

- In some equations, you will need to combine like terms and/or use the distributive property to simplify each side of the equation, and then begin to solve it.

Ex. 4: \(5(4x - 7) = 8x + 45 + 2x\)
- Distribute:
- \(20x - 35 = 10x + 45\)
- Subtract 10x:
- \(10x = 80\)
- \(x = 8\)
Part 1B: Solving Equations PRACTICE PROBLEMS

Solve each equation. You must show all work.

1. \[5x - 2 = 33\]
   \[
   \begin{align*}
   5x & = 35 \\
   x & = 7
   \end{align*}
   \]
   \[x = 7\]

2. \[140 = 4x + 36\]
   \[
   \begin{align*}
   4x & = 104 \\
   x & = 26
   \end{align*}
   \]
   \[x = 26\]

3. \[8(3x - 4) = 196\]
   \[
   \begin{align*}
   24x - 32 & = 196 \\
   24x & = 228 \\
   x & = 9.5
   \end{align*}
   \]
   \[x = 9.5\]

4. \[45x - 720 + 15x = 60\]
   \[
   \begin{align*}
   60x & = 780 \\
   x & = 13
   \end{align*}
   \]
   \[x = 13\]

5. \[132 = 4(12x - 9)\]
   \[
   \begin{align*}
   132 & = 48x - 36 \\
   168 & = 48x \\
   x & = 3.5
   \end{align*}
   \]
   \[x = 3.5\]

6. \[198 = 154 + 7x - 68\]
   \[
   \begin{align*}
   x & = 16
   \end{align*}
   \]
   \[x = 16\]

7. \[-131 = -5(3x - 8) + 6x\]
   \[
   \begin{align*}
   -131 & = -15x + 40 + 6x \\
   -131 & = -9x + 40 \\
   -40 & = -9x \\
   x & = 19
   \end{align*}
   \]
   \[x = 19\]

8. \[-7x - 10 = 18 + 3x\]
   \[
   \begin{align*}
   -10 & = 10x + 18 \\
   -28 & = 10x \\
   x & = -2.8
   \end{align*}
   \]
   \[x = -2.8\]

9. \[12x + 8 - 15 = -2(3x - 82)\]
   \[
   \begin{align*}
   9 & = 0
   \end{align*}
   \]
   \[x = 0\]

Part 2A: Exponent Properties NOTES and EXAMPLES

Multiplication: Recall \((x^m)(x^n) = x^{m+n}\)

Ex: \((3x^4y^3)(4xy^5) = (3 \cdot 4)(x^4 \cdot x^1)(y^3 \cdot y^5) = 12x^5y^8\)

Division: Recall \(\frac{x^m}{x^n} = x^{m-n}\)

Ex: \(\frac{42m^3j^2}{-3m^5j} = \left(\frac{42}{-3}\right)\left(\frac{m^3}{m^5}\right)\left(\frac{j^2}{j^1}\right) = -14m^{-2}j^{-1}\)

Powers: Recall \((x^m)^n = x^{mn}\)

Ex: \((-2a^2b^4)^3 = (-2)^3(a^2)^3(b^4)^3 = -8a^6b^{12}\)

Power of Zero: Recall \(x^0 = 1, x \neq 0\)

Ex: \(5x^0y^4 = (5)(1)(y^4) = 5y^4\)
Part 2B: Exponent Properties PRACTICE PROBLEMS

Fully/Completely simplify each expression.

1. \((c^5)(c^2)(c^3)\)
\[
= c^{5+2+3}
= c^8
\]

2. \(\frac{m^{15}}{m^3}\)
\[
= m^{15-3}
= m^{12}
\]

3. \((k^4)^5\)
\[
= k^{4 \times 5}
= k^{20}
\]

4. \(d^0\)
\[
= 1
\]

5. \((p^4q^2)(p^7q^5)\)
\[
= p^{4+7}q^{2+5}
= p^{11}q^{7}
\]

6. \(\frac{45y^3z^{10}}{5y^3z^2}\)
\[
= \frac{45}{5} \cdot y^{3-3} \cdot z^{10-2}
= 9y^0z^8
= 9z^8
\]

7. \((-r^2)^3\)
\[
= -r^{2 \times 3}
= -r^6
\]

8. \(3f^3g^0\)
\[
= 3f^3 \cdot 1
= 3f^3
\]

9. \((4h^5k^3)(15k^2h^3)\)
\[
= 4 \cdot 15 \cdot h^{5+3} \cdot k^{3+2}
= 60h^8k^5
\]

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1. Multiplying Binomials – the FOIL method

When multiplying two binomials (an expression with two terms), we use the "FOIL" method. The "FOIL" method uses the distributive property twice!

FOIL is the order in which you will multiply your terms.

First

Outer

Inner

Last

Ex. 1: \((x + 6)(x + 10)\)

\[
(x + 6)(x + 10) \\
\text{FIRST} \\
\text{OUTER} \\
(x + 6) \times (x + 10) \\
\text{INNER} \\
\text{LAST}
\]

First \(x \times x \rightarrow x^2\)

Outer \(x \times 10 \rightarrow 10x\)

Inner \(6 \times x \rightarrow 6x\)

Last \(6 \times 10 \rightarrow 60\)

\(x^2 + 10x + 6x + 60\)

\(x^2 + 16x + 60\)  
(After combining like terms)
Recall: \( 4^2 = 4 \cdot 4 \)

\[ x^2 = x \cdot x \]

Ex 2: \((x + 5)^2\)

\((x + 5)^2 = (x + 5)(x + 5)\)

\[ = x^2 + 5x + 5x + 25 \]

\[ = x^2 + 10x + 25 \]

Now you can use the "FOIL" method to get a simplified expression.

**Part 3B: Multiplying Binomials PRACTICE PROBLEMS**

Multiply. Write your answer in simplest form.

1. \((x + 10)(x - 9)\)

\[ = x^2 - 9x + 10x - 90 \]

\[ = x^2 + 1x - 90 \]

2. \((x + 7)(x - 12)\)

\[ = x^2 - 5x - 84 \]

3. \((x - 10)(x - 2)\)

\[ = x^2 - 12x + 20 \]

4. \((x - 8)(x + 81)\)

\[ = x^2 + 73x - 648 \]

5. \((2x - 1)(4x + 3)\)

\[ = 8x^2 + 2x - 3 \]

6. \((-2x + 10)(-9x + 5)\)

\[ = 18x^2 - 10x - 90x + 50 \]

\[ = 18x^2 - 100x + 50 \]

7. \((-3x - 4)(2x + 4)\)

\[ = -6x^2 - 20x - 16 \]

8. \((x + 10)^2\)

\[ = (x + 10)(x + 10) \]

\[ = x^2 + 10x + 10x + 100 \]

\[ = x^2 + 20x + 100 \]

9. \((-x + 5)^2\)

\[ = x^2 - 10x + 25 \]

10. \((2x - 3)^2\)

\[ = 4x^2 - 12x + 9 \]
Part 4A: Factoring Polynomials NOTES and EXAMPLES

I. Factoring – Greatest Common Factor (GCF)

Example: \(2x^2 - 10x\) → The GCF will be 2x

→ DIVIDE each term by the GCF

\(2x(x-5)\) → The answer "pulls out" the GCF and multiplies it by the remaining polynomial

II. Factoring Trinomials (ax^2 + bx + c) using the Grouping Method

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NOTE: You should ALWAYS factor out a GCF first, if one exists.


Part 4B: Factoring Polynomials PRACTICE PROBLEMS

Factor each expression. The stars indicate more challenging problems.

1. \(3x^2 + 6x = 3x(x+2)\)

2. \(4a^2b^2 - 16ab^3 + 8ab^2c = 4ab^2(a-4b+2c)\)

*3. \(x^3 - 25 = x^3 + 5x - 25x - 25\)

\(= (x^3 + 5x) - 5(x+5)\)

\(= (x+5)(x-5)\)

4. \(n^3 + 8n + 15 = (n^2 + 5n + 5)(n+3)\)

5. \(g^3 - 9g + 20 = (g-4)(g-5)\)

6. \(d^2 + 3d - 28 = (d+7)(d-4)\)

7. \(z^2 - 7z - 30 = (z-10)(z+3)\)

8. \(m^3 + 18m + 81 = (m+9)(m+9) = (m+9)^2\)

*9. \(4y^3 - 36y = 4y(y^2-9)\)

\(= 4y(y^2+3y-3y-9)\)

\(= 4y(y+3)(y-3)\)

10. \(5k^2 + 30k - 135 = 5(k+9)(k-3)\)