Dear Future Honors Algebra 2 Student,

Congratulations on your enrollment in Honors Algebra 2! Below you will find the summer assignment questions. It is assumed that these concepts, along with many others, have been mastered by you, the incoming Honors Algebra 2 student. There will be an assessment on this material within the first five days of school. This assessment will be an indicator of your foundation for the course, hence your success with the new material Honors Algebra 2 offers.

It is strongly suggested that you take this assignment seriously. This assignment should be completed prior to the first day of school. Waiting to start it the night before the first day of school is not a wise idea. When you find yourself unable to answer a question, do not skip it — research it. That research can be in the form of a parent, a friend, free on-line help like brightstorm.com and kahnacademy.org, or your old Algebra 1 notebook. The websites are user-friendly and offer excellent explanations. Definitely check them out as a resource.

When you return to school in September, we expect that you will have gone through all of the questions. Feel free to ask specific questions pertaining to the summer assignment within the first few days of school. The Honors Algebra 2 teachers are here to help.

Enjoy your summer and we look forward to meeting you in September. Go Knights!
The following problems will help to prepare you for your Honors Algebra 2 course. You should be able to complete all of these problems without the assistance of a calculator. Many of the tests and quizzes you will take in Honors Algebra 2 are calculator-free assessments, so this gives you an opportunity to sharpen your mental math skills. There will be an in-class calculator-free assessment on these skills within the first five days of school. Good luck!

ORDER OF OPERATIONS

A numerical expression must have exactly one value, to be determined by the order of operations.
- **Grouping Symbols**: Evaluate expressions inside grouping symbols, such as parentheses ( ), brackets [ ], braces { }, and fraction bars, such as in \( \frac{a+b}{c} \).
- **Exponents**: Evaluate all powers.
- **Multiplication and Division**: Perform these operations with equal importance from left to right.
  - Note: A common misconception is that multiplication is always performed before division. These operations rank equally, and only the order in which they appear determines the order in which they are performed. For example, the expression \( 3 \cdot 2 + 3 \) simplifies to 9.
- **Addition and Subtraction**: Perform these operations with equal importance from left to right.

Simplify each expression.

1. \( 8 - 7(2^3 - 5) + 5 - 3 \cdot 2 \)
2. \( \frac{18 \div 6 \cdot 2}{7 - 3(-4)^2} \)
3. \( \frac{1}{2} \left[ 12 - \frac{1}{3} \left( 6^2 - 4^2 \right) \right] \)
4. \( -3\left| 8 - 23 \right| + \frac{2}{3} \left| 8(-2) - (-1)^3 \right| \)
5. \( (9 - (-4))(-4) - 4 - (-9) \)
6. \( [3 + 3 \cdot 3 - 33 \div 3] \cdot \frac{14 - 4}{7 - 2} \)
7. \( 3 - \left| -\frac{3}{4} + \frac{2}{9} \right| - \left| \frac{5}{8} - \frac{3}{4} \right| \)
8. \( \frac{\left[ \frac{3}{4} - \left( -\frac{1}{2} \right) \right](-8)}{\frac{5}{9} \div (-4)} \)

Evaluate each expression if \( a = -5, b = 0.25, c = \frac{1}{2}, d = 4, \) and \( e = 0.6. \)

9. \( \frac{3a + 4c}{2c} \)
10. \( \frac{3ab}{cd} \)
11. \( \frac{ae}{c} + d^2 \)
12. \( \frac{-a^2(b - c)}{d} \)
13. \( b^2 - 4ac \)
14. \( (cd)^2 - a^2 \)
SIMPLIFYING EXPRESSIONS

Simplify each expression.

15. \(5m(m - 3) - \frac{2}{3}(6m + 12)\)
16. \(5 - 4(x + 2) + 3 - \frac{3}{2}(4 - 12x)\)
17. \((2x - 3)(5x + 9)\)
18. \((2x - 3)(3x^2 + 5x - 1)\)
19. \(-50 - 2[3(2 - 3n) - (6 + 2n)]\)
20. \(5(4a - 3b) - (4a - 3b)\)
21. \(3ab - 2a(b - 7) + 5b - 7b(3 - 2a)\)
22. \(-4xy(3x - 5y) - 4x^2(2y - 9)\)

Simplify each expression using the laws of exponents. No negative exponents in your final answer.

\[
\begin{align*}
   b^m \cdot b^n &= b^{m+n} & (b^m)^n &= b^{mn} & (ab)^n &= a^n b^n \\
   \frac{b^n}{b^m} &= b^{m-n}, \ m > n & \frac{b^n}{b^m} &= \frac{1}{b^{m-n}}, \ m > n & b^0 &= 1 \\
   \left(\frac{a}{b}\right)^n &= \frac{a^n}{b^n} & b^{-n} &= \frac{1}{b^n} & \frac{1}{b^{-n}} &= b^n
\end{align*}
\]

23. \(\frac{18a^{18}b^4}{24a^{2x}b^4}\)
24. \(\frac{15x^{15}y^{-3}z^4}{18x^{18}y^4z^{-4}}\)
25. \(\left(\frac{6a^8}{8a^b}\right)^2\)
26. \(\left(\frac{-9c^{-2}}{3c^{-8}}\right)^3\)
27. \((3a^3b^4)(2a^7b)(4a^4b^7)\)
28. \((-3a^3b^4)^2\)
29. \((3x^3)^2 \cdot (2x^2)^3\)
30. \((16x^4y^3 \cdot 2x^7y^6)^0\)
Solve each of the following equations. Report your answers in simplest form.

31. \(9 - \frac{3}{4}(u - 3) = 1\)  
32. \(c + 3 - 2c - (1 - 3c) = 2\)

33. \(\frac{3x - 5}{6} + \frac{x}{3} = \frac{7}{2} - 2x\)  
34. \(\frac{3n - 2}{4} = \frac{8n + 6}{5}\)

35. \(\frac{3}{4}n - 2 = \frac{1}{2}n + 7\)  
36. \(4(a + 2) = 14 - 2(3 - 2a)\)

37. \(\frac{3}{2}(8x + 12) = -3(6 - 3x)\)  
38. \(\frac{2}{3}x + \frac{5}{4} = 2 - \frac{7}{8}x\)

Solve each of the following inequalities. Report your answers in simplest form.

39. \(-2(3 - 7x) - 2 + 4(2x + 1) < 7(x - 2)\)  
40. \(\frac{5}{6}(27 - 12x - 21) \geq \frac{4}{3}(18x + 6)\)

41. \(5a - 2 > 3\) and \(\frac{1}{2} a - 3 < 0\)  
42. \(\frac{m}{4} - 2 > -10\) and \(5 - m > -2\)

43. \(2x - 7 > -3\) or \(-4x \geq 20\)  
44. \(5x + 7 > 2x + 4\) or \(3x + 3 < 24 - 4x\)

45. \(2 \leq 3h + 2 < 14\)  
46. \(-\frac{4x + 2}{5} \geq 0.4\)

Solve each equation for the given variable.

47. \(P = 2w + 2l, \text{ for } w\)  
48. \(A = \frac{1}{2}(b_1 + b_2)h, \text{ for } b_2\)

49. \(C = \frac{5}{9}(F - 32), \text{ for } F\)  
50. \(A = \frac{1}{2}bh, \text{ for } h\)

51. \(A = P + Ptr, \text{ for } P\)  
52. \(ax - by = cx - dy, \text{ for } x\)
SOLVING ABSOLUTE VALUE EQUATIONS AND INEQUALITIES

The absolute value of a number is its distance away from 0 on the number line. Since distance is nonnegative, the absolute value of a number is always nonnegative.

For example, if $|x| = 3$ then we know that either $x = 3$ or $x = -3$.

Solve each of the following equations. Report your answers in simplest form.

53. $|3x| = 24$
54. $|x - 5| = 8$
55. $|2x + 17| = 11$
56. $3|x - 5| - 20 = -9$
57. $|4x + 1| + 9 = 2$
58. $|\frac{1}{3}x - 1| = 3$

To solve an absolute value inequality, we can still use the definition of an absolute value from above.

For example, if $|x| < 3$ then we know that $x$ is less than 3 units away from 0.
And if $|x| > 3$ then we know that $x$ is more than 3 units away from 0.

Solve each of the following inequalities. Report your answers in simplest form.

59. $|x| > 4$
60. $|x - 1| < 7$
61. $|2x - 7| + 4 \leq 15$
62. $-3|x| < -18$
63. $|\frac{1}{2}x| \leq 2$
64. $|5x + 1| + 13 < 9$
65. $-\frac{4}{3}|x + 8| < 12$
66. $|5 - x| > 1$
Find the slope of each line.

67. through $(-3, 6)$ and $(4, -1)$

68. through $(5, -17)$ and $(5, 11)$

69. through $\left(-\frac{2}{3}, -\frac{3}{4}\right)$ and $\left(-\frac{4}{5}, \frac{1}{2}\right)$

70. through $(4, -6)$ and $(-4, 6)$

71. $y = \frac{2}{3}x - 8$

72. $y = 4$

73. $3x - 2y = -10$

74. $x = -9$

75. [Graph of a line]

76. [Graph of a line]

Determine the value of $r$ so the line through the given points has the required slope.

77. $(2, r)$ and $(-5, 11); m = -2$

78. $(2r, 3)$ and $(1, r); m = 2$

Write an equation in slope-intercept form $(y = mx + b)$ for each of the following sets of conditions.

79. Passing through $(2, -3)$ with a slope of $\frac{2}{3}$.

80. Passing through $(7, -3)$ and $(-3, 5)$.

81. A vertical line passing through $(1, -4)$.

82. Parallel to $3x + 5y = 18$ passing through $(-10, -4)$.

83. Perpendicular to $7x - 2y = 16$ passing through $(-7, 5)$.

84. Has an $x$-intercept of $\frac{1}{2}$ and is parallel to the line that passes through $(19, -1)$ and $(17, 15)$. 
Graph each of the following linear equations or inequalities.

85. \( y = \frac{1}{2} x \)

86. \(-4y = 6x + 12\)

87. \( x = \frac{1}{3} y - 1 \)

88. \( \frac{1}{2} x < \frac{1}{3} y + 1 \)

89. \( 3x \geq 6 \)

90. \( y > -\frac{3}{4} x + 4 \)
Solve each system by graphing. Describe it as **consistent and independent**, **consistent and dependent**, or **inconsistent**.

<table>
<thead>
<tr>
<th>Type of System</th>
<th>The Graph</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>consistent and independent</td>
<td>intersecting lines</td>
<td>one solution, (x, y)</td>
</tr>
<tr>
<td>consistent and dependent</td>
<td>coinciding lines</td>
<td>infinitely many solutions</td>
</tr>
<tr>
<td>inconsistent</td>
<td>parallel lines</td>
<td>no solution</td>
</tr>
</tbody>
</table>

91. \( \begin{cases} 2x - y = -4 \\ 4x + y = -2 \end{cases} \)

92. \( \begin{cases} x + 2y = 4 \\ y = \frac{1}{2}x + 4 \end{cases} \)

93. \( \begin{cases} x - 2y = -6 \\ 2(y - 3) = x \end{cases} \)

Solve each system algebraically. You may use either substitution or elimination.

94. \( \begin{cases} -4x + y = -12 \\ x + \frac{1}{2}y = \frac{3}{2} \end{cases} \)

95. \( \begin{cases} y = 3x - 12 \\ 5x + 2y = 20 \end{cases} \)

96. \( \begin{cases} x - \frac{3}{2}y = 2 \\ -5x + 2y = -10 \end{cases} \)

97. \( \begin{cases} 3x - 2y = 16 \\ 6x + y = -8 \end{cases} \)
Guidelines for Factoring:

- Always look for a GCF before doing anything else.
- Consider the number of terms in the polynomial.

**Two Terms:** Try factoring as a difference of two squares.

\[ a^2 - b^2 = (a+b)(a-b) \]

**Three Terms:** Trinomials of the form \( ax^2 + bx + c \) can be factored into the product of two binomials. (Use a method that your Algebra 1 teacher taught you.)

**More Than Three Terms:** Try "factoring by grouping".

- Make sure the polynomial is factored completely. This means that each remaining factor is prime.

Factor each of the following expressions completely.

98. \( 3x^3 - 48x \)  
99. \( 5x^2 - 13x - 6 \)

100. \( 2x^2 - 20x + 48 \)  
101. \( 2x^2 - 20x - 48 \)

102. \( -x^2 + x + 56 \)  
103. \( 49a^2 - 64b^2 \)

104. \( x^3 - 2x^2 - 9x + 18 \)  
105. \( 3x^2 - 4x - 15 \)

106. \( 2x^2 - 12x + 18 \)  
107. \( ac - 3ad + 2bc - 6bd \)

108. \( 6x^2 + 7x - 3 \)  
109. \( 42x^2 + x - 1 \)

110. \( 12x^2 - 13x + 3 \)  
111. \( 8ab^2 - 4ab \)
QUADRATIC EQUATIONS AND SQUARE ROOTS

Solve each of the following quadratic equations. You may use any of the methods (factoring, quadratic formula, or completing the square) you learned in Algebra 1. Please note: not all of the equations can be factored.

112. \( x^2 + 2 = 6x \)
113. \( 2x^2 = 3x + 4 \)
114. \( 4x^2 - 12x = -9 \)
115. \( x^2 + 2x - 5 = 5(x + 1) \)
116. \( x^2 - 10x + 1 = 0 \)
117. \( (x - 3)^2 = 25 \)
118. \( 2x^2 + 1 = 6x - 1 \)
119. \( 7x^2 - 5x = 0 \)

Simplify each of the following.

120. \( \sqrt{80} \)
121. \( \sqrt{200} \)
122. \( \sqrt{72} \)
123. \( \sqrt{98} \)
124. \( \sqrt{50} \)
125. \( \sqrt{20x^{20}} \)
126. \( \sqrt{9} + \sqrt{16} \)
127. \( \sqrt{9} + 16 \)
128. \( 5\sqrt{2} + 8\sqrt{3} + 17\sqrt{3} - \sqrt{2} \)
129. \( \sqrt{48} - 2\sqrt{12} + 5\sqrt{27} \)
130. \( \sqrt{2}\left(2\sqrt{6} + 3\sqrt{10}\right) \)
131. \( (3 - \sqrt{5})\left(3 + \sqrt{5}\right) \)