## 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. As you work through these review problems, please do not use a calculator. The majority of the assessments you will take in this course will be calculator-free, so start sharpening those mental math skills now!

If 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 kahnacademy.org or brightstorm.com, or your old Algebra 1 notebook. The websites are user-friendly and offer excellent explanations. They can be a great resource for you if you need to re-learn any Algebra 1 topics.

Enjoy your summer and we look forward to meeting you in September. Go Knights!


## 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 $\left\}\right.$, 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 $18 \div 2 \bullet 3$ simplifies to 27 .
- Addition and Subtraction: Perform these operations with equal importance from left to right.

Simplify each expression.

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

Evaluate each expression if $a=-5, b=0.25, c=\frac{1}{2}, d=4$, and $e=0.6$.
6. $\frac{3 a+4 c}{2 c}$
7. $\frac{3 a b}{c d}$
8. $\frac{-a^{2}(b-c)}{d}$
9. $b^{2}-4 a c$

## SIMPLIFYING EXPRESSIONS

## Simplify each expression.

10. $5 m(m-3)-\frac{4}{3}(6 m+12)$
11. $(2 x-3)(5 x+9)$
12. $(2 x-3)\left(3 x^{2}+5 x-1\right)$
13. $-50-2[3(2-3 n)-(6+2 n)]$
14. $(3 m+2 n)^{2}$
15. $-4 x y(3 x-5 y)-4 x^{2}(2 y-9)$

## EXPONENT RULES

$$
\begin{array}{lll}
b^{m} \cdot b^{n}=b^{m+n} & \left(b^{m}\right)^{n}=b^{m n} & (a b)^{n}=a^{n} b^{n} \\
\frac{b^{m}}{b^{n}}=b^{m-n}, m>n & \frac{b^{n}}{b^{m}}=\frac{1}{b^{m-n}}, m>n & b^{0}=1 \\
\left(\frac{a}{b}\right)^{n}=\frac{a^{n}}{b^{n}} & b^{-n}=\frac{1}{b^{n}} & \frac{1}{b^{-n}}=b^{n}
\end{array}
$$

Never report an answer with a negative exponent. Always rewrite using positive exponents.

Simplify each expression using the laws of exponents.
16. $\quad \frac{18 a^{18} b^{4}}{24 a^{24} b^{4}}$
17. $\frac{15 x^{15} y^{-3} z^{4}}{18 x^{18} y^{4} z^{-4}}$
18. $\left(\frac{6 a^{8}}{8 a^{6}}\right)^{2}$
19. $\left(\frac{-9}{3 c^{-8}}\right)^{3}$
20. $\quad\left(3 a^{3} b^{4}\right)\left(2 a^{2} b\right)\left(4 a^{4} b^{7}\right)$
21. $\left(3 x^{3}\right)^{2} \cdot\left(2 x^{2}\right)^{3}$

Solve each of the following equations. Report your answers in simplest form.
22. $9-\frac{4}{5}(u-3)=1$
23. $c+3-2 c-(1-3 c)=2$
24. $\frac{3 n-2}{4}=\frac{8 n+6}{5}$
25. $4(a+2)=12-2(3-2 a)$
26. $\frac{3}{2}(8 x+12)=-3(6-3 x)$
27. $\frac{2}{3} x+\frac{5}{4}=2-\frac{7}{8} x$

The graph of an "and" compound inequality is the intersection (overlap) of the solution sets of the two inequalities.

The graph of an "or" compound inequality is the union (overlap is not required) of the solution sets of the two inequalities.

For all real numbers $a$ and $b$, the statement $a<x<b$ can be written as two inequalities joined by the word "and." In other words, $a<x<b$ means $a<x$ AND $x<b$

Remember to switch the direction of the inequality if you multiply or divide by a negative value!

Solve each of the following inequalities. Report your answers in simplest form.
28. $-2(3-7 x)-2+4(2 x+1)<7(x-2)$
30. $5 a-2>3$ and $\frac{1}{3} a-3<0$
32. $2 x-7>-3$ or $-4 x \geq 20$
34. $2 \leq 3 h+2<14$
29. $\frac{5}{6}(27-12 x-21) \geq \frac{2}{3}(18 x+6)$
31. $\frac{m}{4}-2>-10$ and $5-m>-2$
33. $5 x+7>2 x+4$ or $3 x+3<24-4 x$
35. $\frac{4 x+2}{5} \leq-0.4$

## SOLVING ABSOLUTE VALUE EQUATIONS

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 $x=-3$.


How to solve an absolute value equation:

$$
\begin{array}{ll}
|2 x-9|-5=18 & \text { Isolate the absolute value bars on one side of the equation. } \\
|2 x-9|=23 & \text { The value inside of the absolute value bars is either } 23 \text { or }-23 . \\
2 x-9=23 \text { or } 2 x-9=-23 & \text { Solve each equation. Start by adding } 9 \text { to both sides. } \\
2 x=32 \quad \text { or } \quad 2 x=-14 & \text { Divide by } 2 . \\
x=16 \quad \text { or } \quad x=-7 & \text { Check both solutions in the original equation. }
\end{array}
$$

Solve each of the following equations. Report your answers in simplest form.
36. $|3 x|=24$
38. $|2 x+17|=11$
40. $|4 x+1|+9=2$
37. $|x-5|=8$
39. $3|x-5|-20=-9$
41. $\left|\frac{2}{3} x-1\right|=3$

## SOLVING ABSOLUTE VALUE INEQUALITIES

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 .

$x<-3$ or $x>3$

How to solve an absolute value inequality:

$$
\begin{array}{ll}
|2 x-9|-5>18 & \text { Isolate the absolute value bars on one side of the inequality. } \\
|2 x-9|>23 & \begin{array}{l}
\text { Split into two separate inequalities. } \\
\text { Join them with "or" for "greatOR than" inequalities. } \\
\text { Join them with "and" for "less thAND" inequalities. }
\end{array} \\
2 x-9>23 \text { or } 2 x-9<-23 & \text { Solve each inequality. Start by adding } 9 \text { to both sides. } \\
2 x>32 \quad \text { or } 2 x<-14 & \text { Divide by } 2 . \\
x>16 \quad \text { or } \quad x<-7
\end{array}
$$

Solve each of the following inequalities. Report your answers in simplest form.
42. $|x|>4$
44. $|2 x-7|+4 \leq 15$
46. $\quad\left|\frac{4-x}{3}\right| \leq 2$
43. $|x-1|<7$
45. $\quad 3|x|>18$
47. $|5-x|>1$

Find the slope of each line.
48. through $(4,-6)$ and $(-4,6)$
50. $y=4$
52.

49. $y=\frac{2}{3} x-8$
51. $3 x-2 y=-10$
53.


Write an equation in slope-intercept form $(y=m x+b)$ for each of the following sets of conditions.
54. Passing through $(2,-3)$ with a slope of $\frac{5}{3}$.
55. Passing through $(7,-3)$ and $(-3,5)$.
56. A vertical line passing through $(1,-4)$.
57. Parallel to $3 x+5 y=18$ passing through $(-10,-4)$.
58. Perpendicular to $7 x-2 y=16$ passing through $(-7,5)$.

## GRAPHING LINES AND INEQUALITIES

Graph each of the following linear equations or inequalities.
Hint: you may need to rearrange each equation in to slope intercept form $(y=m x+b)$ if possible.
59. $y=\frac{1}{2} x$

61.
$x=\frac{1}{3} y-1$

63. $3 x \geq 6$

60. $-4 y=6 x+12$

62. $\frac{1}{2} x<\frac{1}{5} y+1$

64. $y>-\frac{3}{4} x+4$


## SYSTEMS OF EQUATIONS AND INEQUALITIES

Solve each system by graphing. Describe it as consistent and independent, consistent and dependent, or inconsistent.

| Type of System | The Graph | Solution |
| :---: | :---: | :---: |
| consistent and independent | intersecting lines | one solution, $(x, y)$ |
| consistent and dependent | coinciding lines | infinitely many solutions |
| inconsistent | parallel lines | no solution |

65. $\left\{\begin{array}{l}2 x-y=-4 \\ 4 x+y=-2\end{array}\right.$

66. $\left\{\begin{array}{l}x+2 y=4 \\ y=-\frac{3}{2} x+4\end{array}\right.$

67. $\left\{\begin{array}{l}x-2 y=-6 \\ 2(y-3)=x\end{array}\right.$


Solve each system algebraically. You may use either substitution or elimination.
68. $\left\{\begin{array}{l}-4 x+y=-12 \\ x+\frac{1}{2} y=\frac{3}{2}\end{array}\right.$
69. $\left\{\begin{array}{l}y=3 x-12 \\ 5 x+2 y=20\end{array}\right.$
70. $\left\{\begin{array}{l}x-\frac{2}{5} y=2 \\ -5 x+2 y=-10\end{array}\right.$
71. $\left\{\begin{array}{l}3 x-2 y=16 \\ 6 x+y=-8\end{array}\right.$

