You should “attempt” to complete these required prerequisite problems **without the use of a calculator** as much as possible. All problems, **EXCEPT FOR # 45**, are review of Algebra 1 (Keystone Exam) & Geometry.

1. Evaluate the expression when \( x = -3 \) and \( y = 3 \)
   
   \[
   \frac{4y - x}{3(2x + y)}
   \]

2. Simplify the expression \( 5(n^2 + n) - 3n(2n^2 + 4n - 2) \) completely. Then, **WRITE** your answer in factored form.
   
   \[
   a) \quad -6n^3 + 17n^2 - n \\
   b) \quad -n^2 - 7n + 6 \\
   c) \quad -6n^3 - 7n^2 + 11n \\
   d) \quad 6n^3 - 17n^2 + n
   \]

3. Rewrite the equation so that \( F \) is a function of \( C \).
   
   \[
   C = \frac{5}{9}(F - 32)
   \]

   \[
   a) \quad F = \frac{9}{5}(C + 32) \\
   b) \quad F = \frac{9}{5}C + 32 \\
   c) \quad F = \frac{9}{5}C - 32 \\
   d) \quad F = \frac{5}{9}(32 - C)
   \]

4. Solve the equation for \( x \).
   
   \(-2(4 - 3x) + 7 = -2x + 6 + 8x\)

   \[
   a) \quad 0 \\
   b) \quad 2 \\
   c) \quad -3 \\
   d) \quad 5 \\
   e) \quad \text{No Solution}
   \]

5. A spherical weather balloon needs to hold 175 \( ft^3 \) of helium to be buoyant enough to lift an instrument package to a desired height. To the nearest tenth of a foot (if necessary), what is the radius of the balloon? The volume of a balloon is given by \( V = \frac{4}{3}\pi r^3 \).

   \[
   a) \quad 2.9 \\
   b) \quad 2.5 \\
   c) \quad 3 \\
   d) \quad 3.5 \\
   e) \quad 4
   \]

6. **WRITE** \( \sqrt{192} \) in simplest radical form. **NO DECIMALS.**

7. **WRITE** \( \sqrt[4]{7} \) in simplest radical form. **NO DECIMALS.**
8. Solve the inequality. $-2 \leq x - 7 \leq 11$
   a) $x \leq 5$ or $x \geq 18$  b) $5 \leq x \geq 18$  c) $5 \leq x \leq 18$  d) $x \geq 5$ or $x \leq 18$

9. Solve the inequality. $2x + 3 < 5$ or $4x - 7 > 9$
   a) $x \leq 1$ or $x \geq 4$  b) $1 \geq x \geq 4$  c) $1 \leq x \leq 4$  d) $x < 1$ or $x > 4$

10. Solve the inequality. $3 - 2(2x - 1) < 21$
    a) $x > 4$  b) $x < 4$  c) $x > -4$  d) $x < 2$  e) $x > -2$

11. Solve the inequality. $\left| 20 + \frac{1}{2}x \right| > 6$
    a) $x < -52$ or $x > -28$  b) $28 < x < 52$  c) $-52 < x < -28$  d) $x > -52$ or $x > -28$

12. Determine $\frac{\Delta y}{\Delta x}$, $m$, of the line that passes through the points (-3, 5) and (2, 1).
   a) $\frac{4}{5}$  b) $\frac{5}{4}$  c) $\frac{5}{6}$  d) $-\frac{4}{5}$  e) $-\frac{5}{6}$

13. If $\frac{\Delta y}{\Delta x}$, $m$, of Line 1 is $\frac{3}{5}$, then $\frac{\Delta y}{\Delta x}$, $m$, of Line 2 which is a perpendicular line is:
   a) $\frac{5}{3}$  b) $\frac{3}{5}$  c) $-\frac{3}{5}$  d) $-\frac{5}{3}$  e) Cannot be determined from the given information.

14. Which lines are perpendicular?
    a) Line 1: passing through (0, 3) and (0, -7) & Line 2: passing through (-6, -4) and (12, -4)
    b) Line 1: passing through (-1, 9) and (-6, -6) & Line 2: passing through (-7, -23) and (0, -2)
    c) Line 1: passing through (1, 2) and (6, 7) & Line 2: passing through (2, 4) and (7, 8)

15. The equation of the line in standard form is:
    a) $y = \frac{2}{7}x + 7$  b) $2x + 7y = 7$  c) $-3.5x + y = 7$  d) $y = 3.5x + 7$  e) $1.75x + y = 7$
16. The formula for the area of a circle is $A = \pi r^2$. The formula for the circumference of a circle is $C = 2\pi r$. Write a simplified formula for the area of a circle in terms of its circumference so that $A = f(C)$.

17. The formula for the height, $h$, of an equilateral triangle is $h = \frac{\sqrt{3}}{2}b$ where $b$ is the length of a side. Write a simplified formula for the area of an equilateral triangle in terms of the length of a side only so that $A = f(b)$.

18. You have 480 ft. of fencing to enclose a rectangular garden. You want the length of the garden to be 30 ft. greater than the width. Determine the length and width of the garden if you use all the fencing.

19. Your salary is $1250 per week plus you receive a 5% commission on your sales each week. What are the possible amounts (in dollars) that you can sell each week to earn at least $1500 per week? Write your answer as an inequality.

20. Determine if each input-output table below represents a relation, a function, or BOTH. Explain why you chose your answer(s).

   a) \[
   \begin{array}{c|cccccc}
   X & 0 & 0 & 2 & 5 & 8 & 9 \\
   \hline
   y & -3 & 2 & 3 & 5 & 7 & 9
   \end{array}
   \]

   b) \[
   \begin{array}{c|cccccc}
   X & -1 & 0 & -1 & 2 & 3 & 4 \\
   \hline
   y & -5 & 2 & 3 & 5 & 7 & 9
   \end{array}
   \]

   c) \[
   \begin{array}{c|cccccc}
   X & 2 & 4 & 5 & 7 & 8 & 10 \\
   \hline
   y & -3 & 2 & 3 & 5 & 7 & 9
   \end{array}
   \]

   d) \[
   \begin{array}{c|cccccc}
   X & 0 & 0 & 2 & 5 & 8 & 9 \\
   \hline
   y & -3 & -3 & -3 & -3 & -3 & -3
   \end{array}
   \]

21. Write the equation of the line in slope-intercept form that passes through (-6, -4) and (-1, 1).

   a) $-3x + y = 14$  b) $y = -x + 12$  c) $y = x + 2$  d) $y = \frac{7}{5}x + 14$
22. Write the equation of the line in \textit{slope-intercept} form that passes through \((3, 2)\) and is perpendicular to the line \(6x + 2y = 4\).

\begin{align*}
a) \quad y &= \frac{1}{3}x + 11 \\
b) \quad y &= \frac{1}{3}x + 1 \\
c) \quad y &= -3x + 11 \\
d) \quad y &= 3x + 1
\end{align*}

23. Determine the missing value of \(k\) so that the line passing through the points \((5, k)\) and \((k, 7)\) has \(\frac{\Delta y}{\Delta x}, m = -\frac{2}{3}\). No decimal answer (improper fraction if necessary).

24. Federal regulations require that a wheelchair ramp for a doctor’s office entrance must extend 12 inches outward for every 1 inch of rise. The ramp needs to rise to a height of 18 inches.

   \(a\). How far should the end of the ramp be from the base of the building?

   \(b\). What should the actual length of the ramp itself be (round to the nearest hundredth if necessary)?

25. What is the \textbf{GCF} of \(12x^2y\) and \(18x^3y^2\)?

26. What is the \textbf{LCM} of \(6xy^3\) and \(10x^2y\)?

27. Simplify \(3^2 \left( \frac{3}{\sqrt{27}} \right)^{-2}\).

   \begin{align*}
a) \quad -\frac{4}{3} \\
b) \quad 1 \\
c) \quad \frac{4}{3} \\
d) \quad 81
\end{align*}

28. \textbf{WRITE} the equivalent expression to \((6x^3 + 3x^2 - 4x + 8) - (4x^2 - 3x + 2)\) in Standard form.

29. Factor \(x^2 - 3x - 10\).
30. Factor $2x^2 - 12x + 10$ completely.

31. Factor $32x^2 - 98$ completely.

32. Factor $x^4 - 13x^2 + 36$ completely.

33. Simplify $\frac{30a^2b}{81ab^2}$.

34. Simplify $\frac{(75h^2 - 50hk)}{5h^2}$.

35. Simplify $\frac{x - 4}{4 - x}$.

36. Simplify $\frac{21xy - 7x^2y}{(x - 3)}$.

37. Simplify $\frac{x^2 - 11x + 10}{x - 1}$.

38. Simplify $\frac{x^2 - 6x + 9}{x^2 - 9}$.
39. Solve \(3x - 4y = 26\) algebraically. No decimal answers.

40. A box contains 22 coins, consisting of quarters and dimes. The total value of the coins is $3.55. WRITE and solve a system of equations using any algebraic method to determine the number of quarters and dimes in the box.

41. State the **domain** AND **range** of the function represented by the graph below?

42. State the **domain** AND **range** of the function represented by the graph below?
43. A relation is graphed on the coordinate plane below. State the domain.

44. WRITE the equation in Slope-Intercept form of the function graphed below. NO DECIMALS.

45. Factor $3x^2 + 10x - 8$ completely. NOTE: If you are having difficulty factoring this quadratic, please do some internet research. You could search for “factoring polynomials with leading coefficient not 1” to assist you.
You receive a gift certificate for $25 to the movie theater. Matinees are $4.50 each and evening shows are $7.50 each. **WRITE** and graph an *inequality* that represents the numbers of matinees and evening shows you can attend.
47. Suppose you need $2.40 in postage to mail a package to a friend. You have 9 stamps, some $0.20 and some $0.34. How many of each do you need to mail the package? **WRITE and graph a system of inequalities** that represents the possible solution(s).

48. Suppose you want to fence off a rectangular area in your backyard for your dog. You will use your house as one of the four sides. Since your house is 40 ft. long, the length needs to be no more than 40 ft. You plan to use at least 150 ft. of fencing. **WRITE and graph a system of inequalities** to find possible dimensions for the rectangular area.