Welcome to Algebra II!

The following problems must be completed before the beginning of school in August. Record your answers in the spaces provided in the packet. Be neat, be organized, and show all of your work.

You are allowed to work with your classmates and use your books, notes, and other references, including parents and/or tutors. Obviously, simply copying someone else’s answers is not allowed. **If you need assistance, there will be help sessions at MUS with Math Department faculty during the summer. These sessions will be held every Tuesday between June 4 and August 6, with the exception of July 2, from 9:00 am until noon.**

Make sure that you know how to do these types of problems. You have seen them in your Algebra I class and used them in Geometry, so none of these concepts should be new.

_If there are more than thirty problems in the packet that you cannot work or do not understand, you should come to the help sessions, get a tutor or work with a friend to insure that you are solid on these topics before school starts._

This packet needs to be ready for submission on the first day that we have class, i.e. the day after convocation (Thursday, August 15). **The packet will be graded;** don’t lose it, forget to do it, etc.

_Good luck! See you in the fall._
1) List $5, -1\frac{1}{5}, 3\frac{4}{5}, -\frac{3}{5}, \text{ and } 2\frac{2}{5}$ from least to greatest.

2) Simplify completely $\left[ 2^3 + 4(7-3) \right] \div 8$.

3) Evaluate $\frac{a^2 + b^2}{a-b} + \frac{bc}{a}$ if $a = 5, b = 3$ and $c = 15$.

4) Simplify completely $\frac{-(7-9)(7+9)}{(2-6) \cdot 4^2}$.

5) Simplify completely $\frac{16a^3 - 4a^2 + 64a + 36}{4}$.

Solve for $x$ in the following equations.

6) $\frac{3}{5}x + 3 = 2x - 11$

7) $2(x-1) = 5 - (3 - 2x)$

8) $2(2x - 9) = 7x - 60$

9) $\frac{6x - 2(x-4)}{3} = 8$
Word Problems: For these problems (and for ALL word problems) be sure to begin by reading carefully. Then, identify what the variable will stand for and be VERY specific. Don’t just say “tickets”, say “cost of adult tickets” or “number of tickets sold”. The next step is to write an equation and solve it. Finally, answer the question(s) asked in the problem.

10) A theater has 600 tickets to sell for a show. Of these tickets, 225 sell for $2 apiece more than the others. If all tickets are sold and $2250 is taken for the show, what price is each type of ticket?

11) At 1:30 pm, two planes leave Chicago, one flying east at 540 km/hour and the other flying west at 620 km/hour. At what time will they be 1450 km apart?

Solve each inequality. Remember that when you multiply or divide both sides of an inequality by a negative number, the direction of the inequality changes!

12) \( 5x - 4 \geq 3x \)

13) \( 3(5t + 4) < 13t - 10 \)

For each combined inequality below (conjunctions and disjunctions), be sure to plot your solution on a number line to help you interpret that solution correctly.

14) \(-3 < 3 + 2w < 6\)

15) \( 2 > \frac{t}{5} \) or \( 2t + 4 \leq -6 \)
16) \(-3 \leq -2(t - 3) < 6\) 

17) \(2x + 3 > 1\) or \(5x - 9 \leq 6\)

16) _________________

17) _________________

18) Find the largest possible values for a set of three consecutive even integers whose sum is less than 105.

18) _________________

Absolute Value Equations and Inequalities: Absolute value problems will always be broken down into two separate equations (or inequalities) once the absolute value is isolated. Here is an example of each:

Absolution Value Equation:

\[ 3 - |2x - 3| = 1 \]
\[ -|2x - 3| = -2 \]
\[ |2x - 3| = 2 \]

now split into two equations:
\[ 2x - 3 = 2 \] or \[ 2x - 3 = -2 \]
\[ 2x = 5 \] \[ 2x = 1 \]
\[ x = \frac{5}{2} \] or \[ x = \frac{1}{2} \]

Absolute Value Inequality:

\[ |3x - 2| < 4 \]

now split into two inequalities:
\[ 3x - 2 < 4 \] and \[ 3x - 2 > -4 \]
\[ 3x < 6 \] \[ 3x > -1 \]
\[ x < 2 \] and \[ x > -\frac{1}{3} \]

Solve for \(x\) in each absolute value equation.

19) \(|4x - 10| = 12\) 

20) \(|x - 7| = 2\)

19) _________________

20) _________________
Solve and graph on a number line the solution set of each open sentence. A reminder: when setting up the absolute value inequality as two separate inequalities, a less than inequality becomes a conjunction (i.e. use AND) and a greater than inequality becomes a disjunction (i.e. use OR)

21) \(|2t + 5| \leq 7\)

22) \(|w - 5| > 3\)

True/False. If false, justify your answer by showing a counter-example.

23) If \(a \geq b\), then \(a^2 \geq b^2\).

24) If \(a < b\), then \(\frac{1}{a} < \frac{1}{b}\).

25) If \(a < b\) and \(c > 0\), then \(\frac{a}{c} < \frac{b}{c}\).

26) If \(|a| > |b|\), then \(a > b\).
27) Determine the constant \( k \) so that \((-2, 5)\) will be a solution of \(2x + ky = 3(k - 1)\)

There are three forms of the equation for a line (linear equation):

- **Slope-Intercept**: \( y = mx + b \) where \( m = \text{slope}, \ b = \text{y-intercept} \)
- **Standard Form**: \( Ax + By = C \) where \( A, B, \) and \( C \) are integers
- **Point-Slope Form**: \( y - y_1 = m(x - x_1) \) where \( m = \text{slope}, \ (x_1, y_1) \) is a point on the line

Graph each equation on the coordinate plane.

28) \( y - 3 = 0 \)

29) \( 3x - y = -5 \)

30) \( \frac{x}{2} + \frac{y}{2} = 0 \)

31) Find the slope of the line that passes through \((-2, -7)\) and \((0, 9)\).
32) Find the slope of the line \(3x + 4y = 9\)  

33) Find the equation in standard form of the line that passes through \((2, 5)\) and has slope \(-2\).  

34) Find the equation in standard form of the line that passes through \((-3, 0)\) and \((0, 6)\).  

Find the equation in standard form of the lines through the point \((4, -3)\) that is…

35) parallel to \(3x - y = -5\)  

36) perpendicular to \(3x - y = -5\)
Solve the following systems of equations using either the substitution or elimination method.

37) \[3x + 4y = 2\]
\[-5x + 4y = -2\]

38) \[2x + 3y = 4\]
\[5x + 4y = 3\]

39) It takes 6 hours for a plane to travel 720 km with a tail wind and 8 hours to make the return trip with a head wind. Find the airspeed of the plane and speed of the wind current.

Graph the following linear inequalities. Remember to shade the appropriate area half-plane.

40) \[x + 2y \leq 2\]

41) \[2x - 3y < 6\]
Graph this system of linear inequalities on the coordinate plane. Carefully shade the area that is your final solution.

42) \[ \begin{align*} x - 3y &> 6 \\ x + y &\leq 2 \end{align*} \]

Find the following if \( f(x) = x^2 + 2 \) and \( g(x) = 2x - 1 \).

43) \( f(g(2)) \) \hspace{2cm} 44) \( g(f(2)) \) \hspace{2cm} 45) \( f(g(x)) \) \hspace{2cm} 46) \( g(f(x)) \)
47) A load of 5 kg stretches a coil spring to a length of 24 cm, and a load of 8 kg stretches it to a length of 30 cm. Find the length of the spring when there is no load.

Simplify the following expressions completely.

48) \[4(x^2 + 3) + 5(2 - 3x^2)\]

49) \[(-6x^2r^2y)(5x^3y^2)\]

50) \[(2r - s)(3r + 2s)\]

51) \[b^2x^2(2b + x^2)\]

Find the GCF and LCM of the following.

52) 420, 504

53) \[15r^2s^3, 25rs^2, 45r^2s\]

Factor each polynomial completely. Remember that the first step in any factoring problem is to look for a GCF.

54) \[64r^2 + 16r + 1\]

55) \[6f^2 + 3fg + 10f + 5g\]
56) \( s^2 + sb - 6b^2 \)

57) \( 9x^2 - 15x + 6 \)

56) ____________________

57) ____________________

58) \( 49x^2 - 16 \)

59) \( x^2 - 16x + 64 \)

58) ____________________

59) ____________________

Solve the following equations. There are 3 techniques for solving quadratic equations:

1) Factoring
2) Completing the Square
3) Using the quadratic formula: 
   \[ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \]

60) \((x + 5)(2x - 1) = 0\)

61) \(x^2 - 12x - 10 = 0\)

60) ____________________

61) ____________________

62) \(6t^2 - t - 2 = 0\)

62) ____________________

63) The height of a triangle is 3 cm less than the length of its base, and its area is 20 square cm. Find the height of the triangle.

63) ____________________
Simplify the following expressions completely.

64) \( \frac{5x^2 - 20}{3x^2 + 5x - 2} \)

65) \( \frac{5t^3}{4s} \cdot \frac{16s^2}{25t^3} \cdot \frac{16s}{25t^3} \)

66) \( \frac{x}{x + y} + \frac{x}{x - y} \)

Solve each rational equation by finding the least common denominator and then multiplying both sides by that common denominator.

67) \( \frac{1}{3} - \frac{7}{2} = -\frac{5}{6} \)

68) \( \frac{2}{x-2} - \frac{1}{x^2 + x - 6} = \frac{x}{x+3} \)

69) \( \frac{3x + 2}{x-1} = \frac{3x + 4}{x+1} \)

70) \( \frac{x - 2}{8} - \frac{2x + 1}{12} = \frac{1}{3} \)
Simplify each radical expression completely.

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<tr>
<td>71) ( \sqrt{224} )</td>
<td>72) ( \sqrt[3]{324r^4s^7} )</td>
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<tr>
<td>73) ( \sqrt{3} \cdot 4\sqrt{3} )</td>
<td>74) (-10\sqrt{18} - 5\sqrt{32})</td>
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<tr>
<td>75) ( \frac{11\sqrt{6}}{\sqrt{98}} )</td>
<td>76) ((3\sqrt{5} + \sqrt{3})(3\sqrt{5} - \sqrt{3}))</td>
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