

Name: \_\_\_\_\_

Date: \_\_\_\_\_



Pi( $\pi$ )

Sample Homework

Start Time: \_\_\_\_\_

End Time: \_\_\_\_\_

## 1 - Study the discriminant

For each equation, compute the discriminant, and then determine the number and type of solutions.

Quadratic Equation	Discriminant	Number and Type of solutions
$x^2 - 4x + 3 = 0$		
$x^2 + 3x + 6 = 0$		
$x^2 - 3x - 2 = 0$		

## 2 - Distributive Property

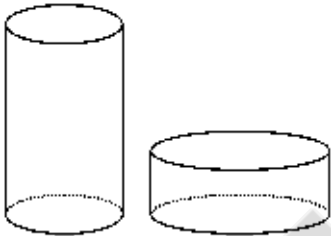
Reduce the expression to the simplest form  $ax + by + cz$ , and then evaluate the expression for  $x = 0$ ,  $y = -\frac{1}{3}$  and  $z = -\frac{2}{3}$

1.  $-4(-4x + 2y - 5z) - 4(3x - 3y - 4z) + 3(-5x + 5y) =$

2.  $-2(-x + 5y - 2z) - 3(4x + y + 4z) + 3(x + 4y) =$

### 3 - Problems

1.  $\left[ \begin{array}{c} \text{🔦} \\ 24 \end{array} \right]^{100}$   $[T_{24}]$  Two cylindrical cans have the same volume. The height of one can is triple the height of the other. If the radius of the narrower can is 12 units, how many units are in the length of the radius of the wider can? Express your answer in simplest radical form. (*MATHCOUNTS*)



2.  $\left[ \begin{array}{c} \text{🔦} \\ 19 \end{array} \right]^{84}$   $[G_{219}]$  A rectangle floor is covered with square tiles. The floor is 81 tiles long and 63 tiles wide. If a diagonal is drawn across the floor, how many tiles will it cross?

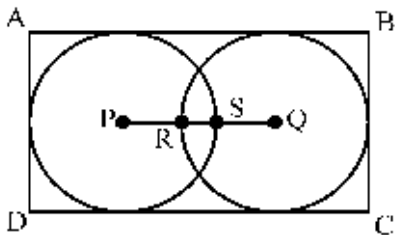
## 4 - Simplify Rational Expressions

1. 
$$\frac{-2x^2 + 6x + 8}{-3x^2 + 9x + 12} - \frac{2x + 2}{3x + 3} =$$

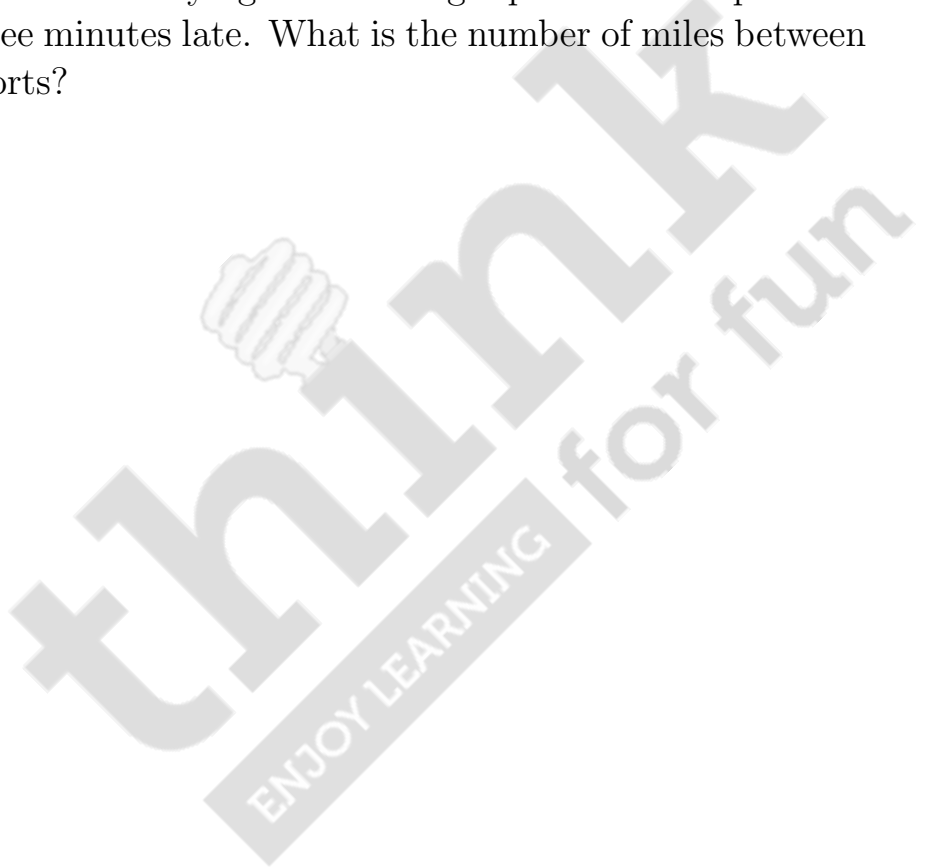
2. 
$$\frac{6x^2 - 4x - 2}{2x^2 + 2x - 4} + \frac{3x + 1}{x + 2} =$$

## 5 - Problems

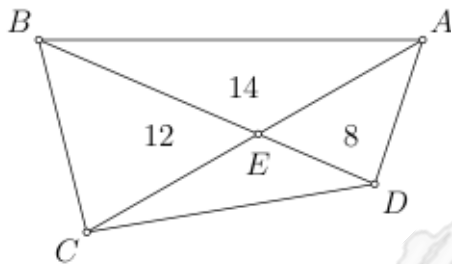
3.  $\left[ \begin{array}{c} \text{owl} \\ 13 \end{array} \right]^{100}$   $[T_{13}]$  Each of the circles  $P$  and  $Q$  is tangent to rectangle  $ABCD$  at three points, as shown. Each circle has a radius of 6 cm.  $RS = 2$  cm. What is the number of square centimeters in the area of rectangle  $ABCD$ ? (*MATHCOUNTS*)



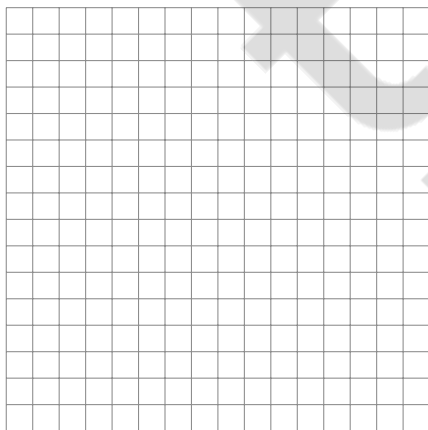
4.  $\left[ \begin{matrix} \text{✈️}^{100} \\ 18 \end{matrix} \right] [T_{18}]$  A jet airplane departing on time, flying between two airports at an average speed of 540 mph arrives eight minutes late. Departing on time and flying at an average speed of 480 mph it arrives fifty-three minutes late. What is the number of miles between the two airports?



5.  $\left[ \begin{matrix} \text{🦋} & 83 \\ & 81 \end{matrix} \right]$   $[G_{181}]$  In the diagonals of quadrilateral  $ABCD$  intersect at  $E$ . The areas of triangles  $AED$ ,  $AEB$ , and  $BEC$  are 8, 14, and 12 respectively. Find the area of triangle  $CED$ .



6.  $\left[ \begin{matrix} \text{🦋} & 100 \\ & 19 \end{matrix} \right]$   $[T_{19}]$  What is the positive value of  $m$  such that the triangle bounded by the lines  $y = 0$ ,  $x = 12$  and  $y = mx$  has an area of 1872 square units? (*MATHCOUNTS*)





## 6 - Factor Quadratic Expressions

Factor the following quadratic expressions by grouping.

1.  $16x^2 - 16x + 3$

5.  $9x^2 + 6x$

2.  $6x^2 - 19x + 15$

6.  $4x^2 - 4x - 8$

3.  $12x^2 + 10x - 8$

7.  $6x^2 + 6x - 12$

4.  $6x^2 + 12x + 6$

8.  $8x^2 + 14x - 15$

## 7 - Operations with Exponents

Simplify the following expressions. The answer should be in simplified radical form.

$$\bullet \sqrt{(9^{-7} \cdot 6^2)^6} =$$

$$\bullet \sqrt{4 \left( \frac{4^{-9}}{4^9} \right)} =$$

$$\bullet \sqrt{9 \left( \frac{9^{-4}}{9^6} \right)^9} =$$

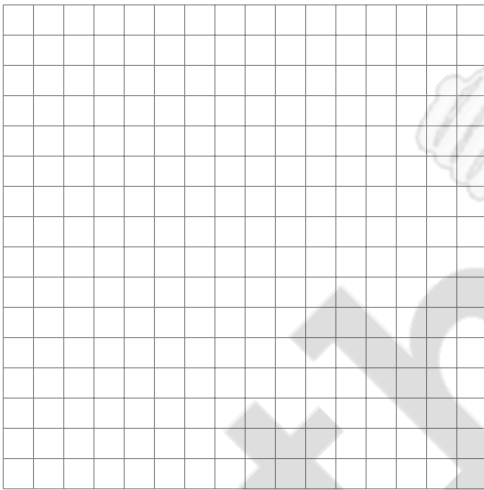
$$\bullet ((-2)^{-5} \cdot 2^4)^{-\frac{1}{2}} =$$

$$\bullet \sqrt{\left( \frac{3}{4} \right)^9} =$$

$$\bullet \sqrt{(2^3 \cdot 2^{-9})^4} =$$

## 8 - Problems

7.  $\left[ \begin{smallmatrix} \text{lightbulb} & 83 \\ 95 \end{smallmatrix} \right]$  [G<sub>195</sub>] Trapezoid  $ABCD$  has vertices  $A(-1, 0)$ ,  $B(0, 4)$ ,  $C(m, 4)$  and  $D(k, 0)$ , with  $m > 0$  and  $k > 0$ . The line  $y = -x + 4$  is perpendicular to the line containing side  $CD$ , and the area of trapezoid  $ABCD$  is 34 square units. What is the value of  $k$ ?



8.  $\left[ \begin{array}{c} \text{🦋}^{84} \\ 07 \end{array} \right]$   $[G_{207}]$  Equilateral  $\triangle ABC$  is inscribed in circle  $O$ . The radius of circle  $O$  is 12 inches. How many square inches are in the area of  $\triangle ABC$ ? Express your answer in simplest radical form.
9.  $\left[ \begin{array}{c} \text{🦋}^{84} \\ 06 \end{array} \right]$   $[G_{206}]$  If the diameter of a right cylindrical can with circular bases is increased by 25%, by what percent should the height be increased in order to double the volume of the original can?

## 9 - Root of exponential expressions

Represent the answer in the simplest radical form. If final answer is in exponential form, all bases should be **prime numbers**.

1.  $\sqrt{7^{11} \cdot 4^5} =$

6.  $\sqrt[4]{3^9} =$

2.  $\sqrt{7^{12}} =$

7.  $\sqrt[3]{4^7 \cdot 3^{10}} =$

3.  $\sqrt[4]{6^6} =$

8.  $\sqrt[3]{7^7 \cdot 6^8} =$

4.  $\sqrt{9^7 \cdot 6^6} =$

9.  $\sqrt[3]{3^8 \cdot 8^9} =$

5.  $\sqrt[4]{6^9} =$

10.  $\sqrt{6^7} =$

## 10 - Distance between point and line

Find the shortest distance between the point and line given.

Point	Line	Distance
$(5, 9)$	$5x - 2 = 5y$	
$(-9, 6)$	$2x - 4 = 5y$	
$(1, -2)$	$2y = -2x + 5$	
$(7, 6)$	$5x - 4 = -4y$	

## 11 - Problems

10.  $\left[ \begin{array}{c} \text{🦀} \\ 37 \end{array} \right]^{64}$  [A<sub>88</sub>] Mary leaves New York City at 9:00 am, traveling to Charlotte, NC, at an average rate of 55 miles per hour. Simba leaves one hour later than Mary and follows Mary's route at an average rate of 65 miles per hour. At what time will Simba catch up to Mary?



## 12 - Fun Time

Begin with the number in the upper left square and travel to the lower right, calculating as you go. Can you find the solution path that meets the following restrictions?

- You may move to any adjacent (but not diagonal) square.
- You may not visit any square more than once.
- You must finish with the value shown in the last square.

**Hint:** No result along the way is a negative number or a fraction.

Start

<b>2</b>	+4	-1	×4	÷5
×2	-5	×3	-8	-2
×0	×7	÷2	+6	÷3
÷5	×6	+1	×5	+2
+8	÷4	+7	-9	<b>=32</b>

End