

Marian Catholic High School  
Pre-Calculus Readiness  
Summer Math Problems

Name \_\_\_\_\_

Simplify each algebraic expression.

1.  $7 - 4[3 - (4y - 5)]$

2.  $\frac{1}{2}(2y) + [(-7x) + 7x]$

Simplify each exponential expression.

3.  $(8x^3)^2$

4.  $\left(-\frac{6}{y}\right)^3$

5.  $\frac{10x^4y^9}{30x^{12}y^{-3}}$

Rationalize the denominator.

6.  $\frac{\sqrt{2}}{\sqrt{5}}$

7.  $\frac{13}{3 - \sqrt{11}}$

8. Fill in each square root to make the statement true.

$$(5 + \sqrt{\quad})(5 - \sqrt{\quad}) = 22$$

Find each product.

9.  $(2x - 5)(7x + 2)$

10.  $(x + y)(x^2 - xy + y^2)$

Factor completely.

11.  $3x^3 - 3x$

12.  $6x^2 - 17x + 12$

Multiply or divide as indicated.

13.  $\frac{6x + 9}{3x - 15} \cdot \frac{x - 5}{4x + 6}$

14.  $\frac{x^2 - 4}{x} \div \frac{x + 2}{x - 2}$

Solve each equation.

15.  $3(x - 2) + 7 = 2(x + 5)$

16.  $x^2 + 8x + 12 = 0$

Solve each inequality.

17.  $8x + 3 > 3(2x + 1) + x + 5$

18.  $\left| 3 - \frac{2}{3}x \right| \geq 5$

### Application Exercises

19. Police use the formula  $v = 2\sqrt{5L}$  to estimate the speed of a car,  $v$ , in miles per hour, based on the length,  $L$ , in feet, of its skid marks upon sudden braking on a dry asphalt road.

A motorist is involved in an accident. A police officer measures the car's skid marks to be 245 feet long. Estimate the speed at which the motorist was traveling before braking. If the posted speed limit is 50 miles per hour and the motorist tells the officer he was not speeding, should the officer believe him? Explain.

20. An HMO pamphlet contains the following recommended weight for women: "Give yourself 100 pounds for the first 5 feet plus 5 pounds for every inch over 5 feet tall." Using this description, what height corresponds to a recommended weight of 135 pounds?

21. The rational expression

$$\frac{130x}{100 - x}$$

Describes the cost, in millions of dollars, to inoculate  $x$  percent of the population against a particular strain of the flu.

a. Evaluate the expression for  $x = 40$ ,  $x = 80$ , and  $x = 90$ . Describe the meaning of each evaluation in terms of percentage inoculated and cost.

b. For what value of  $x$  is the expression undefined?

c. What happens to the cost as  $x$  approaches 100%? How can you interpret this observation?

### Writing in Mathematics

22. In the 1939 movie *The Wizard of Oz*, upon being presented with a Th.D. (Doctor of Thinkology), the Scarecrow proudly exclaims, “The sum of the square roots of any two sides of an isosceles triangle is equal to the square root of the remaining side.” Did the Scarecrow get the Pythagorean Theorem right? In particular, describe the four errors in the Scarecrow’s statement.

23. The mile records, shown below, are a yardstick for measuring how athletes are getting better and better. Do you think that there is a limit to human performance? Explain your answer. If so, when might we reach it?

#### Mile Records

1886	04:12.3	1958	03:54.5
1923	04:10.4	1966	03:51.3
1933	04:07.6	1979	03:48.9
1945	04:01.3	1985	03:46.3
1954	03:59.4	1999	03:43.1

### **Critical Thinking Exercises**

24. Suppose that we agree to pay you 8 cents for every problem in this chapter that you solve correctly and fine you 5 cents for every problem done incorrectly. At the end of the 26 problems we do not owe each other any money, how many problems did you solve correctly?

25. It was wartime when the Ricardos found out Mrs. Ricardo was pregnant. Ricky Ricardo was drafted and made out a will, deciding that \$14, 000 in a savings account was to be divided between his wife and child –to- be. Rather strangely, and certainly with gender bias, Ricky stipulated that if the child were a boy, he would get twice the amount of the mother's portion. If it were a girl, the mother would get twice the amount the girl was to receive. We'll never know what Ricky was thinking of, for (as fate would have it) he did not return from war. Mrs. Ricardo gave birth to twins-a boy and a girl. How was the money divided?