

# CENTRAL WISCONSIN MATHEMATICS LEAGUE

Meet I

November 8, 2000

## Category II (Algebra)

1. [10 points](P) *True/False: On your answer sheet, circle "T" for each of the following statements which is always true; circle "F" for each statement which is not always true.*

- (a) 0 is an even integer.
- (b) An irrational number cannot be an integer.
- (c)  $x[y - (x + y) + x^2] = 0$
- (d)  $\sqrt{a^2} = |a|$  for any real number  $a$ .
- (e)  $3x + 6y = 6$  and  $2x + 3y = 6$  represent parallel lines.

2–5: *Multiple Choice (4 points each). On your answer sheet, circle the letter of the one best choice.*

2. Which property best identifies the statement  $x(y + 2) = x(2 + y)$ ?

- (a) commutative
- (b) associative
- (c) identity
- (d) distributive
- (e) inverse

3. Which statement is true for all  $x$ ?

- (a)  $|x| > 0$
- (b)  $|x|$  is a positive integer
- (c)  $-1 > |x|$
- (d)  $|x| > -1$
- (e)  $|x| > 5$

4. The expression  $\frac{x^{-1} + y^{-1}}{(xy)^{-1}}$  is equivalent to:

- (a)  $\frac{x + y}{xy}$
- (b)  $(x + y)xy$
- (c)  $\frac{xy}{x + y}$
- (d) 1
- (e)  $x + y$

5. One liter is closest in size to:

- (a) 1 quart
- (b) 1 gram
- (c) 1 barrel
- (d) 1 gallon
- (e) 1 deciliter

6–9: Multiple Choice (6 points each). On your answer sheet, circle the letter of the one best choice.

6. If two lines are perpendicular and neither is vertical, the product of their slopes is:

- (a) the smaller of the two
- (b) indefinite
- (c) infinite
- (d)  $-1$
- (e)  $1$

7. Suppose  $z$  varies directly as the square of  $x$  and inversely as  $y$ . If  $z = \frac{3}{2}$  when  $x = 3$  and  $y = 4$ , find  $z$  when  $x = 12$  and  $y = 6$ .

- (a)  $\frac{207}{5}$
- (b)  $16$
- (c)  $3$
- (d)  $\frac{21}{2}$
- (e) none of these

8. Solve the system of equations:  $x - 2y = 0$   
 $4y - 3x = 10$

- (a)  $(6, 3)$
- (b)  $\left(\frac{1}{2}, \frac{1}{4}\right)$
- (c)  $(6, -3)$
- (d)  $\left(1, \frac{1}{2}\right)$
- (e)  $(-10, -5)$

9. An airplane takes off from CWA and heads west with a constant slope of  $\frac{5}{2}$ . After 1 minute, the plane is 2000 meters vertically above the ground. The plane has flown west a distance of:

- (a) 400 meters
- (b) 750 meters
- (c) 800 meters
- (d) 200 meters
- (e) 2000 meters

10–14: Miscellaneous Problems (point values as indicated). On your answer sheet, write your answer in the blank(s) provided. (P) means that partial credit may be given.

10. [10 points] How many two-digit numbers have their units digit greater than their tens digit?

11. [10 points] Find the equation in  $y = mx + b$  form which passes through the point  $(5, 1)$  and is perpendicular to the line  $x - 3y = 1$ .

12. [10 points] Every employee of a company owns a bike or a pet or both. 40% of the employees own bikes, 66 employees own pets, and 21 employees own both bikes and pets. How many employees own a bike but do not own a pet?

13. [10 points] Let  $g(x) = \frac{1+x}{1-x}$  and  $f(x) = \frac{1}{x-1}$ . Find the value of  $g\left(f\left(\frac{1}{2}\right) + 1\right)$ .

14. [10 points] A pizza shop makes small, medium, and large pizzas. Their cost for a small pizza is \$2 for sauce, \$1 for dough, and \$4 for cheese. Their cost for a medium pizza is \$3 for sauce, \$1 for dough, and \$5 for cheese. Their cost for a large pizza is \$4 for sauce, \$2 for dough, and \$6 for cheese. If the shop's total costs are \$64 for sauce, \$27 for dough, and \$108 for cheese on sales for one day, how many small pizzas do they make in one day?

Student's Answer Sheet

Name: \_\_\_\_\_  
 PRINT: First Last

School: \_\_\_\_\_ Code

1. True/False (2 points each). Circle the correct answer.

- (a) T F
- (b) T F
- (c) T F
- (d) T F
- (e) T F

2–5: Multiple Choice (4 points each). Circle the letter of the one best choice.

- 2. a b c d e
- 3. a b c d e
- 4. a b c d e
- 5. a b c d e

6–9: Multiple Choice (6 points each). Circle the letter of the one best choice.

- 6. a b c d e
- 7. a b c d e
- 8. a b c d e
- 9. a b c d e

10–14: Miscellaneous Problems (point values as indicated). Write your answer in the blank(s) provided; the boxes at the right are for grading use only. (P) means that partial credit may be given.

10. \_\_\_\_\_ two digit numbers 

10	
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11.  $y = mx + b$   
 $=$  \_\_\_\_\_  $x +$  \_\_\_\_\_ 

10	
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12. \_\_\_\_\_ employees 

10	
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13.  $g(f(\frac{1}{2}) + 1) =$  \_\_\_\_\_ 

10	
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14. \_\_\_\_\_ small pizzas 

10	
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**FOR GRADING USE ONLY**

#1: \_\_\_\_\_ correct  $\times 2 =$  \_\_\_\_\_  
 #2–5: \_\_\_\_\_ correct  $\times 4 =$  \_\_\_\_\_  
 #6–9: \_\_\_\_\_ correct  $\times 6 =$  \_\_\_\_\_  
 #10–14: \_\_\_\_\_ total  $=$  \_\_\_\_\_

**TOTAL SCORE**