

CENTRAL WISCONSIN MATHEMATICS LEAGUE

Meet II
January 30, 2001

Category III (Advanced)

Miscellaneous Problems (point values as indicated). On your answer sheet, circle the correct response or write your answer in the blank(s) provided. (P) means that partial credit may be given.

1. A check is written for x dollars and y cents, where x and y are both two-digit numbers. In error the check was cashed for y dollars and x cents, the incorrect amount exceeding the correct amount by \$17.82.

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

- (a) x cannot exceed 90.
- (b) y can equal $2x$.
- (c) The amount of the check could be a multiple of 5 cents.
- (d) The incorrect amount can equal twice the correct amount.
- (e) The sum of the digits of the correct amount must be divisible by 9.

2. [10 points] Find the *exact* value of x which solves $\sqrt{\sqrt{x+3} + \sqrt{x}} = 3$. Write your answer as a rational number reduced to lowest terms.

3. [10 points] Find all *exact* values of x which solve $\frac{2x}{2x-1} + \frac{1}{x} = \frac{1}{2x-1}$.

4. [10 points] Find all integers x which solve $\log_7 x \cdot \log_5 7 = 3$.

5. [10 points] Find the *exact* solution to the system of equations. If there is no solution, write *none* in a blank on your answer sheet.

$$\begin{aligned}2x - 4y &= -1 \\ -2x + y &= 3 \\ 4x - y &= 3\end{aligned}$$

6. [10 points] On November 1, 2000 the exchange rates for the some currencies were:

1 US Dollar	=	9.59 Mexican Nuevo Pesos
1 Euro	=	0.848536 US Dollars
1 Mexican Nuevo Peso	=	100 Mexican centavos

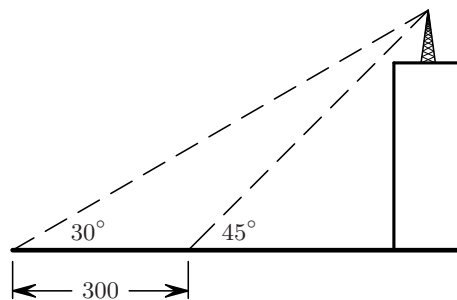
Find the US Dollar value of the least expensive video game if the games cost 14.95 US Dollars, 14300 Mexican centavos, and 17.5 Euros.

7. [10 points] If two resistors with resistances R_1 and R_2 are connected in parallel, then the total resistance R , measured in ohms (Ω), is given by

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

If R_1 changes from 80Ω to 83Ω and if R_2 changes from 100Ω to 105Ω , by how much does R change? *Round your answer to the nearest tenth of an ohm.*

8. [10 points] A radio tower is located on the roof of a building (see figure). A surveyor sights the top of the tower at a 30° angle, walks toward the building 300 feet, and then sights the top of the tower at a 45° angle. Assuming the ground is flat, how far above the ground is the top of the tower? *Round your answer to the nearest foot.*



9. [10 points] Find the *exact* value of a such that $f(x) = ax^2 - \frac{2}{3}x + 7$ has a maximum value of 85. *Give your answer as a rational number reduced to lowest terms.*
10. [10 points] For which values of a and b is the polynomial $p(x) = x^{15} + ax + b$ divisible by $x^2 - 1$?

Student's Answer Sheet

Name: _____
PRINT: First Last

School: _____ Code

I participated in Meet I: Yes No

Miscellaneous Problems (point values as indicated). Circle the correct response or 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.

- | | | | |
|---|--|-----|--|
| <p>1. (a) T F
 (b) T F
 (c) T F
 (d) T F
 (e) T F</p> | <table border="1" style="width: 100%; height: 100%; border-collapse: collapse;"> <tr><td style="width: 15px; text-align: center;">10P</td><td style="width: 25px;"></td></tr> </table> | 10P | |
| 10P | | | |
| <p>2. $x =$ _____</p> | <table border="1" style="width: 100%; height: 100%; border-collapse: collapse;"> <tr><td style="width: 15px; text-align: center;">10</td><td style="width: 25px;"></td></tr> </table> | 10 | |
| 10 | | | |
| <p>3. solution(s) for x: _____</p> | <table border="1" style="width: 100%; height: 100%; border-collapse: collapse;"> <tr><td style="width: 15px; text-align: center;">10</td><td style="width: 25px;"></td></tr> </table> | 10 | |
| 10 | | | |
| <p>4. integer solution(s) for x: _____</p> | <table border="1" style="width: 100%; height: 100%; border-collapse: collapse;"> <tr><td style="width: 15px; text-align: center;">10</td><td style="width: 25px;"></td></tr> </table> | 10 | |
| 10 | | | |
| <p>5. $x =$ _____ $y =$ _____</p> | <table border="1" style="width: 100%; height: 100%; border-collapse: collapse;"> <tr><td style="width: 15px; text-align: center;">10</td><td style="width: 25px;"></td></tr> </table> | 10 | |
| 10 | | | |
| <p>6. least expensive game costs _____ US Dollars</p> | <table border="1" style="width: 100%; height: 100%; border-collapse: collapse;"> <tr><td style="width: 15px; text-align: center;">10</td><td style="width: 25px;"></td></tr> </table> | 10 | |
| 10 | | | |
| <p>7. R changes by _____ ohms</p> | <table border="1" style="width: 100%; height: 100%; border-collapse: collapse;"> <tr><td style="width: 15px; text-align: center;">10</td><td style="width: 25px;"></td></tr> </table> | 10 | |
| 10 | | | |
| <p>8. top of tower is _____ feet above the ground</p> | <table border="1" style="width: 100%; height: 100%; border-collapse: collapse;"> <tr><td style="width: 15px; text-align: center;">10</td><td style="width: 25px;"></td></tr> </table> | 10 | |
| 10 | | | |
| <p>9. $a =$ _____</p> | <table border="1" style="width: 100%; height: 100%; border-collapse: collapse;"> <tr><td style="width: 15px; text-align: center;">10</td><td style="width: 25px;"></td></tr> </table> | 10 | |
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| <p>10. $a =$ _____ $b =$ _____</p> | <table border="1" style="width: 100%; height: 100%; border-collapse: collapse;"> <tr><td style="width: 15px; text-align: center;">10</td><td style="width: 25px;"></td></tr> </table> | 10 | |
| 10 | | | |

TOTAL SCORE