

MTH 110
Exam 1
Summer 2009

Show all work in a neat and organized fashion. Clearly indicate your answers.
100 points possible.

No calculators on this page.

1. Perform the indicated operation.

(a) (1 pt.) $(-3)(-8)$

(b) (1 pt.) -4^2

(c) (1 pt.) $\frac{2}{0}$

(d) (1 pt.) $\frac{0}{3}$

(e) (1 pt.) $\frac{1}{4} + \frac{2}{5}$

(f) (1 pt.) $\frac{1}{4} \cdot \frac{2}{5}$

(g) (2 pts.) $4\frac{1}{3} \div 3\frac{1}{5}$

(h) (2 pts.) $3\frac{1}{4} - 2\frac{4}{5}$

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The following formulas may or may not be useful.

$$A = P(1 + r)^t$$

$$A = P \left(1 + \frac{r}{n} \right)^{nt}$$

Don't forget to submit the take home Excel problem by Tuesday! (15 pts.)

2. (5 pts.) Identify an apparent pattern in the sequence of numbers. Use this pattern to find the next few numbers.

3 7 11 15 19 _____ _____ _____ _____ 39

3. (5 pts.) Identify an apparent pattern in the sequence of numbers. Use this pattern to find the next few numbers.

3 5 9 15 23 _____ _____ _____ _____ 93

4. (5 pts.) Fill in the blanks with the numbers that complete the sequence. Suggestion: Look at the *third* differences.

4 9 17 30 _____ _____ 119

5. (5 pts.) (a) Choose a number and carry out the procedure described below.

(b) Repeat with a different number of your choice.

(c) Write a conjecture that relates the result of the procedure to the original number selected.

(d) Represent your original number by the variable n and carry out the procedure on n to prove your conjecture.

Procedure: Select a number. Add 10. Multiply by 4. Add 8. Divide by 4. Subtract the original selected number.

6. (5 pts.) Expand $(a - b)^6$.

7. (5 pts.) (Canoe problem for 28 People, 14 on each side.)

There are 28 people fishing from a very long but very narrow “canoe.” The seats in the canoe are just wide enough for one person to sit on, and the center seat is empty. The 14 people in the front of the canoe want to change seats and sit in the back of the canoe, and the 14 people in the back of the canoe want to sit in the front. Because the canoe is so narrow, only one person may move at a time. A person changing seats may move to the next empty seat, or step over one other person to reach an empty seat. Any other move will capsize the canoe.

What is the minimum number of moves needed to exchange the people in the front with those in the back? What is the sequence of moves which does it?

8. (5 pts.) Convert the base ten numeral to a numeral in the given base.

539 to base four

9. (5 pts.) Convert the base ten numeral to a numeral in the given base.

1199 to base three

12. (5 pts.) To determine the number of bass in a lake, wildlife biologists tagged 56 bass and released them into the lake. Later they netted 78 bass and found that 23 of them were tagged. Use this information to predict how many bass are in the lake.

13. (5 pts.) 16% of what number is 969.36?

14. (10 pts.) Use the 2005 marginal tax rates in the accompanying table to calculate the income tax owed by this taxpayer.

Unmarried head of household with two dependent children

Gross income: \$68,000

Adjustments: \$1,500

Deductions:

\$6,000 mortgage interest

\$2,500 property taxes

Tax credit: \$1,700

15. (5 pts.) The principal represents an amount of money deposited in a savings account subject to compound interest at the given rate.

Principal	Rate	Compounded	Time
\$20,500	4.8%	monthly	5 years

(a) Find how much money there will be in the account after the given number of years.

(b) Find the interest earned.

Optional Bonus Problem 1. Expand $(r - 3b)^5$.

Optional Bonus Problem 2. Convert the binary numeral

$1\ 110\ 101\ 011_{\text{two}}$

to a Mayan numeral.