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Mathematics for Elementary School Teachers
Math 320
Final Exam
May 9, 2000

The point value of each problem is given in the margin. You must show your work to receive full credit.

(15) 1. Identify each of the following sequences as arithmetic, geometric, or neither, and find the next two terms in each sequence.

(a) $9, 11, 13, 15, 17, 19, \ldots$

(b) $\frac{1}{4}, 1, 4, 16, 32, \ldots$

(c) $1, 2, 7, 16, 29, 46, \ldots$

(12) 2. (a) Calculate the sum

$$2 + 4 + 6 + \cdots + 202$$

(b) If the tenth term in an arithmetic sequence is 210 and the fifteenth term is 275, find the twentieth term.

(12) 3. Circle T for True and F for False:

T F (a) If $3 \mid a$ and $6 \mid a$ then $18 \mid a$.

T F (b) If $b \mid a$ and $b \mid c$, then $b \mid a - c$.

T F (c) If $27 \mid b$ and $4 \mid b$ then $108 \mid b$.

T F (d) $(12)_3 = (10)_5$.

T F (e) If $21 \mid a$ and $21 \nmid b$ then $21 \nmid (a+b)$.

(12) 4. (i) Find all digits n such that $724, n13$ is divisible by:

(a) 3.

(b) 9.

(ii) Find all digits n such that $57,729,764,n88$ is divisible by:

(a) 11.

(b) 88.

(10) 5. (a) Complete the following magic square; that is, complete the square so that the sum in each row, each column, and each diagonal is the same.

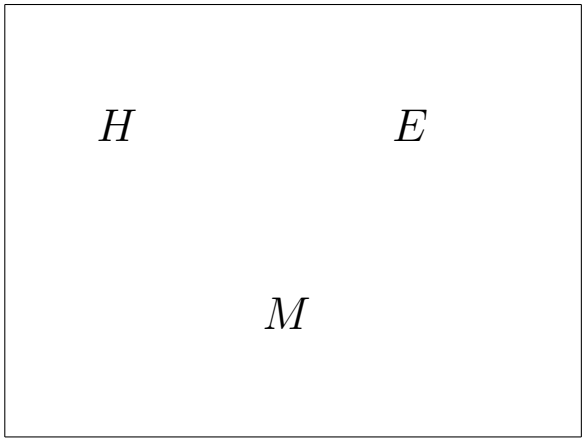
		6
4	3	8

(b) Sally has 4 different blouses, 6 different skirts, and 3 different hats. How many different outfits can she choose?

(10) 6. According to a student survey, 16 students liked history, 19 liked English, 18 liked mathematics, 8 liked math and English, 5 liked history and English, 7 liked history and math, 3 liked all three subjects, and every student liked at least one of the subjects.

Let E = English, M = Mathematics, H = History.

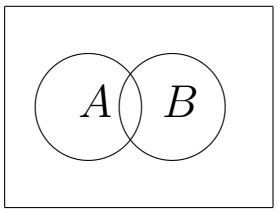
(a) Illustrate the information on a Venn Diagram by writing the appropriate number in the various regions.



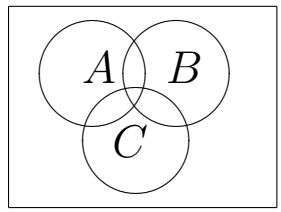
(b) How many students liked English and math but not history?

(10) 7. Shade the following regions in the Venn Diagrams below:

(a) $A \cap \overline{B}$



(b) $A \cap (B \cup C)$



(12) 8. (a) Use the Euclidean Algorithm to find

$$GCD(840, 3432)$$

(b) Find the $LCM(42, 24)$

(12) 9. Circle T for true and F for false.

T F (a) Let m/n be a reduced proper fraction, such that $5 \nmid n$ and $2 \nmid n$. Then m/n has a periodic decimal expansion.

T F (b) If m/q_1 is a reduced fraction with decimal expansion period of Q_1 and m/q_2 is a reduced fraction with decimal expansion period Q_2 and q_1 and q_2 are distinct primes, then the decimal expansion period of the reduced fraction m/q_1q_2 is $LCM(Q_1, Q_2)$.

T F (c) If m/n is a reduced fraction with delay 3 and period 2, then m/n is equal to a fraction with denominator 99900.

(12) 10. Determine:

(a) $15,6391,488 \mod 10$

(b) $7,963,151 \mod 2$

(c) The remainder for $7^{98} \div 13$

(9) 11. Convert the following decimals into fractions.

(a) $.26\overline{31}$

(b) $.2631$

(c) $.\overline{2631}$

(9) 12. Convert the following fractions into decimals.

(a) $2\frac{2}{8}$

(b) $\frac{5}{7}$

(c) $\frac{11}{90}$

(10) 13. (a) Arrange each of the following fractions in decreasing order:

$$\frac{9}{15}, \frac{9}{32}, \frac{9}{7} .$$

(b) Find a rational number between:

$$\frac{8}{11} \quad \text{and} \quad \frac{9}{11} .$$

(10) 14. Compute

(a) $\frac{5}{12} - \frac{23}{24}$.

(b) $\frac{5}{6} + 2\frac{1}{8}$.

(10) 15. (a) State the fundamental theorem of arithmetic.

(b) Find the prime factorization of 180.

(10) 16. (a) A coat is on sale for \$330. What is the original price of the coat if the discount was $\frac{2}{5}$ the original price?

(b) Five eights of the students at Salem State College live in dormitories. If 6,000 students at the College live in dormitories, how many students are there in College?

(12) 17. If $f(x) = 3x + 1$ and $g(x) = 2x - 4$ with $x \in \mathbb{R}$, find:

(a) $(g \circ f)(x)$

(b) $(f \circ g)(x)$

(c) $(g \circ f)(2)$

(d) $(f \circ g)(2)$

(12) 18. Let $A = \{1, a, 3\}$, $B = \{c, 8\}$. Determine:

(a) $A \cup B$

(b) $A \cap B$

(c) $A \times B$