NEATLY PRINT NAME: ____________________________
STUDENT ID: ____________________
DATE: ____________________

"On my honor, as an Aggie, I have neither given nor received unauthorized aid on this academic work."

______________________________
Signature of student

Academic Integrity Task Force, 2004

My signature in this blank allows my instructor to pass back my graded exam in class or allows me to pick up my graded exam in class on the day the exams are returned. If I do not sign the blank or if I am absent from class on the day the exams are returned, I know I must show my Texas A&M student ID during my instructor’s office hours to pick up my exam.

Signature of student ____________________________

Write all solutions in the space provided as full credit will not be given without complete, correct accompanying work, even if the final answer is correct. Use techniques taught in class to solve; do not use brute force (do not use “list by exhaustion” unless that is the only way to solve the problem). Fully simplify all your answers, and give exact answers unless otherwise stated. Make sure that you indicate your answer clearly by circling your response.

ALL CELL PHONES MUST BE TURNED OFF AND PLACED IN YOUR BACKPACK!

MATH JOKE: How do they prove that all odd integers higher than 2 are prime?

Mathematician: 3 is a prime, 5 is a prime, 7 is a prime, and by induction - every odd integer higher than 2 is a prime.
Physicist: 3 is a prime, 5 is a prime, 7 is a prime, 9 is an experimental error, 11 is a prime,...
Programmer: 3 is a prime, 5 is a prime, 7 is a prime, 7 is a prime, 7 is a prime, 7 is a prime,...
Salesperson: 3 is a prime, 5 is a prime, 7 is a prime, 9 -- we'll do for you the best we can,...
Computer Software Salesperson: 3 is prime, 5 is prime, 7 is prime, 9 will be prime in the next release,...
Biologist: 3 is a prime, 5 is a prime, 7 is a prime, 9 -- results have not arrived yet,...
Lawyer: 3 is a prime, 5 is a prime, 7 is a prime, 9 -- there is not enough evidence to prove that it is not a prime,...
Accountant: 3 is prime, 5 is prime, 7 is prime, 9 is prime, deducing 10% tax and 5% other obligations.
Statistician: Let's try several randomly chosen numbers: 17 is a prime, 23 is a prime, 11 is a prime...
Professor: 3 is prime, 5 is prime, 7 is prime, and the rest are left as an exercise for the student.
Computational linguist: 3 is an odd prime, 5 is an odd prime, 7 is an odd prime, 9 is an odd prime, 9 is a very odd prime,...
Psychologist: 3 is a prime, 5 is a prime, 7 is a prime, 9 is a prime but tries to suppress it,...

(10 pts: 1 pt for each TF) On problems 1 through 10, circle either “True” or “False.”

1. True or False: Rational numbers have the following addition properties: closure, commutative, associative, additive identity, and additive inverse.

2. True or False: $4 \oplus (8 \otimes 3) \equiv 3 \mod 5$

3. True or False: Of the positive integers, only perfect squares have an odd number of positive divisors.

4. True or False: Each composite number can be written as a product of primes in one, and only one, way except for the order of the prime factors in the product.

5. True or False: If $3 \mid (a+b)$ and $3 \mid c$, then $3 \mid (a+b-c)$ for all integers $a$, $b$, and $c$.

6. True or False: Using the Fundamental Counting Principle, if $p$ and $q$ are distinct prime numbers, then $(p^2q)^{10}$ has exactly 200 positive divisors.

7. True or False: $\frac{20}{317} < \frac{57}{440} < \frac{37}{123}$

8. True or False: If $b \mid a$, then $(b+c) \mid (a+c)$ for all nonzero integers $a$, $b$, and $c$.

9. True or False: Any positive integer with two distinct positive divisors is a prime number.

10. True or False: The number $\frac{153}{2^4 \cdot 3 \cdot 5^2 \cdot 17}$ can be represented as a terminating decimal.

Short Answer #11 – 21 (11 pts – 1 pt each): No work is needed for full credit.

11. ___________________________ What is the smallest composite number greater than 56?

12. ___________________________ Give an example of two 3-digit composite numbers that are relatively prime.

13. ___________________________ What is the greatest prime needed to test whether or not 391 is prime?

14. ___________________________ Give an example of a real number fraction that is not a rational number.

15. ___________________________ Convert 1234.567 to scientific notation.

16. ___________________________ Give an example of a proper fraction that is a rational number.

17. ___________________________ Write 56.789 in expanded fraction form (fractional meaning).

18. ___________________________ Using circle sectors model $\frac{3}{4}$.

19. ___________________________ Convert $23.45 \times 10^{-4}$ into a standard numeral.
20. ________________________ What is the multiplicative inverse of $-5\frac{6}{7}$?

21. ________________________________ Use the Fundamental Law of Fractions to show $\frac{3}{-5} = -\frac{3}{5}$.

22. (4 pts) Prime factor $141^8 - 141^7$. Leave your answer as a product of primes raised to some power.

23. (4 pts) Use the Intersection-of-Sets Method to find the greatest common divisor of 6 and 15.

24. (4 pts) Use the divisibility rules and then circle all numbers that evenly divide 100,989,900.

3  4  5  6  8  9  10  11

25. (7 pts) Use the Euclidean algorithm and theorem to find the $lcm(165, 105)$. 
26. (3 pts) If $a < \sqrt{19}$, what is the largest value of $a$, such that $a$ is rounded to the nearest tenth.

27. (5 pts) Use division by primes to find the $lcm(6, 28, 18)$.

28. (5 pts) Model and calculate the product: $\left(\frac{1}{2}\right)\left(\frac{2}{3}\right)$.

29. (5 pts) Using base-ten blocks, with a flat representing ten, model and calculate $24.5 + 15.7$. 
30. (5 pts) Write in simplest form \( \frac{2^{103} - \left(2^{26}\right)^4}{\left(-\frac{1}{4}\right)^{-50} + 8^{34}} \).

31. (5 pts) Model and calculate the quotient: \( \frac{1}{2} + \frac{3}{5} \).

32. (4 pts) Use labeled colored rods to model and find the \( \text{gcd}(6, 10) \).

33. (7 pts) Correctly and properly write the number 45.123 in words.
34. (5 pts) Explain to a student why $\frac{0}{0}$ is undefined.

35. (5 pts) Convert $2.\overline{109}$ to a ratio of integers and reduce to lowest terms.

36. (6 pts) \[ \frac{\sqrt[4]{16v^8w^4}}{\sqrt[3]{-64x^9y^{12}}} = \]

37. (5 pts) Prove $\frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd}$ where $b, d \neq 0$.

**5-point Bonus:** Find the 7th term of a geometric sequence in which the 2nd term is 6 and the 5th term is 48.