"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.

“There are only 10 types of people in the world — those who understand binary, and those who don't.”
(10 pts: 1 pt for each TF) On problems 1 through 10, circle either “True” or “False.”

1. True or False: “Young people use smart phones” is logically equivalent to “Old people do not use smart phone”.
2. True or False: $< \sqrt{\sqrt[3]{612}}$ in Babylonian represents the numeral 612.
3. True or False: There are 24 distinct one-to-one correspondences between \{3, 4, 5, 6\} and \{w, x, y, z\}.
4. True or False: $\emptyset$ is a subset of every set.
5. True or False: “TAMU is a fantastic university” is a true statement.
6. True or False: Finite set $A$ has $2^{n(A)} - 2$ nonempty proper subsets.
7. True or False: $\cap || |$ in Egyptian represents the numeral 13.
8. True or False: $3 \subset \mathbb{N} \times \mathbb{N}$, where $\mathbb{N}$ is the set of natural numbers.
9. True or False: If $D$ is the set of odd whole numbers and $\mathbb{N}$ is the set of natural numbers, then $D \sim \mathbb{N}$.
10. True or False: Place value assigns a value to a digit depending upon its placement in a numeral.

11. Indicate, by name, in which step of Poyla’s Four-Step Problem Solving Process each of the following belong.
   a. (2 pts): Check each step of the plan as you proceed
   b. (2 pts): Determine if there is another method for finding the solution
   c. (2 pts): What are you trying to do or find

12. (4 pts) What is the inverse of “You are an Aggie, if you are a student at TAMU.”

13. (7 pts) Use Gauss’s method to find the sum: $9 + 15 + 21 + \ldots + 129$. 
14. (2 pts) Provide a counterexample, with a short explanation, to the statement, “There is no \( x \) such that \( 2x \leq x+5 \) and all whole numbers are positive.”

15. (8 pts)
   a. Give an example showing that whole number subtraction is not closed.

   b. What whole number property justifies \( 0 + 3 = 3 + 0 = 3 \)? ___________________________

   c. What whole number property justifies \( (4 + 6) + 7 = 4 + (6 + 7) \)? __________________________

   d. What justifies \( 204 = 2 \cdot 10^2 + 0 \cdot 10^1 + 4 \cdot 10^0 \)? ___________________________

16. (5 pts) Negate the statement, “Some students do not understand exponents or no rocks are alive.”

17. (5 pts) Complete the following truth table.

   \[
   \begin{array}{ccccccc}
   p & q & p \land q & \neg p & (p \land q) \rightarrow \neg p \\
   \hline
   1 & 1 & 1 & 0 & \ false \\
   1 & 0 & 0 & 1 & \ true \\
   0 & 1 & 0 & 1 & \ true \\
   0 & 0 & 0 & 1 & \ true \\
   \end{array}
   \]

5-point Bonus: Draw the next figure in the sequence.

18. (4 pts) Write the numeral 377 in Mayan.
19. (5 pts) Use the set model to illustrate $1 + 2$.

20. (6 pts) Give the first four terms of the Fibonacci sequence and give its general rule, along with the restrictions on $n$.

\[
\begin{align*}
a_1 &= a_1 \\
a_2 &= a_2 \\
a_3 &= a_3 \\
a_4 &= a_4 \\
a_n &= a_n
\end{align*}
\]

21. (4 pts) $2106_{\text{eight}} - 754_{\text{eight}} =$

22. (4 pts) Convert $1023_{\text{four}}$ to Roman numerals.
23. (4 pts) Use set notation to describe the shaded portion of the Venn diagram.

![Venn Diagram](image)

24. (4 pts) A student claims if \( A \cap B = A \cap C \), then \( B = C \). What is your response?

25. (5 pts) Use the lattice addition to find the sum: 379 + 862.

26. (5 pts) Find the sum, as well as model with Base-Three Blocks: \( 12_{\text{three}} + 21_{\text{three}} \).

27. (3 pts) If \( q \rightarrow r \) and \( q \leftarrow p \), then what is true by the chain rule?

28. (5 pts) Using the “less than” set definition, prove that \( 2 < 3 \).

29. (4 pts) Rewrite “If \( y = mx + b \), then \( b = y - mx \), and if \( b = y - mx \), then \( y = mx + b \)” as a biconditional statement.