

**MATH 6
FALL REVIEW**

1. Simplify $\frac{8^2}{4^3}$
2. Simplify $2 \cdot 2^2 \cdot 2^3 \cdot 2^4$
3. Write the truth table for each of the following formulas. Are they equivalent?
 - (a) $A \implies B$
 - (b) $(\text{NOT } A) \text{ OR } B$.
4. Write the truth tables for NAND and XOR.
5. Prove that $\text{NOT}(A \text{ OR } B)$ is equivalent to $(\text{NOT } A) \text{ AND } (\text{NOT } B)$
6. Prove that $(A \cap B) \subset (A \cup B)$
7. Prove that if $A \subset B$ and $B \subset A$, then $A = B$
8. Find the sets A and B if you know that all conditions are met:
 - (a) $A \cup B = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$
 - (b) $A \cap B = \{4, 6, 9\}$
 - (c) $A \cup \{3, 4, 5\} = \{1, 3, 4, 5, 6, 8, 9\}$
 - (d) $B \cup \{2, 4, 8\} = \{2, 4, 5, 6, 7, 8, 9\}$
9. In a room of 20 people, some of them know French and some of them know German. Suppose that an even number of people know French and an even number of people know German, but an odd number of people know both French and German. Prove that there must be at least one person in the room who knows neither language.
10. What is the formula for permutations and combinations? What is $P(10,10)$, $C(6,2)$? How about $C(6,4)$?
11. In how many ways can you arrange the letters in the word LALALAND?
12. I flip a coin five times. What is the probability I will get more tails than heads? What if I flip the coin six times?
13. On New Year you make a resolution: you put 1 cent into an account, the next day 2 cents, 3 cents the next and so on. How much money will you have at the end of the year?
14. The 20th term of an arithmetic sequence is 20 and the 24th term is 44. What is the 22th term?
15. Given the arithmetic sequences 1, 4, 7, ... and 10, 11, 12, ... , if I sum the first ten terms of each sequence, which sum will be larger?
16. (Bonus Problem) (Has been moved to other problem sheet, uploaded alongside this one)