MATH 7: HANDOUT 1

Review & Warm-Up Problems

Homework

1. (**Knights and Knaves**) On an island of knights (always tell the truth) and knaves (always lie), you meet Al and Bea. Al says: "Bea is a knave." Bea says: "Al and I are different types." Determine who is a knight and who is a knave.
2. (**InclusionExclusion**) In a class of 30 students, 14 take Biology, 12 take Chemistry, 10 take Physics, 5 take both Biology and Chemistry, 4 take both Biology and Physics, 3 take both Chemistry and Physics, and 2 take all three. How many students take none of these three sciences?
3. (**Sets in Words**) Let

   $A = \{\text{students who play a sport}\}, \quad B = \{\text{students who play a musical instrument}\}, \quad C = \{\text{students who volunteer}\}.$

   Describe in words each set:

   (a) $A \cap (B \cup C)$
   (b) $(A^c \cap B) \cup C$
   (c) $(A \cup B) \cap C^c$
   (d) $(A \cap B) \cup (B \cap C)$
4. (**Algebra**) Solve for x:
$$2x^2 - (x-3)(2x+1) + 5x - 12 = 0.$$
5. (**Absolute Value**) Solve for x:
$$|4x - 9| = 7.$$
6. (**Counting**) In how many distinct ways can the letters of the word `ALGEBRA` be arranged?
7. (**Probability**) From a standard 52-card deck, two cards are drawn at random *without* replacement. What is the probability that both cards are face cards (J, Q, or K)?
8. (**Exponent Rules**) Simplify completely:
$$\frac{(a^{-2}b^3)^2 \cdot a^5 b^{-1}}{a^3 b^4}.$$
9. (**Linear & Absolute Value Graphs**) Sketch (by hand) the graphs of the following on the same coordinate axes and label intercepts clearly:

   (a) $3x - 2y = 6$
   (b) $y = -x + 4$
   (c) $y = |x - 2| - 3$
10. (**Coordinate Geometry**) Point P has coordinates $(-2, 5)$.

    (a) Find the coordinates of P' obtained by reflecting P across the y-axis.
    (b) Find the coordinates of P'' obtained by rotating P by 90° counterclockwise about the origin.
    (c) Find the coordinates of $P^{(d)}$ obtained by reflecting P across the line $y = x$.
11. (**Systems**) Solve the system:
$$\begin{cases} 2x + 3y = 11, \\ x - 2y = -1. \end{cases}$$