Name:

Group 1

Result:

1. (1 point) Let $X = \{1, 2, 3, 4, 5\}$ and $Y = \{2, 3, 4\}$. Select all true statements:

   A. $Y \in X$ B. $Y \subset X$ C. $X \cap Y = Y$ D. $X \cup Y = X$

2. (1 point) In a group of 12 students, 5 have blond hair and 4 have blue eyes. 6 students have neither blond hair nor blue eyes. How many students have both blond hair and blue eyes?

   A. 1   B. 2   C. 3   4

3. (1 point) $2^{\frac{3}{2}} =$

   A. $2\sqrt{2}$ B. $\left(\dfrac{1}{8}\right)^{-\frac{1}{2}}$ C. $\sqrt{50} - \sqrt{18}$ D. $(\sqrt[3]{4})^2$

4. (1 point) Let $U = \mathbb{R}$, $X =]-\infty, 2]$ and $Y =]-2, 2[$. Which of the following statements are true? Select all that apply.

   A. $Y - X = \emptyset$ B. $X - Y =]-\infty, -2]$

   C. $X - Y =]-\infty, -2[$ D. $X' =]2, \infty[$

5. (1 point) How many prime numbers satisfy the inequality $16 - 3x > 1 - x$?

   A. 3   B. 4   C. 5   D. infinitely many

6. (2 points) Prove that the number $2^{100} + 5 \times 2^{99}$ is divisible by 14.

7. (3 points) Consider the following statement:

   If x is an irrational number, then $\dfrac{1}{x}$ is also an irrational number.

   State if it is true or false. If it's true prove it and if it is false give a counterexample.

8. (3 points) Find the set of values of x that satisfy the following system of inequalities:

$$\begin{cases} 2x - 1 > 3x - 5 \\ \\ \dfrac{x-4}{2} - x \leqslant \dfrac{x-1}{3} \end{cases}$$

Represent the solution on the number line.

9. (2 points) Write the following in the form 2^k where $k \in \mathbb{Q}$

$$\frac{\sqrt{8} \times \frac{1}{16} \times \sqrt[3]{2}}{(2\sqrt{2})^3 \times 32}$$

10. (5 points) There are 49 mice in a pet shop.
    30 mice are white.
    27 mice are male.
    8 mice are white and have short tails.
    11 mice are male and have short tails.
    7 mice are male but neither white nor short-tailed.
    5 mice have all three characteristics and
    2 have none.

    (a) Draw a Venn diagram to represent the above information. Let W be
        the set of white mice, M male mice and S short-tailed mice.

    (b) How many mice
          i. are not white?
         ii. are white and have short tails but are not male?
        iii. have short tails?

    (c) What type of mice belong to the set $(W \cup S)' \cap M$?