Name:
Group 2
Result:

1. (1 point) Let $X = \{1, 2, 3, 4, 5\}$ and $Y = \{4, 5, 6, 7\}$. Select all true statements:

   A. $4 \in X \cap Y$ B. $4 \in X - Y$ C. $4 \in Y - X$ D. $4 \in X \cup Y$

2. (1 point) In a group of 20 students, 7 have blond hair and 8 have blue eyes. 8 students have neither blond hair nor blue eyes. How many students have blond hair but do **not** have blue eyes?

   A. 3 B. 4 C. 6 7

3. (1 point) $\left(\frac{1}{12}\right)^{-\frac{1}{2}} =$ (select all that apply)

   A. $\sqrt{12}$ B. $\sqrt{18} - \sqrt{6}$ C. $\sqrt{75} - \sqrt{27}$ D. $\frac{\sqrt{6}}{\sqrt{2}}$

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

   A. $X \cap Y = \emptyset$ B. $X - Y = X$

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

5. (1 point) How many **positive integers** satisfy the inequality $15 - 5x > 1 - 2x$?

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

6. (2 points) Prove that the number $2^{999} + 2^{996}$ is divisible by 18.

7. (3 points) Prove that $\sqrt{6}$ is an irrational number.

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

$$\begin{cases} \dfrac{7-2x}{3} > x-1 \\ \dfrac{x-4}{2} - x \leqslant \dfrac{x-2}{4} \end{cases}$$

Represent the solution on the number line and list all integers that satisfy both inequalities.

9. (2 points) Write the following in the form 3^k where $k \in \mathbb{Q}$

$$\frac{\sqrt{3} \times \frac{1}{3} \times 27^2}{(3\sqrt[3]{3})^4}$$

10. (5 points) There are 30 students in a year. Let F be the set of students who take Further Mathematics class, M the set of students who take the Mathematics class and P the set of students who take Physics class.

    Every student who takes Further Mathematics also takes Mathematics.
    3 students take Further Mathematics and Physics.
    3 students who take Further Mathematics do not take Physics.
    9 students in total take both Mathematics and Physics.
    13 students take Physics.
    22 students take Mathematics.

    (a) Draw a Venn diagram to represent the above information.

    (b) How many students:
        i. do not take Further Mathematics?
        ii. take Physics only?
        iii. do not take any of the three mentioned subjects?

    (c) On your diagram shade the region corresponding to the set $M \cap (F \cup P)'$.