QUESTION 1

Given the line with equation $y - (-5) = \frac{1}{4}(x - 7)$, let

$$
\begin{aligned}
A &= \text{the slope of the line} \\
B &= \text{the slope of a line perpendicular to this line} \\
C &= \text{the value of } C \text{ when the line is written in standard form } (Ax + By = C) \\
D &= \text{the slope of a line parallel to this line}
\end{aligned}
$$

Find $\dfrac{AC}{B} + D$.

QUESTION 2

The statements below are either true or false. Add the value of the statements that are true and state your answer as a simplified fraction:

    (2)   the function $3y + 7x = 172$ is a linear function

    (5)   the function $y^2 + 4x - 3 = 5$ is a quadratic

    (49)   the degree of the polynomial $57x^3y^2x + 3z^5y^4x + 14x^3y$ is 10

   (-36) the slope of the line perpendicular to $8x - 7y = 49$ is $\dfrac{-7}{8}$

   $(\dfrac{3}{4})$ the sum of the first 10 prime numbers larger than -2 is 129

QUESTION 3

Let:

$$
\begin{aligned}
A &= \text{the greatest common factor of 567 and 1080} \\
B &= \text{the greatest common factor of } 12x^5y^2z^2 \text{ and } 16z^3y \text{ if } x,\ y, \text{ and } z \text{ are distinct numbers} \\
C &= \text{the least common multiple of 120 and 245} \\
D &= \text{the sum of the coefficients of the terms in the least common multiple } x^2 + 5x + 6 \text{ and } 5x^2 + 10x
\end{aligned}
$$

Find $AB + \dfrac{C}{D}$.

QUESTION 4

Let:

$$4A + 18 = 34$$

$$\frac{4B}{3} = \frac{216}{18}$$

$$2C^3 = 250$$

$$(D-6)(D-2) = -4$$

Find $A + B + C + D$.

QUESTION 5

Jasmine has only four different colors of clothing in her closet: navy blue, gray, black, and white. Of the 50 pieces of clothing she owns, 22 of them are navy blue, 13 of them are gray, 10 of them are black, and 5 of them are white. Her clothes are arranged in no particular order.

$$
\begin{aligned}
A &= \text{the probability that she chooses a navy blue piece of clothing} \\
B &= \text{the probability that she chooses a gray piece of clothing} \\
C &= \text{the probability that she chooses a white or black piece of clothing} \\
D &= \text{the probability that she does not choose a white piece of clothing}
\end{aligned}
$$

Find $(A \times D) + (B \times C)$ in simplest form.

QUESTION 6

The following table has the number owned by each student:

Student	Video Games
Kyle	68
Rida	12
Shardul	9
Meit	45
Aditya	23
Roehl	17

Let:

$$
\begin{aligned}
A &= \text{the median of the number of video games each student owns} \\
B &= \text{the geometric mean of Shardul and Meit's video games} \\
C &= \text{the arithmetic mean of the number of video games each student owns} \\
D &= \text{the number of video games Kyle needs to add to his collection in order to increase the mean by 7}
\end{aligned}
$$

Find $A - B - C + D$.

QUESTION 7

The expression $\dfrac{4x - x^3}{x^4 - 3x^3 + 2x^2}$ can be simplified into the form $\dfrac{Ax - 2}{-Bx^2 + Cx}$ such that A, B, and C are all negative integers.

Find $A - B + C$.

QUESTION 8

Rida was debating whether or not she should go to a frozen yogurt shop or an ice cream shop. Since the decision was too difficult, she decided to go to both. The frozen yogurt shop is located at the coordinates (10, -4) while the ice cream shop is located at the coordinates (-6, 8). If Rida is standing at (-6, -4), find:

$$A \ = \ \text{the shortest distance she would travel if she went to the frozen yogurt shop first}$$
$$B \ = \ \text{the shortest distance she would have to travel if she went to the ice cream shop first}$$
$$C \ = \ \text{the shortest distance she would travel if she went to the midpoint of the two shops}$$
$$D \ = \ \text{the area of the triangle with a vertex at each of the three points}(\textit{Hint: Plot the points})$$

Compute $A + B + C + D$.

QUESTION 9

Expand the following and simplify. Let the letter of each part be equal to the sum of the coefficients and the constant term.

$$A \quad : \quad (x+2)(x+3)$$
$$B \quad : \quad (5x+1)(7x-4)$$

Find the solutions to the following equations. Let each letter equal the sum of the absolute values of each solution.

$$C \quad : \quad x^2 + 2x - 15 = 0$$
$$D \quad : \quad x^2 - 16 = 0$$

Evaluate $\dfrac{AB}{C} + D$.

QUESTION 10
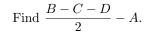
Help Rida and Jasmine learn more about their favorite fruits by finding the number of distinct ways of rearranging the following words:

$$A \quad : \quad PEAR$$
$$B \quad : \quad GRAPE$$
$$C \quad : \quad BANANA$$
$$D \quad : \quad PINEAPPLE$$

Find $A + B + C + D$.

QUESTION 11

Given the functions $f(x) = 2x^2 + 3$, $g(x) = x^3 + 5x + 4$, and $h(x) = \dfrac{3x}{2} + 9$, solve the following:

$$
\begin{aligned}
A &= f(3) \\
B &= f(g(1)) \\
C &= g(h(-4)) + h(g(2)) \\
D &= f(h(g(-1)))
\end{aligned}
$$

Find $\dfrac{B - C - D}{2} - A$.

QUESTION 12

Aditya can finish writing a MAO test in 6 hours while Shardul can finish writing a MAO test in 8 hours. They can work together and write the test for 3 hours until Shardul decides to leave. Let A be how many more hours Aditya will take to finish the test (as a decimal to the nearest hundredth.)

It takes 245 minutes for five people to paint a house together. Let B equal the number of minutes it will take for fourteen people to paint a house together, assuming they all paint at the same rate (as a decimal.)

Find $A \times B$ as a decimal rounded to the nearest hundredth.

QUESTION 13

Kyle is traveling on the path $7x+5y = 25$ to go to play tennis with Mr. Cullen. Meit is traveling on the path $14x-6y = 82$ to go buy popcorn from the supermarket. Roehl is traveling on the path $5x - 3y = 7$ to go to the pet store to buy a unicorn fish.

A = the sum of the x and y coordinates of the intersection of Kyle and Meit's paths
B = the absolute value of the difference between the x and y coordinates of the intersection of Meit and Roehl's paths
C = the slope of Kyle's path
D = the x coordinate of the x-intercept of Roehl's path

Find $\dfrac{C}{D} + (A - B)^2$.

QUESTION 14

Let:

$$
\begin{aligned}
A &= \text{the area (in square inches) of a rectangle with a length of 12 inches and a width of 2.5 yards} \\
B &= \text{the area (in square miles) of a circle with a diameter of 21,120 feet (5280 ft per mile)} \\
C &= \text{the volume (in cubic decimeters) of a cube with side lengths of 800 millimeters} \\
D &= \text{the surface area (in square centimeters) of a rectangular prism with a height of 0.04 meters, a width of 0.5} \\
  &\quad \text{decimeters, and a length that is two times the width}
\end{aligned}
$$

Find $\dfrac{C\pi}{B} + A + D$.