How many ways are there to rearrange all the letters in REEFSURFERS? ______

A) \( \frac{3! \cdot 2! \cdot 1!}{11!} \)  
B) \( \frac{11!}{3! \cdot 3! \cdot 2! \cdot 2!} \)  
C) \( 1 \cdot 1 \cdot 1 \cdot 1 \)  
D) \( P(11,11) \)  
E) \( P(11,(3,3,2,2,1)) \)  
F) \( \frac{11!}{(3! \cdot 2! \cdot 2!)} \)  
G) \( C(11,3) + C(8,3) + C(5,2) + C(3,2) + C(1,1) \)  
H) \( C(11,3) \cdot C(11,3) \cdot C(11,2) \cdot C(11,2) \cdot C(11,1) \)  
I) \( P(11,3) \cdot P(8,3) \cdot P(5,2) \cdot P(3,2) \cdot P(1,1) \)  

In a class of 36, there will always be a group of at least _____ who were born on the same day of the week?

A) \( C(36,2) \)  
B) 3  
C) 4  
D) 5  
E) 6  
F) 7  
G) \( C(36,7) \)  

In Craps, Eight the Hard Way bet wins if the Hard Eight (4-4) is rolled before a 7 is rolled or before an "easy" eight (2-6, 3-5, 5-3, 6-2) is rolled. All other dice combinations are not considered (you neither win nor lose if any other dice combination is rolled). So this is not a single-roll wager. The only dice combinations that are part of this bet (the set that comprises the Universe in this bet) are those that add up to 7 or 8.

What is the probability of rolling a Hard Eight before (versus) a 7 or an "easy" eight?

\[ P(X=\text{Hard Eight}) = \]  

If the payout for hitting a Hard Eight is 9-to-1 (for example, $1 bet pays $9 + the original $1 bet for a total of $10), the Expected Value of the amount of money you will win (your return) in terms of \( P(X=x) \) is

\[ E(X) = 10 \cdot P(X=\text{Hard Eight}) + 0 \cdot P(X = 7 \text{ or } \text{"easy" eight}) \]  

Now replace the \( P(X=x) \) values with their numeric probabilities keeping your answer in terms of fractions vs. decimals. Reduced fractions are preferred.

\[ E(X) = 10 \cdot \frac{\text{Probability}}{\text{Total Outcomes}} + 0 \cdot \frac{\text{Probability}}{\text{Total Outcomes}} = \]  

If your bet is $1 (costs you $1 to play), what is your expected return each time you make this kind of bet? Express your answer as a positive or negative reduced fraction.

\[ E(X) - 1 = \]  

An urn contains four red balls and six green balls. Three balls are drawn at random, without replacement.

a) What is the probability that all three balls are red? _____

A) \( P(4,3)/P(10,3) \)  
B) \( P(4,3)/P(10,6) \)  
C) \( C(4,3)/C(10,3) \)  
D) \( (C(4,3) - C(6,3))/C(10,3) \)  
E) \( C(6,3)/C(10,3) \)  
F) \( C(4,3)/C(10,6) \)  
G) \( 4!/10! \)  
H) \( 3!/10! \)  

b) What is the probability that one of the balls is red and two are green? Express your answer in terms of similar to the above - NO A-H letters or exact number like 42 - in terms of \( P \) or \( C \) or \( ! \) or …
Consider the following algorithm:

\[
x \leftarrow 1 \\
\text{for } i \in \{1, 2, 3\} \text{ do} \\
\quad \text{for } j \in \{1, 2, 3, 4\} \text{ do} \\
\quad \quad x \leftarrow x + x \\
\text{for } k \in \{1, 2, 3, 4, 5\} \text{ do} \\
\quad x \leftarrow x + 1 \\
\quad x \leftarrow x + 5
\]

Count the number of + operations done by this algorithm. ______

Consider the following algorithm:

```c
char alphabet[] = "ABCDEFGHIJKLMNOPQRSTUVWXYZ";
for ( int i = 0; i < n; ++i )
{
    for ( int j = 0; j < n; ++j )
    {
        cout << alphabet[i] << alphabet[j];
    }
}
```

How many characters are output in terms of \( n \)?

________ (in terms of \( n \))

Consider the following algorithm:

```c
for ( int i = 0; i < n - 1; ++i )
{
    for ( int j = i + 1; j < n; ++j )
    {
        if ( array[i] == array[j] )
        {
            ++numOfDuplicates;
        }
    }
}
```

How many "==" comparisons are made in terms of \( n \)?

___________ (give answer in terms of \( n \))

How many "==" comparisons are made if \( n \) is 8?

_________ (give an exact number answer)

_____ Father of Fortran
_____ Father of Lisp
_____ Father of Pascal
_____ Turing Award winner
_____ Father of Garbage Collection

A) John McCarthy  
B) John Backus  
C) Niklaus Wirth  
D) All of the above  
E) None of the above