Group Work:
Task 1: 
According to the information Please Almanac, 6% of the human population is blood type O-negative. A simple random sample of size 4 is obtained, and the number of people $X$ with blood type O-negative is recorded.

a) What is the random variable here?

b) What are the possible values for the random variable?

c) Can the random variable have a value of 5? Explain.

d) What is the probability that a person has O-negative blood? What is the complement of this and what does it mean in the context of this problem?

e) How many ways in the random sample of size 4 can we have a person with O-negative?
f) How many ways in the random sample of size 4 can we have 2 people with O-negative?


g) How many ways in the random sample of size 4 can we have 3 people with O-negative?


h) How many ways in the random sample of size 4 can we have 4 people with O-negative?

Task 2:
Let’s consider the various outcomes of this experiment by listing each outcome as O for those who are O-negative and N for those who are not O-negative.

a) For a random variable $x = 0$ we are implying that no one in the random sample of size 4 is O-negative.

$$P(x = 0) = P(NNNN) = P(N)P(N)P(N)P(N) = (0.94)(0.94)(0.94)(0.94)$$

Since we are assuming independence, we can simply multiply the probabilities of each outcome. Since all four members of sample are Not O-negative (.94) we multiply the corresponding probability.

b) For a random variable $x = 1$, we are implying that only one person in the random sample of size 4 is O-negative. How many ways can one person be selected from a sample size of 4?
c) Statistics students often will submit the probability of one person being selected as

\[ P(x = 1) = P(ONNN) = P(O)P(N)P(N)P(N) = (0.06)(0.94)(0.94)(0.94) \]

Explain what is wrong with this answer?

d) List all the possible outcomes for one person to have O-negative and include their corresponding probabilities, the first two are done for you.

\[ P(x = 1) = P(ONNN) + P(NONN) + \ldots + \ldots \]

\[ = (0.06)^1(0.94)^3 + \ldots + \ldots + \ldots \]

\[ = \ldots (0.06)^1(0.96)^3 \]

This final result is obtained by using the Binomial Probability Distribution Function. Notice that the first number is the number of ways we can obtain 1 O-negative in 4 trials of the experiment. The second term is the probability of an O-negative to the power of the number of O-negative people. The third term is the probability of being Non-O-negative to the power of the number of Non-O-negative people.

e) For a random variable \( X = 2 \), we are implying that only two people in the random sample of size 4 are O-negative. How many ways can two people be selected from a sample size of 4?

f) Statistics students often will submit the probability of two people being selected as

\[ P(x = 2) = P(OONN) = P(O)P(O)P(N)P(N) \]

Explain what is wrong with this answer?
g) List all the possible outcomes for two people to have O-negative and include their corresponding probabilities. Try to use the Binomial Probability Distribution function.

h) For a random variable $x = 3$, we are implying that only three people in the random sample of size 4 are O-negative. How many ways can three people be selected from a sample size of 4?

i) List all the possible outcomes for three people to have O-negative and include their corresponding probabilities. Try to use the Binomial Probability Distribution function.

j) For a random variable $x = 4$, we are implying that only four people in the random sample of size 4 are O-negative. How many ways can four people be selected from a sample size of 4?

k) List all the possible outcomes for four people to have O-negative and include their corresponding probabilities. Try to use the Binomial Probability Distribution function.
Task 3:
We can now use these results to obtain the probability distribution

<table>
<thead>
<tr>
<th>X</th>
<th>P(X)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

Enter these values into your calculator L1, L2, and use the 1 - Var Stats to determine the mean and standard deviation.

Mean = ________________

Standard deviation = ________________

In calculating the mean and standard deviation we use the following equations, where n is the number of trials (n = 4) and p is the probability of a successful event (p = .06).

\[ \mu_x = np = \________ \]

\[ \sigma_x = \sqrt{npq} = \________ \]

Task 4:
What if you need to find the probability that two or more people have O-negative? \( P( X \geq 2) \). Use the probability Distribution table above or use the Binomial Probability Distribution Equation for values of X great than 2.