1.

(a) To find k, we know that the sum of all probabilities in a PMF should equal 1. We have an infinite geometric series where the first term $a = k$ and the common ratio $r = (3/4)$, so the sum S of this series is $S = a / (1 - r) = 1$. Solving this equation, we get:

$$k / (1 - 3/4) = 1$$

$$k = 1 - 3/4 = 1/4$$

-1

(b) The cumulative distribution function (CDF) is the sum of the probabilities up to a certain value of x. So, for x = 1, 2, 3, ... we have:

$$F(x) = P(1) + P(2) + ... + P(x)$$

$$F(x) = k * [(3/4)^1 + (3/4)^2 + ... + (3/4)^x]$$

$$F(x) = k * [1 - (3/4)^x] / [1 - (3/4)]$$

$$F(x) = 1 - (3/4)^x$$

F(x) = { ...

-1

2.

We will use the z-score formula $z = (x - \mu) / \sigma$ to standardize each score, where x is the individual score, μ is the mean, and σ is the standard deviation.

(a) $z = (70 - 80.5) / 9.9 \approx -1.06$. Looking up this z-score in a standard normal distribution table or using software gives a cumulative probability of ≈ 0.1441.

(b) $z_1 = (75 - 80.5) / 9.9 \approx -0.56$ and $z_2 = (90 - 80.5) / 9.9 \approx 0.96$.
The proportion is $P(z_2) - P(z_1) \approx 0.8315 - 0.2877 \approx 0.5438$.

(c) $z = (90 - 80.5) / 9.9 \approx 0.96$.
The proportion with hypertension is $1 - P(z) \approx 1 - 0.8315 = 0.1685$.

(d) $z = (65 - 80.5) / 9.9 \approx -1.56$.
The proportion is $P(z) \approx 0.0594$, which is above 5%, so it's not considered unusual.

3.

(a) Using z-score, $z = 1.96$ for the heaviest 2.5%. The weight that determines the overweight classification is $\mu + z\sigma = 10 + 1.96 * 0.2 \approx 10.392\ lbs.$

(b) $z_1 = (9.8 - 10)\ /\ 0.2 = -1\ and\ z_2 = (10.4 - 10)\ /\ 0.2 = 2.$ The proportion lost is $P(z_2) - P(z_1) \approx 0.9772 - 0.1587 \approx 0.8185.$

-1

4.

(a) The sampling distribution of the mean is normally distributed with mean μ = 50 and standard error $\sigma = 6/sqrt(40) = 0.94868.$

(b) $z = (51 - 50)\ /\ (6/sqrt(40)) \approx 1.0541.$

The probability is $1 - P(z) \approx 1 - 0.8543 = 0.1457.$

(c) The probability is more than 5%, so it's not considered unusual.

5.

(a) According to the Central Limit Theorem, the sampling distribution of X is approximately normally distributed with mean μ = 1 and standard error $\sigma = 1/sqrt(70) = 0.119522.$

(b) $z = (1.1 - 1)\ /\ (1/sqrt(70)) \approx 0.8375.$

The probability is $1 - P(z) \approx 1 - 0.7985 = 0.2015.$

(c) $z = (1.25 - 1)\ /\ (1/sqrt(70)) \approx 2.0948$

The probability is $1 - P(z) \approx 1 - 0.9818 = 0.0182.$