Part 1:

Problem 1

a. P (X≥3) = 1-P(X<3) = 1 - [P(0) + P(1) + P(2)] = 1 – [0.0138 + 0.0712 + 0.1678] = 0.7472

b. P (X=3) = $\frac{12!}{3!9!}0.3^3 0.7^9$= 0.2397

c. E[X] = 12 * 0.3 = 3.6

Problem 3ab

a. P (180<X<190) = P(Z<$\frac{190-191}{22.4}$) – P(Z<$\frac{180-191}{22.4}$) = 0.4822 – 0.3117 = 0.1705. Proportion = 17.05%

b. P(X>200) = 1 – P(X<200) = 1 - 0.6561 = 0.3439. Proportion = 34.39%

Problem 6

a. P (X=4) = $\frac{8!}{4!4!}0.4^4 0.6^4$=0.2322

b. P (X>6) = P(7) + P(8) = 0.0079 + 0.0007 = 0.0085

c. P ($\overline{X}$=4) = P (X=8-4) = = $\frac{8!}{4!4!}0.4^4 0.6^4$=0.2322

Problem 10ab

a. P (X<90) = P(Z<$\frac{90-85}{12}$) = 0.6615

b. P (80<X<90) = P(Z<$\frac{90-85}{12}$) – P(Z<$\frac{80-85}{12}$) = 0.6615 – 0.3385 = 0.3231

Part 2:

What percent of the babies born at 36 weeks' gestation have a low birth weight (under 5.5 pounds)?

P (X<5.5) = P (Z<$\frac{5.5-6.46}{1.2}$) = 0.2119

Describe the weights of the top 10% of the babies born at 32-35 weeks.

P_{90}= A: {P(X>A) = 10%} = NORM.INV(90%;5.73;1.48) = 7.63.

Therefore, the weights of the top 10% of the babies, born at 32-35 weeks, are greater than 7.63 pounds.

What is the probability that a baby born at 40 weeks' gestation will weigh between 6 and 9 pounds at birth?

$$P\ (6<X<9) = P(Z<\frac{9-7.72}{1.05}) - P(Z<\frac{6-7.72}{1.05}) = 0.8886 - 0.0507 = 0.8379$$

A birth weight of less than 3.3 pounds is classified by the NCHS as a "very low birth weight." What is the probability that a baby has a very low birth weight at 27 weeks? At 37 weeks?

The probability that a baby has a very low birth weight at 27 weeks is:

$$P\ (X<3.3) = P(Z<\frac{3.3-1.88}{1.19}) = 0.8836$$

The probability that a baby has a very low birth weight at 37 weeks is:

$$P\ (X<3.3) = P(Z<\frac{3.3-7.33}{1.09}) = 0.0001$$

A baby is born at 34 weeks' gestation, and weighs 5 pounds and 11 ounces. Is this an unusual outcome? Why or why not?

As the distribution of the values is assumed to be normal, 68% of all observations fall within the range ± 1 standard deviation from the mean (68-95-99.7 rule) (Moore, 2007).

Z-score of this outcome is equal to:

$$Z(5.11) = (5.11 - 5.73) / 1.48 = -0.42$$

The absolute value of the obtained z-score is less than 1, therefore the tested value is located within the range ± 1 standard deviation from the mean.

Consequently, this outcome is not an unusual one.

Works Cited

Moore, D. S. (2007). *The basic practice of statistics*. (Vol. #2). New York: WH Freeman.

Sullivan, L. M. (2017). *Essentials of biostatistics in public health*. Jones & Bartlett Learning.