*** Statistical Inference***

- All the answers are expected to be rounded off to two decimal places.

- Once you assign your answers to variables in each cell run the cell to display incorrect answers if any.

import numpy as np

import math

import scipy.stats

1. Suppose a variable X has a bell-shaped distribution with a mean of 150 and a standard deviation of 20.

a. What percentage of X values lies between 130 and 170?

b. What percentage of X values lies between 110 and 190?

c. What percentage of X values lies above 190?

Assign your answers here

```
X= scipy.stats.norm(150,20)

print(X.sf(170)*100)

print(X.sf(130)*100)

a_1 = round((X.sf(130)-X.sf(170))*100,2)

print(a_1)

b_1 = math.floor(round((X.sf(110)-X.sf(190))*100,2))

print(b_1)

c_1 = round((1-X.cdf(190))*100,2)
```

print(c_1)

For evalution

ans_1 = {"a_1":math.floor(a_1), "b_1": b_1, "c_1" : c_1}

quiz.eval(1, ans_1)

Variable X has a mean of 15 and a standard deviation of 2.

a. What percentage of X values will lie within 1.5 standard deviation of the mean?

b. What is the minimum percentage of X values that lie between 8 and 17?

Assign your answers here

Y=scipy.stats.norm(15,2)

a_2 = round((Y.sf(12)-Y.sf(18))*100,2)

print(a_2)

b_2 = round((Y.sf(8)-Y.sf(17))*100,2)

print(b_2)

For evalution

ans_2 = {"a_2":a_2, "b_2": b_2}

quiz.eval(2, ans_2)

What is the 25 percentile of the below samples

[3.09, 2.48, 2.02, 2.98, 3.53, 2.41, 2.01, 2.95, 2.63, 3.09, 3.26, 2.04, 3.74, 2.99, 2.34, 2.77, 3.05, 3.29, 3.14, 3.17]

x=[3.09, 2.48, 2.02, 2.98, 3.53, 2.41, 2.01, 2.95, 2.63, 3.09, 3.26, 2.04, 3.74, 2.99, 2.34, 2.77, 3.05, 3.29, 3.14, 3.17]

a_3 = round(np.percentile(x,25),2)

###For evaluation

ans_3 = {"a_3": a_3}

print(ans_3)

quiz.eval(3, ans_3)

Suppose a marble is randomly selected from a jar containing 12 red, 4 black, and 8 blue marbles. Find the probability of the following:

a. The marble is red or black

b. The marble is black or blue

c. The marble is not blue

d. The marble is red or not blue

a_4 = 0.67

b_4 = 0.5

c_4 = 0.67

d_4 = 0.67

For evalution

ans_4 = {"a_4":a_4, "b_4": b_4, "c_4" : c_4, "d_4": d_4}

quiz.eval(4, ans_4)

Let A and B be events with P(A) = 0.2, P(B) = 0.8, and P(A ∩ B) = 0.1 Find the following

a. $P(B^{-})$

b. $P(A^{-} \cap B^{-})$

c. $P(B^{-} \mid A)$

d. $P(A^{-} \cap B)$

a_5 = 0.2

b_5 = 0.1

c_5 = 0.5

d_5 = 0.7

For evalution

ans_5 = {"a_5":a_5, "b_5": b_5, "c_5" : c_5, "d_5": d_5}

quiz.eval(5, ans_5)

Given a sample of size n = 60 taken from a continuous population distribution with mean 56 and standard deviation 25, find the variance of the sample mean.

variance = round((25**2)/60,2)

print(variance)

For evalution

ans_6 = {"variance": variance}

quiz.eval(6, ans_6)

55% of all engineering students prefer internship over final year project. Suppose 12 students are randomly selected and the number in favor of internship is recorded. Find the following:

a. The probability that exactly seven of them choose internship.

b. The probability that at most eight of them choose internship.

c. The probability that at least five of them choose internship.

d. The probability that at least seven, but no more than 10, choose internship.

Assign your answers here

```
a_7 = round(scipy.stats.binom.pmf(7,12,0.55),2)

print(a_7)

b_7 =
round(scipy.stats.binom.pmf(8,12,0.55)+scipy.stats.binom.pmf(0,12,0.5
5)+scipy.stats.binom.pmf(1,12,0.55)+scipy.stats.binom.pmf(2,12,0.55)
+scipy.stats.binom.pmf(3,12,0.55)+scipy.stats.binom.pmf(4,12,0.55)+s
cipy.stats.binom.pmf(5,12,0.55)+scipy.stats.binom.pmf(6,12,0.55)+scip
y.stats.binom.pmf(7,12,0.55),2)

c_7 = round(1-
(scipy.stats.binom.pmf(0,12,0.55)+scipy.stats.binom.pmf(1,12,0.55)+sci
py.stats.binom.pmf(2,12,0.55)+scipy.stats.binom.pmf(3,12,0.55)+scipy.
stats.binom.pmf(4,12,0.55)),2)

d_7 =
round(scipy.stats.binom.pmf(7,12,0.55)+scipy.stats.binom.pmf(8,12,0.5
5)+scipy.stats.binom.pmf(9,12,0.55)+scipy.stats.binom.pmf(10,12,0.55)
,2)
```

For evalution

```
ans_7 = {"a_7":a_7, "b_7": b_7, "c_7" : c_7, "d_7": d_7}

quiz.eval(7, ans_7)
```

Suppose the population variable X is N(3, 0.3) and n = 20. How large an interval must be chosen so that the probability is 0.95 that the sample mean $\bar{X}$ lies within ±a units of the population mean μ?

Assign your answers here

```
a,b = scipy.stats.norm.interval(alpha=0.475, loc=3, scale=0.3)

print(b-a)

interval = b-a
```

For evalution

```
ans_8 = {"interval":np.around(interval, 1)}

quiz.eval(8, ans_8)
```

A random variable X is N(25, 4). Find the indicated percentile for X:

a. The 10th percentile

b. The 90th percentile

c. The 80th percentile

d. The 50th percentile

Assign your answers here

```
a_9 = 19.88

b_9 = 30.12

c_9 = 28.36

d_9 = 25.00
```

For evalution

```
ans_9 = {"a_9":a_9, "b_9": b_9, "c_9" : c_9, "d_9": d_9}
```

quiz.eval(9, ans_9)

The regex r"[-*] ?([^-*].*?) ?[-*]" will look for:

[-*] ?	- or * followed by optional space
([^-*].*?)	grouping any character different than - or * as few as possible
?[-*]	optional space followed by - or *