

Extra Practice

1- The standard deviation of the population data 6, 5, 9, 13, 12, 8, 10 is

- (A) $\sqrt{\frac{52}{7}}$ (B) $\frac{52}{7}$ (C) $\sqrt{6}$ (D) 6

Answer: (A)

2- Find the mean for the following list of values 13, 18, 13, 14, 13, 16, 14, 21, 13

Answer: 15

3- What is the mean of the following numbers? 10, 39, 71, 39, 76, 38, 25

- a. 42 b. 39 c. 42.5 d. 35.5

Answer: 42.5

4- What number would you divide by to calculate the mean of 3, 4, 5, 8 and 6?

- a. 6 b. 3 c. 5 d. 4

Answer: c. 5

5- What measure of central tendency is calculated by adding all the values and dividing the sum by the number of values?

- a. Median b. Mean c. Mode d. Typical value

Answer: b. Mean

6- The mean of four numbers is 76.5. If three of the numbers are 58, 76, and 88, what is the value of the fourth number?

- a. 84 b. 60 c. 76 d. 82.5

Answer: a.84

7- Determine the mean of the following set of numbers: 42, 61, 95, 79, 9, 50, 80, 63, 109, 43

Answer: 63.1

8- Determine the standard deviation of the following set of numbers for a sample: 40, 61, 95, 79, 9, 50, 80, 63, 109, 42

Answer: 29.33

9- On any given day, the probability that the entire Watson family eats dinner together is $\frac{2}{5}$. Find the probability that, during any 7-day period, the Watson's eat dinner together at least six times. **Hint: It is binomial distribution.**

At least means 6 times or 7 times.

$$\begin{aligned} & \binom{7}{6} \cdot \left(\frac{2}{5}\right)^6 \cdot \left(\frac{3}{5}\right)^1 + \binom{7}{7} \cdot \left(\frac{2}{5}\right)^7 \cdot \left(\frac{3}{5}\right)^0 \\ &= 0.0188416 = \frac{1472}{78125} \end{aligned}$$

10- The probability that surgery success is 60% of the time. If the same surgery is performed four times, what is the probability that the surgery succeeded at least three times ? **Hint: It is binomial distribution.**

At least three strikes:

$$\binom{4}{3} \cdot \left(\frac{6}{10}\right)^3 \cdot \left(\frac{4}{10}\right)^1 + \binom{4}{4} \cdot \left(\frac{6}{10}\right)^4 \cdot \left(\frac{4}{10}\right)^0 = .4752 = \frac{297}{625}$$

11- A board game has a spinner on a circle that has five equal sectors, numbered 1, 2, 3, 4, and 5, respectively. If a player has four spins, find the probability that the player spins an even number no more than two times on those four spins. **Hint: It is binomial distribution.**

There are 2 even numbers out of the 5 numbers.

No more than = at most.

$$\begin{aligned} & \binom{4}{2} \cdot \left(\frac{2}{5}\right)^2 \cdot \left(\frac{3}{5}\right)^2 + \binom{4}{1} \cdot \left(\frac{2}{5}\right)^1 \cdot \left(\frac{3}{5}\right)^3 + \binom{4}{0} \cdot \left(\frac{2}{5}\right)^0 \cdot \left(\frac{3}{5}\right)^4 \\ & = .8208 = \frac{513}{625} \approx 82\% \end{aligned}$$

12- The number of misprints on a page of the Daily Mercury has a Poisson distribution with mean 1.2

Find the probability that the number of errors on page four is 2.

Answer: 0.217

$$P(E = 2) = \frac{e^{-1.2}(1.2)^2}{2!} \approx 0.217.$$

13- The number of industrial injuries per working week in a particular factory is known to follow a Poisson distribution with mean 0.5

Find the probability that in a particular week there will be less than 2 accidents. Hint: it follows Poisson distribution

Answer: 0.9098

14- On average, 9.4 cars arrive at the drive-up window of a bank every hour. Define the random variable x to be the number of cars arriving at any

hour. Compute the probability that exactly 4 cars will arrive in the next hour. (Round your answer to four decimal places.) Hint: it follows Poisson distribution

Answer: 0.0269

15- As only 3 students came to attend the class today, find the probability for exactly 4 students to attend the classes tomorrow. Hint: it follows Poisson distribution

Answer: 0.1680

16- The time it takes a computer repair company to diagnose a computer follows a normal distribution with a mean of 50 minutes and a standard deviation of 12 minutes. What is the probability he will finish his diagnosis before 60 minutes?

Answer:

We are looking for the probability that the technician will finish his diagnosis in 60 minutes or less.

$$P(z < 0.83) = 0.7967$$

17- The life span of the scientific calculator has a normal distribution with a mean of 58 months and a standard deviation of 10 months. The company gives a warranty of 36 months to

replace any defective calculator with a new one. Find the probability that the calculator being defective before 36 months.

Answer:

$$P(z < -2.2) = \text{From table directly} = 0.0139$$

18- X is a normally distributed variable with mean $\mu = 30$ and standard deviation $\sigma = 4$. Find probability

- a) less than 40
- b) $P(x > 21)$
- c) $P(30 < x < 35)$

Answer:

**a) For $x = 40$, the z-value $z = (40 - 30) / 4 = 2.5$
Hence $P(x < 40) = P(z < 2.5) = 0.9938$**

**b) For $x = 21$, $z = (21 - 30) / 4 = -2.25$
Hence $P(x > 21) = P(z > -2.25) = 1 - 0.0122 = 0.9878$**

**c) For $x = 30$, $z = (30 - 30) / 4 = 0$ and for $x = 35$, $z = (35 - 30) / 4 = 1.25$
Hence $P(30 < x < 35) = 0.3944$**

19- A radar unit is used to measure speeds of cars on a motorway. The speeds are normally distributed with a mean of 90 km/hr and a standard deviation of 10 km/hr. What is the probability that a car picked at random is travelling at more than 100 km/hr?

Let x be the random variable that represents the speed of cars. X has $\mu = 90$ and $\sigma = 10$.

We have to find the probability that x is higher than 100 or $P(x > 100)$

For $x = 100$, $z = (100 - 90) / 10 = 1$

$P(x > 90) = P(z > 1) = 0.1587$

20- For a certain type of computers, the length of time between charges of the battery is normally distributed with a mean of 50 hours and a standard deviation of 15 hours. John owns one of these computers and wants to know the probability that the length of time will be between 50 and 70 hours.

Let x be the random variable that represents the length of time. It has a mean of 50 and a standard deviation of 15. We have to find the probability that x is between 50 and 70 or $P(50 < x < 70)$

For $x = 50$, $z = (50 - 50) / 15 = 0$

For $x = 70$, $z = (70 - 50) / 15 = 1.33$ (rounded to 2 decimal places)

$P(50 < x < 70) = P(0 < z < 1.33) = 0.4082$

The probability that John's computer has a length of time between 50 and 70 hours is equal to 0.4082.

22- The length of similar components produced by a company are approximated by a normal distribution model with a mean of 5 cm and a standard deviation of 0.02 cm. If a component is chosen at random

a) what is the probability that the length of this component is between 4.98 and 5.02 cm?

b) what is the probability that the length of this component is between 4.96 and 5.04 cm?

a) $P(4.98 < x < 5.02) = P(-1 < z < 1)$
 $= 0.6826$

b) $P(4.96 < x < 5.04) = P(-2 < z < 2)$
 $= 0.9544$

23- The length of life of an instrument produced by a machine has a normal distribution with a mean of 12 months and standard deviation of 2 months. Find the probability that an instrument produced by this machine will last

a) less than 7 months.

b) between 7 and 12 months.

$$\begin{aligned} \text{a) } P(x < 7) &= P(z < -2.5) \\ &= 0.0062 \end{aligned}$$

$$\begin{aligned} \text{b) } P(7 < x < 12) &= P(-2.5 < z < 0) \\ &= 0.4938 \end{aligned}$$

24- The time taken to assemble a car in a certain plant is a random variable having a normal distribution of 20 hours and a standard deviation of 2 hours. What is the probability that a car can be assembled at this plant in a period of time

a) less than 19.5 hours?

b) between 20 and 22 hours?

$$\begin{aligned} \text{a) } P(x < 19.5) &= P(z < -0.25) \\ &= 0.4013 \end{aligned}$$

$$\begin{aligned} \text{b) } P(20 < x < 22) &= P(0 < z < 1) \\ &= 0.3413 \end{aligned}$$

26- The annual salaries of employees in a large company are approximately normally distributed with a mean of \$50,000 and a standard deviation of \$20,000.

a) What percent of people earn less than \$40,000?

b) What percent of people earn between \$45,000 and \$65,000?

c) What percent of people earn more than \$70,000?

Answer:

$$\begin{aligned} \text{a) For } x &= 40000, z = -0.5 \\ \text{The probability is equal to } &0.3085 \end{aligned}$$

b) For $x = 45000$, $z = -0.25$ and for $x = 65000$, $z = 0.75$
 The probability is equal to 0.3720

c) For $x = 70000$, $z = 1$
 The probability is equal to 0.1586

27- Find the missing value

Variation	Sum of Squares	Degrees of freedom	Mean Squares	F
Between	$SS_B = 213$	$d.f._N = 3$	$MS_B = 71$	F= 1.183
Within	$SS_W = ?$	$d.f._D = 16$	$MS_W = 60$	

28- Find the missing value

Variation	Sum of Squares	Degrees of freedom	Mean Squares	F
Between	$SS_B = 634$	$d.f._N = 2$	$MS_B = 317$	F= 15.85
Within	$SS_W = 180$	$d.f._D =$	$MS_W = 20$	

29- Find the missing value

Variation	Sum of Squares	Degrees of freedom	Mean Squares	F
Between	$SS_B = 634$	$d.f._N = 2$	$MS_B = ?$	F= 15.85
Within	$SS_W = 180$	$d.f._D = 9$	$MS_W = 20$	

30- Find the missing value

Variation	Sum of Squares	Degrees of freedom	Mean Squares	F
Between	$SS_B = 213$	$d.f._N = \square$	$MS_B = 71$	F= 1.183
Within	$SS_W = \square 960$	$d.f._D = 16$	$MS_W = 60$	

31- Find the correlation Coefficient

Age (x years)	ATST (y minutes)
4.4	586
6.7	565
10.5	515
9.6	532
12.4	478
5.5	560
11.1	493
8.6	533
14.0	575
10.1	490
7.2	530
7.9	515

Answer = -0.481

