**Name:**

The age (in months) at which a child begins using a certain type of sentence structure is recorded for 40 children. The frequencies of four categories are given in the table below.

Age (months) frequency

24 - 29 4

30 - 35 8

36 - 41 13

42 - 47 15

1. If one of these 40 children is selected at random, find the probability that the age of that child is:

a) at most 35 months

b) at least 42 months

c) between 30 and 41 months (inclusive)

2. Using this distribution, what is the mean age at which children begin using this type of sentence structure?

3. We have total cholesterol for a sample of 21 people. The results are summarized in the stem-and-leaf plot below.

25 | 3

24 | 4

23 | 4 7

22 | 3 5

21 | 0 1 3

20 | 1 3 8

19 | 0 4 6 7 9

18 | 0 1 2 7

1. The minimum value in this data set is 180, and the maximum is 253. What is the

median?

1. This data set is best described as: (select one)

i) approximately symmetric

ii) positively skewed

iii) negatively skewed

c) What is the interquartile range (difference between the upper and lower quartiles)?

4. The time (in seconds) to complete a task is recorded for three elderly subjects. The results are:

10 30 20 20 20 20

1. What is the sample mean?

1. What is the sample standard deviation?

5. Fifty randomly chosen people are cross-classified by sex and whether they are HIV positive or HIV negative. The results are in the table below.

|  |  |  |
| --- | --- | --- |
|  | Female | Male |
| HIV Positive | 4 | 16 |
| HIV Negative | 14 | 16 |

1. If one person is chosen at random from these 25, find the following probabilities.
2. P( Female and HIV Positive )
3. P( HIV Positive | Female )
4. P( HIV Positive | Male )
5. Are sex and HIV status independent? Make sure to justify your answer.

1. Suppose we select 3 people, without replacement, at random from these 50 people. Find the probability that they are both HIV positive.

6. A screening test for COPD in women is being evaluated. Of the 100 women later confirmed to have COPD, 54 had a positive screen. Of the 150 women later determined to

not have COPD, only 3 had a positive screen. Suppose in our population of interest, 20% of women have COPD.

1. Fill in the frequency table.

|  |  |  |
| --- | --- | --- |
|  | COPD | No COPD |
| Positive |  |  |
| Negative |  |  |

1. Using the results of the table above, calculate the sensitivity and specificity of the screening test for COPD.

**Se =**

**Sp =**

1. Calculate the PPV of the test for our population of interest. Remember that you can’t calculate this directly from the conditional probability and must calculate it using Bayes rule.

1. What is the probability that a woman has a positive screen, if we know she does not have COPD?

7. Suppose **10%** of people have an allergic reaction to a certain medicine. We take a random sample of **9** people.

1. Find the probability that exactly 3 of the 9 people have an allergic reaction.

1. Find the probability that no more than 2 of the 9 people have an allergic reaction.

8. Suppose the number of accidents in a certain factory each year follows a Poisson distribution with  = 10.

1. For a randomly selected year, find the probability that there are exactly 6 accidents in this factory.

1. For a randomly selected year, find the probability that in this factory there are at least 6 accidents, but no more than 8 accidents.

9. Suppose body temperature is Normally distributed with mean 31.42 and standard deviation 0.12.

1. Find the probability that a randomly selected person has a body temperature below 31.27.

1. Find the probability that a randomly selected person has body temperature above 31.6.

1. Find the body temperature that cuts off the lower 2.5% of this distribution.

d) Find the value of (body temperature) such that P(-c < X < c) = 0.95.

10. Multiple choice; choose the one correct answer for each of the following 5 questions.

Blood type is what kind of variable?

a) categorical, nominal

b) categorical, ordinal

c) numeric, discrete

d) numeric, continuous

We have 4 people from USA, 8 people from UAE, 12 people from Qatar, and 5 people from Iraq. We would like to draw a random sample of 4 persons. How many ways can we draw this sample so that the number of people from USA is 1 and the number of people from Iraq is between 2 or 3 ?

a) 4C1 5C2 20C1 + 4C1 5C3 20C0

b) 4C1 25C3 + 5C2 24C2 + 5C3 24C1

c) 4C0 25C3 + 4C1 25C2 + 5C2 24C1 + 5C3 24C0

d) 4C1 5C2 20C1 + 4C1 25C3

The probability of getting heads on the next 2 flips of a fair coin, given that you got heads on the 3 previous flips, is:

a) .03125

b) .125

c) .25

d) .5

To make sure that all people with a disease are classified as positive by a screening test, which must be very high?

a) sensitivity

b) specificity

c) both (a) and (b)

d) none of the above

For any discrete random variable, X, we calculate P( 5 < X < 10 ) as:

a) P( X < 9 ) - P( X < 4 )

b) P( X < 9 ) - P( X < 5 )

c) P( X < 10 ) - P( X < 4 )

d) P( X < 10 ) - P( X < 5 )

We have 4 people from USA, 8 people from UAE, 12 people from Qatar, and 5 people from Iraq. We would like to draw a random sample of 3 persons. How many ways can we draw this sample so that the number of people from USA is <=1 and the number of people from Iraq is between 2 and 4 inclusive?

a) 4C0 5C2 20C1 + 4C0 5C3 20C0 + 4C0 5C4 20C0 + 4C1 5C2 20C0 + 4C1 5C3 20C0 + 4C1 5C4 20C0

b) 4C0 5C2 20C1 + 4C0 5C3 20C0 + 4C1 5C2 20C0

c) 4C0 25C3 + 4C1 25C2 + 5C2 24C1 + 5C3 24C0

d) Not of the above