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Statistics Competition 2023.

## Questionnaire checking

A - Upper secondary
1 - Basic knowledge test
Version: 1 Language: en

1. A test for a statistics competition has $\mathbf{2 0}$ multiple-choice questions. Each question has 5 possible answers. A contestant decides to answer all the questions at random. What is the probability that the contestant answers exactly 5 questions correctly?
A. 0,175
B. $1,66 \cdot 10^{-7}$
C. $1,26 \cdot 10^{-5}$
D. $3,2 \cdot 10^{-4}$
2. Six friends agree to meet at the "Acropolis Hotel" in Athens. However, there are 4 hotels with the same name. Therefore, each of the 6 friends chooses to stay at one of them randomly. What is the probability that two of them choose different hotels and the other four are paired in the other two hotels?
A. 0,527
B. 0,022
C. 0,088
D. 0,070
3. A question is asked consecutively and in random order to $\mathbf{n}$ persons ( $n \geq 7$ ). Suppose that exactly 3 of the $n$ persons know the answer. What is the probability that the first four respondents do not know the answer?
A.

$$
\frac{\binom{n-3}{4}}{\binom{n}{4}}
$$

B.
C.
$\frac{1}{\binom{n}{4}}$
D.

$$
\frac{\binom{n}{n-3}}{\binom{n}{4}}
$$

4. 

Four athletes compete in sharpshooting. The following table shows the results of their shots.

| Athlete | Results |
| :---: | :---: |
| A | $\mathbf{9}, \mathbf{8}, \mathbf{8}, \mathbf{8}, \mathbf{7}$ |
| B | $\mathbf{1 0}, \mathbf{1 0}, \mathbf{8}, \mathbf{7}, \mathbf{5}$ |
| C | $\mathbf{9 , 9} \mathbf{7}, \mathbf{6}, 9$ |
| D | $\mathbf{1 0}, \mathbf{6}, \mathbf{6}, \mathbf{9}, \mathbf{9}$ |

The jury has the following criteria to decide the winner of the competition. First, the athlete with the best shot average and second, in case of a tie, the athlete with the most consistent shots. The winner of the competition is:
A. The first
B. The second
C. The third
D. The fourth
5. A survey is to be conducted on the impact of recent refugee flows on the local community. It is known that the percentage of people who respond to a survey is $k \%$. If $\lambda$ \% of the completed questionnaires are rejected due to incorrect completion, what should the initial sample be, as a function of $k$ and $\lambda$, so that the final number of correctly completed questionnaires is $\mathbf{1 5 0 0}$ ?
A.

$$
\frac{150000}{100+\kappa \cdot \lambda}
$$

B.

$$
\frac{15000000}{\lambda(100-\kappa)}
$$

C.

$$
\frac{15000000}{\kappa(100-\lambda)}
$$

D.

$$
\frac{150000}{\kappa+\lambda}
$$

6. An electronic plotter marks at random red and blue points on a rectangular coordinate system within the square with vertices $A(-4,4)$, $B(4,4), C(4,-4)$ and $D(-4,-4)$. The probability that the electronic plotter marks a blue point is twice that of a red one. The probability of marking a point within a region of the rectangle ABCD is the same as the probability of marking a point in any other region within a rectangle of equal area. Also, the colour of a point is independent of its position. What is the probability that the next two points marked by the electronic plotter will be in the order blue and red, and both will lie within the quadrilateral EFGH, with vertices $E(1,3), F(3,3), G(4,-1)$ and $H(1,-1)$ ?
A. 0,156
B. 0,005
C. 0,035
D. 0,087
7. If $A$ and $B$ are two outcomes of the same sample space $S$, with $P(A \cup B)=\frac{7}{8} \quad$ and $P(A \cap B)=\frac{1}{8}$ and the function,

$$
f(x)= \begin{cases}\frac{P(A) x^{2}-x+P(B)}{x-1} & , x \neq 1 \\ -4 P(A-B) & , x=1\end{cases}
$$

is continuous, then $P(B)$ is:
A.

$$
\frac{5}{6}
$$

B.

[^0]C. $\frac{3}{4}$
D. $\frac{1}{2}$
8.

The following observations of a sample are given:

$$
\text { 7, } \quad 5, \quad a, \quad 2, \quad 5, \quad b, \quad 8, \quad 6, \quad c, \quad 5, \quad 3
$$

where, $a, b$ and $c$ are natural numbers with $a<b<c$. The mean value of the observations is 6 , the median is also 6 , and the range is 8 . If $\alpha^{2}+\beta^{2}+\gamma^{2}=217$, then the value of $b$ is:
A. 9
B. 6
C. 8
D. 7
9. The ratio of the number of ships arriving at a port from EU member countries to the number of ships arriving at the same port from non-EU member countries is 2 to 3. The percentage of ships arriving at the port without delay is $36 \%$. The percentage of ships arriving at the port from non-EU member countries with delay is 60\%. A ship is taken randomly from those arriving at the port with delay. What is the probability that this ship comes from an EU member country is:
A.
$\frac{7}{16}$
B.

$$
\frac{7}{10}
$$

C.
D.

$$
\frac{5}{8}
$$

10. 

In a box, there are $(n-1)$, where $n \geq 7$, white balls and 1 blue ball. Balls are continuously withdrawn, one ball after another, from the box, each time without replacement, until the blue one appears. If the probability that the blue ball is drawn, at most on the $7^{\text {th }}$ draw is $\frac{1}{4}$, then the number of white balls in the box is:
A. 28
B. 27
C. 26
D. 29
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Statistics Competition 2023.

## Questionnaire checking

A - Upper secondary
1 - Basic knowledge test
Version: 2 Language: en

1. A test for a statistics competition has 25 multiple-choice questions. Each question has 5 possible answers. A contestant decides to answer all the questions at random. What is the probability that the contestant answers exactly 7 questions correctly?
A. $4,26 \cdot 10^{-9}$
B. 0,111
C. $2,31 \cdot 10^{-7}$
D. $1,28 \cdot 10^{-5}$
2. Seven friends agree to meet at the "Acropolis Hotel" in Athens. However, there are 5 hotels with the same name. Therefore, each of the 7 friends chooses to stay at one of them randomly. What is the probability that three of them choose different hotels and the other four are paired in the other two hotels?
A. 0,054
B. 0,003
C. 0,323
D. 0,018
3. A question is asked consecutively and in random order to $\mathbf{n}$ persons ( $n \geq 8$ ). Suppose that exactly 3 of the $n$ persons know the answer. What is the probability that the first five respondents do not know the answer?
A. $\frac{1}{\binom{n}{5}}$
B.
$\frac{\binom{n-5}{5}}{\binom{n}{5}}$
C.

$$
\frac{\binom{n-3}{5}}{\binom{n}{5}}
$$

D.

$$
\frac{\binom{n}{n-3}}{\binom{n}{5}}
$$

4. 

Four athletes compete in the sharpshooting. The following table shows the results of their shots.

| Athlete | Results |
| :---: | :---: |
| A | $\mathbf{1 0}, \mathbf{9}, \mathbf{7}, \mathbf{1 0}, \mathbf{8}, \mathbf{7}$ |
| B | $\mathbf{1 0}, \mathbf{1 0}, \mathbf{8}, \mathbf{7}, \mathbf{1 0}, \mathbf{6}$ |
| C | $\mathbf{9 , 8}, \mathbf{1 0}, \mathbf{9}, \mathbf{8}, \mathbf{7}$ |
| D | $\mathbf{1 0}, \mathbf{7}, \mathbf{7}, \mathbf{9}, \mathbf{9}, \mathbf{9}$ |

The jury has the following criteria to decide the winner of the competition. First, the athlete with the best shot average and second, in case of a tie, the athlete with the most consistent shots. The winner of the competition is:
A. The first
B. The second
C. The third
D. The fourth
5. A survey is to be conducted on the impact of recent refugee flows on the local community. It is known that the percentage of people who respond to a survey is $\boldsymbol{\lambda} \%$. If $\kappa$ \% of the completed questionnaires are rejected due to incorrect completion, what should the initial sample be, as a function of $\kappa$ and $\lambda$, so that the final number of correctly completed questionnaires is $\mathbf{1 5 0 0}$ ?
A.

$$
\frac{15000000}{\lambda(100-\kappa)}
$$

B.

$$
\frac{15000000}{\kappa(100-\lambda)}
$$

C.
$\frac{150000}{100+\lambda \cdot \kappa}$
D.

$$
\frac{150000}{\kappa+\lambda}
$$

6. An electronic plotter marks at random red and blue points on a rectangular coordinate system within the square with vertices $A(-4,4)$, $B(4,4), C(4,-4)$ and $D(-4,-4)$. The probability that the electronic plotter marks a blue point is twice that of a red one. The probability of marking a point within a region of the rectangle ABCD is the same as the probability of marking a point in any other region within a rectangle of equal area.
Also, the colour of a point is independent of its position. What is the probability that the next two points marked by the electronic plotter will be in the order blue and red, and both will lie within the quadrilateral EFGH, with vertices $E(1,3), F(4,3), G(4,-1)$ and $H(2,-1)$ ?
A. 0,156
B. 0,087
C. 0,035
D. 0,005
7. 

If $A$ and $B$ are two outcomes of the same sample space S , with $P(A \cup B)=\frac{5}{6}$ and $P(A \cap B)=\frac{1}{6}$ and the function,

$$
f(x)= \begin{cases}\frac{P(A) x^{2}-x+P(B)}{x-1} & , x \neq 1 \\ -3 P(A-B) & , x=1\end{cases}
$$

is continuous, then $P(B)$ is:
A.
$\frac{5}{6}$
B.
$\frac{7}{10}$
C. $\frac{3}{10}$
D. $\frac{1}{6}$
8.

The following observations of a sample are given:

$$
8, \quad 6, \quad a, \quad 3, \quad 5, \quad b, \quad 8, \quad 6, \quad c, \quad 7, \quad 4
$$

where, $a, b$ and $c$ are natural numbers with $a<b<c$. The mean value of the observations is 7 , the median is also 7 , and the range is 9 . If $\alpha^{2}+\beta^{2}+\gamma^{2}=314$, then the value of $b$ is:
A. 9
B. 10
C. 11
D. 7
9. The ratio of the number of ships arriving at a port from EU member countries to the number of ships arriving at the same port from non-EU member countries is 3 to 2. The percentage of ships arriving at the port without delay is $36 \%$. The percentage of ships arriving at the port from non-EU member countries with delay is 60\%. A ship is taken randomly from those arriving at the port with delay. What is the probability that this ship comes from an EU member country is:
A.

$$
\frac{7}{16}
$$

B.

$$
\frac{7}{10}
$$

C. $\frac{2}{3}$
D.

```
5
```

10. 

In a box, there are $(n-1)$, where $n \geq 7$, white balls and 1 blue ball. Balls are continuously withdrawn, one ball after another, from the box, each time without replacement, until the blue one appears. If the probability that the blue ball is drawn, at most on the $7^{\text {th }}$ draw is $\frac{1}{5}$, then the number of white balls in the box is:
A. 34
B. 35
C. 36
D. 33

## Statistics Competition 2023.

## Questionnaire checking

A - Upper secondary
1 - Basic knowledge test
Version: 3 Language: en

1. A test for a statistics competition has $\mathbf{2 0}$ multiple-choice questions. Each question has 4 possible answers. A contestant decides to answer all the questions at random. What is the probability that the contestant answers exactly 5 questions correctly?
A. $19,77 \cdot 10^{-4}$
B. $3,43 \cdot 10^{-6}$
C. $1,31 \cdot 10^{-5}$
D. 0,202
2. Eight friends agree to meet at the "Acropolis Hotel" in Athens. However, there are 6 hotels with the same name. Therefore, each of the 8 friends chooses to stay at one of them randomly. What is the probability that four of them choose different hotels and the other four are paired in the other two hotels?
A. 0,180
B. 0,006
C. 0,030
D. 0,005
3. A question is asked consecutively and in random order to $\mathbf{n}$ persons ( $n \geq 9$ ). Suppose that exactly 4 of the $n$ persons know the answer. What is the probability that the first five respondents do not know the answer?
A.

$$
\frac{\binom{n}{n-4}}{\binom{n}{5}}
$$

B.
$\frac{\binom{n-5}{5}}{\binom{n}{5}}$
C.
$\frac{1}{\binom{n}{5}}$
D.
$\frac{\binom{n-4}{5}}{\binom{n}{5}}$
4.

Four athletes compete in the sharpshooting. The following table shows the results of their shots.

| Athlete | Results |
| :---: | :---: |
| A | $\mathbf{8}, \mathbf{1 0}, \mathbf{6}, \mathbf{9}, \mathbf{8}, \mathbf{8}, \mathbf{7}$ |
| B | $\mathbf{1 0}, \mathbf{1 0}, \mathbf{8}, \mathbf{7}, \mathbf{1 0}, \mathbf{6}, \mathbf{5}$ |
| C | $\mathbf{9}, \mathbf{7}, \mathbf{8}, \mathbf{8}, \mathbf{7}, \mathbf{7}, \mathbf{1 0}$ |
| D | $\mathbf{9}, \mathbf{9}, \mathbf{6}, \mathbf{6}, \mathbf{9}, \mathbf{8}, \mathbf{9}$ |

The jury has the following criteria to decide the winner of the competition. First, the athlete with the best shot average and second, in case of a tie, the athlete with the most consistent shots. The winner of the competition is:
A. The first
B. The second
C. The third
D. The fourth
5. A survey is to be conducted on the impact of recent refugee flows on the local community. It is known that the percentage of people who respond to a survey is $\kappa \%$. If $\boldsymbol{\lambda} \%$ of the completed questionnaires are rejected due to incorrect completion, what should the initial sample be, as a function of $\kappa$ and $\lambda$, so that the final number of correctly completed questionnaires is 1700?
A.

$$
\frac{170000}{100+K \cdot \lambda}
$$

B.

$$
\frac{17000000}{\lambda(100-\kappa)}
$$

c.
$\frac{170000}{\kappa+\lambda}$
D.

$$
\frac{17000000}{\kappa(100-\lambda)}
$$

6. An electronic plotter marks at random red and blue points on a rectangular coordinate system within the square with vertices $A(-5,5)$, $B(5,5), C(5,-5)$ and $D(-5,-5)$. The probability that the electronic plotter marks a blue point is twice that of a red one. The probability of marking a point within a region of the rectangle $A B C D$ is the same as the probability of marking a point in any other region within a rectangle of equal area. Also, the colour of a point is independent of its position. What is the probability that the next two points marked by the electronic plotter will be in the order blue and red, and both will lie within the quadrilateral EFGH, with vertices $E(1,3), F(3,3), G(4,-1)$ and $H(1,-1)$ ?
A. 0,100
B. 0,022
C. 0,002
D. 0,222
7. 

If A and B are two outcomes of the same sample space S , with $P(A \cup B)=\frac{8}{9}$ and $P(A \cap B)=\frac{1}{9}$ and the function,

$$
f(x)= \begin{cases}\frac{P(A) x^{2}-x+P(B)}{x-1} & , x \neq 1 \\ -3 P(A-B) & , x=1\end{cases}
$$

is continuous, then $P(B)$ is:
A. $\frac{4}{15}$
B.

$$
\frac{2}{15}
$$

C. $\frac{11}{15}$
D. $\frac{4}{15}$
8.

The following observations of a sample are given:

$$
9, \quad 6, \quad a, \quad 3, \quad 6, \quad b, \quad 10, \quad 8, \quad c, \quad 6, \quad 5
$$

where, $a, b$ and $c$ are natural numbers with $a<b<c$. The mean value of the observations is 8 , the median is also 8 , and the range is 11 . If $\alpha^{2}+\beta^{2}+\gamma^{2}=429$, then the value of $b$ is:
A. 8
B. 13
C. 12
D. 11
9. The ratio of the number of ships arriving at a port from EU member countries to the number of ships arriving at the same port from non-EU member countries is 1 to 2 . The percentage of ships arriving at the port without delay is $36 \%$. The percentage of ships arriving at the port from non-EU member countries with delay is 60\%. A ship is taken randomly from those arriving at the port with delay. What is the probability that this ship comes from an EU member country is:
A.
$\frac{18}{25}$
B. $\frac{3}{8}$
C. $\frac{33}{50}$
D. $\frac{11}{16}$
10.

In a box, there are $(n-1)$, where $n \geq 7$, white balls and 1 blue ball. Balls are continuously withdrawn, one ball after another, from the box, each time without replacement, until the blue one appears. If the probability that the blue ball is drawn, at most on the $7^{\text {th }}$ draw is $\frac{1}{6}$, then the number of white balls in the box is:
A. 39
B. 40
C. 42
D. 41


[^0]:    $\frac{1}{4}$

