RESULTS

- Possible **66%**
- Impossible **34%**

Submit

Results gathered from 142 respondents.

FEEDBACK

Impossible. For the average to be 10, the remaining 20 meerkats would need to have height zero.

1

0 points possible (ungraded)

Which of the following are correct versions of Markov's Inequality for a nonnegative random variable X:

- [ ] $P(X \geq \alpha\mu) \leq \frac{1}{\alpha}$ ✔
- [ ] $P(X \geq \alpha\mu) \leq \mu\alpha$
- [ ] $P(X \geq \mu) \leq \frac{1}{\alpha}$
- [x] $P(X \geq \alpha) \leq \frac{\mu}{\alpha}$ ✔

✖

Submit You have used 3 of 3 attempts

Answers are displayed within the problem

2 (Markov variations)

2.0/2.0 points (graded)

Upper bound $P(X \geq 3)$ when $X \geq 2$ and $E[X] = 2.5$.

0.5

Answer: 1/2

0.5

Explanation

Let $Y = X - 2$. Then $Y \geq 0$ and $E(Y) = E(X) - 2 = 0.5$ By Markov's inequality,
$P(X \geq 3) = P(Y \geq 1) \leq \frac{E(Y)}{1} = 0.5$

Submit

You have used 4 of 4 attempts

Answers are displayed within the problem

3

4.0/4.0 points (graded)

- In a town of 30 families, the average annual family income is $80,000. What is the largest number of families that can have income at least $100,000 according to Markov's Inequality?

Note: The annual family income can be any **non-negative** number.

24

Answer: 24

24

Explanation

This question can be answered using the Meerkat paradigm, or we can convert it to a probability question and use Markov's Inequality. Imagine that you pick one of the 30 families uniformly at random. The expected income is the average over all families, $80,000. The probability that the random family has income at least $100,000 is the number of families with such income, normalized by 30. By Markov's Inequality, this probability is at most $80000/100000 = 0.8$. Hence the number of families with such income is at most $30 \cdot 0.8 = 24$.

- In the same town of 30 families, the average household size is 2.5. What is the largest number of families that can have at least 4 members according to Markov's Inequality?

Note the household size can be any **postive** integer.

15

Answer: 15

15

Explanation

Let X be the size of a family picked uniformly at random. Then $X \geq 1$ and $E(X) = 2.5$. Define $Y = X - 1$. Then $Y \geq 0$ and $E(Y) = E(X) - 1 = 1.5$ By Markov's Inequality $P(X \geq 4) = P(Y \geq 3) \leq \frac{1.5}{3} = \frac{1}{2}$. Hence the fraction of families with at least 4 members is at most $\frac{1}{2} \cdot 30 = 15$.

Submit

You have used 1 of 4 attempts

Answers are displayed within the problem

Discussion

Hide Discussion

Topic: Topic 10 / Markov's

Add a Post

Show all posts ▼ by recent activity ▼

General Comments
Questions and comments regarding this section.
Staff
4 new_ 8

Problem 3
Questions and comments regarding problem 3.
Staff
3

Problem 2
Questions and comments regarding problem 2.
Staff
3

Problem 1
Questions and comments regarding problem 1.
Staff
1