



[Course](#) > [Topic 8...](#) > [8.2 Bin...](#) > [Binomi...](#)

Binomial Distribution Video

[Start of transcript. Skip to the end.](#)



- Hello, and welcome back.
In the last lecture,
we talked about the
Bernoulli distribution,
and we said that it forms the
foundation
of many other families of
distribution,
and in this lecture we're
going to start with the first
one,
which is the binomial



8.2 Binomial Distribution

POLL

If you flip a fair coin 10 times and let X be the total number of heads, then $V(X)$ is

RESULTS

- | | |
|---|-----|
| <input type="radio"/> 2.5 | 82% |
| <input type="radio"/> None of the above | 12% |
| <input type="radio"/> 1.5 | 4% |
| <input checked="" type="radio"/> 3.5 | 3% |

Submit

Results gathered from 193 respondents.

FEEDBACK

The answer is $V(X) = np(1 - p) = 2.5$.

1

3/3 points (graded)

There are 5 traffic signals between your home and work. Each is red with probability 0.35, independently of all others. Find:

a) the probability of encountering no red lights,

☐ 2.26%

☐ 5.2%

☒ 11.6% ✓

☐ 17.5%

Answer

Correct: Video: Binomial Distribution

Explanation

$$(1 - 0.35)^5 = 0.116$$

b) the probability of encountering only red lights,

☐ 0.03%

☒ 0.52% ✓

☐ 1.16%

☐ 16.4%

Answer

Correct: Video: Binomial Distribution

Explanation

$$0.35^5 = 0.0052$$

c) the expected number of red lights you will encounter?

☐ 0.75

☐ 1.42

☒ 1.75 ✓

☐ 2.25

Answer

Correct: Video: Binomial Distribution

Explanation

The expectation of the sum is the sum of the expectations.

$$0.35 + 0.35 + 0.35 + 0.35 + 0.35 = 1.75$$

Submit

You have used 2 of 4 attempts

i Answers are displayed within the problem

2

2/2 points (graded)

If every student is independently late with probability 10%, find the probability that in a class of 30 students:

a) nobody is late,

☒ 4.2% ✓

☐ 8.0%

☐ 17.4%

☐ 33.3%

Answer

Correct: Video: Binomial Distribution

Explanation

$$(1 - 0.1)^{30} = 0.042$$

b) exactly 1 student is late.

☐ 3.33%

☐ 5.25%

☐ 7.75%

☒ 14.1% ✓

Answer

Correct: Video: Binomial Distribution

Explanation

$$(1 - 0.1)^{29} \times 0.1 \times \binom{30}{1} = 0.141$$

Submit

You have used 1 of 3 attempts

i Answers are displayed within the problem

0 points possible (ungraded)

A coin with heads probability 0.6 is tossed 6 times, calculate the probability of observing:

- exactly two heads,

✖ Answer: 0.13824

Explanation

The number of heads, H is distributed as $H \sim \text{Binomial}(6, 0.6)$. Thus the probability here is $P(H = 2) = \binom{6}{2} 0.6^2 \cdot 0.4^4 = 0.13824$

- at most one tails,

✖ Answer: 0.23328

Explanation

The number of tails, T is distributed as $T \sim \text{Binomial}(6, 0.4)$. Thus the probability here is $P(T = 0) + P(T = 1) = \binom{6}{0} 0.6^6 + \binom{6}{1} 0.4^1 \cdot 0.6^5 = 0.23328$

- an even number of heads.

✖ Answer: 0.500032

Explanation

Using the distribution of H , the probability here is

$$P(H = 0) + P(H = 2) + P(H = 4) + P(H = 6) \\ = \binom{6}{0} 0.4^6 + \binom{6}{2} 0.6^2 \cdot 0.4^4 + \binom{6}{4} 0.6^4 \cdot 0.4^2 + \binom{6}{6} 0.6^6 = 0.50032$$

Submit

You have used 4 of 4 attempts

i Answers are displayed within the problem

4

3.0/3.0 points (graded)

A Binomial distribution $B_{p,n}$, where $p \neq 0$, has the same mean and standard deviation, namely $\mu = \sigma$.

Find the mean of $B_{p,n+1}$.

✓ Answer: 1

Explanation

Since $B_{p,n}$ has $\sigma = \mu$, we have $np = \sqrt{npq}$, hence $1 - p = q = np$ or $p \cdot (n + 1) = 1$

Submit

You have used 1 of 4 attempts

❗ Answers are displayed within the problem

5

0 points possible (ungraded)

For $X \sim B_{0.7,10}$, find:

- $E(X)$,

✗ Answer: 7

Explanation

$E(X) = np = 7$.

- $V(X)$,

✗ Answer: 2.1

Explanation

$V(X) = np(1 - p) = 2.1$

- σ_X ,

✖ Answer: 1.4491

Explanation

$$\sigma_X = \sqrt{V(X)} = 1.4491.$$

- The most likely outcome of X .

✖ Answer: 7

Explanation

$$P(X = 7) = \max_x P(X = x)$$

Submit

You have used 4 of 4 attempts

i Answers are displayed within the problem

6. Balls in urns

0 points possible (ungraded)

Ten balls are randomly dropped into four urns. Let X be the number of balls dropped into one preselected urn. Find:

- $P(X = 0)$,

✖ Answer: 0.056

Explanation

Clearly X is distributed $B_{1/4, 10}$. Hence

$$P(X = 0) = \binom{10}{0} \cdot (1/4)^0 \cdot (3/4)^{10} = (3/4)^{10} = 0.056$$

- $P(X = 1)$,

✖ Answer: 0.188

Explanation

$$P(X = 1) = \binom{10}{1} \cdot (1/4)^1 \cdot (3/4)^9 = 0.188$$

- $E(X)$,

✖ Answer: 5/2

Explanation

$$E(X) = np = 10 \cdot \frac{1}{4} = \frac{5}{2}.$$

- $V(X)$.

✖ Answer: 15/8

Explanation

$$V(X) = np(1 - p) = 10 \cdot \frac{1}{4} \cdot \frac{3}{4} = \frac{30}{16} = \frac{15}{8}.$$

Submit

You have used 4 of 4 attempts

❗ Answers are displayed within the problem

7

0 points possible (ungraded)

Our TA owns four Porsches, each works 80% of the time, and two Ferraris, each works 60% of the time. What is the probability that on a given day, at least half of the Porsches and half the Ferraris work?

✖ Answer: 0.817152

Explanation

Let Q be the number of Porshes that work and F be the number of Ferraris that work.

$$P(Q \geq 2) = 1 - P(Q = 0) - P(Q = 1) = 1 - \binom{4}{0}0.2^4 - \binom{4}{1}0.8^1 \cdot 0.2^3 = 0.9728$$

. Similarly $P(F \geq 1) = 1 - P(F = 0) = 1 - \binom{2}{0}0.4^2 = 0.84$ Therefore the required probability is $P(Q \geq 2) \cdot P(F \geq 1) = 0.817152$

Submit

You have used 4 of 4 attempts

i Answers are displayed within the problem

Discussion

Hide Discussion

Topic: Topic 8 / Binomial

Add a Post

Show all posts ▼

by recent activity ▼



Problem 4

Questions and comments regarding problem 4.

5

Staff



Problem 3

Questions and comments regarding problem 3.

3

Staff



General Comments

Questions and comments regarding this section.

2

Staff



Problem 2

Questions and comments regarding problem 2.

1

Staff



Problem 1

Questions and comments regarding problem 1.

1

Staff



Problem 5

Questions and comments regarding problem 5.

1

Staff



Problem 6

Questions and comments regarding problem 6.

1

 [Staff](#)



Problem 7

Questions and comments regarding problem 7.

1

 [Staff](#)

© All Rights Reserved