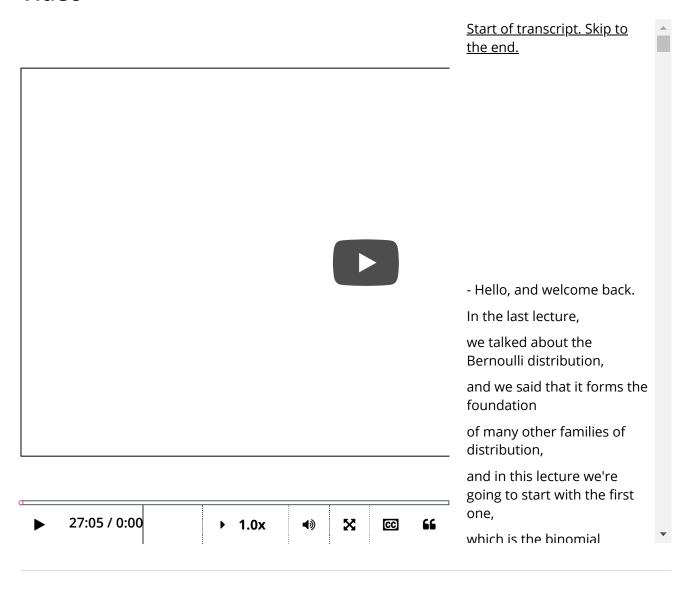


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# Binomial Distribution Video



#### 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**

O 2.5		
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	7 E	020/
	2.3	<b>8270</b>

None of the above	12%
None of the above	14

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,

$$^{\circ}~2.26\%$$

$$\circ$$
 5.2%

#### **Answer**

Correct: Video: Binomial Distribution

#### **Explanation**

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

b) the probability of encountaring only red lights,

0.03%

0.52%	•
0.04/0	

- 0 1.16%
- 0.16.4%

#### Answer

Correct: Video: Binomial Distribution

## **Explanation**

$$0.35^5 = 0.0052$$

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

- 0.75
- 0.1.42
- 1.75 ✓
- 0 2.25

#### **Answer**

Correct: Video: Binomial Distribution

#### **Explanation**

The expection of the sum is the sum of the expections.

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

Submit

You have used 2 of 4 attempts

**1** 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% ✓
- 0 8.0%
- 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**%
- 0 5.25%
- 0 7.75%
- 14.1% ✓

#### **Answer**

Correct: Video: Binomial Distribution

#### **Explanation**

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

Submit

You have used 1 of 3 attempts

**1** Answers are displayed within the problem

3

0 points possible (ungraded)

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

exactly two heads,



**X** Answer: 0.13824

## **Explanation**

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

• at most one tails,



**X** Answer: 0.23328

4

## **Explanation**

The number of tails, T is distributed as  $T\sim \mathrm{Binomial}\,(6,0.4)$ . Thus the probability here is  $P(T=0)+P(T=1)=\binom{6}{0}0.6^6+\binom{6}{1}0.4^1\cdot0.6^5=0.23328$ 

• an even number of heads.



**X** Answer: 0.500032

## **Explanation**

 $\dot{}$  Using the distribution of H, the probability here is

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

Submit

You have used 4 of 4 attempts

**1** 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  $B_{p,n+1}$ .

1

✓ Answer: 1

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

**1** Answers are displayed within the problem

5

0 points possible (ungraded) For  $X \sim B_{0.7,10}$ , find:

• E(X),

220

X Answer: 7

220

# Explanation

$$E(X) = np = 7.$$

• V(X),



**X** Answer: 2.1

Explanation

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

 $\bullet$   $\sigma_X$ ,



#### **Explanation**

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

• The most likely outcome of X.



#### **Explanation**

$$P(X = 7) = \max_{x} P(X = x)$$

Submit

You have used 4 of 4 attempts

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:

• 
$$P(X=0)$$
,

4 **X** Answer: 0.056

#### **Explanation**

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

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

• P(X=1),

**X** Answer: 0.188

## **Explanation**

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

• E(X),



**X** Answer: 5/2

#### **Explanation**

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

• *V*(*X*).



**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

**1** 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?

0

**X** Answer: 0.817152

0

#### **Explanation**

Let Q be the number of Porshes that work and F be the number of Ferraris that work.  $P(Q \geq 2) = 1 - P(Q = 0) - P(Q = 1) = 1 - {4 \choose 0}0.2^4 - {4 \choose 1}0.8^1 \cdot 0.2^3 = 0.9728$  . Similarly  $P(F \geq 1) = 1 - P(F = 0) = 1 - {2 \choose 0}0.4^2 = 0.84$ Therefore the required probability is  $P(Q \geq 2) \cdot P(F \geq 1) = 0.817152$ 

Submit

You have used 4 of 4 attempts

**1** Answers are displayed within the problem

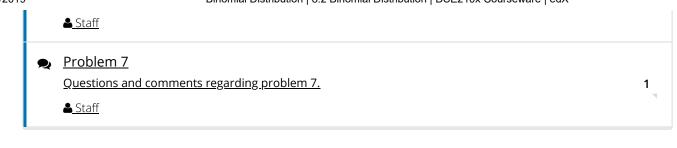
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