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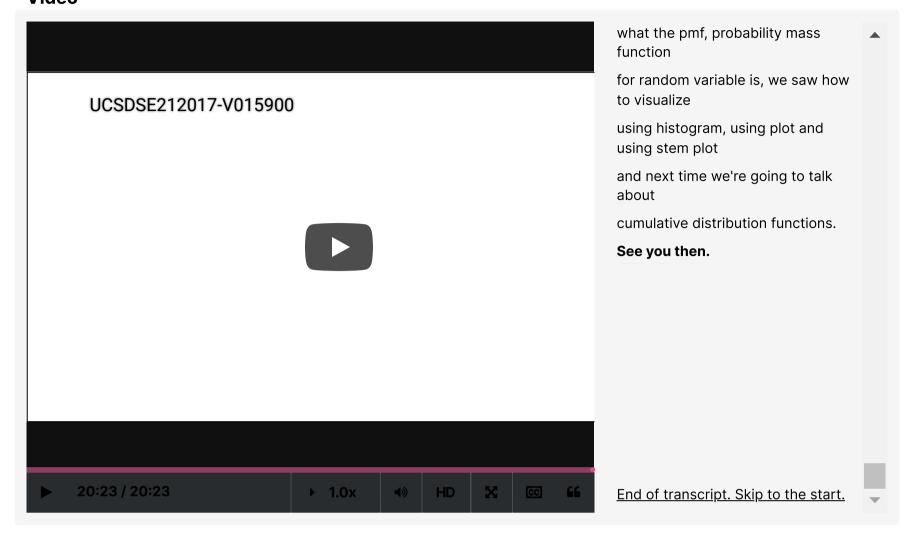
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### Video

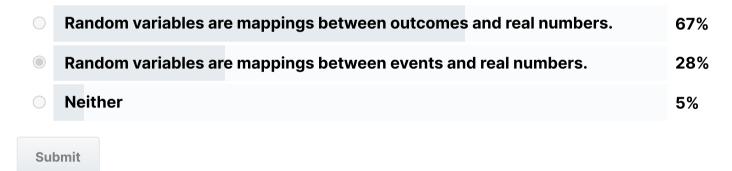


#### 7.1\_Random\_Variables

### **POLL**

Which of the following statements is correct?

### **RESULTS**



Results gathered from 43 respondents.

## FEEDBACK

Random variables are mappings between outcomes and real numbers.

# 1 (Graded)

0/3 points (graded)

For which value of lpha is the function  $p_i=rac{(lpha+1)(i-lpha)+2}{120}$  over  $\{1,2,\cdots,10\}$  a p.m.f.?



### **Explanation**

The p.m.f should add up to 1, hence,

$$\sum_{i=1}^{10} p_i = \sum_{i=1}^{10} rac{(lpha+1)\,(i-lpha)+2}{120} = \sum_{i=1}^{10} rac{-lpha^2+(i-1)\,lpha+i+2}{120} = 1$$

This reduces to the quadratic equation  $2\alpha^2-9\alpha+9=0$  with two solutions  $\alpha=\frac{3}{2}$  and  $\alpha=3$ . Recall that  $0\leq p_i\leq 1$ , the solution  $\alpha=3$  is discarded as some  $p_i$ 's are negative, and we are left eith  $\alpha=\frac{3}{2}$ .

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You have used 4 of 4 attempts

**1** Answers are displayed within the problem

2

0 points possible (ungraded)

Which of the following are true for random variables?

 $oxedsymbol{oxed}$  A random variable  $oldsymbol{X}$  defines an event.

 $\checkmark$  For a random variable X and a fixed real number a, " $X \leq a$ " defines an event.

Random variables for the same sample space must be same.

igwedge For a random variable X, possible values for  $P\left(X=x
ight)$  include 0,0.5 and 1.



#### **Explanation**

Recall either the informal definition of a random variable as a real-valued random experiment, or the more formal one as a function that maps the sample set  $\Omega$  to real numbers  $\mathbb R$ . Therefore:

- False. A random variable does not define an event.
- True. " $X \leq a$ " is the set of outcomes that are at most a.
- False. A fair coin and a biased coin are two different variables with the same sample space \(\\h,t\\\)).
- True.  $0 \leq P\left(X=x
  ight) \leq 1$ , hence both 0,0.5 and 1 are possible.

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You have used 2 of 4 attempts

**1** Answers are displayed within the problem

# 3 (Graded)

3/3 points (graded)

An urn contains 20 balls numbered 1 through 20. Three of the balls are selected from the run randomly without replacement, and X denotes the largest number selected.

• How many values can  $oldsymbol{X}$  take?

18 **✓ Answer:** 18

## Explanation

18

 ${f 1}$  and  ${f 2}$  are impossible, the remaining 18 outcomes can occur.

• What is P(X = 18)?

34/285 **✓ Answer:** 0.119

### **Explanation**

18 is fixed, while the other 2 balls should selected from 1 to 17.  $P(X=18)=\binom{17}{2}/\binom{20}{3}=0.119$ .

• What is  $P(X \ge 17)$ ?

0.5

**✓ Answer:** 0.508

0.5

### **Explanation**

$$P\left(X \geq 17\right) = P\left(X = 17\right) + P\left(X = 18\right) + P\left(X = 19\right) + P\left(X = 20\right) = \frac{\binom{16}{2} + \binom{17}{2} + \binom{18}{2} + \binom{19}{2}}{\binom{20}{3}} = 0.508$$

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You have used 1 of 4 attempts

**1** Answers are displayed within the problem

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