Chapter 6: Random Variables

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| Key Vocabulary: | continuous random variable |
| random variable | uniform distribution |
| discrete random variable | normal distribution |
| probability distribution | expected value |
| probability histogram | Law of Large Numbers |
| density curve | variance |
| probability density curve | standard deviation |

6.1 Discrete and Continuous Random Variables (pp.341-352)

1. What is a ***discrete*** *random variable*?
2. If *X* is a *discrete random variable*, what information does the *probability distribution of X* give?
3. In a probability *distribution* the probability must satisfy what 2 requirements?
4. If *X* is a *discrete random variable*, do P(X>2) and P(X≥2) have the same value? Explain.

**CYU page 344**

1. P(X≥3) means:  
  
2.   
  
3. Graph:

1. What is meant by the *expected value* of *X* ? Use the Roulette example to explain it in common terms.
2. How do you calculate the mean of a *discrete random variable X* ?
3. Explain how to calculate the *variance* of a *discrete random variable* *X* using the formula given on page 347 (copy the formula here).
4. Given the *variance* of a *random variable*, explain how to calculate the *standard deviation.*
5. Explain what the Freq list is for in your Stat Plot menu, and how to use 1 var stat on the calc to get µx and σx for a random variable with a know probability distribution (page 348 Tech Corner!)

**CYU Page 349** (may use calculator as on page 348 or show calculations by hand)

1. What is a ***continuous*** *random variable*?
2. If *X* is a *continuous random variable*, how is the *probability distribution of X* described?
3. What is the difference between a *discrete random variable* and a *continuous random variable*?
4. What is the area under a *probability density curve* equal to?
5. If *X* is a *continuous random variable*, do P(X>2) and P(X≥2) have the same value? Explain.
6. Explain why continuous random variables assign probability on an interval rather than individual outcomes.
7. How is a *normal distribution* related to *probability distribution*?

6.2 Transforming and Combining Random Variables

(pp. 358-377)

1. How does multiplying each value of a Random Variable affect the

* Mean, median, quartiles, percentiles
* σx, range, IQR
* Shape

1. How does adding the same number to each value of a Random Variable affect the

* Mean, median, quartiles, percentiles
* σx, range, IQR
* Shape

**CYU Page 362** (show work!)

1.

2.

1. Suppose µx= 2. According to the rules for means, what is µ3+4x?
2. Suppose σ2x= 4. According to the rules for variances, what is σ23+4x? What is σ3+4x?
3. Suppose µx= 5 and µy= 10. According to the rules for means, what is µx+y?
4. Suppose σ2x= 2 and σ2y= 3 and *X* and *Y* are independent random variables. According to the rules for variances, what is σ2x+y? What is σx+y?
5. Suppose µx = 5 and µy = 10. According to the rule of means, what is µx-y? Is µx-y the same as µy-x?
6. Suppose σ2x= 2 and σ2y= 3 and *X* and *Y* are independent random variables. According to the rules for variances, what is σ2x-y? What is σx-y?
7. The sum or difference of independent normal random variables is also…
8. What happens to the variance when you add 2 random variables? What about if you subtract the random variables?
9. What is the warning on the bottom of page 367?

CYU Page 370

1.

2.

3.

CYU Page 372

1.

2.

3.

6.3 Binomial and Geometric Random Variables Distributions (pp.382-401)

|  |  |
| --- | --- |
| Key Vocabulary: | binomial coefficient |
| binomial setting | “n choose k” |
| binomial random variable | factorial |
| binomial distribution | geometric distribution |
| B(n, p) | binompdf (n, p, X ) |
| probability distribution function | binomcdf (n, p, X ) |
| cumulative distribution function | randBin (n, p, #trials) |
| geometpdf (p, # obs for success) | geometcdf (p, # obs for success) |

1. What is the binomial setting?
2. What are the four conditions for the *binomial setting*?



**CYU Page 385** (remember to justify your answer using #2 above!)

1.

2.

3.

1. In the binomial distribution what do the parameters *n* and *p* represent?
2. What is meant by *B(n, p)* ?
3. Copy the formula for the binomial coefficient from page 387:

* what does *n* represent?
* What does *k* represent?
* What does the value of the binomial coefficient represent?

1. What is the formula for binomial probability?
2. What is the difference between a *probability distribution function* (pdf) and a *cumulative distribution function* (cdf)?

**CYU Page 390**

1.

2.

3.

1. What are the mean and standard deviation of a binomial random variable?

**CYU Page 393**

1.

2.

3.

1. When is it safe to use the binomial probability if there is not replacement?
2. Under what conditions can we approximate the binomial distribution with a normal distribution?
3. What are the four conditions for the *geometric setting*?



1. State the key difference between the *binomial setting* and the *geometric setting*.
2. If *X* has a geometric distribution, what does *(1 – p)n – 1p* represent?
3. What is the *expected value* of a *geometric random variable*? (State in words as well as formula).
4. What does *P(X>n)* represent in a geometric setting? (State in words as well as formula).

**CYU Page 401**

1.

2.

3.