Intro to Contemporary Math

Exam 2 Review

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October 15, 2018

Agenda

- Review

Announcements

- Exam 2 is this Wednesday. Bring a calculator.
- Homework is due tonight.

Project

- I posted information about the group project on the course website and Canvas.
- Please **form your groups of 2 to 3 people** and have someone from your group **email the names of every member** to me by **Thursday, October the 25th.**
- Once you do so, I will put you in a group on Canvas. Any further info about the project will be on your group page in Canvas (in the new "People" tab).

Exam Format

Two parts:

- 16 Multiple Choice questions
  - No partial credit
  - Some material from the mini-exam
  - Record answers on front page of exam
- Short Answer (SA) questions
  - Length of SA is about same as mini-exam

Outline of Topics

- Before mini-exam 2: Basics of probability
  - Discrete
  - Continuous (Intervals)
- After mini-exam 2: Conditional Probability
  - Discrete
  - Continuous (Intervals)

Discrete Probability Basics

- Counting outcomes in events and sample spaces
- Probability as a fraction of counts
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- Counting outcomes in events and sample spaces
- Probability as a fraction of counts
- Probabilities of complements
- Probabilities of intersections
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Discrete Probability Basics

- Counting outcomes in events and sample spaces
- Probability as a fraction of counts
- Probabilities of complements
- Probabilities of intersections
- Identifying unions and finding their probabilities

Continuous Probability Basics

- Computing sizes of events and sample spaces using lengths of intervals
- Probability as a fraction of lengths
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Continuous Probability Basics

- Computing sizes of events and sample spaces using lengths of intervals
- Probability as a fraction of lengths
- Identifying the union of two intervals as a bigger combined interval or two separate intervals
- Finding the probability of a union
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Continuous Probability Basics

- Computing sizes of events and sample spaces using lengths of intervals
- Probability as a fraction of lengths
- Identifying the union of two intervals as a bigger combined interval or two separate intervals
- Finding the probability of a union
- Identifying the intersection of two intervals as a smaller interval (overlap)
- Finding the probability of an intersection

Conditional Probability (discrete)

- Computing conditional probability from a table
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Conditional Probability (discrete)

- Computing conditional probability from a table
- Computing conditional probability by examining changes in events and sample spaces
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Conditional Probability (discrete)

- Computing conditional probability from a table
- Computing conditional probability by examining changes in events and sample spaces
- Determining if two events are independent or not and why
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Conditional Probability (discrete)

- Computing conditional probability from a table
- Computing conditional probability by examining changes in events and sample spaces
- Determining if two events are independent or not and why
- Using conditional probabilities to recover numerators and intersection counts

Conditional Probability (continuous)

- Identifying intersections and given event intervals
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Conditional Probability (continuous)

- Identifying intersections and given event intervals
- Using lengths of intersections and given event intervals to compute conditional probability

?R.1 Union from a Table

This table describes a jar of beads by color and shape:

	Pointy	Round	Total
Red	8	64	72
Blue	128	16	144
Total	136	80	216

What is the probability of drawing a bead that is red or round? Type a fraction.

	Pointy	Round	Total
Red	**8**	**64**	72
Blue	128	**16**	144
Total	136	80	216

What is the probability of drawing a bead that is red or round? Type a fraction.

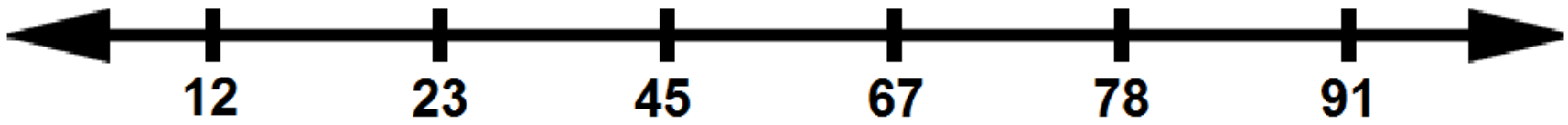
The beads which are red or round are:

$$\begin{array}{rrl} & 8 & \text{red pointy beads} \\ + & 64 & \text{red round beads} \\ + & \underline{16} & \text{blue round beads} \\ & 88 & \text{red or round beads} \end{array}$$

Hence the probability is

$$\boxed{\frac{88}{216}}.$$

?R.2 Union of Two Intervals



Suppose our sample space is $[12, 91]$.
Find $P([23, 67] \cup [45, 78])$.
Hints:

1. Identify the event $[23, 67] \cup [45, 78]$ as an interval.
2. What is the length of the event?
3. What is the length of the sample space?
4. Find $P([23, 67] \cup [45, 78])$.

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Find $P([23, 67] \bigcup [45, 78])$.

1. Identify the event $[23, 67] \bigcup [45, 78]$ as an interval.

$$[23, 78]$$

2. What is the length of the event?

$$78 - 23 = 55$$

3. What is the length of the sample space?

$$91 - 12 = 79$$

4. Find $P([23, 67] \bigcup [45, 78])$.

$$\frac{\text{Length of event}}{\text{Length of sample space}} = \frac{55}{79}$$

?R.3 Drawing Two Marbles

A jar has 23 red marbles and 39 blue marbles (62 total). Suppose two marbles are drawn without replacement. What is the probability of drawing a blue marble second given that a red marble was drawn first?

Drawing Two Marbles

A jar has 23 red marbles and 39 blue marbles (62 total). Suppose two marbles are drawn without replacement. What is the probability of drawing a blue marble second given that a red marble was drawn first?

- On the second draw, there are still 39 blue marbles in the jar
- However, there are only 61 marbles left

Hence the probability is

$$\frac{\text{39 blue marbles left}}{\text{61 marbles left}} = \boxed{\frac{39}{61}}.$$

?R.4 Numerator from Percent

A jar contains beads which are either blue or white, and either round or pointy. If the probability of drawing a blue bead given that it is round is 7/50, and there are 150 round beads in the jar, how many beads are blue and round?
Type and send a whole number.

Numerator from Percent

A jar contains beads which are either blue or white, and either round or pointy. If the probability of drawing a blue bead given that it is round is 7/50, and there are 150 round beads in the jar, how many beads are blue and round?

$$\frac{\text{Number of blue and round beads}}{\text{Number of round beads}} = \frac{7}{50}$$

$$\frac{\text{Number of blue and round beads}}{150} = \frac{7}{50}$$

$$\text{Number of blue and round beads} = 150 \cdot \frac{7}{50} = \frac{1050}{50} = \boxed{21}.$$

Check:

$$\frac{21}{150} = 0.14 = \frac{7}{50}.$$

?R.5 Conditional Probability with Intervals

Suppose our sample space is $[12, 91]$.
Find the probability of picking a number in $[45, 78]$ given that it is in $[23, 67]$.
Hints:

1. Identify the intersection of $[23, 67]$ and $[45, 78]$ as an interval.
2. What is the length of the intersection?
3. What is the length of the given event?
4. Answer the question by dividing the appropriate lengths.

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Suppose our sample space is $[12, 91]$.
Find the probability of picking a number in $[45, 78]$ given that it is in $[23, 67]$.

1. Identify the intersection of $[23, 67]$ and $[45, 78]$ as an interval.

$$[45, 67]$$

2. What is the length of the intersection?

$$67 - 45 = 22$$

3. What is the length of the given event?

$$67 - 23 = 44$$

Find the probability of picking a number in $[45, 78]$ given that it is in $[23, 67]$.

1. Identify the intersection of $[23, 67]$ and $[45, 78]$ as an interval.

$$[45, 67]$$

2. What is the length of the intersection?

$$67 - 45 = 22$$

3. What is the length of the given event?

$$67 - 23 = 44$$

4. Answer the question by dividing the appropriate lengths.

$$\frac{\text{Length of intersection}}{\text{Length of given event}} = \frac{22}{44}.$$

Next time

- Exam 2
- Compensation