

# Unit 7 Practice #1

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For #1-2, state whether the event(s) is/are independent, dependent, mutually exclusive, or inclusive. Then find the probability.

1. A standard deck of cards contains 52 cards. Find the probability of:

- a) picking a heart or an Ace **inclusive**  $16/52$  or  $4/13$
- b) picking a face card, putting it back in the deck, and then picking a red card **independent**  $\frac{312}{2704}$  or  $\frac{3}{26}$
- c) picking a face card or an Ace **mutually exclusive**  $16/52$  or  $4/13$
- d) picking a 3, leaving it out of the deck, and then picking an even numbered card **dependent**  $\frac{80}{2652}$  or  $\frac{20}{663}$
- e) picking a black card or a face card **inclusive**  $\frac{32}{52}$  or  $\frac{8}{13}$

2. Numbers 1 – 15 are written on cards and placed in a bag. Find the probability of:

- a) picking a card greater than 12, putting it back in the deck and then picking a prime number **independent**
- b) picking an even number or a multiple of 3 **inclusive**  $10/15$  or  $2/3$
- c) picking a card greater than 12 or a number less than 5 **mutually exclusive**  $7/15$
- d) picking a 6, not replacing it, and then picking an odd number **dependent**  $8/210$  or  $4/105$

3. There are 11 marbles in a bag: 1 yellow, 2 red, 4 blue, 3 green and 1 purple.

- a) P(yellow | not blue)  $1/7$
- b) P(green | not red)  $3/9$  or  $1/3$

4. A standard deck of cards contains 52 cards.

- a) P(spade | black)  $13/26$  or  $1/2$
- b) P(2 | diamond)  $1/13$
- c) P(Queen | face card)  $4/12$  or  $1/3$
- d) P(Ace | red)  $2/26$  or  $1/13$
- e) P(face card | heart)  $3/13$
- f) P(even numbered card | not red)  $10/26$  or  $5/13$

5. The table below shows the results of a survey that asked 10<sup>th</sup>-12<sup>th</sup> graders if they own a smart phone.

	Owns a Smart Phone	Doesn't Own a Smart Phone	Total
10 <sup>th</sup> grade	204	170	374
11 <sup>th</sup> grade	192	160	352
12 <sup>th</sup> grade	198	165	363
<b>Total</b>	<b>594</b>	<b>495</b>	<b>1089</b>

- a) Complete the totals.
- b) P(owns a smart phone | 10<sup>th</sup> grader)  $204/374$
- c) P(11<sup>th</sup> grader or 12<sup>th</sup> grader)  $715/1089$
- d) P(12<sup>th</sup> grader | don't own a smart phone)  $165/495$
- e) P(10<sup>th</sup> grader | owns a smart phone)  $204/594$
- f) P(11<sup>th</sup> or 12<sup>th</sup> grader | don't own a smart phone)  $325/495$

6. Consider the sample space: {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20}

A = {multiples of 4}

C = {odd numbers}

B = {5, 10, 11, 13}

D = {numbers greater than 15}

- a)  $\sim A \cup B$  {1, 2, 3, 5, 6, 7, 9, 10, 11, 13, 14, 15, 17, 18, 19}
- b)  $C \cap \sim D$  {1, 3, 5, 7, 9, 11, 13, 15}
- c)  $A \cup D$  {4, 8, 12, 16, 17, 18, 19, 20}

1a)  $P(\text{heart or Ace})$  **inclusive**  
 $= P(\text{heart}) + P(\text{Ace}) - P(\text{heart} \cap \text{Ace})$   
 $= \frac{13}{52} + \frac{4}{52} - \frac{1}{52}$   
 $= \frac{16}{52}$

1b) **independent**  $P(\text{face}) \cdot P(\text{red}) = \frac{12}{52} \cdot \frac{24}{52} = \frac{312}{2704}$

1c)  $P(\text{face or Ace})$  **mutually exclusive**  
 $= P(\text{face}) + P(\text{Ace})$   
 $= \frac{12}{52} + \frac{4}{52} = \frac{16}{52}$

1d) **dependent**  $P(3) \cdot P(\text{even} | 3) = \frac{4}{52} \cdot \frac{20}{51} = \frac{80}{2652}$

1e)  $P(\text{black or face})$  **inclusive**  
 $= P(\text{black}) + P(\text{face}) - P(\text{black} \cap \text{face})$   
 $= \frac{26}{52} + \frac{12}{52} - \frac{6}{52}$   
 $= \frac{32}{52}$

2a) **independent**  $P(\text{greater than 12}) \cdot P(\text{prime})$   
 $\frac{3}{15} \cdot \frac{6}{15} = \frac{18}{225}$

2b)  $P(\text{even or multiple of 3})$  **inclusive**  
 $= P(\text{even}) + P(\text{multiple of 3}) - P(\text{even} \cap \text{multiple of 3})$   
 $= \frac{7}{15} + \frac{5}{15} - \frac{2}{15}$   
 $= \frac{10}{15}$

2c)  $P(\text{greater than 12 or less than 5})$  **mutually exclusive**  
 $= P(\text{greater than 12}) + P(\text{less than 5})$   
 $= \frac{3}{15} + \frac{4}{15} = \frac{7}{15}$

2d) **dependent**  $P(6) \cdot P(\text{odd} | 6)$   
 $\frac{1}{15} \cdot \frac{8}{4} = \frac{8}{210}$

$$3a) P(\text{yellow} | \text{not blue}) = \frac{1}{7}$$

$$3b) P(\text{green} | \text{not red}) = \frac{3}{9}$$

$$4a) P(\text{spade} | \text{black}) = \frac{13}{26}$$

$$4b) P(2 | \text{diamond}) = \frac{1}{13}$$

$$4c) P(\text{queen} | \text{face card}) = \frac{4}{12}$$

$$4d) P(\text{Ace} | \text{red}) = \frac{2}{26}$$

$$4e) P(\text{face card} | \text{heart}) = \frac{3}{13}$$

$$4f) P(\text{even} | \text{not red}) = \frac{10}{26}$$

$$5b) P(\text{owns a smart phone} | \text{10th grader}) = \frac{204}{374}$$

$$5c) P(\text{11th or 12th}) = \frac{715}{1089}$$

$$5d) P(\text{12th grader} | \text{doesn't own a smart phone}) = \frac{165}{495}$$

$$5e) P(\text{10th grader} | \text{owns a smart phone}) = \frac{204}{594}$$

$$5f) P(\text{11th or 12th grader} | \text{doesn't own a smart phone}) = \frac{325}{495}$$

$$6a) \sim A \cup B = \{1, 2, 3, 5, 6, 7, 9, 10, 11, 13, 14, 15, 17, 18, 19\} \cup \{5, 10, 11, 13\} \\ = \{1, 2, 3, 5, 6, 7, 9, 10, 11, 13, 14, 15, 17, 18, 19\}$$

$$6b) C \cap \sim D = \{1, 3, 5, 7, 9, 11, 13, 15, 17, 19\} \cap \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15\} \\ = \{1, 3, 5, 7, 9, 11, 13, 15\}$$

$$6c) A \cup D = \{4, 8, 12, 16, 20\} \cup \{16, 17, 18, 19, 20\} = \{4, 8, 12, 16, 17, 18, 19, 20\}$$