1. In a recent year, 389 of the 281,421,906 people in the United States were struck by lightning. Estimate the probability that a randomly selected person in the United States will be struck by lightning this year.

2. Two cards are to be randomly selected without replacement from a shuffled deck. Find the probability of getting an ace on the first card and a '4' on the second card.

3. With one method of a procedure called acceptance sampling, a sample of items is randomly selected without replacement from and the entire batch is accepted if every item in the sample is okay. The Niko Electronics Company has just manufactured 5000 CDs, and 100 are defective. If 4 of these CDs are randomly selected for testing, what is the probability that the entire batch will be accepted?

4. The following table represents the employment status and gender of the civilian labor force ages 16 to 24 (in millions).

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed</td>
<td>11.2</td>
<td>10.3</td>
</tr>
<tr>
<td>Unemployed</td>
<td>1.6</td>
<td>1.4</td>
</tr>
</tbody>
</table>
(a) What is the probability that a randomly selected 16 to 24-year-old individual from the civilian labor force is employed?

(b) What is the probability that a randomly selected 16 to 24-year-old individual from the civilian labor force is employed or male?

(c) Given that the randomly selected individual is male, what is the probability that this male is employed?

(d) What is the probability that a randomly selected 16 to 24-year-old individual is employed and male?

5. The following data represent the number if grams of fat in breakfast meals offered at McDonald’s. Find the five-number summary, and construct a boxplot for the data.

12 23 28 2 28 33
31 11 23 40 35 1
23 33 23 16 11 8
8 17 16 15

6. What is the probability of obtaining five heads in a row when flipping a coin? Assume that each flip is independent of the previous flip.

7. If two events A and B are mutually exclusive and \( P(A) = 0.25 \) and \( P(B) = 0.37 \), find the following

(a) \( P(A \text{ and } B) \)

(b) \( P(A \text{ or } B) \)

(c) \( P(A|B) \)

8. Use the Binomial formula to find the following probabilities.
(a) Find $P(X = 3)$ for $n = 10$ and $p = 0.4$.

(b) Find $P(X \leq 1)$ for $n = 15$ and $p = 0.2$.

9. The following data represents (in thousands) the enrollment levels in grades 1 to 8 in the United States in 2000.

<table>
<thead>
<tr>
<th>$x$ (Grade level)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3635</td>
</tr>
<tr>
<td>2</td>
<td>3633</td>
</tr>
<tr>
<td>3</td>
<td>3673</td>
</tr>
<tr>
<td>4</td>
<td>3708</td>
</tr>
<tr>
<td>5</td>
<td>3701</td>
</tr>
<tr>
<td>6</td>
<td>3658</td>
</tr>
<tr>
<td>7</td>
<td>3624</td>
</tr>
<tr>
<td>8</td>
<td>3532</td>
</tr>
</tbody>
</table>

(a) Construct a discrete probability distribution for the random variable $X$.

(b) Compute the mean of the random variable $X$.

(c) What is the probability of a student being in grade level 5 or lower?

10. Find the number of different ways that the nine player on a baseball team can line up for the National Anthem.

11. In a preliminary test of the MicroSort gender-selection method, 14 babies were born and 13 of them were girls.

(a) Find the number of different possible sequences of genders that are possible when 14 babies are born.
(b) How many ways can 13 girls and 1 boy be arranged in a sequence?

(c) If 14 babies are randomly selected, what is the probability that they consist of 13 girls and 1 boys?

(d) Does the gender selection method appear to yield a result that is significantly different from a result that might be expected by random chance?

12. The probability that a single radar will detect an enemy plane is 0.65. If four stations are in use, what is the mean number of stations that will detect an enemy plane also give the standard deviation?

Answers

1. \( \frac{389}{281421906} = 0.0000138 \).

2. \( \frac{4}{52} \times \frac{4}{51} = 0.006 \).

3. \( \frac{4900}{5000} \times \frac{4999}{4999} \times \frac{4998}{4998} \times \frac{4997}{4997} = 0.922 \).

4. Answer
   
   (a) \( P(\text{employed}) = \frac{215}{243} = 0.8776 \).
   
   (b) \( P(\text{E} \cup \text{M}) = \frac{234}{243} = 0.9429 \).
   
   (c) \( P(\text{E}|\text{M}) = \frac{112}{128} = 0.875 \).
   
   (d) \( P(\text{E} \cap \text{M}) = \frac{112}{243} = 0.4571 \).

5. The five number summary is

   Min 1
   \( Q_1 \) 11
   Median 20
   \( Q_2 \) 28
   Max 40

   The IQR = 20, there are no outliers.
6. \( \left( \frac{1}{2} \right)^5 = 0.03125. \)

7. Since A and B are mutually exclusive \( P(A \cap B) = 0, \) \( P(A \cup B) = 0.62 \) and \( P(A|B) = 0. \)

8. a) 0.2150  
    b) 0.1671

<table>
<thead>
<tr>
<th>x (Grade level)</th>
<th>Frequency</th>
<th>( P(x) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3635</td>
<td>0.1246</td>
</tr>
<tr>
<td>2</td>
<td>3633</td>
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<tr>
<td>3</td>
<td>3673</td>
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</tr>
<tr>
<td>4</td>
<td>3708</td>
<td>0.1271</td>
</tr>
<tr>
<td>5</td>
<td>3701</td>
<td>0.1269</td>
</tr>
<tr>
<td>6</td>
<td>3658</td>
<td>0.1254</td>
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<tr>
<td>7</td>
<td>3624</td>
<td>0.1243</td>
</tr>
<tr>
<td>8</td>
<td>3532</td>
<td>0.1211</td>
</tr>
</tbody>
</table>

Mean = 4.4860

\( P(X \leq 5) = 0.6291 \)

10. \( 9! = 362880. \)

11. a) 16384  
    b) 14  
    c) \( \frac{14}{16384} = 0.00086 \)  
    d) Yes this is very different as with random chance we would expect 7 boys and 7 girls.

12. For the Binomial distribution with \( n = 4 \) and \( p = 0.65 \), Mean = np = 2.6 and Standard deviation = 0.9539.