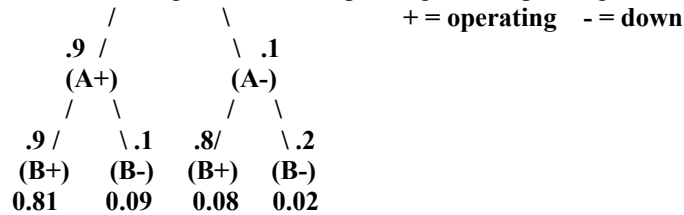


Practice Exam 1 - Answers

1. Two major plants (A and B) are supplying power to an electrical grid. Plant A has a 10% of shutting down. Plant B has a 10% of shutting down if A is operating and a 20% chance of shutting down if A is down. Rolling blackouts will occur if either of these plants shut down.

- a. Draw a tree diagram of all possibilities, starting with Plant A operating or not operating.



- b. Determine the probability of a rolling blackout.

$$0.09 + 0.08 + 0.02 = 0.19$$

2. The data shown in the scatter plot is the distance traveled and the airfare for 12 flights on Delta Airlines:

- a. Which of the following is a reasonable estimate of the correlation coefficient? (Circle one answer)

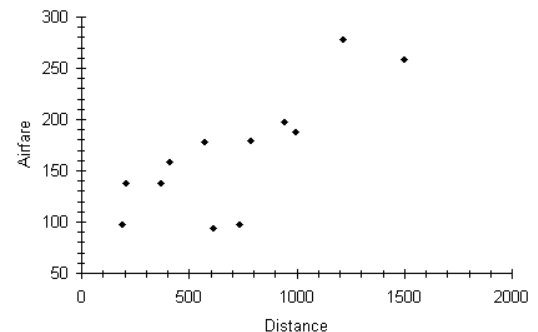
1.0 **(0.8)** 0.0 -0.5

- b. What does this graph tell us about distance and airfare

As distance goes up price goes up.

- c. What is the type and level of distance traveled?

Type (Circle One) Categorical Discrete **(Continuous)**
 Level (Circle One) Nominal Ordinal Interval **(Ratio)**



3. You have a 70% chance of being on time to class today and a 80% chance of being on time to class tomorrow. Assume these two days are independent events.

- a. Find the probability of being on time to class both today **and** tomorrow.

$$0.7 \times 0.8 = 0.56$$

- b. Find the probability of being on time to class at least once today **or** tomorrow.

$$0.7 + 0.8 - 0.56 = 0.94$$

4. The following data represent the daily births at a hospital for 20 days

14	15	15	17	17	19	19	21	23	25
26	27	31	35	36	47	48	59	70	99

- a) Construct a stem and leaf diagram of the data

```

1 | 4 5 5 7 7 9 9
2 | 1 3 5 6 7
3 | 5 6
4 | 7 8
5 | 9
6 |
7 | 0
8 |
9 | 9
  
```

- b) Calculate the interquartile range for this data set.

$$Q1 = 18, Q3 = 41.5 \quad IQR = 41.5 - 18 = 23.5$$

- c) Calculate the median for this data set.

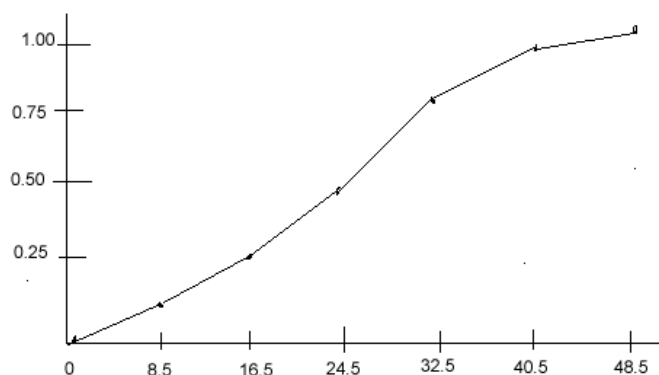
$$\text{Median} = 25.5$$

- d) **Without calculating**, what can you say about the mean births for this Hospital.(check one answer below)?
- ☐ **The mean is greater than the median. Data is skewed right**
- ☐ ~~The mean is less than the median.~~
- ☐ ~~The mean is about the same as the median.~~
- ☐ ~~None of the above — no way to know without calculating.~~

5. The following data represents the hours per week worked outside of school by 200 randomly selected night students at a community college:

<u>Hours</u>	<u>Frequency</u>	<u>Relative Freq</u>	<u>C.R.Freq</u>
0-8	20	0.10	0.10
9-16	30	0.15	0.25
17-24	50	0.25	0.50
25-32	60	0.30	0.80
33-40	30	0.15	0.95
40-48	10	0.05	1.00
Total	200	1.00	

- a) In the space above, determine the relative frequencies and cumulative relative frequencies.
- b) Sketch a cumulative relative frequency **ogive**, showing **all horizontal and vertical labels**.



- c) Estimate the median from the graph.
median = 24.5
- d) What percentage of the night students work 32 hours per week or less?
0.80 (crf)

Without calculating but explaining your reasoning, which of the following is a reasonable estimate for the standard deviation? a) 0.5 b) 1 c) **10** d) 50

10 is the only answer that makes sense since the range is 48 and the range is between 4s and 6s.

6. Determine if each of the following data are categorical, continuous or discrete (circle one for each)

a. Number of fatalities from a tsunami:	categorical	continuous	discrete
b. Time spent in traffic:	categorical	continuous	discrete
c. Number of Songs on your I-pod:	categorical	continuous	discrete
d. Your student number	categorical	continuous	discrete
e. Names of cities in California with a Walmart:	categorical	continuous	discrete
f. Price per gallon of gasoline:	categorical	continuous	discrete
g. Number of Courses taken in a year.	categorical	continuous	discrete
h. Tons of steel used by a manufacturer:	categorical	continuous	discrete

7. 1000 students (500 morning, 300 afternoon, 200 night) were asked how often they use the campus library. The results are summarized in the table below:

	<i>Never uses library</i>	<i>Sometimes uses library</i>	<i>Frequently uses library</i>	Total
<i>Morning</i>	200	250	150	600
<i>Afternoon</i>	80	145	75	300
<i>Night</i>	80	10	10	100
Total	360	405	235	1000

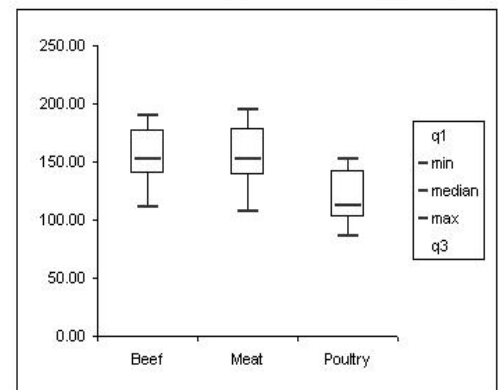
- Find the following probabilities:
 - A randomly selected student never uses the library.
 $360/1000=.360$
 - A randomly selected student is a night student and frequently uses the library.
 $10/1000=.010$
 - Given** the student is an afternoon student, the student never uses the library.
 $80/300=.267$
- Are “Afternoon Student” and “Never uses library” Independent Events? **Justify and explain your answer.**
No. $P(\text{Never}) \neq P(\text{Never}|\text{Afternoon})$ ($0.360 \neq 0.267$)
- Would the probabilities generated from this data be classical, empirical or subjective probability?
Empirical – based on data

8. These descriptive statistics and boxplots were generated from data representing **calories per serving** for three types of hotdogs: All **Beef**, Mixed **Meat** and **Poultry**.

Descriptive statistics

	<i>Beef</i>	<i>Meat</i>	<i>Poultry</i>
count	20	17	17
mean	156.85	158.71	118.76
sample variance	512.66	636.85	508.57
sample standard deviation	22.64	25.24	22.55
minimum	111	107	86
maximum	190	195	152
range	79	88	66
median	152.5	153	113
mode	149	#N/A	102

- Compare the mean to the median calories for the **Meat** group. Is the result consistent with the shape of the box plot? Explain your answer.
Mean>median, but it is difficult to read the skewness from graph so its unclear.
- If the data is approximately bell shaped, between what two values of calories would you expect to find about 95% of the **Beef** data?
(111.57, 202.13)
- Which of the three groups has the most variability in calories per serving? Explain your answer.
Meat – highest Standard deviation
- Hebrew National All Beef Hotdogs had 190 calories per serving. Calculate and interpret the z-score for Hebrew National Hotdogs using the **Beef** Category data.
 $Z=1.46$ Hebrew national calories are above average.
- Determine the probability a randomly selected **Poultry** Hot Dog exceeds 113 calories.
50% (half the data is above the median)
- Compare the three groups and draw at least two conclusions from the results.
Chicken dogs are lower in calories. Meat and Beef are about the same. (other answers ok).



9. 70% of students at a large New York University receive some financial aid. (use binomial table $n=4$, $p=.7$)

- If 4 students are randomly selected, determine the probability that **exactly 2** students in the sample receive some financial aid. $P(X=2) = .265$
- If 4 students are randomly selected, determine the probability that **less than 2** students in the sample receive some financial aid. $P(X<2) = P(0) + P(1) = .084$
- Find the probability you sample **exactly 3** students before finding the first student who receives some financial aid. $P(NNY)=P(N)P(N)P(Y)=(.3)(.3)(.7)=.063$

10. Serious accidents occur at an oil refinery at a Poisson rate of **1 per year**.

- Find the probability of **exactly 2** serious accidents occurring in the next year.
0.1839
- Find the probability of **at least 1** serious accident occurring in the next **3 years**.
1-0.0498 = 0.9502 (use $\mu=3$)

11. The random variable X follows the probability distribution function as shown to the right:

- Determine $P(X=3)$ **$P(3)=0.3$**
- Determine the population mean. **$\mu=2$**
- Determine the population variance **$\sigma^2=1.4$**

x	$P(x)$
0	0.1
1	0.3
2	0.2
3	
4	0.1

12. 39% of students at a college use the cafeteria.

- If 9 students are randomly sampled, determine the probability that less than 3 use the cafeteria. (Probability table for binomial $n=9$, $p=.39$ shown on the right) ----->
0.25016
- If 9 students are randomly sampled and X represents the number of students in the sample who use the cafeteria, find the **mean** and **standard deviation** of X.
 $\mu=3.51$ $\sigma=1.463$
- Students are sampled until the first student is found who uses the cafeteria. Find the probability this student is selected on the third trial.
 $P(NNY)=P(N)P(N)P(Y)=(.61)(.61)(.39)=.1451$

X	$p(X)$
0	0.01169
1	0.06729
2	0.17208
3	0.25672
4	0.24619
5	0.15740
6	0.06709
7	0.01838
8	0.00294
9	0.00021

13. Accidents in a power plant occur at a Poisson rate of 1.39 per year. A Poisson Distribution table for $\lambda=1.39$ is shown on the right. ----->

- Find the probability of **at least 2** accidents occurring at the plant in the next year.
 $1 - 0.24908 - 0.34621 = 0.40471$
- Find the probability that the plant has zero accidents in two years
 $0.24908^2 = 0.06204$

X	$p(X)$
0	0.24908
1	0.34621
2	0.24062
3	0.11149
4	0.03874
5	0.01077
6	0.00250
7	0.00050
8	0.00009
9	0.00001
10	0.00000