MTH 142: Practice Exam 2 Key

College of Lake County

1. The distribution of systolic blood pressures for 18-year-old women is bell shaped with a mean of 120 mmHg and a standard deviation of 12 mmHg.

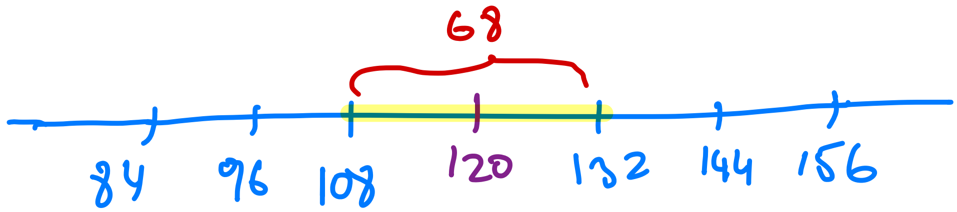
   What percentage of 18-year-old women have a systolic blood pressure is not between 108 mmHg and 132 mmHg? $\bar{x} = 120$, $s = 12$

   a. 68%

   b. 84%

   c. 32%

   d. 16%



2. The table below shows the scores of a group of students on a 10-point quiz:

   1 Var Stats L_1, L_2

Test Score	Frequency
3	3
4	2
5	2
6	2
7	4
8	1
9	0
10	2

L_1 L_2

Use this data to answer the following. Enter your answer as a numerical value only, and round answers to one decimal place.

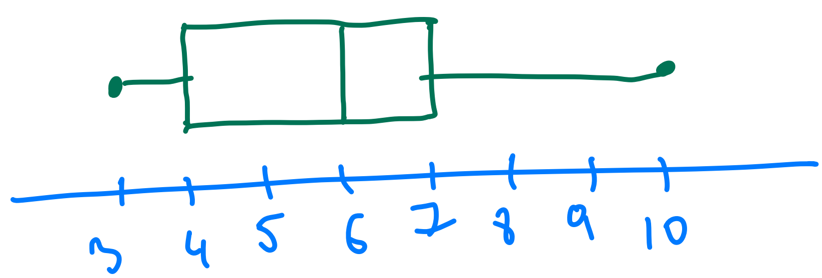
(a) Find the standard deviation of the scores. $s = 2.3$

(b) Find the variance of the scores. $(2.3)^2$

(c) Find the 5 number summary.

min = 3
$Q_1 = 4$
Med = 6
$Q_3 = 7$
max = 10

(d) Draw the boxplot.



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3. The table below describes the smoking habits of a group of asthma sufferers:

	N Nonsmoker	LS Light smoker	HS Heavy smoker	Total
M Men	339	63	72	474
W Women	343	75	66	484
Total	682	138	138	958

If one of the 958 subjects is randomly selected, find the probability that the person chosen is

(a) A man $P(M) = \frac{474}{958}$

(b) A man who is a heavy smoker. $P(M \text{ and } HS) = \frac{72}{958}$

(c) A nonsmoking woman. $P(W \text{ and } N) = 343/958$

(d) A woman or a nonsmoking person. $P(W \text{ or } N) = P(W) + P(N) - P(W \text{ and } N)$
$= \frac{484}{958} + \frac{682}{958} - \frac{343}{958}$

(e) A woman given that the person is a light smoker.
$P(W \mid LS) = \frac{75}{138}$

4. How many ways can 3 fraternity members be selected from 20 members to serve as president, vice president, and treasurer?

Answer: 20 19 18 $20 \cdot 19 \cdot 18$

5. Suppose that A, B are two mutually exclusive events, with $P(A) = 0.3$ and $P(B) = 0.4$. Find P(A or B)

a. 0.7

b. 0.3

c. 0.58

d. 0.12

$P(A \text{ or } B) = P(A) + P(B)$
$= 0.3 + 0.4$
$= 0.7$

$S = \{1, 2, 3, 4, 5, 6\}$

6. A single die rolled. Find the probability of each of the following events, and write your answers as fractions.
   (a) The number showing is 3. $P(3) = 1/6$
   (b) The number showing is not 3. $P(\text{not } 3) = 1 - 1/6 = 5/6$
   (c) The number showing is even. $P(\text{even}) = 3/6 = 1/2$
   (d) The number showing is greater than 3. $P(>3) = 3/6 = 1/2$
   (e) The number showing is 3 or even. $P(3 \text{ or eve}) = P(3) + P(\text{even})$
   $= 1/6 + 3/6 = 4/6 = \frac{2}{3}$

7. A basketball player hits three-point shots 45% of the time. If she takes 4 shots during a game, what is the probability that she misses the first shot and hits the last three shots?

   $P(H) = 0.45$: hit
   $P(M) = 0.55$: miss

   a. 0.05
   b. 0.41
   c. 0.5
   d. 0.041

   $P(MHHH) = (.55)(0.45)(0.45)(0.45)$
   $= 0.05011$

8. John Beale of Stanford, California, recorded the speeds of cars driving past his house, where the speed limit read 25 mph. The mean of 100 representative readings was 28.75 mph, with a standard deviation of 3.37 mph.
   (a) How many standard deviations from the mean would a car going the speed limit be? In other words, what is the z-score for the speed limit value?

   $$z \text{ score of } 25 = \frac{25 - 28.75}{3.37} = -1.11$$

   (b) What is the speed corresponding to a z score of 3.78?

   $$3.78 = \frac{x - 28.75}{3.37} \Rightarrow x - 28.75 = (3.78)(3.37)$$
   $$x = 12.7386 + 28.75$$
   $$x = 41.499$$

9. Let A, B be events, with $P(A) = 0.5, P(B) = 0.8$, and $P(A|B) = 0.40$.

Calculate the following probabilities for parts a through d, and give your answer as a decimal rounded to two decimal places. Answer part e as either "yes" or "no":

not B

(a) $P(B') = 1 - P(B) = 1 - 0.8 = 0.2$

(b) $P(A \text{and} B) = P(B) \cdot P(A|B) = (0.8)(0.4) = 0.32$

(c) $P(A \text{or} b) = P(A) + P(B) - P(A \text{ and } B)$
$= 0.5 + 0.8 - 0.32 = 0.98$

(d) $P(B|A) = \frac{P(A \text{ and } B)}{P(A)} = \frac{0.32}{0.5} = 0.64$

(e) Are events A and B independent? Justify your answer by showing what formula you used to decide on the answer.

NO $\quad P(A \text{ and } B) \neq P(A) \cdot P(B)$
$.2 \neq .4$

10. Two language majors, Anna and Megan, took exams in two languages. Anna scored 83 on both exams. Megan scored 76 on the first exam and 94 on the second exam. Overall, student scores on the first exam had a mean of 80 and a standard deviation of 6, and the second exam scores had a mean of 74 and a standard deviation of 14.

(a) To qualify for language honors, a major must maintain at least an 85 average across all language courses taken. So far, which of Anna and Megan qualify?

only Megan

Exam 1: $\bar{x}_1 = 80$, $s_1 = 6$

Exam 2: $\bar{x}_2 = 74$, $s_2 = 14$

(b) Which student's overall performance was better?

Anna

Anna: 83 — 83

Megan: 76 — 94

Anna:

1: $z = \frac{83-80}{6} = 0.5$

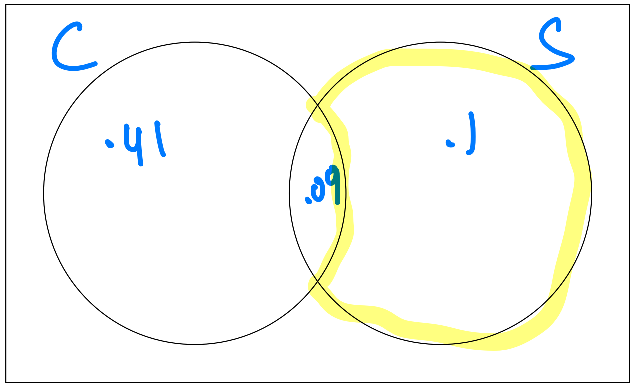
2: $\frac{83-74}{14} = 0.64$

Megan

1: $z_1 = \frac{76-80}{6} = -0.667$

$z_2: \frac{94-74}{14} = 1.429$

11. A magazine published the results of an extensive investigation of broiler chickens purchased from food stores in 23 regions. Tests for bacteria in the meat showed that 50% of the chickens were contaminated with campylobacter, 19% with salmonella, and 9% with both.



$$\begin{array}{r} .50 - \\ .09 \\ \hline .41 \end{array}$$

(a) Are contamination with the two kinds of bacteria mutually exclusive events? Explain.

NO $.09 \neq 0$

(b) What's the probability that a tested chicken was not contaminated with either kind of bacteria?

$1 - (0.41 + 0.09 + 0.1) = 1 - 0.6 = 0.4$

(c) What's the probability that a tested chicken was contaminated with salmonella only?

$.1$

(d) What's the probability that a tested chicken was contaminated with campylobacter or salmonella?

$0.41 + 0.09 + 0.1 = 0.6$

1. If you randomly select 3 packs of chicken, what is the probability that all 3 are contaminated with salmonella?

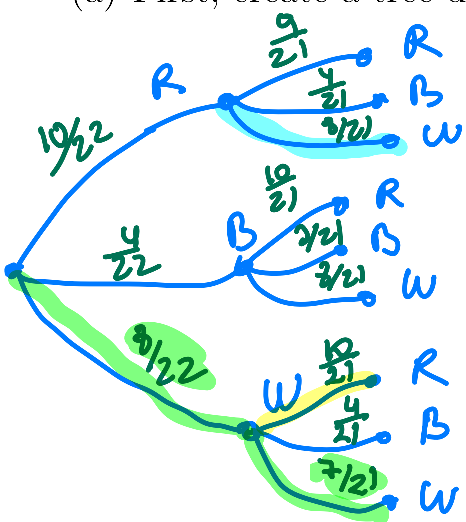
$P(S \text{ and } S \text{ and } S) = (.19)(.19)(.19) = 0.007$

2. If you randomly select 3 packs of chicken, what is the probability that all 3 are contaminated ~~with~~ with both bacteria?

fix $(.09)(.09)(.09) = 0.000729$

12. A jar contains 10 red marbles, 4 blue marbles, and 8 white marbles. If two marbles are drawn randomly from the jar without replacement, find the probability of the given event, and write your answers as fractions.

(a) First, create a tree diagram with probabilities on each possible outcome.



(b) The second ball is red, given that the first ball is white:

$\boxed{\frac{10}{21}}$

(c) The second ball is white, given that the first ball is red:

$\boxed{\frac{8}{21}}$

(d) Both balls are white: $\boxed{\frac{8}{22} \cdot \frac{7}{21}}$

13. You are dealt two cards successively (without replacement) from a shuffled deck of 52 playing cards.

Find the probability that the first card is a king and the second card is a queen.

a. 2/13

b. 4/663

c. 1/169

d. 1/13

$$P(K_{1st} \text{ and } Q_{2nd}) = P(K_{1st}) \cdot P(Q_{2nd} \mid K_{1st})$$
$$= \frac{4}{52} \cdot \frac{4}{51}$$

Bonus question on exam will be from what we do on Monday.