STAT 157 – Test 2: Version A

November 26, 2019 **Name:** Solution Set

Instructor: Patricia Wrean

Total: 30 points

1. (8 points) For the following question, show enough work that I can figure out what method you are using.

   If the letters in the word POKER are shuffled randomly, what is the number of new arrangements of these letters that

   (a) begin with a K?

(2)

$$\underline{1}_{K}\ \underline{4}\ \underline{3}\ \underline{2}\ \underline{1} = 4! = \boxed{24}$$

4 letters left

3 because can't repeat letters

   (b) begin with a K and end in an R?

(2)

$$\underline{1}_{K}\ \underline{3}\ \underline{2}\ \underline{1}\ \underline{1}_{R} = 3! = \boxed{6}$$

   (c) begin with a K or end in an R?

(2)

$$P(\text{begin K or end R}) = P(\text{begin K}) + P(\text{end R}) - P(\text{both})$$
$$= 24 + 24 - 6$$
$$= \boxed{42}$$

   What is the probability that if the letters in the word POKER are shuffled randomly, that the outcome has the letters in alphabetical order?

(2)

$$\text{total number of outcomes} = \underline{5}\ \underline{4}\ \underline{3}\ \underline{2}\ \underline{1} = 5! = 120$$

$$P(\text{alphabetical}) = \frac{n(\text{alphabetical})}{n_{tot}} = \boxed{\frac{1}{120} \text{ or } 0.00\overline{83} \text{ or } 0.8\overline{3}\%}$$

2. (7 points) A class of 45 students is surveyed to find out whether they own cars and/or have part-time jobs. The result is shown in the table below.

		job (J)	no job ($\bar{J}$)	
C	car	16	1	17
$\bar{C}$	no car	10	18	
		26		

In parts (b) through (d), show enough work that I can see which method you are using.

(1) (a) Fill in the missing entry in the table. (sum of all table entries is 45)

(b) What's the probability that a randomly-chosen student owns a car but does not have a part-time job?

$$P(C\bar{J}) = \frac{n(C\bar{J})}{n_{tot}} = \frac{1}{45} \text{ or } 0.0\bar{2} \text{ or } 2.\bar{2}\%$$

(2)

(c) What's the probability that a randomly-chosen student owns a car?

$$P(C) = \frac{n(C)}{n_{tot}} = \boxed{\frac{17}{45} \text{ or } 0.3\bar{7} \text{ or } 37.\bar{7}\%}$$

(2)

(d) What's the probability that if a randomly-chosen student owns a car, that they also have a part-time job?

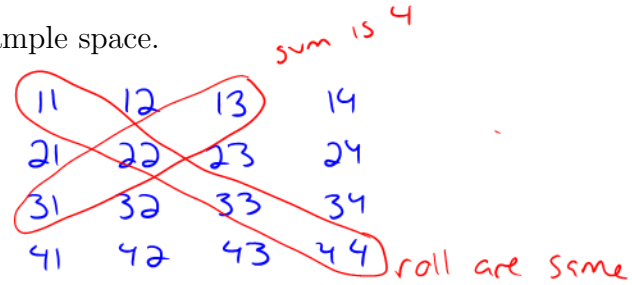
$$P(J \mid C) = \frac{n(CJ)}{n(C)} = \boxed{\frac{16}{17} \text{ or } 0.941176 \text{ or } 94\%}$$

(2)

3. (8 points) A students is conducting an experiment in which they have rolled two fair 4-sided dice.

(a) Write out the sample space.

(1)



(b) What is the probability that the two rolls are different?

(2)

$P(\text{different}) = \frac{n(\text{different})}{n_{tot}}$

$= \frac{12}{16} = \frac{3}{4}$ or 0.75 or 75%

or

$P(\text{different}) = 1 - P(\text{same})$

$= 1 - \frac{4}{16}$

= same answer

(c) What is the probability that the sum of the rolls is a 4?

(2)

$P(\text{sum} = 4) = \frac{n(\text{sum} = 4)}{n_{tot}} = \frac{3}{16}$ or 0.1875 or 19%

(d) Are the events "two rolls are different" and "the sum of the rolls is 4" independent? Explain briefly, being sure to state the values of the probabilities you are comparing. This part is difficult, and credit will only be given if the method you are using is valid.

(3)

method #1

$P(\text{different}) = 3/4$ or 75%

$P(\text{different} \mid \text{sum } 6) = \frac{n(\text{both})}{n(\text{sum } 6)}$

$= \frac{2}{3}$ or $66.\bar{6}\%$

not equal

∴ dependent

method # 2

$P(\text{sum } 4) = \frac{3}{16}$

$P(\text{sum } 4 \mid \text{different}) = \frac{n(\text{both})}{n(\text{diff})}$

$= \frac{2}{12} = \frac{1}{6}$

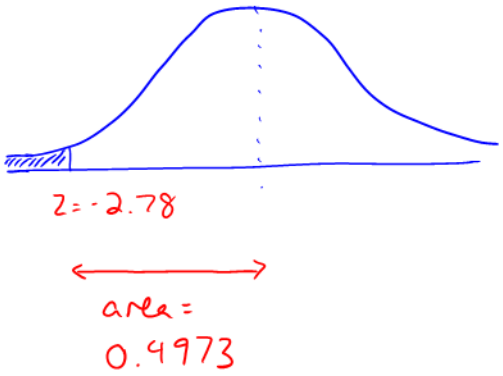
not equal

∴ dependent

4. (7 points) In January, the highest temperature during the day at Gowlland Todd Provincial Park is normally distributed with a mean of 2.5°C and standard deviation of 0.9°C. You are planning on hiking there for one day in January.

   (a) What is the probability that on the day that you are there, the temperature will be below freezing (0°C)? Give your answer as a percentage rounded to one decimal place.

3



$$z = \frac{x - \mu}{\sigma}$$

$$= \frac{0 - 2.5}{0.9}$$

$$= -2.\overline{7}$$

$$\approx -2.78$$

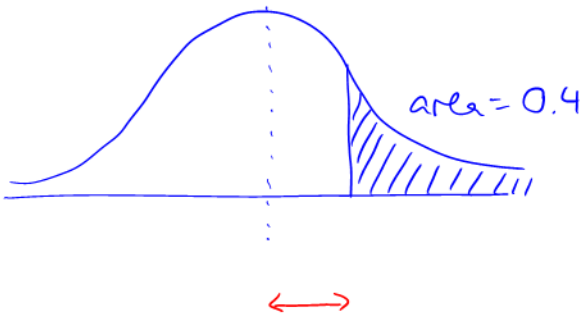
$$P = 0.5 - 0.4973$$

$$= 0.0027$$

$$= 0.3\%$$

   (b) 40% of the time, the highest daytime temperature will be above a certain value. Calculate that value. Round your answer to one decimal place.

4



$z = 0.255$

z is positive because it is to the right of zero

(z = 0.25 and 0.26 also fine)

$$z = \frac{x - \mu}{\sigma}$$

$$\sigma z = x - \mu$$

$$x = \mu + \sigma z$$

$$= 2.5 + (0.255)(0.9)$$

$$= 2.7295$$

$$= 2.7\,^{\circ}C$$