# STAT 157 – Test 2

**April 3, 2020** **Name:** Solution Set

**Instructor: Patricia Wrean**

**Total: 20 points**

1. (7 points) Pat surveyed her thirty-six Stat 157 students to find out what kind of devices they had, and the results are shown in the table below.

| | laptop | no laptop | |
|---|---|---|---|
| smartphone | 23 | 5 | 28 |
| no smartphone | 6 | 2 | 8 |
| | 29 | 7 | $\boxed{36}$ total |

For the following questions, give any probabilities either as a simplified fraction or as a percentage rounded to one decimal place.

(a) Calculate the missing entry in the contingency table.

$$\text{entry} = 36 - (23 + 5 + 2) = \boxed{6}$$

(b) Calculate the probability that a randomly chosen student doesn't own a laptop.

$$P(\bar{L}) = \frac{n(\bar{L})}{n_{tot}} = \frac{7}{36}$$

$\frac{7}{36}$ or 19.4%

(c) Calculate the probability that a randomly chosen student owns a laptop but not a smartphone.

$$P(L\bar{S}) = \frac{n(L\bar{S})}{n_{tot}} = \frac{6}{36} = \frac{1}{6}$$

$1/6$ or 16.7%

(d) Calculate the probability that a randomly chosen student owns a smartphone or a laptop.

$$P(S \text{ or } L) = \frac{n(S \text{ or } L)}{n_{tot}} = \frac{23+5+6}{36}$$

$$= \frac{34}{36} = \frac{17}{18}$$

$\frac{17}{18}$ or 94.4%

2. (7 points) A computer system requires that its users have passwords. The systems administrator is trying to choose between various options.

   If you are writing your answer in scientific notation, please round your answer to two decimal places.

   (a) How many passwords would be allowed if users had to choose a 16-character password but only lower-case letters were allowed?

   $26^{16}$ or $4.36 \times 10^{22}$

   n(lower case letters) = 26

   # passwords = $26^{16} \approx 4.36 \times 10^{22}$

   (b) How many passwords would be allowed if users had to choose an 8-character alphanumeric case-sensitive password?

   $62^{8}$ or $2.18 \times 10^{14}$

   n(characters) = $10 + 26 + 26$

   $= 62$

   # passwords = $62^{8} \approx 2.18 \times 10^{14}$

   (c) How many passwords would be allowed if users had to choose an 8-character alphanumeric case-sensitive password that contains at least one number?

   $1.65 \times 10^{14}$

   n(allowed) = n(total) − n(not allowed)

   n(not allowed) = n(all letters, no numbers) = $52^{8}$

   n(allowed) = $62^{8} - 52^{8} \approx 1.65 \times 10^{14}$

3. (6 points) An experiment consists of flipping a coin and then rolling a fair six-sided die.

For the following questions, give any probabilities either as a simplified fraction or as a percentage rounded to one decimal place.

(a) How many possible outcomes does this experiment have? Show your work.

method 1:

sample space

H1 H2 H3 H4 H5 H6

T1 T2 T3 T4 T5 T6

method 2

$\underline{2}\ \underline{6}$ multiplication rule

$\uparrow$ H, T $\quad$ $\uparrow$ 1 through 6

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(b) What is the probability that the coin toss is *HEADS* and the die roll is a *2*?

$$P(H2) = \frac{n(H2)}{n_{tot}} = \frac{1}{12}$$

1/12

(c) What is the probability that the coin toss is *HEADS* or the die roll is a *2*? Please show enough work that I can see what method you are using.

$$P(H \text{ or } 2) = \frac{n(H \text{ or } 2)}{n_{tot}} = \frac{7}{12}$$

7/12

(d) Calculate your answer to part (c) again, but using a different method! Show your work.

$$P(H \text{ or } 2) = P(H) + P(2) - P(H2)$$

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

$$= \frac{7}{12}$$

or

$$P(H \text{ or } 2) = 1 - P(\overline{H \text{ or } 2})$$

$$= 1 - \frac{5}{12}$$

$$= \frac{7}{12}$$

7/12