I Joshua Patton, declare that I have completed this assignment in accordance with the UAB Academic Integrity Code and the UAB CS Honor Code. I have read the UAB Academic Integrity Code and understand that any breach of the Code may result in severe penalties.

Student signature/initials: JDP

Date: 2/14/23

1.
In order to get 11 on your third roll you cannot have less than a sum of 5, or more than a sum of 10 from your first two rolls.

There are 6 ways you can roll less than 5 {(1,1), (1,2), (2,1), (1,3), (3,1), (2,2)} and 3 ways you can roll more than 10 {(5,6), (6,5), (6,6)}

Thus giving you 36 - 6 - 3 = 27 different chances to get the required amounts to make a sum of 11 possible.

P(11) = (3+4+5+6+5+4) / 6^3 = 27/216 or 0.125%

In order to get 12 on your third roll you can't have less than 6 and no more than 11 on your first two rolls.

Add the 4 more ways to get the 5 that we did not get in the problem above {(4,1), (3,2), (2,3), (1,4)} but since you can't roll more than 12 you have to account for the rolls that will give you 11 which there are 2 {(6,5), (5,6)}

Thus giving you 27 - 4 + 2 = 25 different chances to get the required amounts to make a sum of 12 possible.

P(12) = (2+3+4+5+6+5) / 6^3 = 25/216 or 0.1157%

So it is more likely to get a sum of 11 out of these three rolls.

2.

hw4.py > ...

```python
from math import pi, sin, cos


s = int(input("How many rectangles would you like to use? "))
w = (4*pi)/s

def exp(n):
    v = (sin(n) * cos(n))
    return v

i = 0
sum = 0.0
while(i <= 4*pi):
    k = exp(i)
    val = abs(k) * w
    sum = sum + val
    i += w
print("\nArea under the curve = %f\n" %sum)
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL

```
PS C:\Users\patto\Documents\CS355-Statistics&ProbabilityinCS\HW\HW4> python -u
How many rectangles would you like to use? 64

Area under the curve = 3.948463

PS C:\Users\patto\Documents\CS355-Statistics&ProbabilityinCS\HW\HW4>
```

3.

First we have to define a random variable X. This will represent the score that the team can have over the weekend. To represent the score and for which match we will use Y_i to represent the score on the ith match. X will have a sample space of (0,1,2,3,4) and Y_i will have a sample space of (0,1,2)

Considering that there is 0.4 possibility that the team will not lose the first match we can gain that $P(Y_1 = 0) = 0.6$ which tells us that $P(Y_1 = 1) = 0.2$ and $P(Y_1 = 2) = 0.2$

Since there is a 0.7 possibility that they will not lose the second match we can gain that $P(Y_2 = 0) = 0.3$ which tells us that $P(Y_1 = 1) = 0.35$ and $P(Y_2 = 2) = 0.35$

Now we can use these values to predict the possibility of each possible sum of scores for the weekend:

$P(X = 0) = 0.6 * 0.3 = 0.18$
$P(X = 1) = 0.2 * 0.3 + 0.6 * 0.35 = 0.27$
$P(X = 2) = 0.2 * 0.3 + 0.6 * 0.35 + 0.2 * 0.35 = 0.34$
$P(X = 3) = (0.2 * 0.35) * 2 = 0.14$
$P(X = 4) = 0.2 * 0.35 = 0.07$

4.
Since there is equal chance for the kids to be either boy or girl that tells us that each gender has a 50% possibility. We will calculate all possible combinations of children to give us the PMF of girls out of the 7 children.

P(GGBBBBB) = 5 Choose 0 * $(0.5)^0$ * $(0.5)^5$ = 0.03125
P(GGGBBBB) = 5 Choose 1 * $(0.5)^1$ * $(0.5)^4$ = 0.15625
P(GGGGBBB) = 5 Choose 2 * $(0.5)^2$ * $(0.5)^3$ = 0.3125
P(GGGGGBB) = 5 Choose 3 * $(0.5)^3$ * $(0.5)^2$ = 0.3125
P(GGGGGGB) = 5 Choose 4 * $(0.5)^4$ * $(0.5)^1$ = 0.15625
P(GGGGGGG) = 5 Choose 5 * $(0.5)^5$ * $(0.5)^0$ = 0.03125

5.
a.
Given formula = Y = X mod(3)
All 10 possibilities are equally weighted: 1/10

Y = 0 when X = 0,3,6,9 : with 4 possibilities we get 4 * 1/10 = 4/10
Y = 1 when X = 1,4,7 : with 3 possibilities we get 3 * 1/10 = 3/10
Y = 2 when X = 2,5,8 : with 3 possibilities we get 3 * 1/10 = 3/10

b.
Given formula = Y = 5 mod(X + 1)
All 10 possibilities are equally weighted: 1/10

Y = 0 when X = 1,5 : with 2 possibilities we get 2 * 1/10 = 2/10
Y = 1 when X = 2,4 : with 2 possibilities we get 2 * 1/10 = 2/10
Y = 2 when X = 3 : with 1 possibilities we get 1 * 1/10 = 1/10
Y = 5 when X > 5: with 4 possibilities we get 4 * 1/10 = 4/10