Chapter 1.1 In-class Exercise

Info: In-class exercises are meant to introduce you to the new topics of this chapter of the book. Each part will have an introductory description of the content and example(s), followed by practice problems for you to work on.

These assignments are **team assignments** - your team will turn in *one* copy of the exericse. It is up to your team how to appropach the assignments; you can work separately and then check your work together, or you can collaborate on the assignment together.

Work must be clean; points may be deducted if the instructor cannot read the work.

Section:
☐ MW 4:30 - 5:45 pm ☐ M 6:00 - 8:50 pm ☐ TR 2:00 - 3:15 pm

Team: Please write down all people in your team.

1. 2.
3. 4.

Score: _____ %

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1. Coin toss

Coin toss
When we're flipping a coin, there are two possible outcomes: *heads* or *tails*. If we flip more than one coin, then we end up with more possible outcomes. For example, when flipping two coins, we have four possible outcomes:

1.	HEADS	HEADS
2.	HEADS	TAILS
3.	TAILS	HEADS
4.	TAILS	TAILS

Question 1 _____ / 10%
Draw a table of all possible outcomes if someone flips three coins.

Question 2 _____ / 30%
Write out how many outcomes there are for each of the following.

1. Flipping one coin: _____
2. Flipping two coins: _____
3. Flipping three coins: _____
4. Rolling one 6-sided die: _____
5. Rolling two 6-sided dice: _____
6. Rolling three 6-sided dice: _____

Question 3 _____ / 10%

So if we have n possible outcomes per event (roll die, flip coin), and we "run" the event m times (one coin, two dice), how many total outcomes o will there be? (Write as a simple equation).

$o =$

2. Josephus game

The Josephus game

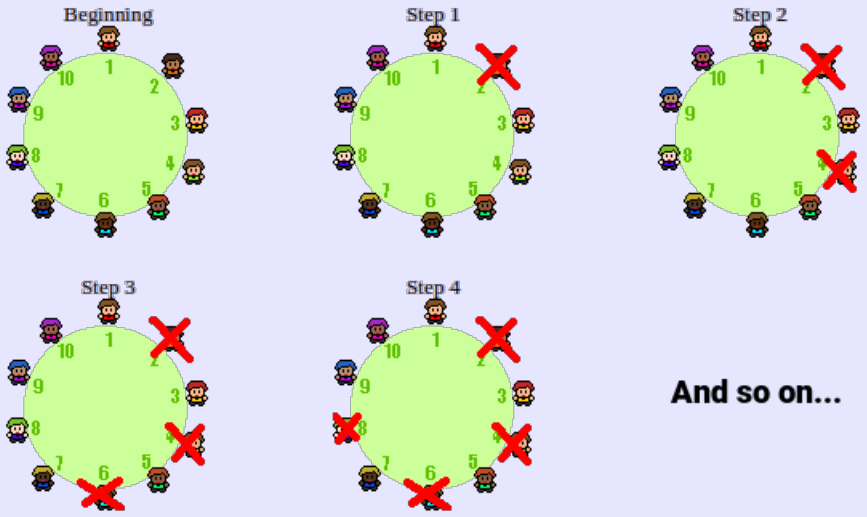
The Josephus game is a theoretical problem, and for now we will just solve it systematically by stepping through the instructions given.

Setup: People are sitting in a circle, each with an assigned number (their location in the circle).

Step: People are eliminated at every nth step, with counting beginning at the nth person.

Result: After stepping through, figure out the position of the *last* and *second-to-last* person left (not eliminated).

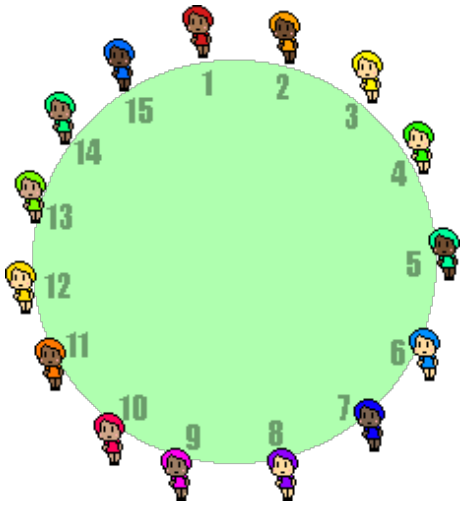
Example: Let's say that we begin with a circle of *10* people, numbered from 1 to 10. We will eliminate people at an interval of *2* - so, every-other-person, beginning with person #2. Who will be the last person standing?



Question 4 _____ / 10%

Given a Josephus circle of 15 people, if we are eliminating every 3rd person (starting with person 3), who is the last to be tagged – and the 2nd to last to be tagged?

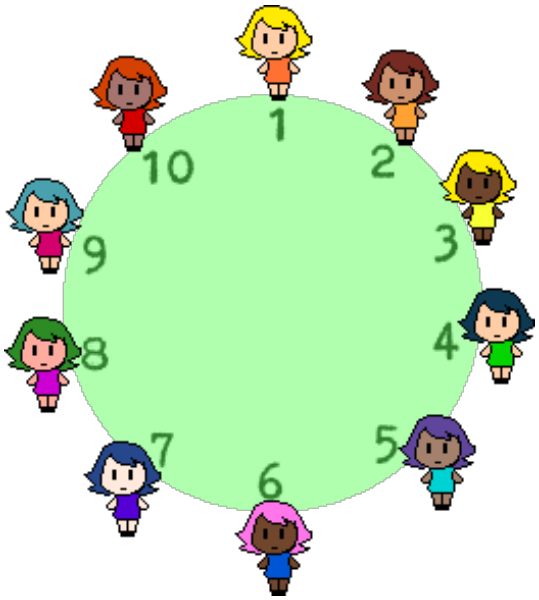
2nd-to-last: _____ Last: _____



Question 5 _____ / 10%

Given a Josephus circle of 10 people, if we are eliminating every 4th person (starting with person 4), who is the last to be tagged – and the 2nd to last to be tagged?

2nd-to-last: _____ Last: _____



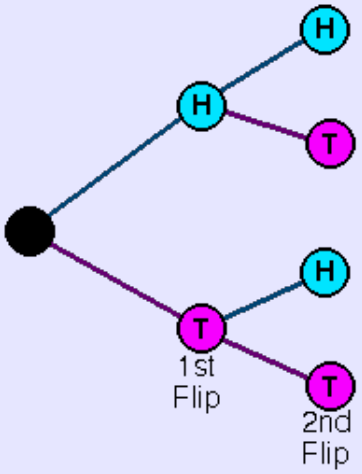
3. Game trees

Game trees

In section 1.1, we will also be looking at events that have multiple outcomes – such as flipping one coin, two coins, or three coins, or who of two people win one, two, or three tennis matches. With small amounts of "variables", we can list out all the possible outcomes, and we can build a game tree based on this.

Example:

If you flip one coin, the result with be HEADS (H) or TAILS (T). If you flip two coins, what are all the outcomes?



1. HH 2. HT
3. TH 4. TT

Question 6 _____ / 30%

Suppose you toss three coins – a nickel, a dime, and a quarter, and you record the results in that order. For example, "HTH" means nickel = heads, dime = tails, quarter = heads.

1. In a systematic way, list all the different results you could record.

2. Draw a game tree for recording the results

3. On the game tree, label each possible result either 0, 1, 2, or 3, to indicate how many *heads* there are.

4. Do you think a person who tosses three coins is more likely to get all three heads, or to get exactly two heads?