1 Lost on the Moon

Your spaceship has just crashed on the moon. You were scheduled to rendezvous with a mother ship 200 miles away on the lighted surface of the moon, but the rough landing has ruined your ship and destroyed all the equipment on board except for the 15 items listed below.

Your crew’s survival depends on reaching the mother ship, so you must choose the most critical items available for the 200-mile trip. Your task is to rank the 15 items in terms of their importance for survival. Place a number 1 by the most important item, number 2 by the second most important, and so on, through number 15, the least important.

| Item                                      | Your Rank (1) | Group's Rank (2) | NASA’s Rank (3) | |(3) − (1)| |(3) − (2)| |
|-------------------------------------------|---------------|------------------|-----------------|----------------|-----------------|
| Box of matches                            |               |                  |                 |                |                 |
| Food concentrate                          |               |                  |                 |                |                 |
| 50 feet of nylon rope                     |               |                  |                 |                |                 |
| Parachute silk                            |               |                  |                 |                |                 |
| Solar-powered portable heating unit       |               |                  |                 |                |                 |
| Two .45 caliber pistols                   |               |                  |                 |                |                 |
| One case of dehydrated milk               |               |                  |                 |                |                 |
| Two 100-pound tanks of oxygen             |               |                  |                 |                |                 |
| Stellar map (of the moon’s constellations)|               |                  |                 |                |                 |
| Self-inflating life raft                  |               |                  |                 |                |                 |
| Magnetic compass                          |               |                  |                 |                |                 |
| 5 gallons of water                        |               |                  |                 |                |                 |
| Signal flares                             |               |                  |                 |                |                 |
| First-aid kit containing injection needles|               |                  |                 |                |                 |
| Solar-powered FM receiver-transmitter     |               |                  |                 |                |                 |
| **Total**                                 |               |                  |                 |                |                 |
Introduction

Error points are the absolute difference between your rankings and NASA’s (disregard plus or minus signs).

- 0 - 25: excellent
- 26 - 32: good
- 33 - 55: fair
- 56 - 70: oops
- 71 - 112: oh well

<table>
<thead>
<tr>
<th>Item</th>
<th>NASA’s Reasoning</th>
<th>NASA’s Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Box of matches</td>
<td>No oxygen to sustain flame, virtually worthless</td>
<td>15</td>
</tr>
<tr>
<td>Food concentrate</td>
<td>Efficient means of supplying energy requirements</td>
<td>4</td>
</tr>
<tr>
<td>50 feet of nylon rope</td>
<td>Useful in scaling cliffs, tying injured together</td>
<td>6</td>
</tr>
<tr>
<td>Parachute silk</td>
<td>Protection from sun’s rays</td>
<td>8</td>
</tr>
<tr>
<td>Solar-powered portable heating unit</td>
<td>Not needed unless on dark side</td>
<td>13</td>
</tr>
<tr>
<td>Two .45 caliber pistols</td>
<td>Possible means of self-propulsion</td>
<td>11</td>
</tr>
<tr>
<td>One case of dehydrated milk</td>
<td>Bulkier duplication of food concentrate</td>
<td>12</td>
</tr>
<tr>
<td>Two 100-pound tanks of oxygen</td>
<td>Most pressing survival need</td>
<td>1</td>
</tr>
<tr>
<td>Stellar map (of the moon’s constellations)</td>
<td>Primary means of navigation</td>
<td>3</td>
</tr>
<tr>
<td>Self-inflating life raft</td>
<td>CO₂ bottle in military raft may be used for propulsion</td>
<td>9</td>
</tr>
<tr>
<td>Magnetic compass</td>
<td>Magnetic field on moon is not polarized; worthless for navigation</td>
<td>14</td>
</tr>
<tr>
<td>5 gallons of water</td>
<td>Replacement for tremendous liquid loss on lighted side</td>
<td>2</td>
</tr>
<tr>
<td>Signal flares</td>
<td>Distress signal when mother ship is sighted</td>
<td>10</td>
</tr>
<tr>
<td>First-aid kit containing injection needles</td>
<td>Needles for vitamins, medicines, etc., will fit special aperture in NASA space suits</td>
<td>7</td>
</tr>
<tr>
<td>Solar-powered FM receiver-transmitter</td>
<td>For communication with mother ship; but FM requires line-of-sight transmission and short ranges</td>
<td>5</td>
</tr>
</tbody>
</table>
Secrets to Success in CS 61A

CS 61A is definitely a challenge, but we all want you to learn and succeed, so here are a few tips that might help:

- Ask questions. When you encounter something you don’t know, ask. That is what we are here for. This is not to say you should raise your hand impulsively, but you are going to see a lot of challenging stuff in this class, and you can always come to us for help.

- Study in groups. Again, this class is not trivial; you might feel overwhelmed going at it alone. Work with someone, either on homework, on lab, or for midterms, as long as you don’t violate the cheating policy!

- Go to office hours. Office hours give you time with the instructor or TAs by themselves, and you will be able to get some (nearly) one-on-one instruction to clear up confusion. You are not intruding; the instructors and TAs like to teach! Remember, if you cannot make office hours, you can always make separate appointments with us!

- Do (or at least attempt seriously) all the homework. We do not give many homework problems, but those we do give are challenging, time-consuming, and rewarding. The fact that homework is graded on effort does not imply that you should ignore it: it will be one of your primary sources of preparation and understanding.

- Do all the lab exercises. Most of them are simple and take no more than an hour or two. This is a great time to get acquainted with new material. If you do not finish, work on it at home, and come to office hours if you need more guidance!

- Optional lab questions are “optional” in the sense that they are extra practice, not that they are material that’s out of scope. Make sure you do them if you have time!

- Do the readings before lecture! There is a reason why they are assigned. And it is not because we are evil; that is only partially true.

- When preparing for the midterms and final, do past exam questions! Lecture, lab, and discussion provide a great introduction to the material, but the only way to learn how to solve exam-level problems is to do exam-level problems.

- Most importantly, have fun!
2 Python Basics (Optional)

Primitive expressions

A **primitive expression** requires only a single evaluation step. Literals, such as numbers and strings, evaluate to themselves. Names require a single lookup step (see the *Assignment statements* section below).

```python
>>> 2
2
>>> 'Hello World'
'Hello World'
```

Arithmetic expressions

**Arithmetic expressions** in Python are very similar to ones we’ve seen in other math contexts. They involve binary arithmetic operators (+, -, *, /, //, %, and **) and follow PEMDAS rules.

```python
>>> 6 + 2 * 5
16
>>> 9 // 2 # Floor division (rounding down)
4
>>> 9 % 2 # Modulus (remainder of 9 // 2)
1
>>> (3 + 2) * 4 // 3
6
>>> 4 ** 3 # Exponent
64
```

Assignment statements

An assignment statement assigns a certain value to a variable name.

```
\[
\text{Name} = \text{Expression}
\]
```

To execute an assignment statement:

1. Evaluate the expression on the right-hand-side of the statement to obtain a value.
2. Bind the value to the name on the left-hand-side of the statement.

Let’s try to assign the primitive value 6 to the name `a`, and subsequently do a lookup on `a`.

```python
>>> a = 6
>>> a
6
```
Now, let’s reassign \( a \) to another value. This time, let’s use a more complex expression. Note that the name is bound to the value, not the expression!

```python
>>> a = (3 + 5) // 2
>>> a
4
```

### Questions

2.1 What would Python display?

```python
>>> 3 + 4 ** 2
19

>>> a = 6 + 2 * 4
>>> a
14

>>> b = (2 + 2) * 2 + 3 % 2
>>> b
9

>>> a + 2 * b
32

>>> b += a  # Equivalent to b = b + a
>>> a
14
>>> b
23
```