

L5 PROBLEM 3 (2/2 points)

1. If you wanted to run a simulation that estimates the value of $\sqrt{2}$ in a way similar to the Pi estimation shown in lecture, what geometric shape would you throw needles at?
- ☐ A square, with a smaller square drawn inside it. The smaller square is formed by connecting the larger square's midpoints.
 - ☐ A cube with a sphere inscribed inside it.
 - ☒ A flat line ranging from 1 to root 2 and with a subsection that spans from 0 to 1. ✓
2. What introduced the error for Archimedes' method of calculating Pi?
- ☐ Incorrect conceptual model. ✓
 - ☐ Calculation error.
 - ☒ Not enough samples. ✓

EXPLANATION:

For Q1, we can approximate using the following code:

```
def throwNeedles(numNeedles):
    success = 0
    for n in xrange(numNeedles):
        x = random.random()
        if (1+x)**2 < 2.0:
            success += 1
    sqrt2 = 1+(float(success)/numNeedles)
    return sqrt2
```

If the needles fall in the section from 1 to 2 then the ratio of the square of the successful random throws in the unit section between 1 and 2 to the total number of throws will approximate the decimal fraction of root 2. Since we started the lower bound at 1, we have to add 1 to the fraction to get the actual approximation of root 2.

For Q2, Archimedes' method of calculating was not a simulation but a calculation from using polygons. The error came from the fact that Archimedes used polygon approximations instead of circles.

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