

Q1. (1 pnt)

I tried to be very generous with this question.

In general people observed the following:

1. Scribbler has no memory, so it is hard to sample shape by changing locations. At any time only 2 samples are given (due to 2 sensors).
2. Can simulate memory with multi-stage program, but it is complicated.
3. Need to assume uniform reflectance from a surface

I gave full credit as long as there student provided arguments for her/his point of view

Q2. (2 pnts)

```
Do While <Light from any 1 side>
End
Do forever
    Play Sound for 1s at Freq 440 Hz
End
```

NOTE: many people just put 'if' condition, but missed the loop, I deducted 1 pnt for this.

Q3. (2 pnts)

```
sum <- 0
Do for i=1 to n
    sum <- sum + A[i];
End
sum = sum / n
```

NOTE: many people found average of $i=1..n$ rather than $A[1..n]$. Note also that loop goes from 1 to n, not from 2..n (I considered this to be a type out and did not deduct points).

Q4. (2 pnts)

nth generation would have: d^n

$n = 2000/25 = 80$ - number of generations

$$d^n = 3 \cdot 10^9$$

Take log of both sides:

$$n \cdot \ln d = \ln(3 \cdot 10^9)$$

Find d:

$$d = \exp(\ln(3 \cdot 10^9) / n) = \mathbf{1.31}$$

This value is very small (in older times people had many more

children). However, many women died childless due to war, disease, and starvation.

Q5. (1 pnts)

Say 25% of school involved math.

I had about 8 classes per day,

for about 250 days per year.

Each math-related class required 100 arithmetic operations.

$100 * 0.25 * 8 * 250 = 50,000$ operations / year

500,000 operations / school years.

Undergraduate: 100% of school involved math.

Say, 600 arithmetic operations per day.

300 days per year.

180,000 operations / year.

720,000 operations per undergraduate.

Scribbler could do it in

0.244 seconds

Q6. (2 pnts)

```
retval=1
```

```
for i=1 to n
```

```
    retval = retval * d;
```

```
end
```

```
return retval
```

NOTE: you can't use exponentiation as an operator here.

You have to multiply n times.