1a.

```javascript
var cels = 0;

document.write("<br> Fahrenheit  Celsius");

while (cels <= 100) {
    document.write("<br> " + cels + " " + (9 / 5 * cels + 32));
    cels = cels + 10;
}
```

1b.

```javascript
i = 1
heads = 0
tails = 0
while (i <= 1000) {
    r = Math.random() // random number r >= 0, < 1.0
    if (r < 0.5) {
        tails = tails + 1
    } else {
        heads = heads + 1
    }
    i = i + 1
}
print "heads = ", heads, " tails = ", tails
```

2a. Using Rule of 72, doubling time period = \( \frac{72}{5} = 14.4 \) years

Number of times, amount doubles = \( \frac{100 \text{ years}}{14.4 \text{ years}} = 6.944 \) times; so about 7 times

Worth of Franklin’s bequests in 100 years = 1000 * 2^7 ~ 128,000 pounds.

By the rule of 72 method, we see that Franklin’s estimate is slightly higher.

2b. Using Rule of 72, doubling time period = \( \frac{72}{3} = 24 \) minutes

Number of times bacteria double to reach the number 1,000,000 starting from 1 would be,
1,000,000 is about $2^{20}$

Time taken to fill the dish would be $20 \times 24 = 480$ minutes

2c. Using Rule of 72, doubling time period $= \frac{72}{3} = 24$ minutes

Number of times bacteria double to reach the number 2,000,000 starting from 1 would be,

2,000,000 is about $2^{21}$

Time taken to fill the dish would be $21 \times 24 = 504$ minutes

3a. 1. 33 bits, 5 bytes; 29 bits, 4 bytes
   2. 26 bits, 4 bytes
   3. 17 bits, 3 bytes
   4. 18 bits, 3 bytes
   5. 16 bits, 2 bytes
   6. 13 bits, 2 bytes
   7. 10 bits, 2 bytes
   8. 8 bits, 1 byte
   9. 6 bits, 1 byte

3b. N=1; 2 encodings; on/off
   N=2; 4 encodings; four seasons
   N=3; 8 encodings; 8 semesters in an undergraduate program
   N=4; 16 encodings; 12 months in a year
   N=5; 32 encodings; 30 days in a month
   N=6; 64 encodings; 50 states in USA
   N=7; 128 encodings; 100 cents in a dollar
   N=8; 256 encodings; 168 hours in a week
   N=9; 512 encodings; 365 days in a year
   N=10; 1024 encodings; 1000 meters in a kilometer

4a. There are about 300 million people in USA. Assuming around 50 million of them do not eat turkey, then we can say that around 250 million people consume turkey during Thanksgiving break. I also assume that on average each person consumes around 2 pounds of turkey during the break. Therefore we can say that, the total amount of turkey consumed in USA during Thanksgiving break would be:
   \[(250 \text{ million people} \times 2 \text{ pounds/person}) = 500 \text{ million pounds}\]

4b. Total additional calories consumed across USA due to turkey would be
   \[(500 \text{ million pounds of turkey} \times 771 \text{ calories/pound of turkey}) = 385,500,000,000 \text{ calories} \]
   Weight gained by people due to consumption of additional calories is:
\[
\frac{385,500,000,000}{3,500} = 110,142,857 \text{ pounds}
\]

4c. 385,500,000,000 calories need to be burnt. A person can burn 100 calories by walking a mile in 15 minutes. Therefore, number of miles to be walked at the rate of 15 minutes each to shed all the additional calories would be:

\[
\frac{385,500,000,000}{100} = 3,855,000,000 \text{ miles}
\]