Question 1

There is a laundry bin with 20% blue socks.

You randomly draw 10.

What is the probability that 2 are blue?

Ans:

First, we need to find the probability of selecting a blue sock from the bin. Since there are 20% blue socks in the bin, the probability of selecting a blue sock is 0.2.

Next, we need to find the probability of selecting a non-blue sock from the bin. Since there are 80% non-blue socks in the bin, the probability of selecting a non-blue sock is 0.8.

To find the probability of selecting 2 blue socks out of 10, we need to use the binomial distribution formula. The formula for the probability of getting k successes in n trials is:

P(k successes) = (n choose k) * p^k * (1-p)^(n-k)

where n is the number of trials, p is the probability of success, and (n choose k) is the binomial coefficient, which represents the number of ways of choosing k items from a set of n items.

In this case, we want to find the probability of getting 2 successes (i.e., selecting 2 blue socks) in 10 trials (i.e., selecting 10 socks total), given that the probability of success (i.e., selecting a blue sock) is 0.2. Plugging these values into the formula, we get:

P(2 blue socks out of 10) = (10 choose 2) * 0.2^2 * 0.8^8 = 0.302

Therefore, the probability of randomly selecting 2 blue socks out of 10 from the laundry bin is 0.302, or approximately 30.2%.

Question 2

Out of a set of 1000 emails, 700 are spam.

400 of the emails have the word "free"; 300 of those are spam.

100 of the emails have the word "credit"; 90 of those are spam.

You get an email that contains both "free" and "credit".

What is the probability it is spam?

Ans:

P(spam | "free" and "credit") = P("free" and "credit" | spam) * P(spam) / P("free" and "credit")

First, let's calculate P("free" and "credit" | spam):

P("free" and "credit" | spam) = P("free" | spam) * P("credit" | spam)

P("free" | spam) = 300/700 = 0.43

P("credit" | spam) = 90/700 = 0.13

P("free" and "credit" | spam) = 0.43 * 0.13 = 0.056

Next, let's calculate P("free" and "credit"):

P("free" and "credit") = P("free" and "credit" | spam) * P(spam) + P("free" and "credit" | not spam) * P(not spam)

P("free" and "credit" | not spam) = (100/300) * (10/300)= 0.01

P("free" and "credit") = 0.056 * 0.7 + 0.01 * 0.3 = 0.0422

Finally, we can calculate P(spam | "free" and "credit"):

P(spam | "free" and "credit") = 0.056 * 0.7 / 0.0422 ≈ 0.929

Therefore, the probability that the email is spam given that it contains both "free" and "credit" is approximately 0.929 or 92.9%.

Question 5

```
SELECT
    DATE(tests.date) AS date,
    ROUND(COUNT(pos_res.id)/COUNT(DISTINCT tests.id), 2) AS rate
FROM
    tests
    LEFT JOIN pos_res
    ON tests.id = pos_res.id
GROUP BY date;
```