(4) There are 75 ducks, so 75 possible outcomes.

- probability of winning a stuffed duck: Happens for ducks 60-70, inclusive, 11 outcomes, so probability is $11/75$
- probability of not winning a duck or banana: Happens for ducks 1-59, for 59 outcomes, so probability is $59/75$

(10) There are 17 possible outcomes, one for each ping-pong ball.

- probability of an R: 4 outcomes give an R, since there are 4 R's in "BURGER AND STARBIRD", so probability is $4/17$
- probability of a B: $2/17$ since there are two B's
- letters in 1st half of alphabet: BURGER AND STARBIRD.
  9 outcomes, so the probability is $9/17$
- vowels: UEAAI, 5 outcomes, so probability is $5/17$

(15) Outcomes for the penny, nickle, and dime:

(1) HHH	(3) HTH	(5) THH	(7) TTH	8 possible
(2) HHT	(4) HTT	(6) THT	(8) TTT	outcomes

- probability of 3 presidents [3 heads]: 1 outcome, probability $1/8$
- probability of 2 presidents [2 heads]: outcomes (2), (3), (5)
  3 outcomes, so probability is $3/8$
- Suppose we know a president is showing.
  - possible outcomes are all except (8) so 7 <u>possible outcomes</u>
  - probability of 3 presidents: 1 outcome, probability $= 1/7$
- Suppose we know Lincoln is showing
  - possible outcomes are (1)-(4), so 4 <u>possible outcomes</u>
  - possibility of 3 presidents: $1/4$
- Answers are different because we have different knowledge in each case, so the number of <u>possible</u> outcomes is different.

(18) 38 possible outcomes. probability of 13 is $\frac{1}{38}$
There are $36/2$, or 18 red spaces, so the probability of red is $\frac{18}{38}$

(19) 365×365 possible outcomes [pairs of birthdays]. Only <u>one</u> of the

possible outcomes has both birthdays equal to December 9.
So the probability is $\frac{1}{365 \times 365} = \frac{1}{133225}$

(28) A 5 and a 6 have already been removed from the deck, so the number of possible outcomes for the next card is 50. 12 of the cards are face cards, so the probability of a face card is $12/50$

(38) Since the card that we draw is replaced and can be drawn again, the number of possible outcomes for 10 cards is $52 \times 52 \times 52 \times 52 \times 52 \times 52 \times 52 \times 52 \times 52 \times 52$. The number of ways for all cards to be different is $52 \times 51 \times 50 \times 49 \times 48 \times 47 \times 46 \times 45 \times 44 \times 43$. [There are 52 possibilities for the 1^{st} card, 51 for a 2^{nd} that differs from the first, 50 for a 3^{rd} that differs from the 1^{ST} and 2^{nd}, etc.]
So the probability of 10 different cards is

$$\frac{52 \times 51 \times \cdots \times 43}{52 \times 52 \times \cdots \times 52} = 0.3971$$

(39) The decree would not change the fraction of babies that are boys. This assumes that each birth is an independent event, with the probability of a boy being 50%. It doesn't matter that some mothers are prevented from having children. There will be fewer babies, but 50% will be boys.

(40) When it says "Two coins will land the same", it doesn't say which two! So talking about the "3rd coin" doesn't make any sense. (Essentially, the argument is counting HHH 3 times, once for each choice of which coin is "the third coin". Another way of saying this: the argument looks at HH_, H_H, and _HH and says there are two ways to fill in the _'s. But putting H in for the _ will give HHH in all three cases.)