

1.  $7 \times (5 + 6) \div 1 - 2 \times 3 = 71$

2.  $1806; 816$

3.  $225; 29$

4. The largest possible product comes from  $3 + 3 + 3 + 3 + 3 + 4 = 19$ .  $3 \times 3 \times 3 \times 3 \times 3 \times 4 = 972$ .

5.  $97; 20$

6. Since we need to ensure that Albert will be the next president, we will assume the worst case scenario; that is that Brandon will receive all of the remaining votes that Albert does not receive. There are  $42 - 12 - 9 - 7 = 14$  votes remaining. Brandon has to receive 3 more votes than Albert in order to win. This means that as long as Albert receives  $6$  of the remaining votes, he is guaranteed a victory (Brandon would receive the remaining 8, giving him 17 to Albert's 18).

7.  $1640$

8. To get the smallest possible number, we first of all want the fewest number of digits. If the number only has two digits, the largest sum would be  $9 + 9 = 18$  and this is not large enough. Thus the number must have at least three digits.

Now we need to find the smallest hundreds digit such that we can get a sum of 25. This happens when we assume the other two digits to be 9. Then  $25 - 9 - 9 = 7$ , so our hundreds digit is 7 and the other two digits must be 9.  $799$

9.  $12$

10.  $3$  weighings is the minimum number we need to take.

For the first weighing, split the 27 coins into 3 groups of 9 coins. We will weigh 9 of them, 9 on one side and 9 on the other. The lighter side of the scale contains the fake coin. If the two sides of the scale are equal, we know that the fake coin must be in the group of 9 coins that was not weighed.

Now we've reduced the possible fake coins down to 9. With our second weighing we will split the remaining 9 coins into 3 groups of 3 coins. We will weigh 3 of them, 3 on one side and 3 on the other. The lighter side of the scale contains the fake coin. If the two sides of the scale are equal, we know that the fake coin must be in the group of 3 coins that was not weighed.

Now we've reduced the possible fake coins down to 3. With our third and final weighing we will weigh only 2 of the 3 coins. The lighter coin is obviously our fake coin. If both coins weigh the same, then we know that the coin that was not weighed must be our fake coin.