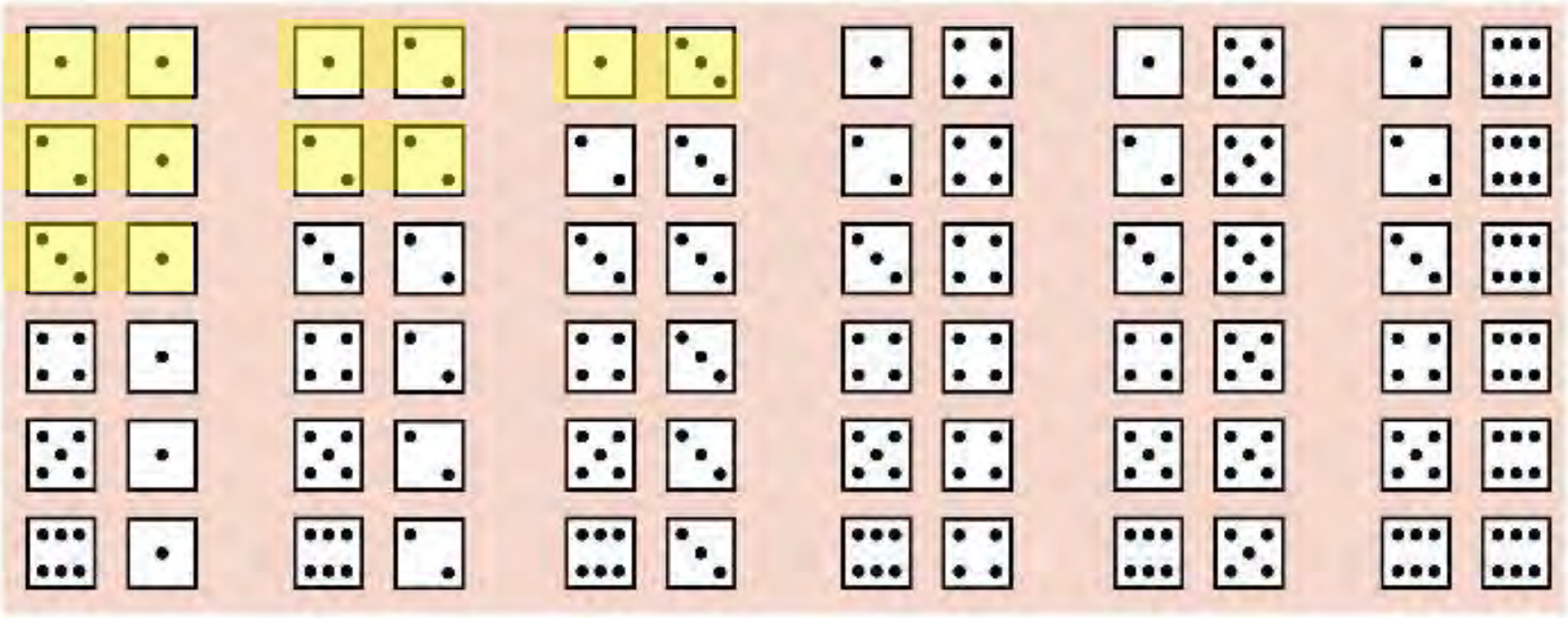
The Law of Complements

$$P(A) = 1 - P(A^C) \qquad \text{Or} \qquad P(A^C) = 1 - P(A)$$



This is just like the dice problem from earlier.

What is the probability of rolling a number greater than 4?

Since P(2) + P(3) + P(4) + P(5) + P(6) + P(7) + P(8) + P(9) + P(10) + P(11) + P(12) = **1**

P(greater than 4) = 1 – P(4 or less) = 1 – 6/36 = 1 – 1/6 = **5/6**

Law of Complements

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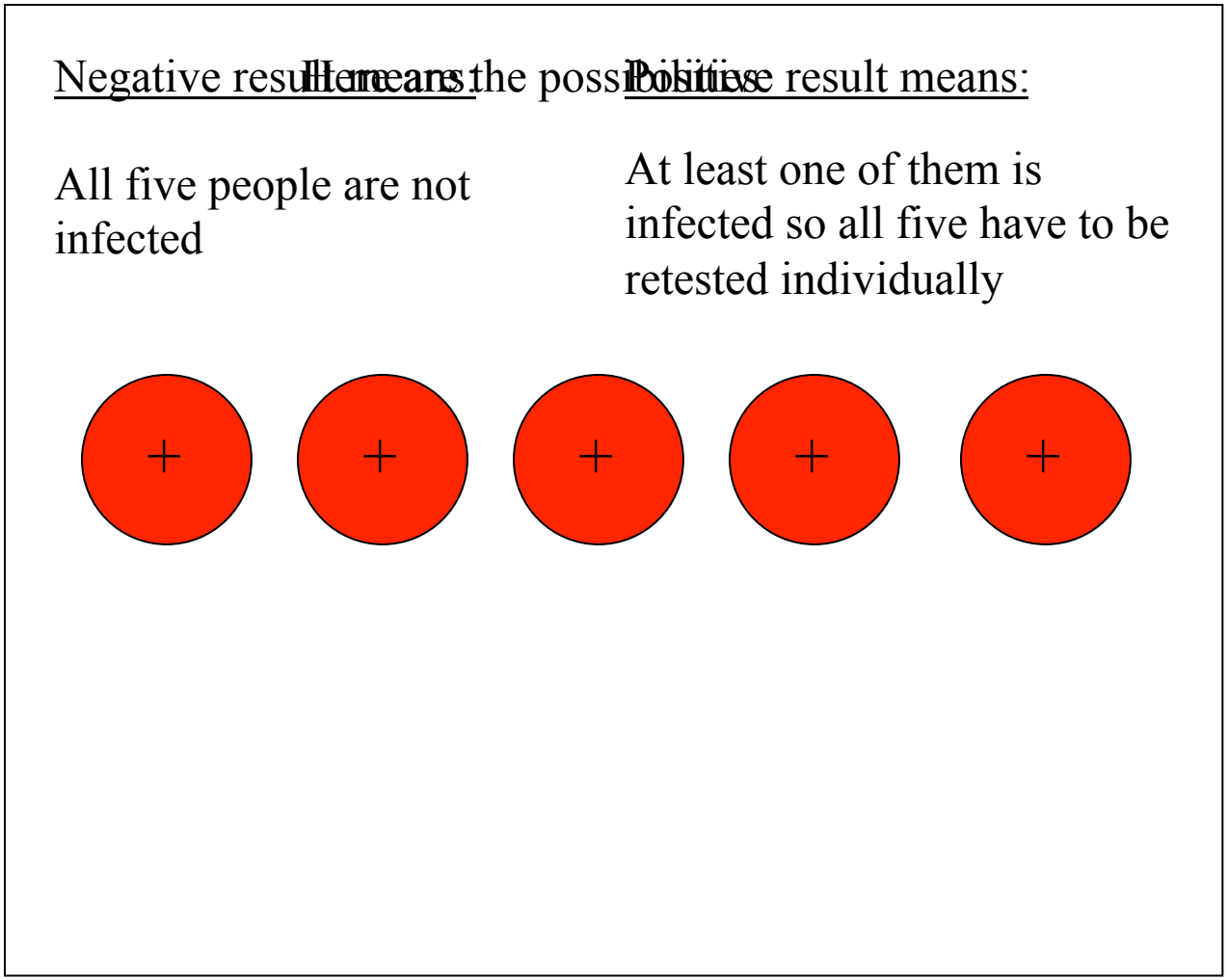
A certain blood disease appears in 1.5% of the population. When testing for this disease, to save time and resources, a lab mixes 5 blood samples into one and tests the one sample at once.

P(<u>one person</u> testing positive) = 0.015 P(<u>one person</u> testing negative) = 0.985



There are many different ways to get a positive result so we would have to add all of the probabilities of each combination of negatives and positives.

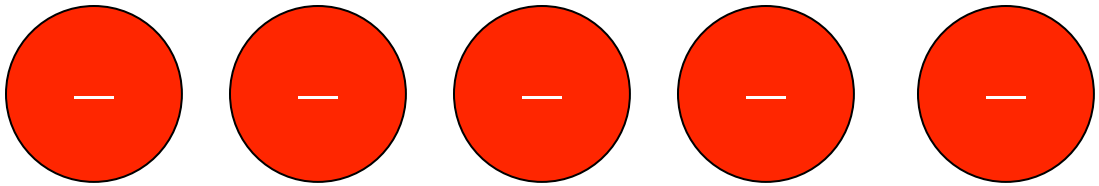
But there is only one way to get a negative result…

Negative result means:

All five people are not infected

Positive result means:

At least one of them is infected so all five have to be retested individually



Sample Space

There are actually 31 different ways for at least one positive to appear.

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So instead of adding all of the positive combinations, we can just find the probability of the one negative combination and…

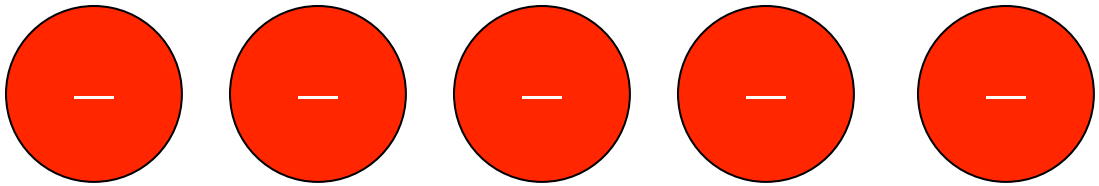
Subtract it from **1**

Negative result means:

All five people are not infected

Positive result means:

At least one of them is infected so all five have to be retested individually



Sample Space

P(positive result) = 1 – P(negative result)

P(positive result) = $1 - (0.985)^5 =$ 0.0728