

**Team name:**

Please write down all people in your team.

- 1.
  - 2.
  - 3.
  - 4.
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**Grading**

Question	Score	Max
1		3
2		3
3		3
Total		9

## 6.3 Probability in games of chance

### Theorem 1

Given a simple experiment, called a **Bernoulli trial**, and an event that occurs with a probability  $p$ , if the trial is repeated independently  $n$  times, then the probability of having exactly  $k$  successes is

$$C(n, k) \cdot p^k \cdot (1 - p)^{n-k}$$

*a*

**Example 1** What is the probability that in 10 successive rolls of a fair, six-sided die, we get exactly five results of 6?

Here, we have  $n = 10$ ,  $k = 5$ , and  $p = \frac{1}{6}$ , so:

$$C(10, 5) \cdot \left(\frac{1}{6}\right)^5 \cdot \left(1 - \frac{1}{6}\right)^{10-5}$$

$$\frac{10!}{5!(10-5)!} \cdot \left(\frac{1}{6}\right)^5 \cdot \left(\frac{5}{6}\right)^5$$

$$\frac{3628800}{14400} \cdot \frac{1}{7776} \cdot \frac{3125}{7776}$$

$$\approx 0.013$$

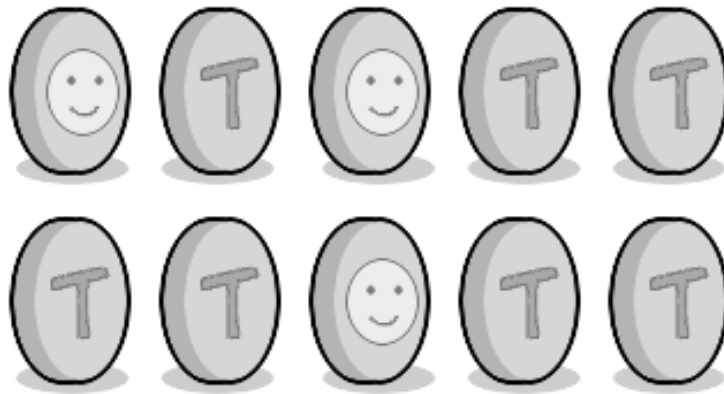
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<sup>a</sup>From Discrete Math by Ensley and Crawley, page 460

**Question 1**

\_\_\_\_\_ / 3

What is the probability of getting exactly 3 heads on 10 tosses of a fair coin?



$n$ , the amount of trial repeats: \_\_\_\_\_

$k$ , the amount of successes (heads): \_\_\_\_\_

$p$ , the probability of success: \_\_\_\_\_

Use the formula of  $C(n, k) \cdot p^k \cdot (1 - p)^{n-k}$  to find the probability.

**Question 2**

\_\_\_\_\_ / 3

What is the probability that in seven rolls of a six-sided die, the result of 1 appears *at least* five times?

**Hint**

For this one, we will need to use the **rule of sums** to combine several outcomes: Getting 5 1's, 6 1's, OR 7 1's.

		repeats $n$	successes $k$	probability $p$
A	Getting five 1's	7	5	1/6
B	Getting six 1's	7		
C	Getting seven 1's	7		

Now, using the formula  $C(n, k) \cdot p^k \cdot (1 - p)^{n-k}$  three different times for case (A), (B), and (C).

$$(A) \quad C(n, k) \cdot p^k \cdot (1 - p)^{n-k} =$$

$$(B) \quad C(n, k) \cdot p^k \cdot (1 - p)^{n-k} =$$

$$(C) \quad C(n, k) \cdot p^k \cdot (1 - p)^{n-k} =$$

To find the probability of getting at least five 1's in seven rolls, add (A), (B), and (C) together. (Just write out the formula; don't solve.)

$$Prob(\text{ at least five 1's }) =$$

**Question 3**

\_\_\_\_\_ / 3

What is the probability of getting exactly one 6 on 10 tosses of a fair six-sided die?