

# Probability Assignment 1 (10.13.2.11)

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## Question

If you toss a coin 6 times it comes down heads on each occasion. Can you say that the probability of getting a head is 1? Give reasons.

## Solution

No, we cannot say that probability of getting a head is 1. Let  $X$  denote the no. of heads appeared when 6 coins are tossed.  $X$  follows Binomial distribution. Let  $p$  be the probability that head is an outcome.

The given information is summarised in Table 2

Parameters	Values	Description
$X$	1,2,3,4,5,6	No.of heads appeared when 6 coins are tossed
$n$	6	No.of coins tossed
$p$	1/2	Probability that outcome is head

Table 2

$$\Pr(X = r) = {}^nC_r p^r (1 - p)^{n-r} \quad (1)$$

For  $X=6$

$$\Pr(X = 6) = {}^6C_6 p^6 (1 - p)^0 \quad (2)$$

$$\Pr(X = 6) = p^6 \quad (3)$$

The given event has occurred with a probability of  $p^6$ . From this we cannot infer that the value of  $p$  is 1 (assuming a non-biased coin). Hence, the given statement is false.