

4.3 Binomial Distributions (continued)

You know you have a binomial probability distribution if:

- 1) Fixed number of trials.*
- 2) Trials are independent*
- 3) Trials have 2 categories*
- 4) Probabilities stay the same for each trial.*

① Binompdf:

for particular probability values

exactly
2
correct

② Binomcdf: for cumulative
probability values

inequalities
less than 2
more than 2

If you toss a coin 5 times, find the probability you toss

Exactly 3 tails
 $n=5$ $p=\frac{1}{2}$ $r=3$ $P(3) = \text{binompdf}(5, .5, 3) = .313$
 $P(3) = {}_5C_3 \left(\frac{1}{2}\right)^3 \left(\frac{1}{2}\right)^2$

Exactly 0 tails
 $P(0) = \text{binompdf}(5, \frac{1}{2}, 0) = .0313$
 $P(0) = {}_5C_0 \left(\frac{1}{2}\right)^0 \left(\frac{1}{2}\right)^5$

Exactly 4 tails
 $P(4) = \text{bpdf}(5, \frac{1}{2}, 4) = .156$

Inequality practice

more than 3

$$r > 3$$

at least 5

$$r \geq 5$$

less than 4

$$r < 4$$

at most 7

$$r \leq 7$$

no more than 2

$$r \leq 2$$

You take a 5 question multiple choice test.
There are 4 answer choices for each question
What's the probability that you get

$n = 5, p = 1/4$
less than 2 correct

0 1 2 3 4 5

$$P(r < 2) = \text{bcdf}(5, 1/4, 1) = .633$$

or

$$\begin{aligned} P(r < 2) &= P(0) + P(1) \\ &= {}^5C_0 \left(\frac{1}{4}\right)^0 \left(\frac{3}{4}\right)^5 + {}^5C_1 \left(\frac{1}{4}\right)^1 \left(\frac{3}{4}\right)^4 = .633 \end{aligned}$$

You take a 5 question multiple choice test.
There are 4 answer choices for each question
What's the probability that you get

$n = 5$, $p = 1/4$
at most 3 correct

$0 \ 1 \ 2 \ 3 \ 4 \ 5$

$$P(r \leq 3) = \text{bcdf}(5, 1/4, 3) = .984$$

$$P(r \leq 3) = 1 - (P(4) + P(5))$$

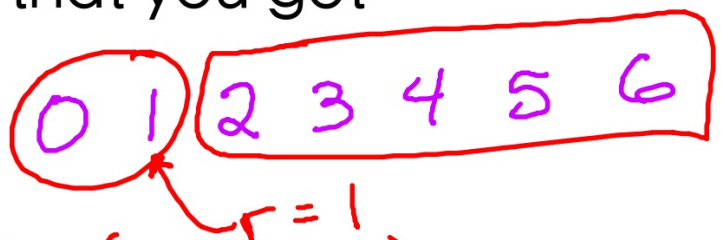
You take a 6 question multiple choice test.
There are 4 answer choices for each question

What's the probability that you get

$$n=6 \quad p=\frac{1}{4}$$

At least 2 correct

$$P(r \geq 2) = 1 - \text{bcdf}(6, 1/4, 1) \\ = .466$$

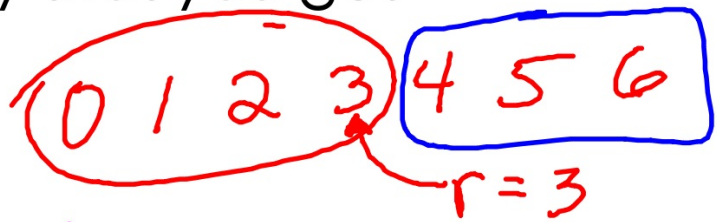


You take a 6 question multiple choice test.
There are 4 answer choices for each question

What's the probability that you get

$$n=6, p=\frac{1}{4}$$

More than 3 correct



$$P(r > 3) = 1 - \text{bcdf}(6, 1/4, 3) \\ = .0376$$