P(3 tails in 4 tosses) = $\frac{4}{16} = \frac{1}{4}$

HHHH HHHT HHTH HTHH THHH HHTT HTHT HTTH THTH THHT TTTH TTHT THTT HTTT TTTT

4/16 = 0.25

**Answer by listing all possibilities**

Given *x*, *n*, and *P*, we can compute the binomial probability based on the following formula:

$$P(X) = {}_nC_x \cdot p^x \cdot q^{n-x}$$

Toss a Coin 4 times; prob we get 3 tails

$x = 3$

$n = 4$

$p = 0.5$

$q = 0.5$

$P(x=3) = {}_4C_3 (0.5)^3 (0.5)^1$

$= 0.25$

**Answer by using binomial distribution**

The probability that a person has blue eyes is 0.375. If 50 people are randomly selected, what is the probability that 20 of them have blue eyes.

$n = 50$; $p = 0.375$; $q = 0.625$

$$P(X=20) = {}_{50}C_{20}(0.375)^{20}(0.625)^{30}$$

$$\approx 0.107$$

10.7%

It is known that 18% of the population have completed at least one University degree. 16 people are randomly selected, what is the probability that

$n = 16$
$p = 0.18$
$q = 1 - 0.18$
$0.82$

(a) 5 of them completed a degree $x = 5$

(b) 10 of them complete $11 = 4$

(a) ${}_{16}C_5 (0.18)^5 (0.82)^{11}$
$= 0.093$

(b) $P(x = 10) =$
${}_{16}C_{10} (0.18)^{10} (0.82)^6$
$= 0.000087$
$8.692\ldots \times 10^{-5}$

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$n = 6$ $p = 0.03$,
$x = 3$

${}_6C_3 (0.3)^3 (0.7)^3$

The probability that a new driver passes their drivers test on the first time is 0.583 . Five people are randomly chosen, $n=5;\ p=0.583\ \ q=1-0.583=0.417$

a. what is the probability that 3 of them get their license the first time

$${}_5C_3(0.583)^3(0.417)^2 = 0.345$$

(b) What are all the possibilities

$$P(X=0) = {}_5C_0(0.583)^0(0.417)^5 = 0.0126$$
$$P(X=1) = {}_5C_1(0.583)^1(0.417)^4 = 0.088$$
$$P(X=2) = {}_5C_2(0.583)^2(0.417)^3 = 0.246$$
$$P(X=3) = {}_5C_3(0.583)^3(0.417)^2 = 0.345$$
$$P(X=4) = {}_5C_4(0.583)^4(0.417)^1 = 0.241$$
$$P(X=5) = {}_5C_5(0.583)^5(0.417)^0 = 0.0674$$

P(at least 3 passed the first time) = P(X=3)+P(X=4)+P(X=5)

= 0.345+0.241+0.0674

Quiz

1. What is the 11th digit after the decimal point for the irrational number *e*?
(a) 2 (b) 7 (c) 4 (d) 5
2. What was the Dow Jones Average on February 27, 1993?
(a) 3265 (b) 3174 (c) 3285 (d) 3327
3. How many students from Sri Lanka studied at U.S. universities from 1990-91?
(a) 2320 (b) 2350 (c) 2360 (d) 2240
4. How many kidney transplants were performed in 1991?
(a) 2946 (b) 8972 (c) 9943 (d) 7341
5. How many words are in the American Heritage Dictionary?
(a) 60,000 (b) 80,000 (c) 75,000 (d) 83,000

## Quiz Results

The correct answers to the quiz are:
1. d 2. a 3. b 4. c 5. b

Count the number of correct answers. Let the number of correct answers = *x*.

Why is this a binomial experiment?

What are the values of n, p and q?

What are the possible values for *x*?

## Quiz Results

The correct answers to the quiz are:
1. d 2. a 3. b 4. c 5. b

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# Binomial Experiments

A multiple choice test has 8 questions each of which has 3 choices, one of which is correct. You want to know the probability that you guess exactly 5 questions correctly. Find *n*, *p*, *q*, and *x*.

n = 8 p = 1/3 q = 2/3 $x = 5$

A doctor tells you that 80% of the time a certain type of surgery is successful. If this surgery is performed 7 times, find the probability exactly 6 surgeries will be successful. Find *n*, *p*, *q*, and *x*.

n = 7 p = 0.80 q = 0.20 $x = 6$

| $x$ | ${}_nC_x\, p^x q^{n-x}$ | $P(x)$ |
|---|---|---|
| 0 | ${}_7C_0 (0.8)^0 (0.2)^7$ | 0.0000128 |
| 1 | ${}_7C_1 (0.8)^1 (0.2)^6$ | 0.000358 |
| 2 | ${}_7C_2 (0.8)^2 (0.2)^5$ | 0.0043 |
| 3 | ${}_7C_3 (0.8)^3 (0.2)^4$ | 0.0287 |
| 4 | ${}_7C_4 (0.8)^4 (0.2)^3$ | 0.1147 |
| 5 | ${}_7C_5 (0.8)^5 (0.2)^2$ | 0.2753 |
| 6 | ${}_7C_6 (0.8)^6 (0.2)^1$ | 0.367 |
| 7 | ${}_7C_7 (0.8)^7 (0.2)^0$ | 0.2097 |

$\Sigma P(x) = 1$

what is the prob. that:

a) 4 surgeries are successful? 0.1147

b) at least 5 surgeries are successful
0.2753 + 0.367 + 0.2097 = 0.852

(c) no more than 2 are successful
$P(x=0) + P(x=1) + P(x=2)$ = 0.00467

(d) that less than 2 surgeries are successful
$P(x=0) + P(x=1) = 0.000393$

The probability that a grad 12 students owns an IPhone is 27%. If 11 students are randomly questioned find the probability:
(a) that 6 own an IPhone?
(b) less than 3 own IPhones?

(a) $P(x=6) = {}_{11}C_6 (0.27)^6 (0.73)^5 = 0.037$ 3.7%

(b) $P(x=2) = {}_{11}C_2 (0.27)^2 (0.73)^9 = 0.236$
$P(x=1) = {}_{11}C_1 (0.27)^1 (0.73)^{10} = 0.128$
$P(x=0) = {}_{11}C_0 (0.27)^0 (0.73)^{11} = 0.0314$
0.395

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1, 3, 5, 7, 9, 11, 13,

we are working on these monday!!!

The probablity that a randomly selected student lives in Renous is 0.31. given that 5 students are randomly selected, what is the probability that:

a. 0 live in Renous $P(x=0) = {}_5C_0(0.31)^0(0.69)^5 = 0.1564$
b. 1 lives in Renous $P(x=1) = {}_5C_1(0.31)^1(0.69)^4 = 0.3513$
c. 2 lives in Renous $P(x=2) = {}_5C_2(0.31)^2(0.69)^3 = 0.3157$
d. 3 lives in Renous $P(x=3) = {}_5C_3(0.31)^3(0.69)^2 = 0.1418$
e. 4 lives in Renous $P(x=4) = {}_5C_4(0.31)^4(0.69)^1 = 0.0319$
f. 5 lives in Renous $P(x=5) = {}_5C_5(0.31)^5(0.69)^0 = 0.0029$

P(4 live in Renous)
= 0.0319

P(at least 4 live in Renous)
P(x=4) + P(x=5)
0.0319 + 0.0029
= 0.0348