The results of rolling 5 dice to simulate guessing at 5 T/F questions is shown below:

	1st hr	2nd hr	3rd hr	5th hr	Total
# times pass	129		151	53	333
# trials	240		300	90	630

Experimental probability of passing = $\dfrac{333}{630}$ = 52.8%

Theoretical Probability that pass:

Probability that guess correctly on a T/F question = 0.5

Prob Guess 3 correct = (0.5)(0.5)(0.5)(0.5)(0.5) = 3.125%
correct   correct   correct   incorrect   incorrect

How many ways can you get 3 out of 5 questions correct?   Order isn't important: $_5C_3$ = 10

3.125% • 10 = 31.25%

Prob Guess 4 correct = (0.5)(0.5)(0.5)(0.5)(0.5) = 3.125%
correct   correct   correct   correct   incorrect

How many ways can you get 4 out of 5 questions correct?   Order isn't important: $_5C_4$ = 5

3.125% • 5 = 15.625%

Prob Guess 5 correct = (0.5)(0.5)(0.5)(0.5)(0.5) = 3.125%
correct   correct   correct   correct   correct

How many ways can you get 5 out of 5 questions correct?   Order isn't important: $_5C_5$ = 1

3.125% • 1 = 3.125%

Probability that you guess at all 5 questions
on a T/F quiz and pass are:

3 correct OR 4 correct OR 5 correct =

3 correct = 31.25%
+ 4 correct = 15.625%
+ 5 correct =   3.125%

50% chance

What if there were 10 questions?

Passing would be getting:
6 correct = 20.51%
7 correct = 11.72%
8 correct = 4.39%
9 correct = 0.98%
or
10 correct = 0.10%

37.7% chance you pass by guessing

What if there were 5 multiple choice questions, with A,
B, C, or D as choices?

3 correct = 8.79% chance
4 correct = 1.46% chance
5 correct = 0.10% chance

10.35% chance you will pass by guessing

What if there were 10 multiple choice questions, with
A, B, C, or D as choices?

6 correct = 1.62% chance
7correct = 0.31% chance
8 correct = 0.04% chance
9 correct = 0.003% chance
10 correct = 0.000095% chance

1.97% chance you will pass by guessing

The previous problems are examples of Binomial Probability.

Binomial Probability:
- Repeated independent trials
- Only two possible outcomes: Success & Failure.
- P(Success)=s and P(Failure)=f $\longrightarrow$ s + f = 1

Probability of x successes in n trials:

$$ _nC_x \cdot s^x \cdot f^{(n-x)} $$

Probability that you guess at all 5 questions on a T/F quiz and pass are:

3 correct OR 4 correct OR 5 correct =

3 correct = $_5C_3 (.5)^3(.5)^2$ = 31.25%
+ 4 correct = $_5C_4 (.5)^4(.5)^1$ = 15.625%
+ 5 correct = $_5C_5 (.5)^5$ = 3.125%
                        50% chance

What if there were 5 multiple choice questions, with A, B, C, or D as choices?

P(Success) = .25 correct   P(Failure) = .75 incorrect

3 correct = $_5C_3 (.25)^3(.75)^2$ 8.79% chance
+ or
4 correct = $_5C_4 (.25)^4(.75)^1$ 1.46% chance
+ or
5 correct = $_5C_5 (.25)^5$ 0.10% chance

(10.35%) chance you will pass by guessing

What if there were 10 multiple choice questions, with A, B, C, or D as choices?

P(Success) = .25   P(Failure) = .75

or 6 correct = $_{10}C_6 (.25)^6(.75)^4$ 1.62% chance
or 7 correct = $_{10}C_7 (.25)^7(.75)^3$ 0.31% chance
or 8 correct =   ⋮   0.04% chance
or 9 correct =   ⋮   0.003% chance
or 10 correct =   0.000095% chance

1.97% chance you will pass by guessing

Throughout the season a basketball player has made 70% of their free-throws. Find the probability that they will make 4 of their next 5 free-throws.

P(Success) = .70   P(Failure) = .30
make   miss

$$= \; _5C_4 \, (.70)^4 (.30)^1$$

$$= \boxed{36.02\%}$$

You plant 10 cucumber seeds in your garden. The seed company claims that their seeds will produce a plant 80% of the time.

Find the probablity that at least 8 seeds will produce a cucumeber plant.

P(Success) = .80   P(Failure) = .20
seed germinates   Seed doesn't germinate

$$8 \longrightarrow \; _{10}C_8 \, (.8)^8 (.2)^2 = 30.20\%$$
or
$$+$$
$$9 \longrightarrow \; _{10}C_9 \, (.8)^9 (.2)^1 = 26.84\%$$
or
$$+$$
$$10 \longrightarrow \; _{10}C_{10} \, (.8)^{10} = 10.74\%$$

$$\boxed{67.78\%}$$

A nationwide survey found that 72% of people in the United States like pizza. Three people are selected at random. Find each probability as a percent to the nearest tenth.

P(Success) = .72 P(Failure) = .28
LIKE PIZZA   NOT PIZZA

1. What is the probability that all three like pizza?

$$_3C_3 \, (.72)^3 = 37.32\%$$

2. What is the probability that only one of them likes pizza?

$$_3C_1 \, (.72)^1 (.28)^2 = 16.93\%$$