Power
(Solutions)

All exercises (and more) can be found on:
http://introstatsonline.com/chapters/chapter1/start.shtml
In order to log in:
ID: DemoStats-0
Password: 12345678
Nice demos and explanations are waiting for you… ☺

1) Which of the following choices is the best definition of power?

A) It is the probability of rejecting a true null hypothesis.

B) It is the probability of rejecting a false null hypothesis. (Power is related to beta, which is the probability of failing to reject a false null hypothesis, but it is not the same value.)

C) It is the probability the null hypothesis is false.

D) It is the probability the alternative hypothesis is true.

E) It is the probability of failing to reject a false null hypothesis.

2) Which of the following choices will increase the power of an experiment.

A) bigger sample sizes.

B) bigger standard deviation.

C) bigger significance (alpha) level.

D) a one tailed rather than a two-tailed test.

E) bigger mean values.

F) a two sample rather than a one sample test.

3) Power is highest for the

A) .01 level

B) .05 level

C) .10 level (The less stringent the significance level, the higher the power.)

4) What increases power more?

A) An increase in sample size from 10 to 20 (The increase is greater for small sample sizes.)

B) An increase in sample size from 20 to 30

5) As sample size increases, power

A) increases quickly at first and then levels off (Power increases quickly at first and then levels off.)

B) increases linearly

C) is unaffected

6) As sample size increases, the Type I error rate

A) Increases

B) Decreases

C) Increases and then decreases

D) Does not change (Sample size does not affect the Type I error rate.)

7)Increasing the difference between the population mean and the hypothesized mean

A) Increases power (Larger differences are easier to detect.)

B) Decreases power

8)Which is more powerful

A) One-tailed tests (as long as the hypothesized direction of the effect is correct.)

B) Two-tailed tests

9)The larger the standard deviation, the higher the power

A) True

B) False (The larger the standard deviation, the lower the power.)

10) If the null hypothesis is false, which of the following is/are true?

A) Increasing sample size increases power.

B) Increasing sample size decreases the Type I error rate.

C) The smaller the difference between the hypothesized mean and the population mean, the lower the power.

D) A test at the .05 level has more power than a test at the .01 level.

11) If the power of an experiment is low, then

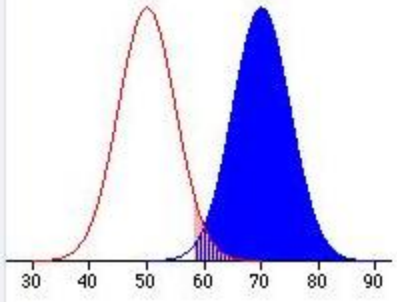
A) The experiment will likely be inconclusive. (With low power, the null hypothesis is unlikely to be rejected. When the null hypothesis is not rejected, the experiment is inconclusive.)

B) Any significant findings obtained are suspect.

C) The results are skewed.

12)

The graph below displays power for a one-sample Z-test of the null hypothesis that the population mean is 50. The red distribution is the sampling distribution of the mean assuming the null hypothesis is true. The blue distribution is the sampling distribution of the mean assuming the population mean is 70. A sample mean over 58 is significantly greater than 50 at the .05 level. The shaded area in the red distribution is

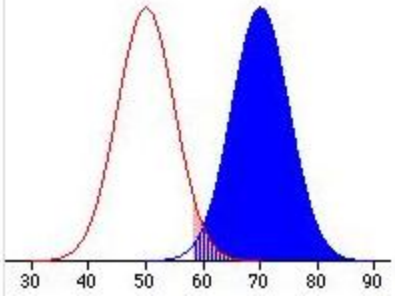


A) Type I error rate (The area shaded in red is the probability of getting a mean that is significantly different from 50 if the null hypothesis is true.)

B) Power

13)

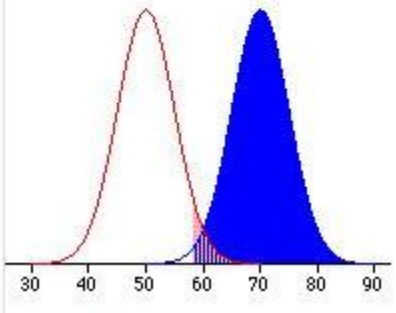
The graph below displays power for a one-sample Z-test of the null hypothesis that the population mean is 50. The red distribution is the sampling distribution of the mean assuming the null hypothesis is true. The blue distribution is the sampling distribution of the mean assuming the population mean is 70. A sample mean over 58 is significantly greater than 50 at the .05 level. The shaded area in the blue distribution is



A) Type I error rate

B) Power (The area shaded in blue is the probability of getting a mean that is significantly different from 50 if the population mean is 70.)

14) The graph below displays power for a one-sample Z-test of the null hypothesis that the population mean is 50. The red distribution is the sampling distribution of the mean assuming the null hypothesis is true. The blue distribution is the sampling distribution of the mean assuming the population mean is 70. A sample mean over 58 is significantly greater than 50 at the .05 level. If the blue distribution had a mean of 75 instead of 70 then:



A) The Type I error rate would increase

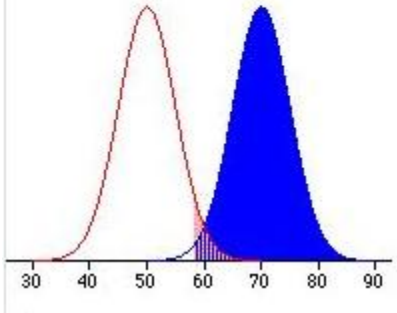
B) Power would increase

C) The two distributions would not overlap

D) The cut-off point for significance would increase

(The type I error rate would not increase since that is a function of the red distribution. Power would increase since more of the blue distribution would be to the right of the cutoff. The two distribution would overlap less, but would still overlap. The cut-off point for significance is not a function of the blue distribution.)

15) The graph below displays power for a one-sample Z-test of the null hypothesis that the population mean is 50. The red distribution is the sampling distribution of the mean assuming the null hypothesis is true. The blue distribution is the sampling distribution of the mean assuming the population mean is 70. A sample mean over 58 is significantly greater than 50 at the .05 level. If the standard deviation were reduced then:



A) The Type I error rate would increase

B) Power would increase &

C) The cut-off point for significance would decrease

(The Type I error rate is not a function of the standard deviation. Power would increase since the overlap of the distributions would decrease and the cutoff point would decrease. The cut-off point for significance would be reduced because a smaller distance from the red distributions mean is needed to be significant.)

16)

The following table lists the properties of five experiments that each used a t-test to determine if there was a significant difference between population means. n is the sample size for each group. Each experiment was tested with alpha=.05 for a two-tailed test. Which of the follow correctly describes the order of the experimental powers?

Experiment	n	μ_1	μ_2	σ
a	20	29	33	12
b	75	34	40	6
c	240	45	50	27
d	4	150	120	10
e	300	30	31	8

A) b > c > e > a > d.
B) a > d > b > c > e.
C) b > d > c > e > a.
D) c > a > e > b > d.

You can either make a table of power (using the tool provided on the website) of each experiment and then sort or you can think about it in terms of tradeoff between the different parameters.
Reminder: power is bigger
- with bigger n
- with bigger mean differences (μ1-μ2)
-with smaller σ