Minitab Activity 5

Example 1

Step 1

Method

p_1: proportion where Sample 1 = Event
p_2: proportion where Sample 2 = Event
Difference: $p_1 - p_2$

Step 2

Descriptive Statistics

Sample	N	Event	Sample p
Sample 1	150	80	0.533333
Sample 2	100	30	0.300000

Step 3

Estimation for Difference

Difference	95% CI for Difference
0.233333	(0.113162, 0.353504)

CI based on normal approximation

Step 4

Test

Null hypothesis $H_0: p_1 - p_2 = 0$
Alternative hypothesis $H_1: p_1 - p_2 \neq 0$

Method	Z-Value	P-Value
Normal approximation	3.64	0.000
Fisher's exact		0.000

The test based on the normal approximation uses the pooled estimate of the proportion (0.44).

Step 5

At alpha = .02 there is sufficient evidence to suggest $H_1: p_1 - p_2 \neq 0$.

Example 2

Step 1

Method

p_1: proportion where Sample 1 = Event
p_2: proportion where Sample 2 = Event
Difference: $p_1 - p_2$

Step 2

Descriptive Statistics

Sample	N	Event	Sample p
Sample 1	50	16	0.320000
Sample 2	75	28	0.373333

Step 3

Estimation for Difference

Difference	95% CI for Difference
-0.0533333	(-0.222747, 0.116081)

CI based on normal approximation

Step 4

Test

Null hypothesis H_0: $p_1 - p_2 = 0$
Alternative hypothesis H_1: $p_1 - p_2 \neq 0$

Method	Z-Value	P-Value
Normal approximation	-0.61	0.541
Fisher's exact		0.572

The test based on the normal approximation uses the pooled estimate of the proportion (0.352).

Step 5

At alpha = .05 there is not sufficient evidence to suggest H_1: $p_1 - p_2 \neq 0$.

Example 3

Step 1

Method

μ_1: population mean of Sample 1
μ_2: population mean of Sample 2
Difference: $\mu_1 - \mu_2$

Equal variances are assumed for this analysis.

Step 2

Descriptive Statistics

Sample	N	Mean	StDev	SE Mean
Sample 1	100	1023	287	29
Sample 2	100	966	290	29

Step 3

Estimation for Difference

Difference	Pooled StDev	99% CI for Difference
57.0	288.5	(-49.1, 163.1)

Step 4

Test

Null hypothesis $H_0: \mu_1 - \mu_2 = 0$
Alternative hypothesis $H_1: \mu_1 - \mu_2 \neq 0$

T-Value	DF	P-Value
1.40	198	0.164

Step 5

At alpha = .01 there is not sufficient evidence to suggest $H_1: \mu_1 - \mu_2 \neq 0$

Example 4

Step 1

Method

μ_1: population mean of Sample 1
μ_2: population mean of Sample 2
Difference: $\mu_1 - \mu_2$

Equal variances are not assumed for this analysis.

Step 2

Descriptive Statistics

Sample	N	Mean	StDev	SE Mean
Sample 1	23	150.3	13.1	2.7
Sample 2	22	156.8	22.0	4.7

Step 3

Estimation for Difference

Difference	99% CI for Difference
-6.44	(-21.29, 8.41)

Step 4

Test

Null hypothesis H_0: $\mu_1 - \mu_2 = 0$
Alternative hypothesis H_1: $\mu_1 - \mu_2 \neq 0$

T-Value	DF	P-Value
-1.19	33	0.244

Step 5

At alpha = .05 there is not sufficient evidence to suggest H_1: $\mu_1 - \mu_2 \neq 0$

Example 5

Step 1

μ_difference: population mean of (After - Before)

Step 2

Descriptive Statistics

Sample	N	Mean	StDev	SE Mean
After	6	193.2	22.3	9.1
Before	6	209.8	26.9	11.0

Step 3

Estimation for Paired Difference

Mean	StDev	SE Mean	90% CI for μ_difference
-16.7	25.4	10.4	(-37.6, 4.2)

μ_difference: population mean of (After - Before)

Step 4

Test

Null hypothesis H_0: μ_difference = 0

Alternative hypothesis H_1: μ_difference ≠ 0

T-Value	P-Value
-1.61	0.169

Step 5

At alpha = .10 there is not sufficient evidence to suggest H_1: $\mu_1 - \mu_2 \neq 0$

Example 6

Step 1

μ_difference: population mean of (Errors Before - Errors After)

Step 2

Descriptive Statistics

Sample	N	Mean	StDev	SE Mean
Errors Before	6	5.50	4.32	1.77
Errors After	6	4.00	2.97	1.21

Step 3

Estimation for Paired Difference

Mean	StDev	SE Mean	95% Lower Bound for μ_difference
1.500	1.643	0.671	0.148

μ_difference: population mean of (Errors Before - Errors After)

Step 4

Test

Null hypothesis H_0: μ_difference = 0

Alternative hypothesis H_1: μ_difference > 0

T-Value	P-Value
2.24	0.038

Step 5

At alpha = .05 there is sufficient evidence to suggest H_1: $\mu_1 - \mu_2 > 0$