Output from Minitab 17 for Confidence Intervals and Hypothesis Tests for Means and Proportions

The output for all the one- and two-sample inference on means and proportions is very similar. It is all shown all together here to illustrate to you how learning to read one of these means that you can read all of them.

1-Sample Z

One-Sample Z: Treatment A

```
Test of μ = 105 vs ≠ 105
The assumed standard deviation = 20


Variable      N    Mean  StDev  SE Mean       90% CI          Z      P
Treatment A  25  104.12  15.80     4.00  (97.54, 110.70)  -0.22  0.826
```

1-Sample t

One-Sample T: Treatment A

```
Test of μ = 105 vs ≠ 105


Variable      N    Mean  StDev  SE Mean       88% CI          T      P
Treatment A  25  104.12  15.80     3.16  (99.03, 109.21)  -0.28  0.783
```

Paired t

Paired T-Test and CI: Treatment A, Treatment B

```
Paired T for Treatment A - Treatment B

              N    Mean  StDev  SE Mean
Treatment A  25  104.12  15.80     3.16
Treatment B  25  117.44  27.26     5.45
Difference   25  -13.32  22.94     4.59


93% CI for mean difference: (-22.02, -4.62)
T-Test of mean difference = 0 (vs ≠ 0): T-Value = -2.90  P-Value = 0.008
```

2-Sample t

Two-Sample T-Test and CI: Treatment E, Group

```
Two-sample T for Treatment E

Group   N   Mean  StDev  SE Mean
C       8  20.00   3.16      1.1
T      10  19.00   3.53      1.1


Difference = μ (C) - μ (T)
Estimate for difference:  1.00
95% CI for difference:  (-2.37, 4.37)
T-Test of difference = 0 (vs ≠): T-Value = 0.63  P-Value = 0.536  DF = 15
```

One Proportion

Test and CI for One Proportion

```
Test of p = 0.4 vs p ≠ 0.4


Sample   X    N  Sample p          96% CI          Z-Value  P-Value
1       67  160  0.418750  (0.338647, 0.498853)     0.48    0.628

Using the normal approximation.
```

Two Proportions

This is **estimating the two proportions separately** (appropriate for confidence interval.)

Test and CI for Two Proportions

```
Sample   X   N  Sample p
1       32  83  0.385542
2       39  90  0.433333


Difference = p (1) - p (2)
Estimate for difference:  -0.0477912
85% CI for difference:  (-0.155348, 0.0597661)
Test for difference = 0 (vs ≠ 0):  Z = -0.64  P-Value = 0.522

Fisher's exact test: P-Value = 0.540
```

This is using **the pooled estimate of the two proportions** (appropriate for hypothesis test.)

Test and CI for Two Proportions

```
Sample   X   N  Sample p
1       32  83  0.385542
2       39  90  0.433333


Difference = p (1) - p (2)
Estimate for difference:  -0.0477912
85% CI for difference:  (-0.155348, 0.0597661)
Test for difference = 0 (vs ≠ 0):  Z = -0.64  P-Value = 0.523

Fisher's exact test: P-Value = 0.540
```

Note that the different choices about how to estimate the two proportions give very similar results here. Partly that is because the sample proportions were not very far apart in this case. But mostly it is because these two methods almost always give very similar results.

The reason for the two different methods is theoretical. The extra assumption during hypothesis testing that the two proportions are equal implies that you should have equal estimates. That means you combine all the information in both samples when you use that information to estimate the standard error in the denominator of the z-statistic. That's why we use the pooled estimate of the proportions when doing hypothesis testing.