

AP Statistics - Inference for the Difference of Two Means - Worksheet

Common Core AP STAT 7.6, AP STAT 7.7, AP STAT 7.8, AP STAT 7.9, HSS-IC.B.5 · maths-pdf.fr/en/

Name: _____ Class: _____ Date: ____/____/____

These 20 problems practice AP Statistics topics 7.6 to 7.9. You will compute standard errors for a difference of means, build and interpret two-sample t intervals, run two-sample t tests, and decide between two-sample and paired designs.

AP Statistics · Common Core State Standards: **AP STAT 7.6, AP STAT 7.7, AP STAT 7.8, AP STAT 7.9, HSS-IC.B.5**

Exercise 1 - Parameters and hypotheses

Group	n	Mean	Std dev
Method A (new)	35	78.4	9.2
Method B (old)	40	72.1	11.5

Scores in two independent classes taught with different methods.

Using the table, define the parameters and write hypotheses to test whether the new method gives a higher mean score.

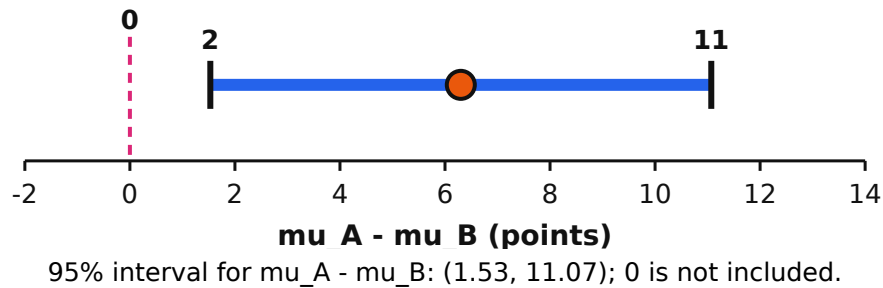
Exercise 2 - Difference and standard error

For the two classes (A: $n = 35$, mean 78.4, $s = 9.2$; B: $n = 40$, mean 72.1, $s = 11.5$), find the difference of means and the standard error.

Exercise 3 - Degrees of freedom

For the same data, find the conservative degrees of freedom and compare it with the calculator value 72.5.

Exercise 4 - Confidence interval

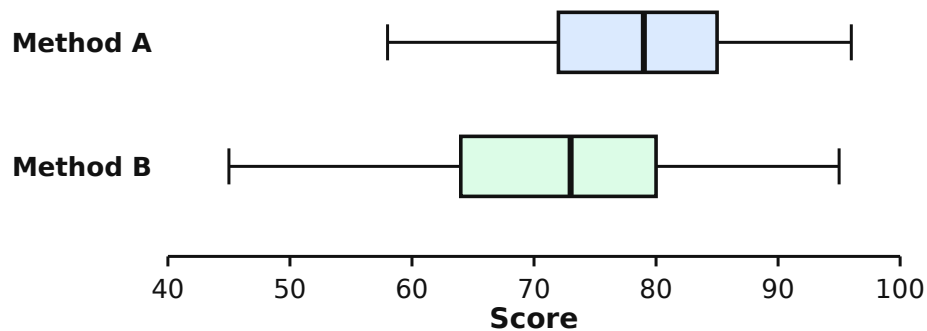


Find a 95% confidence interval for $\mu_A - \mu_B$.

Exercise 5 - Interpret the interval

Interpret the interval (1.531, 11.069) in context.

Exercise 6 - Check conditions



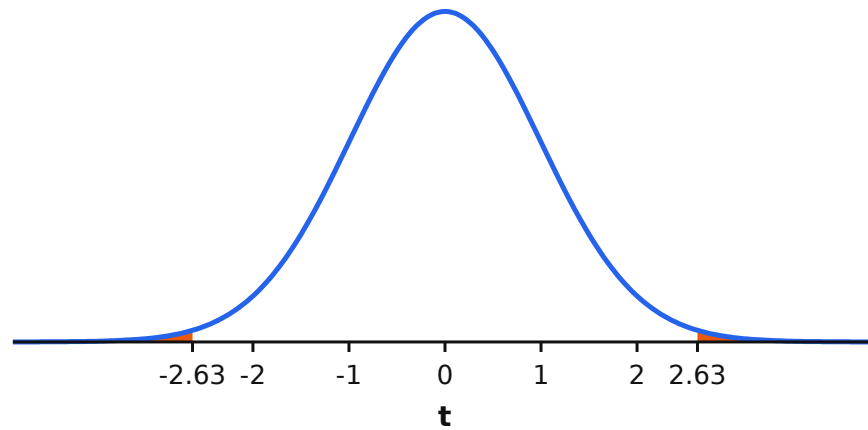
Boxplots of both classes: no outliers and roughly symmetric.

Check the conditions for a two-sample t procedure, given independent random samples of 35 and 40 students from large schools and the boxplots shown.

Exercise 7 - Compute t

Compute the t statistic for $H_0: \mu_A - \mu_B = 0$ using the school data.

Exercise 8 - p-value



Two-sided p-value for $t = 2.63$: 0.0104.

Find the two-sided p-value for $t = 2.63$ with $df = 72.5$.

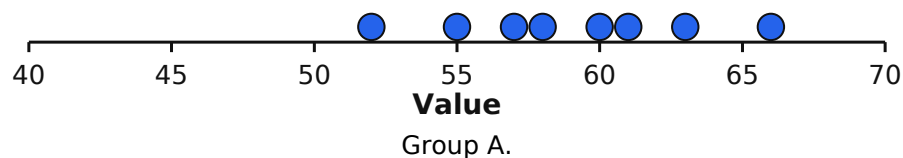
Exercise 9 - Conclusion

State the conclusion at $\alpha = 0.05$ (p-value 0.0104).

Exercise 10 - Experiment with caffeine

Volunteers were randomly assigned to caffeine ($n = 12$, mean 25.4 correct, $s = 4.8$) or a placebo ($n = 14$, mean 22.1, $s = 5.2$) on a memory test. Test whether caffeine increases the mean number correct at $\alpha = 0.05$.

Exercise 11 - From raw data

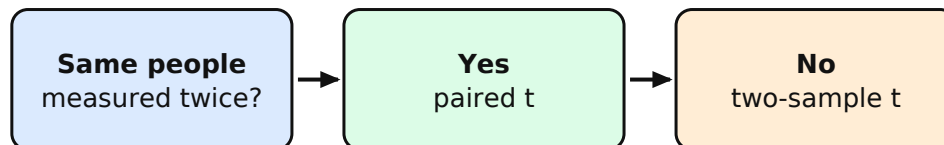


Two independent random groups of 8 plants were grown with different fertilizers (growth in cm). Fertilizer 1: 55, 61, 58, 66, 52, 60, 63, 57. Fertilizer 2: 48, 54, 50, 61, 45, 53, 56, 49. Find the means and standard deviations, then a 95% interval for $\mu_1 - \mu_2$.

Exercise 12 - Paired or independent?

Decide whether to use a paired or a two-sample procedure: (a) 30 runners' times before and after a month of training; (b) mean salaries of 40 randomly selected teachers in two districts; (c) 20 pairs of twins, one twin randomly assigned to each of two diets.

Exercise 13 - Wrong procedure



Choose the procedure by the design.

A student uses a two-sample t procedure for scores of the same 25 students before and after a workshop. Explain the error and the correct procedure.

Exercise 14 - Interval and test

A 95% interval for $\mu_1 - \mu_2$ is $(-1.2, 6.8)$. What does this say about a two-sided test of $H_0: \mu_1 = \mu_2$ at $\alpha = 0.05$?

Exercise 15 - Homework hours

Random samples: 45 boys average 2.9 hours of homework per week ($s = 1.4$) and 50 girls average 2.4 hours ($s = 1.1$). Test whether the true means differ at $\alpha = 0.05$.

Exercise 16 - Effect of sample size

Two studies find the same difference of means (4 points) with $s = 10$ in each group. Compare the standard errors when $n = 25$ per group and $n = 100$ per group.

Exercise 17 - Outlier problem

Group 1 has mean 50, $s = 5$, $n = 15$. Group 2 has mean 56, $s = 25$, $n = 15$ because of one value of 150. Explain why a two-sample t interval for the difference may be unreliable.

Exercise 18 - 99 percent interval

Random samples: 60 adults in city A spend a mean of 34.5 minutes ($s = 6.0$) commuting and 55 adults in city B spend 31.0 minutes ($s = 5.5$). Find a 99% interval for $\mu_A - \mu_B$.

Exercise 19 - Multi-step

A randomized experiment compares two study plans: Plan 1 ($n = 30$, mean gain 12.5, $s = 4.0$) and Plan 2 ($n = 28$, mean gain 10.2, $s = 3.5$). (a) Test $H_a: \mu_1 > \mu_2$ at $\alpha = 0.05$. (b) Would a 90% interval agree?

Exercise 20 - Describe the difference

The 95% interval for the mean difference in reaction time (men minus women) is $(-8, 21)$ ms. Write a conclusion in context.