

PSYCH 10 Tutorial Session • Fall 2026

Week 5 • The Reaction Room • Answer key

Full name (in CAPITAL LETTERS)

SUNet ID (the part before @stanford.edu)

Section (e.g., TUES 9:30)

Answer key

Sheet A: the Model Room

Please write legibly so the teaching team can log your attendance: if we can't read your name, we can't give you credit.

The situation

Q. Ledger has locked you in the Archive at **Strangeford University** with Dr. Truett's reaction-time file. "Somebody has to read that file before Monday," Ledger says through the door. "I have torn it in two: the numbers are in the Model Room, and the people are in the Records Room. The door between the rooms stays shut until my signal."

Work through your own room first. When the door opens, pair up with someone from the other room for the last door.

The file

You are in the Model Room, which holds the lab's numbers.

Two of Dr. Truett's research assistants disagree. The lab's computer has flagged four trials as "impossible." **Sam** wants all four trials deleted. **Mel** says that at least one of them came from a real person.

The task. A light turns on, and the participant presses a button as fast as possible: five trials each, timed in milliseconds (ms). In a harder **choice task**, the light is red or blue, and the participant presses the left button for red and the right button for blue.

Sam's note, clipped to the file: "Four SDs below the mean? On a normal curve, that is a few trials in a hundred thousand. P04's 180 and P07's 182 are either typos or numbers that somebody invented. I typed all two hundred trials into the spreadsheet myself last night, and I typed fast. Fast typing makes typos. Delete both trials."

Model Room, part 1 • Total error, and the typical miss

Before the study began, Dr. Truett ran five warm-up trials of the simple task. Jo used their mean, **260 ms**, as a one-number model for the five.

Jo's note: "I added up the errors from 260 and got 0. So 260 is a perfect model?" *Avi's note:* "The median, 250, sits closer to most of the trials. It has to be a better model."

Warm-up trial (ms)	240	250	250	270	290	Total
a. Error from 260 (trial - 260)	-20	-10	-10	+10	+30	0
b. Squared error	400	100	100	100	900	SS = 1600

a. Fill in each trial's error from 260, then add up the errors. *You get 0, as Jo did. You always will around the mean, because the mean is the balance point of the data: the errors below it cancel the errors above it. So Jo's 0 cannot measure how well 260 fits, and that is why the next step squares the errors.*

b. Square each error, then add up the squares to get the SS around 260. Avi worked out the SS around 250: **2,100**. Circle the better model, justify your answer: **Jo's 260 • Avi's 250** *Jo's 260: an SS of 1600 against Avi's 2100. Avi is right that 250 sits closer to three of the five trials, but once you square the errors, you pay 400 and 1600 for the far trials at 270 and 290 alone. You will not find a number with a smaller SS than the mean.* c. Use the formulas at the bottom of the back of this sheet. Variance = $1600 / 4 = 400$ SD = $\sqrt{400} = 20$ ms. A typical warm-up trial lands about **20 ms** from the mean. *Check that the group divided by 4, not 5: dividing by 5 gives 320 and an SD of about 17.9 ms.*

The file, continued

The computer's flag rule is to flag any trial more than 75 ms from its task's mean. The four flagged trials are in the part 2 table; the rest of each participant's trials are in the Records Room. Below you will find a description of the total mean and SD of each task.

Task	Mean of all trials (ms)	SD of all trials (ms)
Simple (light on, press)	260	20
Choice (red or blue)	420	60

Model Room, part 2 • Far is relative

Fill in the two empty columns of the table. Which flagged trial is the least unusual for its own task? Justify your answer in terms of SDs. *P09. Notice that P09's 330 ms is 90 ms below the choice-task mean, the largest gap in milliseconds of the four, and yet it is the smallest gap in SDs, because the choice task has an SD of 60 ms and 90 ms is only 1.5 SDs. The other three flags are 3.9, 4 and 10 SDs below their mean. This is the point of the question: you can only compare distances across the two tasks after you convert them into SDs. Which flagged trials is Sam's note describing as "four SDs below the mean"? P04 (4.0 SDs below) and P07 (3.9 SDs below). Notice that P11 is 10 SDs below the mean, far more than four, so Sam's note is not about P11.*

Participant	Task	Flagged trial (ms)	Deviation from task mean (ms)	z-score (deviation in SDs)
P04	simple	180	−80	−4.0
P07	simple	182	−78	−3.9
P09	choice	330	−90	−1.5
P11	simple	60	−200	−10

The last door • What made each flagged trial?

Pair up with someone from the other room. Together you have the whole file. For each flagged trial, circle what produced it, say what Dr. Truett should do with it, and note your evidence.

Participant	Flagged trial (ms)	z-score (Model Room)	Typical of this participant? (Records Room)	What produced this trial? (circle one)	Keep, fix, or mark?	Evidence
P04	180	−4.0	No. Compare 180 with P04's other four trials, 276 to 288.	typo	Fix it: check the printout.	Notice that 180 is about a hundred milliseconds faster than anything else P04 did, and four SDs below the lab mean. Add Sam's admission of typing all two hundred trials fast, and a typing slip is the simplest explanation. Dr. Truett's note confirms it: the printout reads 280, an ordinary trial.
P07	182	−3.9	Yes. Compare 182 with P07's other four trials, 186 to 192.	genuinely fast	Keep it.	Notice that every one of P07's five trials is about this fast, and that 182 is only 1.5 of P07's own SDs below P07's mean. Mel's report that P07 is a varsity fencer fits. Keep in mind that a trial can be rare for the lab and ordinary for the person.
P09	330	−1.5	Yes, once you have the SD. P09's other four are 348 to 360, and 330 is 18 ms under the lowest of them.	ordinary variation	Keep it.	Notice that 1.5 SDs below the mean is well inside the usual range for the choice task. The computer flagged P09 only because the rule applies the same 75 ms cutoff to both tasks, and on a task with an SD of 60 ms, 75 ms is a small distance. You are looking at a flaw in the rule, not at anything P09 did.
P11	60	−10	No. Compare 60 with P11's other four trials, 248 to 270.	pressed early	Mark it: keep the row, leave this trial out of the averages.	Notice that 60 ms is below the 100 ms floor in Dr. Truett's rule of thumb, so the press must have started before the light could have been seen, and remember Avi's report of P11's finger on the button before "go". Treat the number as real but not as a reaction time.

Sam wanted to delete P04's 180 and P07's 182 because both are about four SDs below the mean. Was Sam right about both trials? If not, which one is a real trial, and what in the file shows it?

No. Keep P07's 182: P07 is about that fast on all five trials (182 to 192), and Mel says P07 is a varsity fencer. Fix P04's 180: next to P04's other trials, 276 to 288, you are looking at a typo. Four SDs from the mean makes a trial rare, not impossible, and you need the rest of the row to tell which kind of rare you have.

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[Sheet B: the Records Room](#)

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The situation

Q. Ledger has locked you in the Archive at **Strangeford University** with Dr. Truett's reaction-time file. "Somebody has to read that file before Monday," Ledger says through the door. "I have torn it in two: the numbers are in the Model Room, and the people are in the Records Room. The door between the rooms stays shut until my signal."

Work through your own room first. When the door opens, pair up with someone from the other room for the last door.

The file

You are in the Records Room, which holds the people.

Two of Dr. Truett's research assistants disagree. The lab's computer has flagged four trials as "impossible." **Sam** wants all four trials deleted. **Mel** says that at least one of them came from a real person.

The task. A light turns on, and the participant presses a button as fast as possible: five trials each, timed in milliseconds (ms). A research assistant types each printout into the spreadsheet. In a harder **choice task**, the light is red or blue, and the participant presses the left button for red and the right button for blue.

Each row holds one flagged participant's five trials (flagged trial in bold).

Participant	Task	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
P04	simple	281	276	180	288	279
P07	simple	186	190	182	192	190
P09	choice	348	360	330	352	356
P11	simple	255	262	60	248	270

Mel: "P07 is on the varsity fencing team. Ask P07 to do the task again, and you will get the same kind of numbers. Real people are weird."

Avi: "P11 was so ready. P11 had a finger on the button before I had finished saying 'go!'"

Records Room, part 1 • One person's typical miss

Is Mel right about P07? Check P07's own five trials.

a. P07's mean = $940 / 5 = 188$ ms.

P07's trial (ms)	186	190	182	192	190	Total
b. Error from P07's mean	-2	+2	-6	+4	+2	0
c. Squared error	4	4	36	16	4	SS = 64

b. Fill in each trial's error from P07's mean, then add up the errors. *You get 0, because the mean is the balance point of P07's trials. That is why you square the errors before adding them.*

c. Square each error and add up the squares. Then use the formulas at the bottom of the back of this sheet: variance = $64 / 4 = 16$ SD = $\sqrt{16} = 4$ ms.

d. The flagged 182 is 6 ms below P07's mean, which is $6 / 4 = 1.5$ of P07's own SDs. Circle one: **unusual for P07** • **ordinary for P07**. Justify your answer in terms of P07's SD. *Ordinary for P07: P07 misses by 6 ms here, about one and a half of P07's typical misses. Notice that this is the only comparison you can make from this sheet, because the lab's SD is in the Model Room.* ### Records Room, part 2 • In character?

Dr. Truett's rule of thumb. No one reacts to a light faster than about 100 ms: a faster press started before the light could be seen.

Compare each flagged trial with that participant's other four trials (front of this sheet). Circle one answer, and say why.

Participant	Flagged trial (ms)	Compared with this participant's other four trials, the flagged trial is (circle one)	Evidence (the other four trials, the rule of thumb, or a statement)
P04	180	<i>out of character</i>	<i>Compare 180 with P04's other four trials, 276 to 288: all four are about a hundred milliseconds slower. You will not find another trial like it in P04's row.</i>
P07	182	<i>in character</i>	<i>Compare 182 with P07's other four trials, 186 to 192: P07 is fast on every trial, so 182 fits the row. Mel's report that P07 is a varsity fencer fits too.</i>
P09	330	<i>can't tell</i>	<i>Compare 330 with P09's other four trials, 348 to 360: 330 is 18 ms under the lowest of them. To decide whether 18 ms is a lot, you need the spread of the choice task, and that SD is on the Model Room's sheet. Once you have it (60 ms), you can see that 330 is 1.5 SDs below the task mean and in character.</i>
P11	60	<i>out of character</i>	<i>Compare 60 with P11's other four trials, 248 to 270. Notice also that 60 ms is under Dr. Truett's 100 ms floor, so the press must have started before the light could have been seen, and remember Avi's report of P11's finger on the button before "go".</i>

The last door • What made each flagged trial?

Pair up with someone from the other room. Together you have the whole file. For each flagged trial, circle what produced it, say what Dr. Truett should do with it, and note your evidence.

Participant	Flagged trial (ms)	z-score (Model Room)	Typical of this participant? (Records Room)	What produced this trial? (circle one)	Keep, fix, or mark?	Evidence
P04	180	−4.0	<i>No. Compare 180 with P04's other four trials, 276 to 288.</i>	<i>typo</i>	<i>Fix it: check the printout.</i>	<i>Notice that 180 is about a hundred milliseconds faster than anything else P04 did, and four SDs below the lab mean. Add Sam's admission of typing all two hundred trials fast, and a typing slip is the simplest explanation. Dr. Truett's note confirms it: the printout reads 280, an ordinary trial.</i>
P07	182	−3.9	<i>Yes. Compare 182 with P07's other four trials, 186 to 192.</i>	<i>genuinely fast</i>	<i>Keep it.</i>	<i>Notice that every one of P07's five trials is about this fast, and that 182 is only 1.5 of P07's own SDs below P07's mean. Mel's report that P07 is a varsity fencer fits. Keep in mind that a trial can be rare for the lab and ordinary for the person.</i>
P09	330	−1.5	<i>Yes, once you have the SD. P09's other four are 348 to 360, and 330 is 18 ms under the lowest of them.</i>	<i>ordinary variation</i>	<i>Keep it.</i>	<i>Notice that 1.5 SDs below the mean is well inside the usual range for the choice task. The computer flagged P09 only because the rule applies the same 75 ms cutoff to both tasks, and on a task with an SD of 60 ms, 75 ms is a small distance. You are looking at a flaw in the rule, not at anything P09 did.</i>
P11	60	−10	<i>No. Compare 60 with P11's other four trials, 248 to 270.</i>	<i>pressed early</i>	<i>Mark it: keep the row, leave this trial out of the averages.</i>	<i>Notice that 60 ms is below the 100 ms floor in Dr. Truett's rule of thumb, so the press must have started before the light could have been seen, and remember Avi's report of P11's finger on the button before "go". Treat the number as real but not as a reaction time.</i>

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