

Trials Tell More

Read a data table for variables, repeated trials, and means.

PS.1.c.i "interpreting, analyzing, and evaluating data construct and interpret data tables showing independent and dependent variables, repeated trials, and means"

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB In the passage and table, underline the factors kept the same, circle the three trial values in one row, number them 1, 2, and 3, and box that row's mean.

A Marble on a Ramp

- ① A class tested how release height affected the time a marble needed to travel 1.0 meter down a smooth ramp. For each height, students released the same marble from rest and timed its trip three times. They kept the ramp surface, travel distance, and timer the same. The results appear below. Each row shows height, three measurements, and a mean.

DATA FROM THE MARBLE RAMP TEST

Release height (cm)	Trial 1 time (s)	Trial 2 time (s)	Trial 3 time (s)	Mean time (s)
10	2.40	2.35	2.45	2.40
20	1.80	1.75	1.85	1.80
30	1.40	1.35	1.45	1.40
40	1.10	1.05	1.15	1.10

- ② The three time columns are repeated trials, not three different marble types. Repeating a measurement can reveal an unusual reading and makes the mean more dependable. The mean is found by adding the three times in one row and dividing by three. Because the distance stayed fixed, shorter mean times show that the marble moved faster over that distance.
- ③ A data table can help a reader judge a claim, but it cannot prove every cause. This test compares heights only on this ramp with this marble. A weak result might occur if a student starts the timer late or gives the marble a push. More trials and careful release from rest would make the evidence stronger.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 For the 30 cm release height, what is the range of the three trial times? Show the subtraction.

2 Use the three trial values in the 20 cm row to show why the reported mean is correct.

3 Compare the mean times for 10 cm and 40 cm. How much did the mean travel time change, and in which direction?

4 Which factor did the class deliberately change? Which measurement responded to that change?

3 YOUR TURN _____ Your own words

Choose a safe classroom investigation, such as testing how added mass changes a spring's length. Fill in the table with four levels of one independent variable, three repeated measurements of one dependent variable, and a correctly calculated mean for each row.

INDEPENDENT VARIABLE LEVEL AND UNIT	TRIAL 1, DEPENDENT VARIABLE AND UNIT	TRIAL 2, DEPENDENT VARIABLE AND UNIT	TRIAL 3, DEPENDENT VARIABLE AND UNIT	MEAN, DEPENDENT VARIABLE AND UNIT

PART 1 • READ AND MARK

In the passage and table, underline the factors kept the same, circle the three trial values in one row, number them 1, 2, and 3, and box that row's mean. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	For the 30 cm release height, what is the range of the three trial times? Show the subtraction.	0.10 s, because 1.45 s minus 1.35 s equals 0.10 s.
2	Use the three trial values in the 20 cm row to show why the reported mean is correct.	$(1.80 + 1.75 + 1.85) \div 3 = 1.80$ s.
3	Compare the mean times for 10 cm and 40 cm. How much did the mean travel time change, and in which direction?	The mean time decreased by 1.30 s, from 2.40 s to 1.10 s.
4	Which factor did the class deliberately change? Which measurement responded to that change?	The class changed release height. The responding measurement was the marble's travel time.

PART 3 • YOUR TURN (SAMPLE ANSWER)

INDEPENDENT VARIABLE LEVEL AND UNIT	TRIAL 1, DEPENDENT VARIABLE AND UNIT	TRIAL 2, DEPENDENT VARIABLE AND UNIT	TRIAL 3, DEPENDENT VARIABLE AND UNIT	MEAN, DEPENDENT VARIABLE AND UNIT
50 g added mass	12.0 cm	12.0 cm	12.0 cm	12.0 cm
100 g added mass	14.0 cm	14.0 cm	14.0 cm	14.0 cm
150 g added mass	16.0 cm	16.0 cm	16.0 cm	16.0 cm
200 g added mass	18.0 cm	18.0 cm	18.0 cm	18.0 cm

Accept equivalent calculations and descriptions of the changed and measured variables. For the open task, accept any safe, plausible investigation with clear units, three repeated trials per level, and means calculated correctly.