

Data Detective Tools

Evaluate how collection methods affect the accuracy of investigation data.

6.1.b.ii "planning and carrying out investigations evaluate the accuracy of various methods for collecting data"

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each method detail that improves accuracy, circle each detail that may reduce accuracy or limit what is measured, and number the two kinds of evidence used to judge a method.

Testing Pond Temperature Methods

- ① Ms. Chen's class investigated whether shade keeps pond water cooler. Each team measured water temperature at the same three sites, once in shade and once in sun. They needed data that described the water, not the air or the muddy bottom. Before collecting data, the class listed possible sources of error. A thermometer could be read too soon, placed at different depths, or warmed by a student's hand. Accurate methods would limit these problems and give similar results when repeated.
- ② Team A used a digital probe. They lowered it 10 centimeters below the surface, waited one minute, and recorded the display without touching the metal tip. They also checked the probe in an ice-water mixture, which should read 0 °C. Team B used an alcohol thermometer but chose depths by eye and read it after 15 seconds. Team C pointed an infrared thermometer from shore. That tool measures only the surface, so it cannot fairly replace a reading taken below the surface.
- ③ At one shaded site, Team A took three readings: 18.4 °C, 18.5 °C, and 18.4 °C. A calibrated reference thermometer read 18.4 °C there. Team B recorded 17.8 °C, 18.6 °C, and 19.1 °C at the same site. The class judged Team A's method more accurate because its repeated readings were close together and close to the reference reading. They noted that Team C could still be accurate for a different question, such as comparing surface temperatures across the pond on a calm day.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 Name two steps in Team A’s method that helped make its readings more accurate. Explain what each step controlled.

2 Why is Team B’s method less likely to give accurate water-temperature data than Team A’s method?

3 Why cannot Team C’s infrared thermometer replace Team A’s below-surface reading? When could Team C’s tool be an accurate choice?

4 What two pieces of evidence did the class use to judge Team A’s method more accurate?

3 YOUR TURN _____ Your own words

Plan how to collect soil-temperature data at one garden bed. In the table, compare three methods by naming each method, identifying one likely source of error, stating a change that improves accuracy, and naming evidence you would use to evaluate the method.

METHOD	LIKELY SOURCE OF ERROR	CHANGE TO IMPROVE ACCURACY	EVIDENCE TO EVALUATE ACCURACY

PART 1 • READ AND MARK

Underline each method detail that improves accuracy, circle each detail that may reduce accuracy or limit what is measured, and number the two kinds of evidence used to judge a method. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	Name two steps in Team A's method that helped make its readings more accurate. Explain what each step controlled.	Lowering the probe 10 centimeters below the surface kept the measurement depth the same. Waiting one minute reduced the chance of reading the thermometer too soon.
2	Why is Team B's method less likely to give accurate water-temperature data than Team A's method?	Team B chose depths by eye, so readings may have come from different water layers. Team B also read the thermometer after only 15 seconds, which may have been too soon.
3	Why cannot Team C's infrared thermometer replace Team A's below-surface reading? When could Team C's tool be an accurate choice?	The infrared thermometer measures only the water surface, not water below the surface. It could be accurate for comparing surface temperatures across the pond.
4	What two pieces of evidence did the class use to judge Team A's method more accurate?	Team A's three readings were close together, and they were close to the calibrated reference thermometer reading of 18.4 °C.

PART 3 • YOUR TURN (SAMPLE ANSWER)

METHOD	LIKELY SOURCE OF ERROR	CHANGE TO IMPROVE ACCURACY	EVIDENCE TO EVALUATE ACCURACY
Digital soil probe, 5 cm deep	Different measurement depths	Mark 5 cm on the probe and use that depth each time	Three close readings and comparison with a calibrated reference thermometer
Alcohol thermometer in soil	Reading before the thermometer settles	Wait the same full minute for every reading	Repeated readings that are close together
Infrared thermometer aimed at soil	It measures only the soil surface	Use it only for a surface-temperature question	Compare its surface readings with a reference surface thermometer

Accept any accurate evaluation that connects a collection procedure to a source of error, an improvement, and evidence such as repeated agreement or comparison with a calibrated reference. For the open task, methods and evidence may vary if they fit the measurement question.