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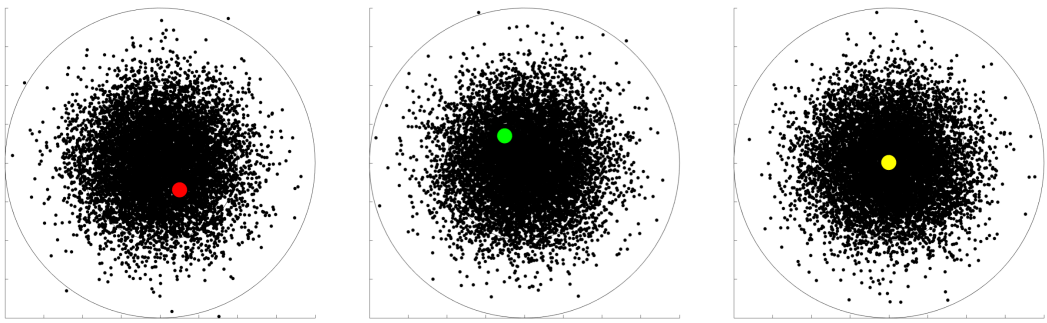
Unit 5 - Week 2

Assignment 2

The due date for submitting this assignment has passed. Due on 2020-02-12, 23:59 IST.
As per our records you have not submitted this assignment.

1) Which dot represents the average of the measurement most appropriately? ***1 point***



- Red only
- Green only
- Yellow only
- Red and green
- Red and yellow
- Green and yellow
- All the three
- None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
Yellow only

2) Pick the correct statements from the following ***1 point***

- [ ] All accurate measurements are precise
- [ ] All precise measurements are accurate
- [ ] Accurate and imprecise measurements are same as inaccurate and imprecise
- [ ] Accurate and imprecise measurement is preferred over inaccurate and precise measurement
- [ ] Inaccurate and precise measurement is preferred over accurate and imprecise measurement
- [ ] Inaccurate and imprecise measurements could indicate that the researcher is neither following a well prepared protocol and making mistakes while performing experiments
- [ ] Accurate yet imprecise measurements could at times be a limitation of the technique used for measurement
- [ ] Accuracy and precision are directly proportional to each other

No, the answer is incorrect.
Score: 0

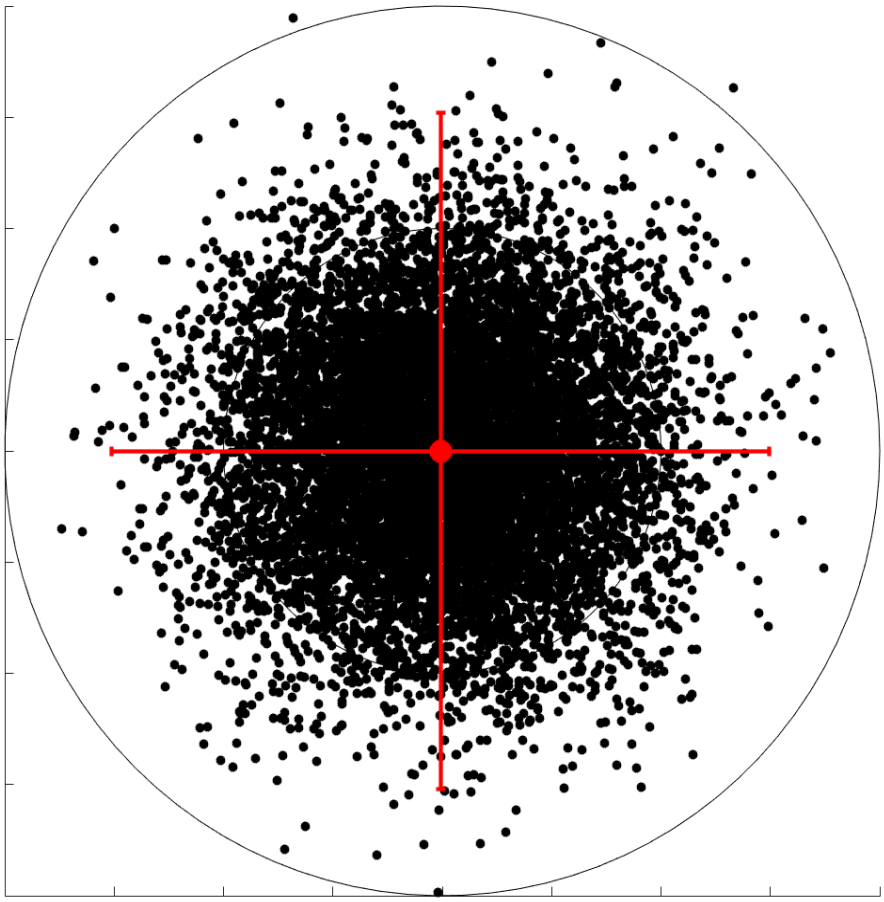
Accepted Answers:
Accurate and imprecise measurement is preferred over inaccurate and precise measurement
Inaccurate and imprecise measurements could indicate that the researcher is neither following a well prepared protocol and making mistakes while performing experiments
Accurate yet imprecise measurements could at times be a limitation of the technique used for measuremer

3) In the scatter plot given here, the red dot and the lines indicate the average and three times the standard deviation of the measurements, respectively. ***1 point***

Does itmake sense that many points are scattered outside the standard deviation denoted here?

Text Transcripts

Total number of measurements 10,000



- Yes, I see about 30 points outside
- No, all points must fall within the 3 standard deviation measure
- Partly yes, but lesser points must fall outside
- Partly yes, but more points must fall outside
- No, the average for this measurement seems wrong
- More data points are required to arrive at the average and standard deviation
- The amount of information provided is insufficient to come to a conclusion

No, the answer is incorrect.
Score: 0

Accepted Answers:
Yes, I see about 30 points outside

4) Scientist “A” measures a physical parameter given by 4.1 ± 0.3 units (one-standard deviation). ***1 point***
While scientists “B” and “C” measure 5.0±0.2 units and
6.0 ± 0.3 units, respectively. Pick the correct statement from the following

- Measurement from A agrees with B but not with C
- Measurement from A agrees with C but not with B
- Measurement from B agrees with A but not with C
- Measurement from B agrees with C but not with A

- Measurement from C agrees with A but not with B
- Measurement from C agrees with B but not with A
- Measurement from A agrees with both B & C, but B and C do not agree with each other
- Measurement from B agrees with both A & C, but A and C do not agree with each other
- Measurement from C agrees with both A & B, but A and B do not agree with each other
- All the three agree with each other
- All the three do not agree with each other
- Data provided is insufficient to make this comparison

No, the answer is incorrect.
Score: 0

Accepted Answers:
Measurement from B agrees with both A & C, but A and C do not agree with each other

5) Fill in the blank with the appropriate number of significant figures for 0.0840

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 3

0.5 points

6) Fill in the blank with the appropriate number of significant figures for $6.59000*10^{+7}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 6

0.5 points

7) Fill in the blank with the appropriate number of significant figures for 53.500

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 5

0.5 points

8) Fill in the blank with the appropriate number of significant figures for 872000

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 3

0.5 points

9) Fill in the blank with the appropriate number of significant figures for 13.02

No, the answer is incorrect.
Score: 0

Accepted Answers:

(Type: Numeric) 4

0.5 points

10) Fill in the blank with the appropriate number of significant figures for 681160

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 5

0.5 points

11) For the dataset provided below, the mean, standard deviation, median and mode: ***2 points***

5.34, 4.64, 5.04, 4.78, 5.12, 4.76, 5.20, 5.30, 5.68, 4.92, 4.14, 4.66, 5.54, 4.57, 5.38, 5.05, 5.57, 4.22, 4.92, 4.52, 6.16, 5.33, 5.55, 4.58, 4.81, 4.89, 5.44, 4.89, 5.28, 4.18, 4.86, 4.67, 4.37, 5.20, 5.11, 5.01, 4.47, 5.45, 5.14, 4.88, 5.01, 4.90, 4.30, 4.89, 4.67, 4.61, 4.54, 4.79, 4.20, 5.39

- 4.94, 0.43, 4.90, 4.89
- 4.90, 0.44, 4.94, 4.89
- 4.94, 0.44, 4.90, 4.89
- 4.90, 0.44, 4.89, 4.94
- 4.90, 0.43, 4.89, 4.94
- 4.89, 0.44, 4.90, 4.90
- 4.89, 0.43, 4.90, 4.90
- 4.94, 0.44, 4.90, N/A

No, the answer is incorrect.
Score: 0

Accepted Answers:
4.94, 0.44, 4.90, 4.89

12) For the function $f(x, y, z) = (x + y)^* log_{10}(z)$, σ_f will be given by ***2 points***

- $f * \sqrt{\left(\frac{\sigma_x^2 + \sigma_y^2}{(x+y)^2}\right) + \frac{\sigma_z^2}{(z * log_{10} z)^2}}$
- $f * \sqrt{\left(\frac{\sigma_x^2 + \sigma_y^2}{(x+y)^2}\right) + \frac{\sigma_z^2}{(z * log_e z)^2}}$
- $\sqrt{\left(\frac{\sigma_x^2 + \sigma_y^2}{(x+y)^2}\right) + \frac{\sigma_z^2}{(z * log_e z)^2}}$
- $\sqrt{\left(\frac{\sigma_x^2 + \sigma_y^2}{(x+y)^2}\right) + \frac{\sigma_z^2}{(z * log_{10} z)^2}}$
- $f * \sqrt{\left(\frac{\sigma_x + \sigma_y}{x+y}\right)^2 + \frac{\sigma_z^2}{(z * log_{10} z)^2}}$

$$f * \sqrt{\left(\frac{\sigma_x + \sigma_y}{x + y}\right)^2 + \frac{\sigma_z^2}{(z * log_e z)^2}}$$

$$\sqrt{\left(\frac{\sigma_x + \sigma_y}{x + y}\right)^2 + \frac{\sigma_z^2}{(z * log_e z)^2}}$$

$$\sqrt{\left(\frac{\sigma_x + \sigma_y}{x + y}\right)^2 + \frac{\sigma_z^2}{(z * log_{10} z)^2}}$$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$f * \sqrt{\left(\frac{\sigma_x^2 + \sigma_y^2}{(x + y)^2}\right) + \frac{\sigma_z^2}{(z * log_e z)^2}}$$

Fill in the blanks with M_{final} (with error propagation) for the following arithmetic with the following values:

$$M_{final} = [(M_1 * V_1) + (M_2 * V_2)] / (V_1 + V_2)$$

$M_1 = 0.30 \pm 0.05$ M

$M_2 = 0.50 \pm 0.03$ M

$V_1 = 10.2 \pm 0.2$ mL

$V_2 = 7.5 \pm 0.3$ mL

13) Value of M_{final} = _____ ?

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 0.37,0.39

2 points

14) Value of σ_{final} = _____ ?

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 0.02,0.04

2 points

15) Why should a given experiment must be repeated several times? Select all that apply ***1.5 points***

- We have the required resources and time
- It provides mean that aids in uncovering the “truth”

- [ ] It provides uncertainty in terms of standard deviation so as to compare similar measurements across various labs/techniques
- [ ] It aids in comprehensively writing the protocol for the given experiment
- [ ] It aids in improving the precision of a given measurement,to a certain extent
- [ ] It aids in reducing the precision of a given measurement
- [ ] A single measurement might fall away from the truth yet still within uncertainty of the measurement
- [ ] A single measurement might fall away from the truth and outside the uncertainty of the measurement

No, the answer is incorrect.
Score: 0

Accepted Answers:
It provides mean that aids in uncovering the "truth"
It provides uncertainty in terms of standard deviation so as to compare similar measurements across various labs/techniques
It aids in comprehensively writing the protocol for the given experiment
It aids in improving the precision of a given measurement,to a certain extent
A single measurement might fall away from the truth yet still within uncertainty of the measurement

16) Select all that apply: If an experiment is not repeatable, then it could imply that ***1.5 points***

- [ ] The experiment can never be performed correctly
- [ ] The protocol followed is incorrect
- [ ] The protocol is not written with all necessary details
- [ ] The experimenter is not following the protocol stepwise and changing it every time it is repeated
- [ ] The protocol followed is correct but the details are incorrect
- [ ] The equipment/technique used might not be appropriately referenced/calibrated before measurement
- [ ] The conditions of the experiment (for instance like temperature, pH, etc) are not controlled properly and might be varying while the experiment is being performed

No, the answer is incorrect.
Score: 0

Accepted Answers:
The protocol followed is incorrect
The protocol is not written with all necessary details
The experimenter is not following the protocol stepwise and changing it every time it is repeated
The equipment/technique used might not be appropriately referenced/calibrated before measurement
The conditions of the experiment (for instance like temperature, pH, etc) are not controlled properly and might be varying while the experiment is being performed

17) Select all that apply: If an experiment performed by scientist "A" is repeatable and accurate ***1.5 points*** but not replicable when attempted by scientist "B", then it could imply that:

- [ ] The experiment can never be performed correctly
- [ ] The protocol followed by "A" is incorrect
- [ ] The protocol followed by "B" is incorrect
- [ ] The protocol provided by "A" does not contain all necessary details
- [ ] Scientist "B" is not following the protocol stepwise and changing it every time it is repeated
- [ ] The protocol followed by "A" is correct but the details are incorrect
- [ ] The protocol followed by "B" is correct but the details are incorrect
- [ ] The equipment/technique used might not be appropriately referenced/calibrated before measurement by "A"

- [ ] The equipment/technique used might not be appropriately referenced/calibrated before measurement by “B”
- [ ] The conditions of the experiment (for instance like temperature, pH, etc) are not controlled properly by “A” and might be varying while the experiment is being performed
- [ ] The conditions of the experiment (for instance like temperature, pH, etc) are not controlled properly by “B” and might be varying while the experiment is being performed

No, the answer is incorrect.
Score: 0

Accepted Answers:
The protocol followed by “B” is incorrect
The protocol provided by “A” does not contain all necessary details
Scientist “B” is not following the protocol stepwise and changing it every time it is repeated
The protocol followed by “B” is correct but the details are incorrect
The equipment/technique used might not be appropriately referenced/calibrated before measurement by “B”
The conditions of the experiment (for instance like temperature, pH, etc) are not controlled properly by “B” and might be varying while the experiment is being performed

18) Select all that apply: If an experiment performed by scientist “A” is repeatable, replicable and accurate, but not reproducible when attempted by scientist “B”, then it could imply that: ***1.5 points***

- [ ] Scientist A could be inaccurate
- [ ] Scientist B could be inaccurate
- [ ] The techniques used by scientists A and B provide complementary information about the system
- [ ] The technique used either by A or B or both is resulting in a standard error due to an additional/external agent used in the study resulting in their mutual disagreement
- [ ] The equipment/technique used might not be appropriately referenced/calibrated before measurement by “A”
- [ ] The equipment/technique used might not be appropriately referenced/calibrated before measurement by “B”
- [ ] The conditions of the experiment (for instance like temperature, pH, etc) are not controlled properly by “A” and might be varying while the experiment is being performed
- [ ] The conditions of the experiment (for instance like temperature, pH, etc) are not controlled properly by “B” and might be varying while the experiment is being performed

No, the answer is incorrect.
Score: 0

Accepted Answers:
Scientist B could be inaccurate
The techniques used by scientists A and B provide complementary information about the system
The equipment/technique used might not be appropriately referenced/calibrated before measurement by “B”
The conditions of the experiment (for instance like temperature, pH, etc) are not controlled properly by “B” and might be varying while the experiment is being performed