The Practice of Science: SC.5.N.1.1

1) Jane is investigating to find out if bean plants grow taller in ordinary topsoil or special potting soil over a three week period. She sets up her investigation with 10 bean plants of equal size in each type of soil.

What should Jane do each day to make sure she gets valid results?

A. Water only the plants in special potting soil.
B. Calculate the average plant height for each soil type.
C. Move the plants in ordinary topsoil to different locations.
D. Estimate the height of each plant's stem and record the estimate.

2) Sonya wanted to know if mowing affects the health of grass during a drought. To find out, she collected data on how often her neighbors mowed their grass. Based on the information she collected, what is the BEST next step?

<table>
<thead>
<tr>
<th>Location</th>
<th>How Often Mowed</th>
<th>Lawn Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jones’ House</td>
<td>Once per month</td>
<td>Lawn is very green and tall. No bare spots.</td>
</tr>
<tr>
<td>Hodge’s House</td>
<td>Every Saturday</td>
<td>Lawn is brown with some green. Patches of bare dirt.</td>
</tr>
<tr>
<td>Mitchell’s House</td>
<td>Every two weeks</td>
<td>Lawn is green and tall. No bare spots.</td>
</tr>
<tr>
<td>Perez’s House</td>
<td>Every Saturday</td>
<td>Lawn is green with some brown patches.</td>
</tr>
<tr>
<td>Sonya’s House</td>
<td>Every two weeks</td>
<td>Lawn is green. No bare spots.</td>
</tr>
<tr>
<td>William’s House</td>
<td>Every Saturday</td>
<td>Lawn has large bare patches and is mostly brown</td>
</tr>
</tbody>
</table>

A. Report her findings to her neighbors.
B. Develop a plan to save everyone's lawns.
C. Stop her neighbors from mowing their lawns.
D. Find out if other things might be affecting the grass.
3) Thomas and Julie wanted to find out which material would insulate their teacher's coffee cup and keep the coffee hot for the longest period of time. They first wrapped her cup with bubble wrap and recorded the temperature of the coffee once every 15 minutes for 2 hours. They repeated the investigation, this time using newspaper instead of bubble wrap, but they got the same results for both materials.

What could they do to make sure their results are valid?

☐ A. Repeat their experiment.
☐ B. Use tea instead of coffee.
☐ C. Use a different thermometer.
☐ D. Conduct their investigation in a colder room.

4) Brianna's class wants to determine if boys or girls recycled more paper each day. They set up separate recycling bins in the classroom and labeled them "Boys" and "Girls." The students then placed their paper items in the right bins.

Which of the following should the students do each day before emptying the bins?

☐ A. Make lists of the different types of paper in each bin.
☐ B. Count and record the number of paper items recycled in each bin.
☐ C. Make a list of which student recycled which paper item in each of the bins.
☐ D. Record their estimate of the number of times students placed items in each bin.

5) Kevin wanted to find out which of his toy cars, the Corvette or the Mustang, would roll downhill faster. He made a ramp by putting several books under one end of a board so that the board was slanted. Which would be the best way for him to perform his experiment?

☐ A. Roll each car down the ramp separately five times and estimate which car looked faster.
☐ B. Roll both cars down the ramp together one time and see which one gets to the bottom first.
☐ C. Roll each car down the ramp separately one time, and time them with the second hand on his watch.
☐ D. Roll both cars down the ramp together five times and record which gets to the bottom first each time.
6) Jonathan and Sarah have performed an experiment and are not sure their results are valid. What should they do to check their results?

☐ A. average their data

☐ B. change their lab report

☐ C. perform a new experiment

☐ D. repeat the same experiment

7) The students in Miss Smith's class were using catapults to launch small and large marshmallows across the room. The table below shows the distances in centimeters (cm) that the marshmallows traveled. Which of the following statements best describes the students' data?

<table>
<thead>
<tr>
<th>Trial</th>
<th>Small</th>
<th>Large</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>22 cm</td>
<td>8 cm</td>
</tr>
<tr>
<td>2</td>
<td>30 cm</td>
<td>10 cm</td>
</tr>
<tr>
<td>3</td>
<td>27 cm</td>
<td>8 cm</td>
</tr>
<tr>
<td>4</td>
<td>16 cm</td>
<td>12 cm</td>
</tr>
<tr>
<td>5</td>
<td>25 cm</td>
<td>11 cm</td>
</tr>
<tr>
<td>6</td>
<td>32 cm</td>
<td>7 cm</td>
</tr>
<tr>
<td>7</td>
<td>25 cm</td>
<td>8 cm</td>
</tr>
<tr>
<td>8</td>
<td>20 cm</td>
<td>11 cm</td>
</tr>
</tbody>
</table>

Mean: Small 25 cm, Large 9 cm

☐ A. Small marshmallows travel an average of 9 centimeters.

☐ B. Large marshmallows travel an average of more than 20 centimeters.

☐ C. On average, small marshmallows travel farther than large marshmallows.

☐ D. On average, large marshmallows go higher in the air than small marshmallows.
8) During a recent drought, Sonya noticed some yards in her neighborhood were healthy and green, and some were mostly brown and dead. Sonya believes the difference has to do with how often her neighbors mow their grass. What should Sonya do first to find out if she is right?

A. Ask her neighbors to cut their grass on the same schedule.
B. Study other neighborhoods to see if there are similar problems.
C. Compare the neighbors' lawn mowers to see if there are similarities.
D. Survey her neighbors about their mowing schedule and record the details.

9) Jordan wants to find out if a hamster can learn a maze as quickly as a mouse can. She has researched mice and hamsters and predicts which rodent she thinks will learn more quickly. What should her next step be?

A. analyze hamster behavior in the maze
B. research how a rabbit would behave in a maze
C. observe the behavior of both rodents in the maze
D. make conclusions about rodent behavior in the maze

10) Stephen and his classmates are going on a field trip to a nature preserve. His teacher has told the class that when they return to school, they will be required to give a report on their trip and the animals and plants they saw while walking through the preserve.

What is the BEST method Stephen can use to make sure he remembers everything he sees?

A. He should bring a pad and pen to write down his observations.
B. He should do research on the computer when he returns to class.
C. He should ask his classmates to help him remember what he saw.
D. He should look for a map of the nature preserve at the visitors' center.
Characteristics of Scientific Knowledge: SC.5.N.2.1

1) For her science fair project, Marcy is investigating how levels of carbon dioxide affect plant growth. Which of the following is most important for Marcy to do?

A. She needs to make sure her results match her predictions.
B. She needs to make sure that her results contain both words and numbers.
C. She needs to make sure that the explanation of her results is based on evidence.
D. She needs to make sure her results get published so that everyone can read them.

2) Which of the following must be true for scientific results to be valid?

☐ A. The results should be drawn in a graph.
☐ B. The results should be based on evidence.
☐ C. The results should support the ideas of other scientists.
☐ D. The results should match the predictions of the scientist.

3) Kyle completes his science project for his 5th grade teacher by carrying out a scientific investigation. Which statement about Kyle's investigation is true?

☐ A. Kyle's investigation must include observation and evidence.
☐ B. Kyle must have an investigation with steps that follow a set pattern.
☐ C. Kyle's project is valid only if the teacher personally likes the results.
☐ D. Kyle must include all the steps of the scientific method for his results to be valid.

4) When conducting an investigation, a scientist's main goal should be which of the following?

☐ A. The scientist should include his opinions in the results.
☐ B. The scientist should aim to become famous for his work.
☐ C. The scientist should follow a very specific scientific method.
☐ D. The scientist should aim to answer questions about the natural world.
5) Which of the following questions could be answered by a scientific investigation?

A. What color is the best to paint with?
B. What animal makes a good pet?
C. What is the best flavor of soft drink?
D. What causes some metals to rust?

6) Jose wants to create an excellent science fair project for the school competition. In order for his project to be valid, which of the following must happen?

A. The project must include his beliefs.
B. The results must be based on evidence.
C. The project must prove his predictions correct.
D. The results must be based on personal opinion.

7) Which of the following statements about science is true?

A. Science always contains the opinions of the investigator.
B. Science proves the predictions of scientists to be correct.
C. Science is based on observation or measurement that answers a question.
D. Science answers all questions using strict rules called the scientific method.

8) Which of the following is the main purpose of a scientific investigation?

A. to prove a scientific law
B. to determine the investigator's opinion
C. to answer questions about the natural world
D. to support results from previous investigations
9) Which of the following should be a goal of a scientific investigation?

☐ A. to help the scientist make money
☐ B. to make sure the scientist is correct
☐ C. to help the scientist solve a problem
☐ D. to make sure other scientists are incorrect

10) Ellie conducts an investigation to determine if size or weight affect how fast objects fall. Her investigation includes repeatedly dropping a basketball and a golf ball at the same time. After many trials, she determines that both balls land at the exact same time.

Why would Ellie's investigation be valid?

☐ A. It includes her opinion.
☐ B. It is based on evidence.
☐ C. It uses objects that move.
☐ D. It proves her predictions are correct.
1) Dr. Jones thinks she has just discovered a new plant species. How should she best communicate her findings with other scientists?

A. Try to find another plant to discover.
B. Post her discovery on the internet as fact.
C. Publish her discovery for other scientists to test.
D. Call her friends and tell them about the discovery.

2) Maria and her brother like to go fishing at the lake on Saturdays. They wondered if fish were more likely to bite at one time of day than another. They decided to try an experiment the next two Saturdays.

On the first Saturday, it was hot and sunny, and they went fishing in the morning. Maria and her brother caught a total of five fish. On the second Saturday, it was overcast and cool, and they went fishing in the afternoon. They only caught a total of three fish this time. Can they conclude that fish bite better in the morning?

A. Yes. They caught more fish in the morning, so morning is a better time to fish.
B. Yes. It is more likely to be sunny in the morning, and fish bite better when it is sunny.
C. No. They will need to repeat their experiment several times, since the weather conditions and times were different both days.
D. No. They only did their experiment on Saturdays, so they don't know if they would get the same results on other days.
3) Ximena is an expert at blowing bubbles with bubble gum. She discovered that her bubbles were bigger if she stood facing the Sun when she blew them. At lunch she told her three best friends about her discovery and after school they all tried it. No one else was able to blow bigger bubbles when they faced toward the Sun.

Which of the following would be best for Ximena to do next?

A. She should give them each bigger pieces of bubble gum and try it one more time.
B. She should prove she is right by blowing bubbles while her friends are watching.
C. She should ask her friends to try it again and concentrate harder when they face the Sun.
D. She should think about what else she is doing that might have made the bubbles bigger

4) Jamal and Billy are testing paper airplanes to see which design makes a plane fly farther. Jamal's design has straight wings and Billy's has bent wings. They stood side by side and each threw their planes at the same time. They did this six times, measuring how far each plane went from the starting line in meters. They decided that Billy's design with bent wings travels farther.

What should they do next to see if their results are valid?

<table>
<thead>
<tr>
<th>Trial</th>
<th>Jamal’s Plane</th>
<th>Billy’s Plane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trial 1</td>
<td>3.5 m</td>
<td>5.2 m</td>
</tr>
<tr>
<td>Trial 2</td>
<td>4.1 m</td>
<td>4.8 m</td>
</tr>
<tr>
<td>Trial 3</td>
<td>3.9 m</td>
<td>5.0 m</td>
</tr>
<tr>
<td>Trial 4</td>
<td>4.5 m</td>
<td>4.7 m</td>
</tr>
<tr>
<td>Trial 5</td>
<td>4.7 m</td>
<td>5.3 m</td>
</tr>
<tr>
<td>Trial 6</td>
<td>3.8 m</td>
<td>4.9 m</td>
</tr>
</tbody>
</table>

A. Have other friends try the same experiment.
B. Have them throw planes in different locations.
C. Have them throw with their eyes shut each time.
D. Have Billy bend the wings up even more on his plane.
5) Many people take vitamin C when they feel they are catching a cold. In fact, some people seem to recover more quickly when they take C vitamins. What is the main problem with concluding vitamin C helps you fight off a cold based on this information?

A. We cannot know exactly how vitamin C works.
B. We cannot keep track of how much vitamin C people take.
C. We cannot know how long the cold would have lasted without the vitamin C.
D. We cannot know what other changes in diet people may have made while sick.

6) Tom is creating an experiment to see what food his pet lizard likes the best. He creates an experiment in which he offers his lizard a choice of crickets or mealworms. He records how much of each choice is eaten each day. At the end of two weeks, Tom finds the lizard has eaten a few more mealworms than crickets.

What must Tom do to be sure his results are valid?

A. include another food option besides crickets
B. repeat the same experiment to confirm his results
C. buy additional lizards and begin multiple experiments
D. feed only mealworms for a while then offer a choice again

7) Juana decided to find out if it was worth spending the money to buy bags of potting soil sold at the store. She bought one bag of potting soil and some bean seeds. At home she put potting soil in ten pots and soil she dug up from the yard in ten other pots. She planted one bean seed in each pot.

8) After one week, all twenty seeds had sprouted and all the seedlings had two leaves. She concluded that her soil was just as good as potting soil.

What would be the best thing for Juana to do next?

A. Repeat the experiment to see if she gets the same results.
B. Mix the potting soil with her soil and see how seeds grow in it.
C. Start watering some of the plants in each group twice as much.
D. Let the plants grow in different soil types to see if they remain healthy.
9) Ms. Barber's science class was doing an experiment to see how fast a toy car would roll down inclined planes made of three different materials; wood, metal and plastic.

For the first trial, each group tested its car on a wooden board raised up by putting three science books under one end of the board. All the cars and boards were exactly the same. Each group used a stopwatch to time how fast the car traveled one meter. They each repeated it three times and averaged the results.

Since there was quite a large difference in average times, what should the class do next?

<table>
<thead>
<tr>
<th>Group</th>
<th>Average Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>10 seconds</td>
</tr>
<tr>
<td>Group 2</td>
<td>13 seconds</td>
</tr>
<tr>
<td>Group 3</td>
<td>9 seconds</td>
</tr>
<tr>
<td>Group 4</td>
<td>10 seconds</td>
</tr>
<tr>
<td>Group 5</td>
<td>10 seconds</td>
</tr>
<tr>
<td>Group 6</td>
<td>6 seconds</td>
</tr>
</tbody>
</table>

A. Assign students to different groups before testing the metal and plastic surfaces.
B. Only allow groups 1, 4 and 5 to participate in testing the other types of surfaces.
C. Compare how each group conducted the experiment to see if they were all doing it the same way.
D. Conclude that it takes 10 seconds for a car to travel one meter since that was the most common time.
10) Ana has to walk her little sister to school each morning and walk her home each afternoon. There are two routes they could take and Ana wants to know which way is quickest. Every day for one week they walk to school down Palmetto Avenue and every afternoon they walk home on Redbug Street. Ana kept careful records of how much time each journey took.

Which of the following would help Ana the most in making sure that Palmetto Ave. is the shortest route?

<table>
<thead>
<tr>
<th></th>
<th>Palmetto Ave.</th>
<th>Redbug St.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>10 min</td>
<td>12 min</td>
</tr>
<tr>
<td>Tuesday</td>
<td>10 min</td>
<td>13 min</td>
</tr>
<tr>
<td>Wednesday</td>
<td>11 min</td>
<td>15 min</td>
</tr>
<tr>
<td>Thursday</td>
<td>9 min</td>
<td>12 min</td>
</tr>
<tr>
<td>Friday</td>
<td>11 min</td>
<td>13 min</td>
</tr>
</tbody>
</table>

A. She should take Palmetto Avenue in both the morning and afternoon each day.
B. She should count the number of steps it takes going down each of the streets.
C. She should ask others to walk the same routes and see if they get the same results.
D. She should carry her sister's book bag for her when they walk home in the afternoon.

Janna has offered her canary, Sammy, a choice of sunflower seed or ground corn for two months. She has observed that Sammy eats more sunflower seeds than ground corn during the two months. She concludes Sammy prefers sunflower seeds over ground corn.

What should Janna do if she wants to confirm her results?

A. Repeat the experiment with her friend's bird.
B. Repeat the experiment using different food containers.
C. Repeat the experiment with the same exact conditions.
D. Repeat the experiment with another feed instead of corn.