**LEGO Robotics SBA Review**

1. It is important to share with the scientific community findings from your design process to help in the future development of robotics. At what point in the engineering design process would you expect scientists or engineers to share their results with the community?
   1. After you have tested the prototype.
   2. After you have explored the research of others.
   3. After you have developed a plan for your design.
   4. After you have run the program.

**Please use the following passage to answer question 2.**

It is hard to design robots that can function in Antarctica. The weather is nasty, and the ice cracks and shifts. Scientists want lots of robots to roam across the ice and snow and collect data for them to process. Ayanna Howard designed robots with spider-like legs, but they became trapped in the snow banks. She and her colleagues now use a commercial snowmobile designed for kids. They added sensors, gauges, and cameras and programmed it. She designed a shell to protect the robot from the cold and plans to include heaters at some point. On a Colorado glacier, Dr. Howard found a way for the robots to navigate using patterns in the ice. She will use that technology and data for robots in Antarctica. The plan is to have 40 to 50 robots roaming around Antarctica, providing data to help scientists understand how conditions are changing in places that it is hard for humans to go.

1. What do these robots use to navigate over the ice?
   1. Spider-like legs
   2. Snowmobile tracks
   3. Patterns in the ice
   4. Sensors and gauges
2. What type of data would the sensors on the robots collect?
   1. How many robots are nearby.
   2. How the weather conditions change.
   3. How warm the robots should be kept.
   4. How the robot communications change.
3. A robot is holding a ball five feet off of the ground. After giving the robot a command it releases the ball. What kind of energy conversion are your observing?
   1. Kinetic energy to potential energy.
   2. Potential energy to mechanical energy.
   3. Potential energy to kinetic energy.
   4. Kinetic energy to mechanical energy.
4. The teacher showed students a gear arrangement to demonstrate an example of gearing up. What possible gear arrangement below could the teacher have used in the demonstration?
   1. A 40-tooth gear driving an 8-tooth gear
   2. An 8-tooth gear driving an 8-tooth gear
   3. An 8-tooth gear driving a 40-tooth gear
   4. A 40-tooth gear driving a 40-tooth gear
5. A robot has been programmed to avoid the edge of a table. Which programming block must be included in the program for the robot to avoid the edge indefinitely?
   1. Loop block
   2. Switch block
   3. Move block
   4. Wait block
6. Which of the following is true about the switch block?
   1. It has to use the light sensor to work properly.
   2. It must always be used with the loop block
   3. It switches sensors on and off, depending on how it is programmed.
   4. It allows different actions to occur depending on a condition of an input.
7. A student is measuring the distance it takes a robot to move from object A to object B. Which tool would provide the student with an accurate measurement of how many turns the motor makes from object A to object B?
   1. Rotation sensor
   2. Move tank block
   3. Ultrasonic sensor
   4. Metric ruler
8. Annalisa has programmed a robot to go forward, but it goes backward. Her program has been checked and it is accurate. Which of the following could be the problem?
   1. The connector wires have been plugged into the wrong ports.
   2. The battery has been installed backwards.
   3. The rechargeable battery is dying.
   4. The motors have been mounted backwards.
9. The motor is normally used as a(n):
   1. Output device.
   2. Energy source.
   3. Sensor
   4. Input device.
10. The circumference of a LEGO wheel is 10 millimeters; engineer wants to program the robot to move 5 millimeters. What parameters for you need in your program block to make it travel the correct distance?
    1. ½ rotation
    2. 2 degrees
    3. 2 rotations
    4. 360 degrees
11. Virtual Vacuums is developing a small robotic vacuum cleaner to clean floors. They need advice on which sensors to use to make sure that the vacuum cleans up to the edges. Which of the following sensors would be most appropriate?
    1. Touch and ultrasonic sensor
    2. Gyro and light sensor
    3. Touch and rotation sensor
    4. Infrared and rotation sensor