Name: _____ Date: _____

"Belts" Worksheet

Condition	Size of Pulley on Motor (cm)	Size of Pulley on Wheel (cm)	Gear Ratio between Motor Axle and Wheel Axle	Number of Motor Axle Rotations	Distance Robot Traveled (cm) [3 Trials]	Overall Average Distance for Condition (cm)
1					1. 2. 3.	
2					1. 2. 3.	
3					1. 2. 3.	

Condition 1:

1. We intend to show a connection between distance and gear ratio, but we are using pulleys, not gears. We can find the gear ratio of different gears by counting their teeth. How can we find the gear ratio of pulleys?

2. Fill in the following values in your data table.
   a. Diameter of the "motor" pulley for this condition
   b. Diameter of the "wheel" pulley for this condition
   c. Gear ratio for this condition
   d. Number of clicks the robot travels.

3. If the driving axle goes around once, how many times does the driven axle go around?

4. How far did the robot travel on average in this Condition? Record your answer in the data table.

Condition 2:

5. On the data table, fill in the diameters of each pulley and the number of clicks the robot runs, and calculate the gear ratio in this condition.

6. If the driving axle goes around once, how many times does the driven axle go around?

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7. How far did the robot travel on average in Condition 2? Record your answer in the data table.

8. Complete the following calculations:
    a. Write a fraction comparing the distance the robot traveled in Condition 1 to the distance the robot traveled in Condition 2.

    b. Convert your answer to a decimal number.

    c. Round the decimal to the nearest whole number.

9. How many times greater distance was traveled in Condition 2 than in Condition 1? Give your answer as a decimal.

10. Answer the following questions:
    a. What is the ratio of the distance traveled by the robot in Condition 1 to the distance traveled by the robot in Condition 2?

    b. What is the ratio of the gear ratio in Condition 1 to the gear ratio in Condition 2?

    c. How are distance traveled and gear ratio related based on these comparisons?

Condition 3:

11. On the data table, fill in the diameters of each pulley and the number of clicks the robot runs, and calculate the gear ratio for this condition.

12. If the driving axle goes around once, how many times does the driven axle go around?

13. How far did the robot travel on average in Condition 3? Record your answer in the data table.

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Analysis and Conclusions:

14. In which experimental condition did the robot go the longest distance? The shortest distance?

15. Predict the distance that should have been traveled in Condition 2 based on its gear ratio and the gear ratio and distance traveled in Condition 1.

16. Compare this value to the actual distance traveled in Condition 2. How accurate was the prediction? Give your answer as a percentage of the distance traveled in Condition 1 that the prediction was off by.

17. Predict what the gear ratio should have been in Condition 3 based on the distance it traveled and the gear ratio and distance traveled in Condition 1.

18. Compare this value to the actual gear ratio in Condition 3. How accurate was the prediction? Give your answer as a percent of the gear ratio of Condition 1 that the prediction was off by.

19. Explain how gear ratio affects the distance a vehicle will travel when the number of driving axle rotations is held constant.

20. Did your results support or refute the hypothesis? Explain.
    Hypothesis: As the gear ratio between the motor and the wheel on Tankbot decreases, the distance it travels will increase proportionally.

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