



Objectives:

The students will demonstrate the ability to:

- Design and implement looped, linear programs to operate the K'NEX Double Ferris Wheel.
(Science and Technology)
- Solve mathematical problems to find the cost of materials to build the K'NEX Double Ferris Wheel.
(Engineering and Mathematics)
- Explore the rotational motion of the ride to determine its speed.
(Science and Mathematics)
- Complete speed comparisons of the various rides in this set to determine the fastest and slowest.
(Science and Mathematics)

Have students open the K'NEX Double Ferris Wheel SCE.

Context:

The Ferris Wheel is found at almost every amusement park. Your amusement park will be the first in the country to have a double Ferris Wheel. Your team will be writing a series of programs to show the capabilities of your one-of-a-kind Ferris Wheel and to demonstrate how the programs loop to make the your Double Ferris Wheel the best ride at the amusement park!

Requirements:

For this activity you are required to:

1. Make daily entries in your STEM Journal.
(Teacher Note: Help students to realize the importance of keeping records and journaling. Inform students of the materials they must include in their STEM Journals.)
2. List the K'NEXions Chart for all Challenge Activities your team completes.
(Teacher Note: If you are using the simplified Program Presentation Sheet, the K'NEXions Chart will be at the top of that sheet. If not, a template page for K'NEXions Charts has been provided.)
3. List and describe the steps in your programs. Keep a record of changes you made to programs as you improved them.
(Teacher Note: The simplified Program Presentation Sheet will help students with limited writing skills to describe their program in a graphic as well as a written form. Students with better writing skills can list and describe their programs directly in their STEM Journals.)
4. Include all calculations, charts, and graphs you prepare in your STEM Journal.

Construction:

Use the instructions to build the K'NEX Double Ferris Wheel model.
(Technology and Engineering)

Ensure that all of the electronic components have been plugged into the K'NEX Control Box before you begin work.

(The K'NEXions Chart outlines the placement of the buzzer, motors, and LEDs for the Learning Tasks in this lesson. The students will find this information in graphic form in the building instructions.)

K'NEXions Chart

K'NEX Double Ferris Wheel

Output	Device
1	MOTOR
2	MOTOR
3	LED
4	BUZZER
A	
B	



Learning Tasks:

Complete these learning tasks using both the Double Ferris Wheel SCE on the computer and the K'NEX Double Ferris Wheel model Control Box.

(Teacher Note: Encourage students to complete these learning tasks using the K'NEX Double Ferris Wheel SCE on the computer before they program the Control Box to operate the model.)

Write programs that enable the Double Ferris Wheel Ride complete these tasks.

1. * Write a program for the Double Ferris Wheel Ride that includes the following:

- The buzzer sounds when the ride is about to begin.
- The two wheels should both spin in the same direction for some time.
- The LED should flash while the wheels are turning.
- Allow the Control Box to repeat your program several times.

(Science and Technology)

2. * Write a program that:

- Spins the Ferris wheels one at a time.
- Includes the LED and Buzzer.
- Allow the Control Box to repeat your program several times.

(Science and Technology)

Challenge Activities:

Keep daily notes in your STEM Journal and include all of the programs you write.

(Teacher Note: Remind students that the output devices may need to be plugged into different locations on the Discover Control Box for Challenge Activities.)

1. * Write a program so that the following actions can be completed. You must remove the LED and buzzer from the Control Box and place the motors' plugs into the Output A and B positions on the Control Box.

- Spin both wheels in the same direction for five (5) seconds,
- Change the direction of both wheels for five (5) seconds,
- Spin both wheels in opposite directions for five (5) seconds.
- Allow the Control Box to repeat your program several times.

(Science, Technology, and Mathematics)

2. * Write a program for the K'NEX Double Ferris Wheel that will make it fun and exciting.

- Use both of the motors, the buzzer and the LED in your program.
- Demonstrate how your ride allows riders time to exit the ride when it is over.
- Allow the Control Box to repeat your program several times.

3. ** Find how many riders can ride the K'NEX Double Ferris Wheel Ride in one day.

- If the ride lasts for a total of 5 minutes and it takes 7 minutes to load and unload passengers, how many rides can take place in one hour?
- How many rides can take place in a full day at the amusement park if the park opens at 11:00 am and closes at 9:00 pm?
- If the ride can hold a total of eight riders when it is full, how many riders could ride in one day?

(Note: Save this information and calculations in your STEM Journal for later activities.)

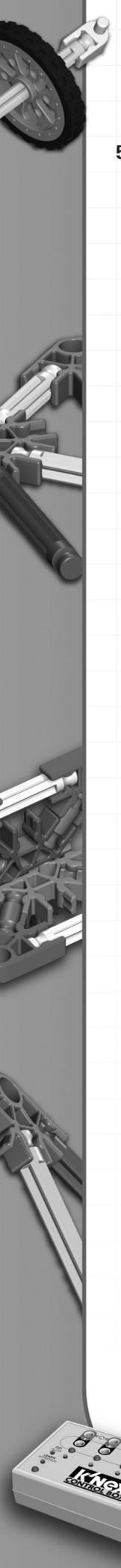
(Science, Engineering and Mathematics)

4. * Determine the speed of the K'NEX Double Ferris Wheel Ride in revolutions per minute (rpm). In other words, how many times does the ride spin in one minute?

(Note: You may place a masking tape flag on one seat of the ride to make counting easier.)

(Science and Mathematics)





5. ** Find the average speed of the K'NEX Double Ferris Wheel in revolutions per minute (rpm) for a total of four (4), one-minute trials.

- Collect the data and design a data chart to display the data.
- Compute the average speed of the four (4) trials.
- Show all calculations in your STEM Journal.
- Be prepared to explain your experimental strategy and to demonstrate how you arrived at your answer.
- Previously, you gathered similar information for the K'NEX Swing Ride and the K'NEX Spinning Carpet Ride.
- Compare the performance of each ride and list the fastest of the rides, the slowest of the rides.
- What feature(s) of the fastest ride made it the fastest?
- What feature(s) of the slowest ride made it the slowest?
(Science, Technology, Engineering and Mathematics)

6. * Refer to the building instructions for the K'NEX Double Ferris Wheel and the Cost per Piece Chart provided by your teacher. Find the cost of the materials that are used to build the ride.

- a. Make a data chart for this activity in your STEM Journal and include all of your calculations
- b. Place your answer on the board in the spot indicated by your teacher.
(Teacher Note: Set aside space on the white board or chalk board for each team to list their cost of materials so that the costs are visible to the entire class.)
- c. How do your results compare with other groups who have completed the challenge? If answers vary, devise and implement a plan to check your work.
(Teacher Note: Provide time for the teams to compare their answers and to correct any differences. The Cost Per Piece Chart has been provided in an editable format allowing you to assign costs to the K'NEX Pieces that are appropriate for the students you are working with.)
(Science and Mathematics)

7. ** Complete the activity above using a spreadsheet program to organize the data, compute the costs, and calculate the total cost of the materials used to build the K'NEX Double Ferris Wheel Ride.
(Science, Technology, and Mathematics)