



Wind Racer & Money Management

Student: _____

Partner: _____

Group Name: _____

Date: _____

Learning Objectives:

1. Design and build a wind racer in teams of two students
2. Compete against other teams to see who's wind racer travels the farthest in a straight line
3. Budget resources efficiently for the purchase of materials, tools and opportunities
4. Develop project management and collaboration skills within and across teams

Overview:

A wind racer is a structure built of wheels, a platform, and a sail, which should roll in a straight line when impelled by the wind of a fan. Your task is to design and build a wind racer in teams of two, using materials that are purchased or rented from the teacher with Monopoly Money. At the end of the project, teams will enter into a contest. Winning will be based on wind racer competition results, as well as successful money management.

Here's how it works:

- Everything you need to construct a wind racer is made available; the design is up to you.
- All teams will start with \$70 of Monopoly money. Materials are purchased, tools are rented. Once returned, tools are reimbursed at full cost.
- If you are having trouble designing a wind-racer, you may purchase educational services from the teacher at \$3 per tip. You may also get construction/design assistance of other teams, at a fee negotiated between the teams.
- You can earn extra money by assisting other teams, trading unused materials, or returning scraps to the recycling center.
- You are allowed several trial runs to test the wind racer, and the opportunity to make any adjustments you think will help the wind racer achieve better results.
- There will be a final competition run to see how far each team's wind racer travels when placed in front of the fan.
- Money management will factor into your final results: if you managed your money well and have leftover funds, you can add three centimeters for every dollar left; if you managed your money poorly and had to borrow from the bank, you have to subtract five centimeters for every dollar borrowed. So budget wisely!
- Winning teams are awarded based on wind racer AND money management outcomes.

Expenses:

MATERIALS	COST
Round plastic lid (4 max)	\$2 each
36-inch dowels (3 max)	\$4 each
Straws (2 max)	\$1 each
Newsprint (1 page max)	\$1 per page
Cardboard squares (4 max)	\$3 each
Tape (1 max)	\$4 per roll

TOOLS	RENTAL COST
Hole puncher	\$5
Scissors	\$5
Ruler	\$2
Timer	\$2

MISCELLANEOUS	COST
Educational tips from teacher	\$3 per tip
Service assistance from peers	negotiable
Extra trial test run	\$3 each

**TIPS:**

- * **Observation skills and a good design plan are important for success!**
- * **Remember to balance your expenses and income efficiently! Have a good sense of what materials you'll need BEFORE you go shopping!**
- * **Save for a rainy day: make sure you have enough money in case you run out of materials, your tools break, you need some assistance, or you want to purchase**

Income:

BANK ACCOUNT	AMOUNT
Starting Balance	\$70 per team
Assisting other teams	negotiable
Trading unused materials	market value
Returning scraps	market value

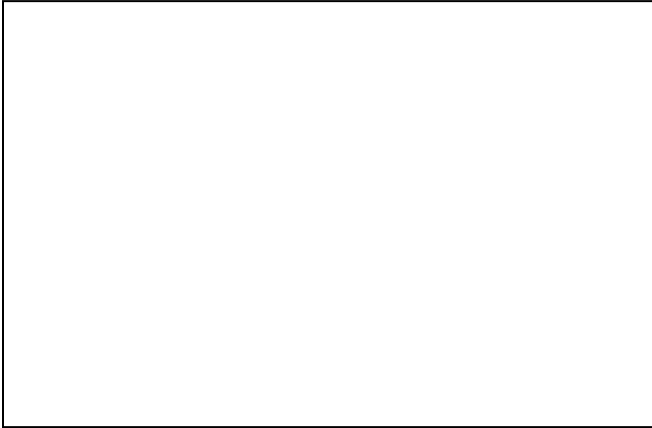
STEP ONE: Review the materials

Review the list below to gain a better understanding of the purpose of each of the materials in the design and construction of the wind racer. Observe the sample materials on the table to get a visual of each item.

Shoebox lid	Serves as the base of the Wind Racer
Plastic lid	Used as wheels
Dowels	May be cut down to size for different purposes: axel and mast
Straws	Holds the axel in place while allowing wheels to spin
Newsprint	Used in the construction of the sail
Tape	Adheres the different parts of the wind racer
Hole Puncher	Used to create holes for inserting dowels into the cardboard
Scissors	For cutting materials
Ruler	For measurement and proper alignment
Timer	To test the wind racer's travel time and speed

STEP TWO: Brainstorm

Now that you're familiar with all the materials and how they can be used, brainstorming a design plan. In the box below, draw an initial diagram of what your wind racer will look like.



THINGS TO CONSIDER:

- * An axel has to be free-moving so that the wheels can spin.
- * Wobbly wheels will make the wind racer veer off course.
- * The size of the sail affects how much wind it can catch to propel it forward.
- * The wind racer should be solid enough to sail firmly in the wind, but not so heavy that it doesn't move!

Figure 1: Initial diagram

STEP THREE: Figure out the details

Answer the following questions, which will help you determine design and construction details.

1. How will you get the wheels to spin, while being attached to the platform?

2. How will you ensure that the wheels keep the racer in a straight path?

3. Why is a hole punching tool better than a scissor to make a hole?

4. How will you get the mast of the sail to stand vertically?

5. How can you take advantage of the strength of the shoebox lid to anchor your mast?

STEP FOUR: Collect your allowance

Go to the bank to collect your \$70. You will need to bring your paperwork to show your design plan and your answers to the above questions.

STEP FIVE: Purchase or rent your materials

By now you should know how many of each item on the materials list are you going to need. Fill in the order form below with the quantity and costs of your materials. Make sure you don't overspend your budget. You'll want to have enough money left over for additional services that you may want or need. Rented materials can be reimbursed at full cost.

Take your order form to the supplier and get your materials.

PURCHASE ITEM	COST PER ITEM	QUANTITY	COST
Plastic lid (4 max)	\$2		
Dowel (2 max)	\$4		
Straws (2 max)	\$1		
Newsprint (1 max)	\$1		
Cardboard square (4)	\$3		
Tape (1 max)	\$4		
RENTAL ITEM	(reimbursed upon return)		
Hole Puncher (1 max)	\$5		
Scissors (2 max)	\$5		
Ruler (2 max)	\$2		
Timer (1 max)	\$2		
TOTAL COST			\$

STEP SIX: Construct your Wind Racer

Once you have your design plan, construct your wind racer. If you need extra help, you may purchase tips from the teacher, or contract the services of other teams at a fee that is reasonable to both of you.

Draw detailed figures of various views, showing how different parts will be held in place. Showing measurements will earn you extra credit points.



Figure 2: Platform

Comments: _____



Figure 3: Axel

Comments: _____

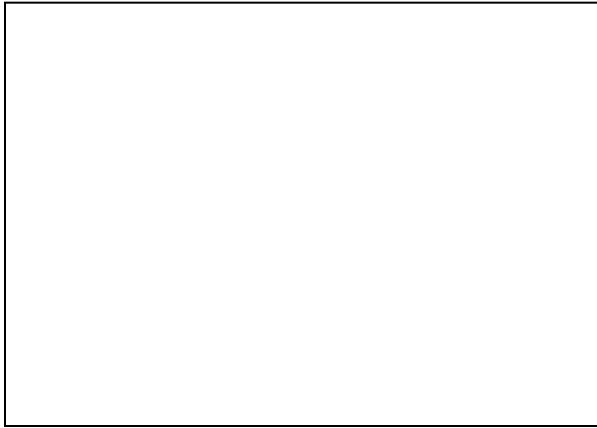


Figure 4: Wheels

Comments: _____

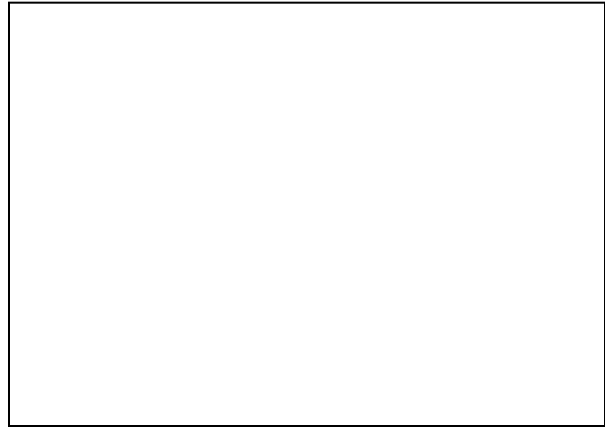


Figure 5: Mast and Sail

Comments: _____

STEP SEVEN: Trial Runs

The trial runs are an opportunity to see how well your wind racer travels. Place your wind racer at the start line. Use the timer to measure how long it travels when placed in front of the fan, and the tape measure to determine how far it traveled. After each trial run, you may modify your wind racer if you think there is a design or construction error that is keeping it from reaching maximum results. You are allowed up to five trial runs; the first two are free, additional runs are \$3 each. Document your results.

	RUN DISTANCE (cm)	RUN TIME (seconds)	SPEED (cm/sec)	COST (\$)
1.				FREE!!
2.				FREE!!
3.				\$
4.				\$
5.				\$
TOTAL				\$

1. Did your wind racer perform the way you expected? Explain.

2. How did you calculate speed?

3. Did you need to modify your wind racer or use extra trial runs? Explain.

4. Did you need the assistance from other teams in constructing or modifying your wind racer? How did you negotiate a service charge, if any?

5. Each team is allowed to purchase a second chance competition run for a fee of \$10. Do you have enough money to purchase a second competition run? Do you think you'll need it? Explain.

STEP EIGHT: Competition Runs and Money Management

By now your wind racer should be achieving peak results! At this points all teams will compete to see who's wind racer traveled the farthest, and how they did managing their money.

Column 1: Write the name of your team.

Column 2: Write the distance the wind racer traveled in the Competition Run.

Column 3: Write the amount of money your team had left over and circle the positive symbol; if your team was in debt (had to borrow money from the bank), circle the negative symbol.

Column 4: Calculate the amount of time added to/subtracted from the Competition Run Distance.

* For every dollar you have left, you get a positive 3 cm.

* For every dollar you borrowed, you get a negative 5 cm.

Column 5: Add (or subtract) the amount in Column 4 to the distance in Column 2. This is your final run distance.

Column 1	Column 2	Column 3	Column 4	Column 5
Team Name	Distance traveled (cm)	Account Balance (\$ +/-)	Distance added or subtracted (cm +/-)	Final Run distance (cm)
		+ / -	+ / -	

STEP NINE: Results and Evaluation

1. Did you do balance your cash resources and expenses well? Explain. Did you have enough money to meet all your needs? Explain _____

2. What would happen if you didn't buy enough materials just to save money? Explain _____

3. What would happen if you spent too much on materials? Explain. _____

4. What strategies were most successful in terms of design and money management? Explain. _____

5. What might you have done differently? Did you learn from your mistakes? Explain. _____

6. Were you able to assist another team, or get the assistance of another team? Was there any benefit in this type of cooperation? Explain. _____

7. If you had to give three tips to another group of students doing this project, what would they be?

WIND RACER LEDGER

TEAM NAME: _____

	COST	QTY	TOTAL
Purchases			
Plastic lid	2		
Dowel	4		
Straws	1		
Newsprint	1		
Cardboard square	3		
Tape	4		
Rentals			
Hole Puncher	5		
Scissors	5		
Ruler	2		
Timer	2		
Services			
Educational	3		
Peer Assistance	?		
Trial Run	3		
TOTAL			

WIND RACER COMPETITION RESULTS

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Team Name	Competition Run Distance (cm)	Account Balance (\$ +/-)	Distance added or subtracted (cm +/-)	Final Run distance (cm)	Rank (#)
1.		+ / -	+ / -		
2.		+ / -	+ / -		
3.		+ / -	+ / -		
4.		+ / -	+ / -		
5.		+ / -	+ / -		
6.		+ / -	+ / -		
7.		+ / -	+ / -		
8.		+ / -	+ / -		
9.		+ / -	+ / -		
10.		+ / -	+ / -		
11.		+ / -	+ / -		
12.		+ / -	+ / -		