THE AMAZING PI RACE

Rules and Procedures

1. You will work in a 2- or 3-member team to attempt to be the first to complete all the mathematical activities in ***The Amazing Pi Race***.

2. The only items you will be allowed to carry on the race will be one pencil per person and one calculator per team.

3. As you complete the task at each location, bring your work to your teacher to have it verified. Both (or all 3) team members must stand in line and appear in front of the teacher to have your work checked. The problems will be checked in the order that the team members arrive. If you are incorrect, sit back down with your partner(s) and make your corrections. Once the clue is correct, you and your partner(s) may take your next clue.

4. At each location, you will have a task to complete.
    - At one location, you will find a DETOUR, a choice of two tasks. Your team needs to complete only one of the two choices in order to move on.
    - At another location, you will find a FAST FORWARD. If your team is the first to correctly complete that activity, you will be allowed to skip the next location. However, don't waste a lot of time on the FAST FORWARD if you're not sure how to work it. You can complete the alternate activity and continue on to the next stop on your journey.

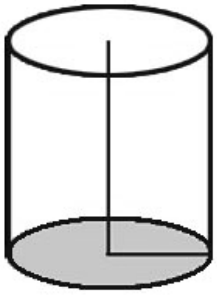
5. Perform all calculations using the π key on your calculator, rather than using an approximate value for π.

6. Read and follow carefully all directions, including how to round your answers.
    - You can do work anywhere on the clue sheet you are given; your teacher will check answers written in the answer box.
    - You must also write your team number in the box on each page.
    - Your answers will be marked correct only if you give them in the form instructed and with correct units.

1. Welcome to ***The Amazing Pi Race***, a journey around the United States in pi-related mathematics. Your journey begins here at Potosi High School. Before you head to your next destination, you need to review the following formulas. After your answers have been verified as correct, you might want to hold on to this page for reference throughout the rest of the race.

   For 1-8, match each formula with the shape it relates to. (Obviously, there is more than one formula for each shape.)

A.



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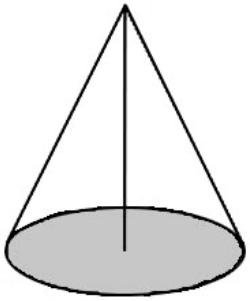

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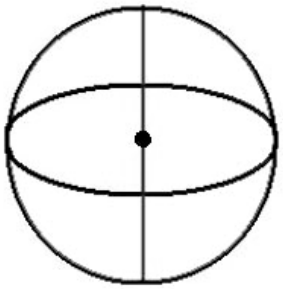
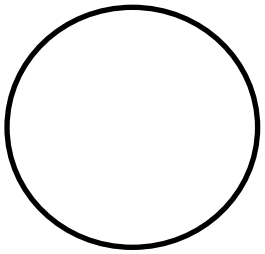


D.



1. $A = \pi r^2$ _____

2. $V = \frac{1}{3}\pi r^2 h$ _____

3. $V = \pi r^2 h$ _____

4. $V = \frac{4}{3}\pi r^3$ _____

5. $C = 2\pi r$ _____

6. $SA = 2\pi rh + 2\pi r^2$ _____

7. $SA = 4\pi r^2$ _____

8. $SA = \pi r^2 + \pi rs$ _____

Team Number

Good work. You are now ready to get in your car and travel across town to Purcell Tire Company.

2. Welcome to the corporate headquarters of Purcell Tire Company in Potosi, MO.

   Some of the largest tires ever made are produced by Purcell. These tires are used on earthmovers in the mining industry. The overall diameter of one of the tires is 158 inches. If an earthmover had tires that size, how far would it have traveled when the tires rotated 5 times? (Give your answer correct to the nearest tenth of a yard.)

Team Number
ANSWER:

Congratulations. Now you are ready to drive a couple of hours up the road to St. Louis.

3. Welcome to St. Louis, home of the 1904 World's Fair. The story is that ice cream cones were invented (or at least popularized) at the 1904 World's Fair in St. Louis, MO.

   In St. Louis you will need to take one of the two following DETOURS. After you have completed either one of the problems, bring your work to the check-in location.

D1. Suppose the height of a sugar cone is 5 inches and the largest diameter (at the top of the cone) is 2 inches. If a cone is completely filled and then topped with a perfectly hemisphere-shaped scoop, what is the total volume of the ice cream needed? (Round your answer to the nearest tenth.)

ANSWER:

Team Number

D2. On a standard ice cream cone (shaped sort of like 2 stacked cylinders) the top section has a diameter of 1¾ inches and a height of 1 inch. For the bottom section both the diameter and the height measure 1½ inches. If a cone is completely filled and then topped with a perfectly hemisphere-shaped scoop, what is the total volume of the ice cream needed? (Round your answer to the nearest tenth.)

ANSWER:

Team Number

Good work! You've completed the detour. Now board a plane for a trip to Seattle, Washington.

4. Welcome to Seattle, home of the Space Needle. This structure was completed in 1962, just before the opening of the World's Fair in that city. About 500 feet above ground is the revolving Sky City Restaurant. The entire Space Needle saucer does not turn; only a 14-foot wide ring, next to the windows in the restaurant, rotates. The 94.5 foot diameter ring rotates 360 degrees in exactly 47 minutes.

<u>Here in Seattle you have two tasks to choose from, a fast forward or a regular task</u>.

Fast Forward: *If you are the first team to correctly complete this fast forward dealing with angular and linear velocity, you can skip the next city and proceed to the final destination.*

In <u>miles per hour</u>, what is the linear velocity at which diners seated next to the window travel as they eat? (<u>Round your answer to the nearest hundredth</u>.)

ANSWER:
Team Number

Congratulations on completing the Fast Forward. Now you can catch the next flight to your final destination, New York City.

OR

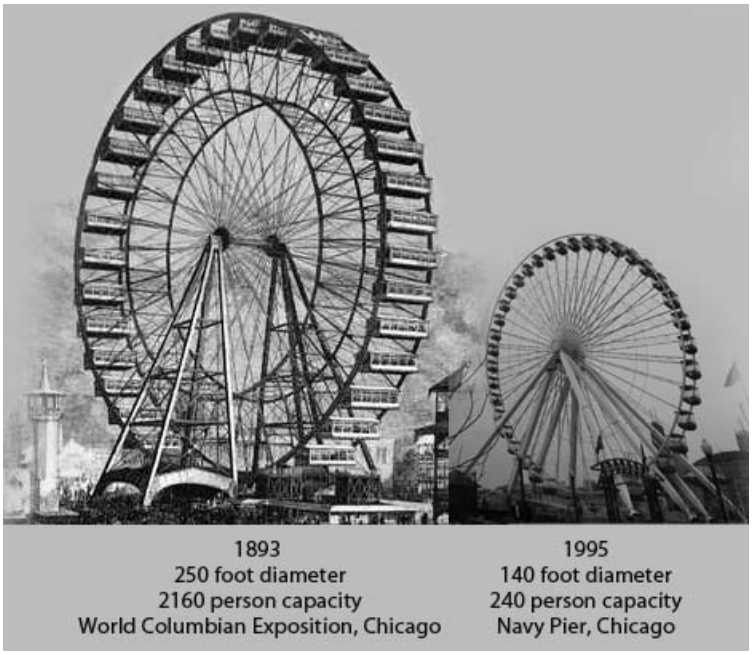
Regular Task:

If you could stretch out in a straight line the distance a diner seated next to the window would travel in 23.5 minutes, what would that distance be (<u>to the nearest tenth of a foot</u>)?

ANSWER:
Team Number

Good work on this task. Catch a flight to Chicago for your next-to-last task.

5. Welcome to Chicago, home of the first Ferris wheel. George W. Ferris, a bridge-builder from Pittsburgh, Pennsylvania, designed the Ferris wheel for the 1893 World's Fair. The Chicago Fair's organizers wanted something that would rival the Eiffel Tower that was built for the Paris World's Fair of 1889.



1893	1995
250 foot diameter	140 foot diameter
2160 person capacity	240 person capacity
World Columbian Exposition, Chicago	Navy Pier, Chicago

Suppose the original Ferris wheel is still standing and one of the members of your team boards that wheel and the other boards the wheel currently standing on Navy Pier in Chicago. Both Ferris wheels start turning at the same time and at the same speed and continue turning until the first time the two of you return to the bottom position at the same time. How many revolutions will each of you have made and how many feet will each of you have traveled? (Round to the nearest whole number.)

ANSWER:

1893 wheel

_____ revolutions

_____ feet

1995 wheel

_____ revolutions

_____ feet

Team Number

Great job! Hurry to catch a flight to New York City for your final challenge.

6. Welcome to your final destination -- "The Big Apple," New York City. Attention focuses on Times Square every New Year's Eve for the "dropping of the ball."

It was in 1907 that the first New Year's Eve Ball made its descent. The first New Year's Eve Ball, made of iron and wood and adorned with one hundred 25-watt light bulbs, was 5 feet in diameter and weighed 700 pounds. The Ball has been lowered every year since 1907, with the exceptions of 1942 and 1943, when the ceremony was suspended due to the wartime "dimout" of lights in New York City.

The 2000-2007 version of the Times Square New Year's Eve Ball, designed by Waterford Crystal, was a geodesic sphere, six feet in diameter, and weighed approximately 1,070 pounds. It was covered with a total of 504 Waterford crystal triangles that varied in size and ranged in length from 4.75 inches to 5.75 inches per side.

The new Times Square New Year's Eve Ball (introduced for bringing in 2008) is a 12 foot geodesic sphere, double the size of previous balls, weighs 11,875 pounds, and is covered in 2,668 Waterford Crystals.

Your final challenge has two parts:

a. If the shape of the newest ball was a perfect sphere with the diameter given, what would be its surface area? (Leave your answer in terms of π, with appropriate units.)

ANSWER:

b. The description says the new ball is double the size of the previous ball. How many times greater is the volume of the new ball than the one used in 2000?

ANSWER:

Team Number

CONGRATULATIONS ON COMPLETING THE AMAZING PI RACE!
You are team number _____ in order of finish.