PDMC Motorsports at Oakland University Presents

The Students First Program
"21 Questions for the 21st Century"

A Math Evaluation Tool for 7th Grade Students

7th Grade Edition
Version 2.0
Sept 1, 2007

The Students First Program is an effort of PDMC Motorsports, a student-based professional race team at Oakland University. The goal of the program is to help prepare students for the job market of the 21st Century. The 21 Questions for the 21st Century tool you are reading is the first phase of this outreach and has two aims. First it is aimed at helping parents evaluate their child's math competency. Secondly, the 21 Questions are designed to provide parents with a deeper understanding of what their children are supposed to be learning in each grade.

Hopefully with this knowledge parents can take a more active role in helping make sure their child is ready for the future and not be left behind. PDMC Motorsports and our corporate and institutional affiliates also work with the schools of Michigan to help teach math and inspire children to do well. Additional information about the Students First Program can be found on the PDMC Motorsports at Oakland University web-site (www.pdmcmotorsports.com). Please sign up for the mailing list so we can keep you informed of future phases of the "Students First" program and information about how we can help you help your child.

PDMC Motorsports at Oakland University – Helping Children Race into the Future.

The Students First Program is made possible because the companies below care about your children.

INSTRUCTIONS:
STUDENTS:
Ok, remember that this is not a contest. This is a tool to help you, the student understand where you are in your math education. Math is an amazing subject, because it gives a student the opportunity to solve problems in a way that no other class in school provides. However, it can also be cruel, in that if you fall behind somewhere, there is a chance that the next thing you learn will build on that. So, you can keep falling farther behind.

The purpose of this test and accompanying material is to break that cycle. By using this to pinpoint areas that need improvement, they can be addressed and overcome.

The funny thing about math is that it requires practice and soak time doing it. Then it clicks and rapid progress can be made. So, don't give up, because early struggles don't mean later failure. The only two insurmountable hurdles to mastering math are your child believing they can't and them not liking it. Don't forget, Michael Jordan got cut from his high school basketball team, and he kept working (I understand he did alright for himself in basketball through hard work).

Now some of the questions here are very straight forward, and some are a challenge. Some of this tool is aimed at helping you understand how math relates to doing cool stuff, like racing cars. Also, the 21st Question is a real challenge. Mathematically it is not difficult. However, it is a multi step solution that you need to think through.

Have Fun, and remember don't get frustrated. It is all within your grasp.

PARENTS:
Read the 21 Questions for the 21st Century Parent Guide that accompanies this before going through this with your student.

The 21 Questions – 7th Grade Edition

1) Solve the following problems

35.7 ÷ 2.1= ____ 43.5 x 1.91 = _____

44535 + 234303 = _____ 9994953 - 34434 = _____

2) Identify the following as being an expression or an equation

122 + X = 111 – 44 _____ 55 < 145 < 190 _____

Circle the variable in the problem above!

3) List three multiples that are common to 12 and 7 on the lines below.

1. _____ 2._____ 3._____

4) Which number 64 or 81 has the most factors?

5) What are the prime factors of the number 100?

6) Solve the following fraction problems and put the answer on the line

$1/32 + 1\ 1/8 =$ _____ $1/32 - 1\ 1/8 =$ _____

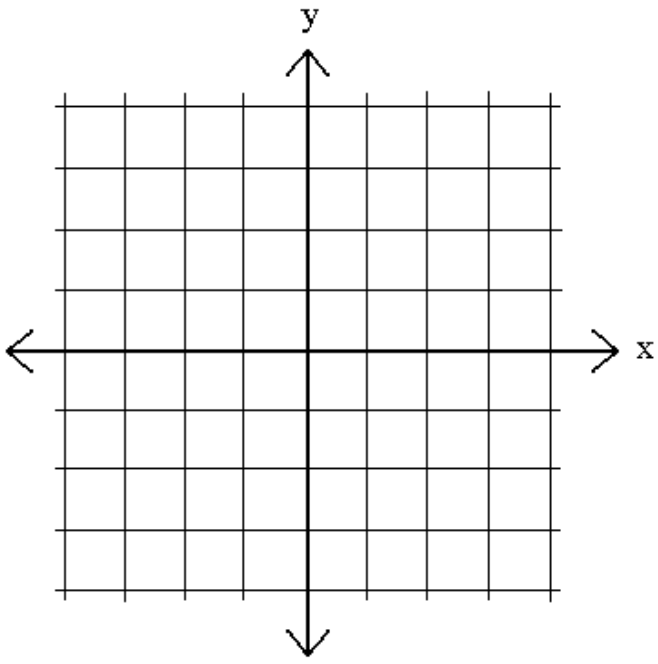
Solve the following fraction problems and put the answers on the line.

1/32 x $1\frac{1}{8}$ = _____ 1/32 ÷ $1\frac{1}{8}$ = _____

7) There are 33.81 ounces in a liter. How many liters in 1000 ounces?

9) Chart the following points on the graph to the right.

X	Y
-2	0
-1	1
0	2
1	3
2	4



How long is the line segment from the first point (-2,0) to the last point (2,4)?

_____

10) Define the following, draw them for extra points.

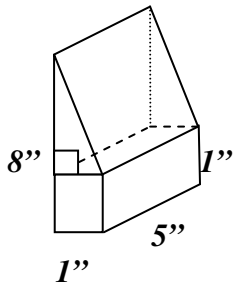
Obtuse Triangle: _____

Right Triangle: _____

Acute Triangle: _____

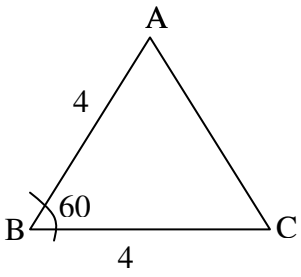
11) What is the volume of the following shape? The shape is 8 inches along the height and 5 inches along the base.

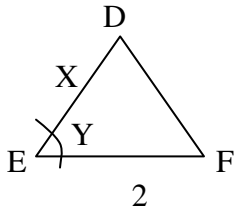
Volume = _____



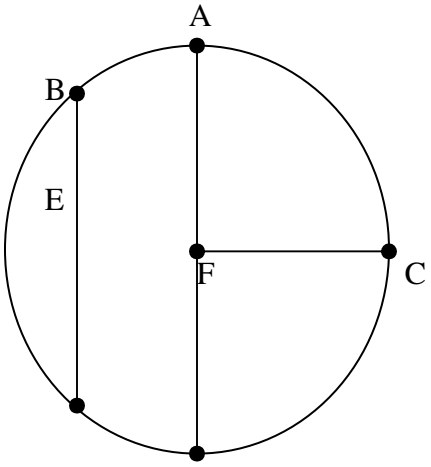
12) Given the two triangles below are congruent, fill in the missing numbers on the triangles.

X = _____ Y = _____





13) If Line Segment FC = 2 m, answer the following



What is the length between point F and point A? ____

What is the length between A and C if you go around the circle?

14) Solve the problem below:

$4 + 2 - 3 \div 1.5 \times 3 - 3 \times 2 =$ _____

15) Define the following and give an example of the following properties of addition and multiplication.

Commutative Property:

Associative Property:

Identity Property: Of Addition

Of Multiplication

Distributive Property of Multiplication over Addition and Subtraction:

16) Find Y in the following equations and write the correct answer on the line.

$Y - 13 = 7$ _____ $14 + 5 = Y + 10$ _____

$Y \div 2 = 26 - 20$ _____ $Y \times 16 = 64 \div 2$ _____

17) Horsepower is a number that describes the amount of power that the engine produces. The more horsepower, the faster the car will go. You can estimate Horsepower using the following equation.

Horsepower = Vehicle Weight / $(ET / 5.825)^3$

ET is the Elapsed Time (in seconds) it takes the car to travel 1320 feet (1/4 of a mile) from a dead stop.

If the PDMC Motorsports #24 Car goes down the track in 11.7 seconds and the car weighs 2100 lbs, what is the horse power rating estimate?

18) Simplify (if you can) and solve the following equations

$3^5 \times 3^2 =$ _____

$5^2 \times 4^2 =$ _____

$3^5 \div 3^2 =$ _____

$5^2 \div 3^2 =$ _____

19) PDMC Motorsports is taking some practice laps in the #24 car. The following laps times were taken

	1	2	3	4	5	6	7
Lap Time	1:20	1:20	1:15	1:15	1:10	1:10	1:15

What is the average lap time for the #24 Car? _____

What is the median lap time for #24 Car ? _____

20) If the PDMC Motorsports #24 car is going 60 miles an hour than

How many feet does it travel per second? _____

How many feet does it travel per minute? _____

How much time does it take to go a half mile? _____

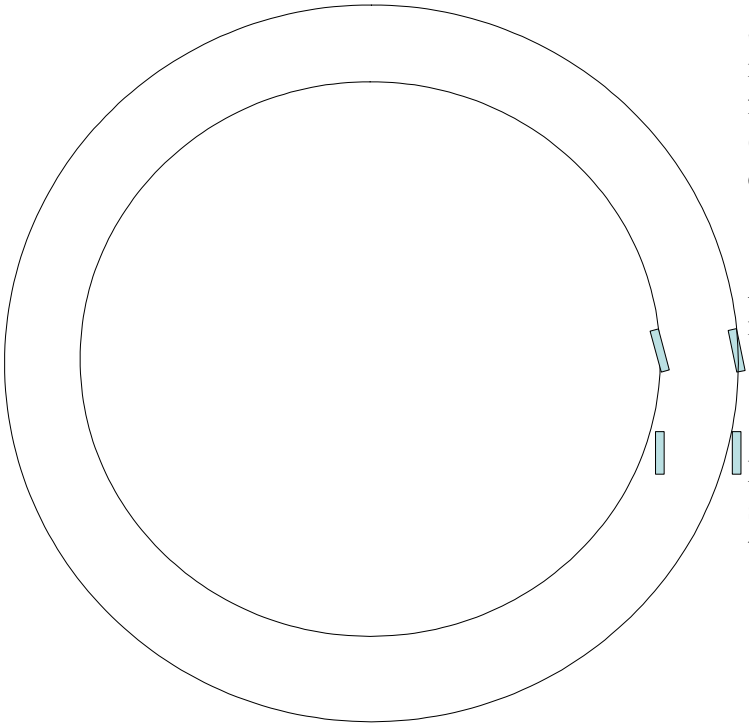
21st Question

Help the PDMC Motorsports Car do the right thing using math!

You might not think much about it, but when your car turns, it goes in a curve of some radius. In racing, this is important because the bigger the radius of the turn, the faster you can go. This makes sense, because even if you are running on foot the same holds. Tight turns make you slow down.

What makes your car turn is the force generated by the front wheels when they turn. You might not have thought about it, but the front wheels can't turn at the same angle. Think about it. The "track" of the car (the distance between wheels) means that they will be traveling different radius circles to make the car turn.

So, when you design a steering system, you have to take into account "Ackermann Geometry" which is the difference in turn radius between the right and left front tires which is shown below. The smaller circle is the path taken by the left front tire and the larger circle is the right front tire. If the car is balanced, then the heading of the car will be average of the two radii of the front wheels.



So, the track on the PDMC Motorsports #24 car is 1458 mm and the car has to go through a 40 foot radius circle at the center of the car (between the wheels), what is the turning radius on the front inner and outer tires?

Also, what is the distance each tire travels in making a complete circle.

If it takes a 20 seconds to do a circle what is the speed in feet per second of the inside wheel and the outside wheel?