To: Frank Riordan
Subject: RE: this is for frank, amit, leon, greg, and mike

-----Original Message-----
Sent: Friday, October 01, 1999 2:36 PM
To: 'sales@dmcinfo.com'
Subject: this is for frank, amit, leon, greg, and mike

FYI,

The planet's deepest spot is the Mariana Trench in the Pacific floor, SIX miles deep. That's 9656 meters.

The circumference of a bowling ball shall not be more than 27.002 inches nor less than 26.704 inches, nor shall it weigh more than 16 Lbs (no minimum weight).
We'll take the average and assume 26.85 inches in circumference. That's 8.54 inches in diameter, or 21.7 cm.
This equates to a volume of 0.005358 meters cubed. The mass of water displaced by this volume is 5.358 Kg. This equates to roughly 11.8 Lbs of buoyancy force. So, if you're a wimp and you use a 6, 8, 10, or 11 Lb ball, your ball will float and never make it to the bottom of the trench.

I like to use a 13 Lb ball, so lets sum up the forces. We got 11.8 upwards and 13 downwards. My ball will sink, since our net force is 1.2 Lbs (or 5.36 Newtons) DOWNWARD.

Now comes the fun part.....Fluid mechanics.

The water in the trench is really cold, lets say its 0 degrees Celsius.

The viscosity of water at this temp is roughly 0.0018 pascal-sec

The density is around 1000 Kg/m^3

When i drop my ball into ocean, it will accelerate (because of the net force of 1.2 Lbs) until the fluid drag equals the 1.2 Lbs of downward force. This point of terminal velocity will be reached very quickly, so we will neglect the acceleration time and assume the ball has a constant velocity all the way down.

The drag force is defined as 1/2*Cd*A*U^2*rho, with Cd the drag coefficient, A the frontal area of the sphere, U the mean flow speed and rho the density of the flowing medium.
The drag coefficient is a function of the Reynolds number Re, which depends on the flow velocity, the diameter of the sphere and the

viscosity (mu) of the flowing medium as per the equation:
Re = D*rho*U/mu.

If we equate the drag force equation with the net downward force of 1.2 lbs. we iterate using different Reynolds numbers and a Moody chart (a graph of drag coefficient vs Re) and solve for the velocity of the bowling ball. After a few iterations we get a Reynolds number of about 92,000 and a velocity of .761 meters/ second.
This equals about 1.7 miles per hour. (my guess last night was 2 miles/hr....not bad!)

So, 6 miles down at 1.7 miles/hour would take our ball about 3.5 hours to reach the bottom.

Please print this out and keep it with you at all times in case some jackass (or group of jackasses) asks you this during an interview.

-tim

PS. Thanks for the pizza! Hope to hear from you soon.