



The Tanker Truck Problem

This cylindrical tanker needs to be filled with gas and transported across the state.



Estimated dimensions of the tanker cylinder

7 feet high

21 feet long

How much gas can be pumped into this tanker truck?

What do you need to know to answer this question?

What answer is correct?

What answer is dangerous?

Teacher notes

This is an interesting problem to break students away from the rules of rounding in the face of practical applications. Behind every math application is a human who must use the math to make a decision.

Students must make a decision about which value of pi they will use and not just use the pi button on their calculator. If students insist on using the pi button, ask them if their answer is too high or too low and how they know. The calculator rounded pi at some point. Finding how many decimal places are used for rounding on the calculator could be an interesting process for them but will require much more work than rounding pi themselves.

Solutions to this problem would make a **wonderful Math Talk**, comparing and justifying decisions and answers.

Students will need to ask for, find, or be given the formula for cylinder volume ($V = \pi r^2 h$). They will need to decide how to round pi, and/or the answer and be able to justify their thinking. Answers should include **appropriate units**.

Some things to think about as a teacher

Here is pi to a whole bunch of digits:

3.14159265 35897932384626433832795028841971693993751

- If you round to the nearest whole number (3), tenth (3.1) or hundred-thousandths (3.14159), you get a value that is *less* than pi and any calculations will be smaller than the true or actual value of the tank.
- If you round to the nearest thousandth (3.142), ten-thousandth (3.1416), or millionth (3.141593), you get a value that is more than pi and any calculations will be larger than the true or actual value of the tank.

So many questions!

1. What did you do to solve this problem?
2. Is it a problem if a calculation is more or less than the true volume of the cylindrical tank?
3. Does it make a difference if you round to a digit further to the right?
4. Does it matter if the tank overflows (with gas)?
5. Would it make a difference if you were filling multiple tanks?
6. What would you do if you were in charge of determining how much gas should go into the tanks?

I am sure you can think of more good questions!