

Deflate-gate



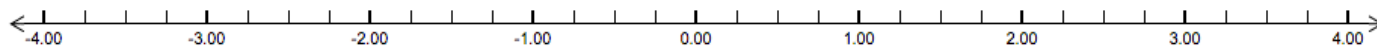
NFL rules stipulate that footballs are to be inflated anywhere from 12.5 to 13.5 pounds per square inch. The pressure gauge pictured above shows how close a football is inflated to the target of 13 pounds per square inch. On this particular pressure gauge a pressure of 13 pounds per square inch reads as zero. This gauge displays a negative number if the pressure is less than 13 pounds per square inch and displays a positive number if the pressure is greater than 13 pounds per square inch.

1. The table below shows the pressure reading of five different footballs. Determine which footballs are within regulation pressure.

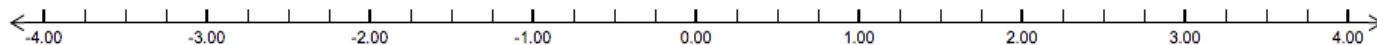
Pressure Reading	Regulation?
0.4	
-0.4	
0.25	
-1.5	
2	
-0.5	
0.5	

2. List several different values the gauge could read for a properly inflated NFL football. List as many as you can.

3. Graph the values you listed from problem two on the number line below:



4. Consider your answers to problem two and your plotting on the number line in problem three. Generalize the region(s) on the number line that show properly inflated footballs. Graph the region(s) on the number line below. Where are the boundary points of the region(s)? Are the boundary points included in the region of properly inflated footballs?

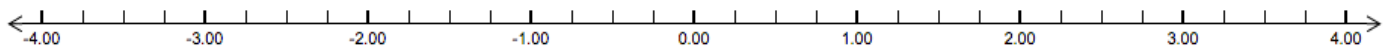


5. Use variables, symbols or even absolute value brackets to communicate symbolically the range of values of properly inflated footballs that would display on this gauge.

6. According to ESPN, during the 2014-15 AFC Championship Game, the New England Patriots were found to have 11 of their 12 game balls underinflated by up to two pounds per square inch. Using the same air pressure gauge from the previous problems, what could have been the reading on the gauge for the 11 under inflated balls? Give several possibilities. Use a number line if helpful.

7. Assume that two of the under inflated balls read -2.4 and - 1.8 on this pressure gauge. Which ball was less inflated (or more deflated)? Explain your reasoning.

8. Graph the region on the number line that gives the possible gauge readings for the 11 under inflated Patriot footballs. Also describe this region symbolically.



9. One theory on “Deflate-gate” is that a change in temperature may have decreased the inflation (the air pressure in the football) below NFL specifications. Before the game the Patriots may have had their footballs checked inside, thus at room temperature. Each football could have been inflated anywhere from 12.5 to 13.5 pounds per square inch at that time. Air pressure is proportional with air temperature. The temperature during the game was about 49 degrees. According to a Boston College physics professor, a 20-degree drop in temperature could account for a 1-pound per square inch drop of pressure in a football. A 40-degree drop in temperature could account for a 2-pound per square inch drop in pressure. Could the change of temperature (going from inside to outside) have caused the air pressure in the footballs to drop below 12.5 pounds per square inch? Could the temperature change have caused them to drop as much as two pounds per square inch from regulation? Show or explain your reasoning.

We credit http://ccsstoobox.agilemind.com/parcc/about_middle_3794.html “Cake Weighing” problem for the idea behind some of the elements of this activity.

Sources: <http://www.businessinsider.com/cold-weather-patriots-balls-deflate-2015-1>

http://espn.go.com/boston/nfl/story/_/id/12202450/nfl-says-new-england-patriots-had-inflated-football-afc-championship-game