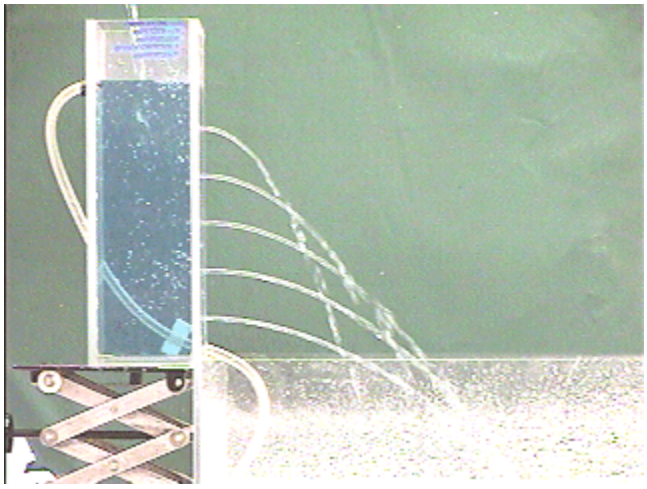
Answer #84

The answer is: 3 > 2 = 4 > 1 = 5, as seen in the photograph below and in an mpeg video by clicking your mouse on the photograph.



The kinetic energy of an exiting water stream is proportional to the potential energy of the water and therefore to the pressure of the water at that level. Therefore the horizontal velocity of the water in each stream, being proportional to the square root of the kinetic energy, is proportional to the square root of the distance below the surface of the water. (We can arbitrarily set the zero point of potential energy at the top of the container.) The time taken for water in the water stream to fall from the hole to the level of the bottom of the container is proportional to the square root of the height above the bottom of the container.

With the heights of the respective holes above the bottom of the container equal to:

1*d*, 2*d*, 3*d*, 4*d*, and 5*d*,

the time of fall for each jet respectively is proportional to the square root of:

1*d*, 2*d*, 3*d*, 4*d*, and 5*d*,

and the horizontal velocities of the respective jets proportional to the square root of:

5*d*, 4*d*, 3*d*, 2*d*, and 1*d*,

the ranges of the jets are equal to the velocity of efflux multiplied by the time of fall, so they are proportional to the square root of:

5*d*, 8*d*, 9*d*, 8*d*, and 5*d*,

as seen in the photograph. QED.

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For questions and comments regarding the *Question of the Week* contact Dr. Richard E. Berg by e-mail or using phone number or regular mail address given on the Lecture-Demonstration Home Page.