

Cubic and Cube Root Applications

Name: _____

1) The formula $d = \sqrt[3]{\frac{4w}{0.02847}}$ relates the average diameter d of a cultured pearl in millimeters to its weight w in carats.

a) Solve the equation for w .

b) To the nearest tenth of a carat, what is the weight of a cultured pearl with an average diameter of 10 mm?

2) A tetrahedron is a triangular pyramid with four congruent faces. The side length s in meters of a tetrahedron is given by the formula $s = (6V\sqrt{2})^{\frac{1}{3}}$, where V is the volume of the tetrahedron in the cubic meters. What is the volume of a tetrahedron with a side length of 32 m?

3) The height of a geostationary satellite (stays over the same equatorial spot on the Earth's surface) is given by the equation: $G * M = W^2(R + h)^3$.

a) Solve the equation for h .

b) Given: R (radius of Earth) = 6.27×10^6 , W (angular speed of Earth) = 7.2921×10^{-5} , M (mass of Earth) = 5.97×10^{24} , and G (gravitational constant) = 6.67259×10^{-11} , find the height the satellite orbits the Earth.

4) The Manning Equation is used to find the rate (in ft³/s) at which a liquid flows through an open channel. Manning's Equation is given by: $Q = \frac{1.49}{n} AR^{2/3} \sqrt{S}$, where Q is the flow rate of the liquid, n is the roughness of the material of the passage, A is the cross-sectional area of the channel, R is the ratio of the cross-sectional area to the perimeter of the channel, and S is the slope of the channel.



a) Solve Manning Equation for R.

b) Find the flow rate of a liquid if $n = 0.011$, $A = 6$, $R = 6/7$, and $S = 0.03$.

5) Compound interest is interest that is added back into the principle amount to earn more interest during the next compounding period. The formula for compound interest is $A = P \left(1 + \frac{r}{n}\right)^{nt}$, where A is the future amount of money in the account, P is the principal (or current) amount of money in the account, r is the rate, n is the compounding period, and t is the years the account lasts. Monthly compounding means $n = 12$.

a) Solve for the variable r.

b) What rate would you need for the account to go from \$4000 to \$6000 after 5 years compounded monthly. (convert rate from a decimal → percent)

6) The position of a water polo player is given by the equation $y = 2\sqrt{-2x - 20} + 6$ where the y-axis is the center of the pool in between the two goals. One goal is located at the point (-25, 0) and the other at (25, 0). The width of the pool is 15 meters.

a) What is the y-coordinate of the water polo player's position when they are 15 feet to the left of the center of the pool?

b) The water polo player can throw the ball 15 meters. Could they score a goal when the y-coord. of their position is -1?