

**YOU MAY USE A CALCULATOR.
MUST SHOW WORK, INCLUDE UNITS AND ROUND TO 3 DECIMAL PLACES WHERE NECESSARY.**

1. Lance is standing at the side of a road watching a cyclist go by. The distance 'd' in meters between Lance and the cyclist as a function of time 't' in seconds is given by $d = \sqrt{9 + 36t^2}$. Find the distance between Lance and the cyclist after 3 seconds.
2. A basketball has a volume of about 382 cubic inches. Find the radius of the basketball.
3. The distance to the horizon 'd' miles from a satellite orbiting 'h' miles above Earth can be approximated by $d = \sqrt{8000h + h^2}$. What is the distance to the horizon if a satellite is orbiting 150 miles above the Earth?
4. Cathy is building a cubic storage room. She wants the volume of the space to be 1728 cubic feet. What should the dimensions of the cube be?
5. Marcos has a rectangular box with dimensions 20 inches by 35 inches by 40 inches. He would like to replace it with a box in the shape of a cube but with the same volume. What should the length of a side of the cube be?
6. Mr. Ingram's physics class is experimenting with pendulums. The class learned the formula $T = 2\pi\sqrt{\frac{L}{g}}$ which relates the time T in seconds that it takes for a pendulum to swing back and forth based on gravity g (32 feet per second squared) and the length of the pendulum L in feet.
 - A) One group in the class made a 2-foot long pendulum. Use the formula to determine how long it will take for their pendulum to swing back and forth.
 - B) Another group decided they wanted to make a pendulum that took about 1.76 seconds to go back and forth. Approximately how long should their pendulum be?

7. The area of an isosceles triangle with two sides of equal length 'a' and the other side length 'c', has area given by the formula $A = \frac{c}{4} \sqrt{4a^2 - c^2}$.

A) Find the area of an isosceles triangle with two sides of length 6 inches and the other side length 7 inches.

B) If the area of an isosceles triangle is 12 square inches and the 3rd side length is 6 inches, find the other two equal side lengths.

**YOU MAY NOT USE A CALCULATOR FOR THIS SECTION.
MAKE SURE ALL ANSWERS ARE SIMPLIFIED COMPLETELY!!**

8. The dimensions of a prism are $10x^4y^4$ inches, $\frac{1}{7}x^4y^3$ inches and $7x^{-4}y^2$ inches. Find the volume and give the units for the answer.

9. The dimensions of a prism are $8x^5y^{-3}$ inches, $\frac{1}{2}x^6y^{-5}$ inches and $3x^{-6}y^3$ inches. Find the volume and give the units for the answer. Simplify completely.

10. Find the area and the perimeter of a rectangle with sides of $3x + \sqrt{3}$ and $2x + \sqrt{2}$.

11. Given a rectangle with an area of $6x^6y^4$ and a width of $2x^4y^3$ find the length.

12. The velocity V of an object in meters per second can be defined as $v = \sqrt{\frac{2K}{m}}$, where m is the mass of an object and K is the kinetic energy.

A) Find the velocity of an object with a mass of 11 grams and a kinetic energy of 550.

B) Find the kinetic energy of an object with velocity of 8 meters per second and a mass of 5 grams.

C) Solve the given formula for K in terms of v and m :

Solve the given formula for m in terms of v and K :

13. Rearrange the formula as directed: $T = 2\pi\sqrt{\frac{L}{g}}$

Solve for L in terms of T and g :

Solve for g in terms of T and L :

14. A spherical balloon is being inflated faster and faster. The volume of the balloon as a function of time is $9\pi t^2$. What is the radius of the balloon as a function of time?

15. The formula $r = 2\sqrt{5L}$ is used by police to estimate the speed ' r ' in miles per hour of a car if the length ' L ' of the car's skid mark is measured in feet.

A) Estimate the speed of a car that leaves a skid mark 300 feet long.

B) Estimate the skid mark length if the car is travelling at 50 miles per hour.