1) **CONSTRUCTION** The minimum depth d in inches of a beam required to support a load of s pounds is given by the formula $d = \sqrt{\frac{sl}{576w}}$, where l is the length of the beam in feet and w is the width in feet. Find the load that can be supported by a board that is 25 feet long, 2 feet wide, and 5 inches deep.

$d = 5$, $s = ?$, $l = 25$, $w = 2$

$5 = \sqrt{\frac{s(25)}{576(2)}}$ → $5 = \sqrt{\frac{25s}{1152}}$ → $(5)^2 = \left(\sqrt{\frac{25s}{1152}}\right)^2$ → $(1152)25 = \frac{25s}{1152}(1152)$ → $\frac{28,800}{25} = \frac{25s}{25}$

$s = 1152$ lbs

2) **AEROSPACE ENGINEERING** The radius r of the orbit of a satellite is given by $r = \sqrt[3]{\frac{GMt^2}{4\pi^2}}$, where G is the universal gravitational constant, M is the mass of the central object, and t is the time it takes the satellite to complete on orbit. Solve this formula for t. * Leave π as a symbol until end!

$r = \sqrt[3]{\frac{GMt^2}{4\pi^2}}$ → $(r)^3 = \left(\sqrt[3]{\frac{GMt^2}{4\pi^2}}\right)^3$ → $(4\pi^2)r^3 = \frac{GMt^2}{4\pi^2}(4\pi^2)$ → $\frac{4r^3\pi^2}{GM} = \frac{GMt^2}{GM}$ → $\frac{4r^3\pi^2}{GM} = t^2$ → $\sqrt{\frac{4r^3\pi^2}{GM}} = \sqrt{t^2}$ → $t = \sqrt{\frac{4r^3\pi^2}{GM}}$

3) **PHYSICS** When an object is dropped from the top of a 50-foot tall building, the object will be h feet above the ground after t seconds, where $\frac{\sqrt{50-h}}{4} = t$. How far above the ground will the object be after 1 second?

$h = ?$, $t = 1$

$(4)1 = \frac{\sqrt{50-h}}{4}(4)$ → $4 = \sqrt{50-h}$ → $(4)^2 = (\sqrt{50-h})^2$ → $16 = 50-h$ → $-50 \quad -50$ → $-34 = -h$

$h = 34$ ft

4) **HEALTH** A ponderal index p is a measure of a person's body based on height h in meters and mass m in kilograms. One such formula is $p = \frac{\sqrt[3]{m}}{h}$. A 70-kilogram person who is 1.8 meters tall has a ponderal index of about 2.29. How much weight could such a person gain and still have an index of at most 2.5?

$p \leq 2.5$, $m = 70+m$, $h = 1.8$

$(1.8)2.5 \geq \frac{\sqrt[3]{70+m}}{1.8}(1.8)$

$4.5 \geq \sqrt[3]{70+m}$

$(4.5)^3 \geq (\sqrt[3]{70+m})^3$

$91.125 \geq 70+m$

$21.125 \geq m$ → $m \leq 21.125$ kg

5) Explain how you know that $\sqrt{x+2} + \sqrt{2x-3} = -1$ has no real solution without trying to solve it.

The sum of two sq. roots can not equal a negative #!

6) **GEOMETRY** The surface area S of a cone can be found by using $S = \pi r\sqrt{r^2+h^2}$, where r is the radius of the base and h is the height of the cone. Find the height of the cone if the radius is 5cm and the surface area is 225cm^2. Keep π symbol until end!

$S = 225$, $r = 5$, $h = ?$

$225 = \pi(5)\sqrt{(5)^2+h^2}$

$\frac{225}{5\pi} = \frac{5\pi\sqrt{25+h^2}}{5\pi}$

$\frac{45}{\pi} = \sqrt{25+h^2}$ → $\left(\frac{45}{\pi}\right)^2 = (\sqrt{25+h^2})^2$ → $\frac{2025}{\pi^2} = 25+h^2$ → $\frac{2025}{\pi^2} - 25 = h^2$ → $\sqrt{\frac{2025}{\pi^2}-25} = \sqrt{h^2}$

$h = \sqrt{\frac{2025}{\pi^2}-25}$

$h = 13.4$ cm

7) Explain why you do not have to square each side to solve $2x + 1 = \sqrt{3}$.

This is not a radical equation, variable is not in the radicand (it is not under radical).

8) **TECHNOLOGY** Computer chips are made from the element silicon, which is found in sand. Suppose a company that manufactures computer chips uses the formula $C = 10n^{\frac{2}{3}} + 1500$ to estimate the cost C in dollars of producing n chips. Rewrite this equation in radical form, then determine how many chips the company could make for $10,000.

Part 1

$C = 10\sqrt[3]{n^2} + 1500$

* the "n" is the only thing that is raised to 2/3!

Part 2

$10000 = 10\sqrt[3]{n^2} + 1500$

$-1500 \quad -1500$

$\frac{8500}{10} = \frac{10\sqrt[3]{n^2}}{10}$

$850 = \sqrt[3]{n^2}$

$(850)^3 = (\sqrt[3]{n^2})^3$

$614,125,000 = n^2$

$\sqrt{614125000} = \sqrt{n^2}$

$n = 24,781.55$ → 24,781 chips