

Inverses in Context

The population of a town can be modeled by

where t = # years after 1998

$$P = \frac{16,500t^{0.15}}{16,500}$$

Re-write the equation in terms of t .

$$\left(\frac{P}{16,500} \right)^{\frac{1}{0.15}} = \left(t^{0.15} \right)^{\frac{1}{0.15}}$$

$$t = \left(\frac{P}{16,500} \right)^{\frac{1}{0.15}}$$

BOAT SPEED The maximum hull speed v (in knots) of a boat with a displacement hull can be approximated by

$$v = 1.34\sqrt{\ell}$$

where ℓ is the length (in feet) of the boat's waterline. Find the inverse of the model. Then find the waterline length needed to achieve a maximum speed of 7.5 knots.



$$\frac{v}{1.34} = \frac{1.34\sqrt{\ell}}{1.34}$$

$$\left(\frac{v}{1.34} \right)^2 = \left(\sqrt{\ell} \right)^2$$

$$\Rightarrow \ell = \left(\frac{v}{1.34} \right)^2$$

if $v = 7.5$

$$\ell = \left(\frac{7.5}{1.34} \right)^2$$

$$\ell = 31.3 \text{ ft.}$$

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50. **BIOLOGY** The body surface area A (in square meters) of a person with a mass of 60 kilograms can be approximated by the model

$$A = 0.2195h^{0.3964}$$

where h is the person's height (in centimeters). Find the inverse of the model. Then estimate the height of a 60 kilogram person who has a body surface area of 1.6 square meters.

$$A = 0.2195 h^{0.3964}$$
$$\frac{A}{0.2195} = h^{0.3964}$$

$$\left(\frac{A}{0.2195}\right)^{\frac{1}{0.3964}} = h$$

If $A = 1.6 \dots$

$$\left(\frac{1.6}{0.2195}\right)^{\frac{1}{0.3964}} = h = 150_{\text{cm}}$$