Hydraulic Radius

Nomograph to calculate hydraulic radius in unity-
radius pipe as a percentage of total capacity.

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Instructions:

Draw a line from the "Start" through fluid height (as a percentage
of maximum) to determine R_h per unit radius.

Start →

Fluid height (% of total)

$\frac{R_h}{r}$

Theory:

Hydraulic radius of a circular pipe is given by the formula:

$$R_h = \frac{A}{P}$$

where R_h is the hydraulic radius, A is the cross-sectional area of
the flow and P is the "wetted" perimeter.

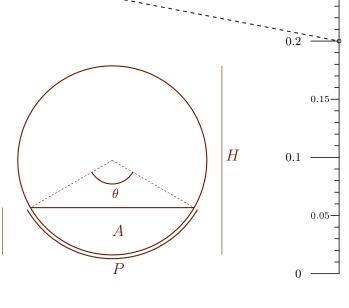The cross-sectional area of flow is given by the formula:

$$A = \frac{\theta - sin(\theta)}{2}$$

and "wetted" perimeter is

$$P = \theta.$$

Finally, θ (in radians) is determined by the following formula:

$$\theta = 2 \times \arccos(1 - 2 \times \frac{h}{H}).$$