Solution to Problem 148A:

To model the aerodynamics of the boundary layers and other viscous effects in the flow of an automobile traveling at $60 km/hr$ in a wind tunnel using a one third scale model, it is necessary to run at the same Reynolds number, $Re = UL/\nu$, where U is the velocity and L is the size of the model autommobile. Assuming that air is the fluid in both cases with the same kinematic viscosity, ν, the wind tunnel velocity needs to be $60 \times 3 = 180 km/hr$.

However, in a water tunnel in which the kinematic viscosity is half that of air, maintaining the appropriate Reynolds number would require a water velocity of $1/2 \times 60 \times 3 \ = \ 90 km/hr$.

Note that both of these modeling options are very difficult if not impossible; a wind tunnel flow of $180 km/hr$ combined with a one third scale model would be very difficult and a water tunnel at $90 km/hr$ would be virtually impossible at one third scale.