$$y'\left(t+\frac{h}{2}\right) \approx \frac{y(t+h)-y(t)}{h}$$

Using this approximation in the initial value problem leads to

$$y(t+h) \approx y(t) + hf\left(t+\frac{h}{2}, y\left(t+\frac{h}{2}\right)\right)$$

Moreover, the half-step $y(t+h/2)$ is approximated by

$$y\left(t+\frac{h}{2}\right) \approx y(t) + \frac{h}{2}y'(t) = y(t) + \frac{h}{2}f(t, y(t))$$

which finally leads to an iteration of the form

$$y_{n+1} = y_n + hf\left(t_n + \frac{h}{2}, y_n + \frac{h}{2}f(t_n, y_n)\right)$$