Pushing Off…

Fred (75 kg) and Jane (50 kg) are at rest on skates facing each other. Jane then pushes Fred w/ a constant force F = 45 N for a time Δt=3 seconds. Who will be moving fastest at the end of the push?

A) Fred B) Same C) Jane

Fred

F = +45 N (positive direct.)

I = +45 (3) N-s = 135 N-s

$I = \Delta p$

$= mv_f - mv_i$

$I/m = v_f - v_i$

v_f = 135 N-s / 75 kg

= 1.8 m/s

Jane

F = -45 N Newton's 3rd law

I = -45 (3) N-s = -135 N-s

$I = \Delta p$

$= mv_f - mv_i$

$I/m = v_f - v_i$

v_f = -135 N-s / 50 kg

= -2.7 m/s

Note: $P_{fred} + P_{jane} = (1.8)\,75 + (-2.7)\,50 = 0$!