QUESTION:

A 3kg box is pushed with a force of 15 N across a friction less floor for 3 second. What is the power exerted on the box?

SOLUTION:

Power is

$$P = \frac{W}{t}$$

Where work $W = F \cdot s$
As floor is frictionless:
$$F = m \cdot a$$
$$a = \frac{F}{m}$$
$$s = \frac{at^2}{2} = \frac{Ft^2}{2m}$$
Hence
$$W = F \cdot s$$
$$W = \frac{F^2 t^2}{2m}$$
And power
$$P = \frac{W}{t} = \frac{\frac{F^2 t^2}{2m}}{t} = \frac{F^2 t}{2m}$$
$$P = \frac{15^2 \cdot 3}{2 \cdot 3} = 112.5 \ W$$

Another way:
According to the work-energy theorem, in this case
$$W = \frac{m\upsilon^2}{2}$$
$$\upsilon = at$$
$$F = ma$$
$$a = \frac{F}{m}$$
$$\upsilon = \frac{Ft}{m}, \text{ hence}$$
$$W = \frac{m\upsilon^2}{2} = \frac{m}{2}\left(\frac{Ft}{m}\right)^2 = \frac{mF^2 t^2}{2m^2} = \frac{F^2 t^2}{2m}$$
And power
$$P = \frac{W}{t} = \frac{\frac{F^2 t^2}{2m}}{t} = \frac{F^2 t}{2m}$$
$$P = \frac{15^2 \cdot 3}{2 \cdot 3} = 112.5 \ W$$