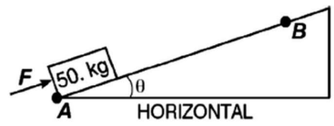
8) The diagram below shows a 50.-kilogram crate on a frictionless plane at angle θ to the horizontal. The crate is pushed at constant speed up the incline from point *A* to point *B* by force *F*.



If angle θ were increased, what would be the effect on the magnitude of force *F* and the total work *W* done on the crate as it is moved from *A* to *B*?

A) *W* would remain the same and the magnitude of *F* would decrease.
B) *W* would increase and the magnitude of *F* would decrease.
C) *W* would increase and the magnitude of *F* would increase.
D) *W* would remain the same and the magnitude of *F* would increase.

$W = F_{\parallel} d$

$\uparrow\theta, \uparrow F_{\parallel} \Rightarrow W\uparrow$

9) The graph below represents the relationship between the work done by a student running up a flight of stairs and the time of ascent.

$\uparrow$ SLOPE $= \frac{\Delta Y}{\Delta X} = \frac{W}{t} = P$

MEASURED IN WATTS

The slope of the given graph would have units of

A) watts B) newtons C) seconds D) joules

10) Two weightlifters, one 1.5 meters tall and one 2.0 meters tall, raise identical 50.-kilogram masses above their heads. Compared to the work done by the weightlifter who is 1.5 meters tall, the work done by the weightlifter who is 2.0 meters tall is

A) the same B) greater C) less

$W = Fd$ ← GREATER FOR 2.0 m LIFTER; ↑ SAME FOR BOTH ($F = F_g = mg$) ↓ SAME

11) A 680-newton student runs up a flight of stairs 3.5 meters high in 11.4 seconds. The student takes 8.5 seconds to run up the same flight of stairs during a second trial.

A) $F = 680\,N$, $d = 3.5\,m$, $t = 11.4\,s$, $W = ?$

$W = Fd$

$W = (680\,N)(3.5\,m)$

$W = 2380\,J \Rightarrow 2400\,J$

(a) Determine the work done by the 680-newton student in climbing the stairs. [*Show all calculations, including the equation and substitution with units.*]

(b) Determine the power developed by the student during the 11.4-second climb. [*Show all calculations, including the equation and substitution with units.*]

B) $t = 11.4\,s$, $P = ?$

$P = \frac{W}{t} = \frac{2380\,J}{11.4\,s} = 209\,W$

(c) Using one or more complete sentences, compare the power developed by the student climbing the stairs in 11.4 seconds to the power developed during the 8.5-second trial.

C) When a student runs up in 8.5 s the power developed is greater because they do the same amount of work, but in less time.

$P = \frac{W}{t}$ ← SAME, ↓ t ⇒ ↑ P