Power $= \frac{Fs}{t} = Fv$

Measured in Watts

Ex 9C Q 1 to 8 and 12 to 16

(1) (i) $PE = mgh$

$= 3.5 \times 10 \times 9$

$= 315$ J

(ii) $315 \times 120 = 37800$ J

(iii) Power $= 37800 \div 3600$

$= 10.5$ Watts

number of seconds in one hour

(2) (i) Work done $= 120(10)(2)$

$= 2400$ J

(ii) Power $= 2400/2$

$= 1200$ W

(iii) First bit : $(120 \times 10 \times 0.8)/0.5$

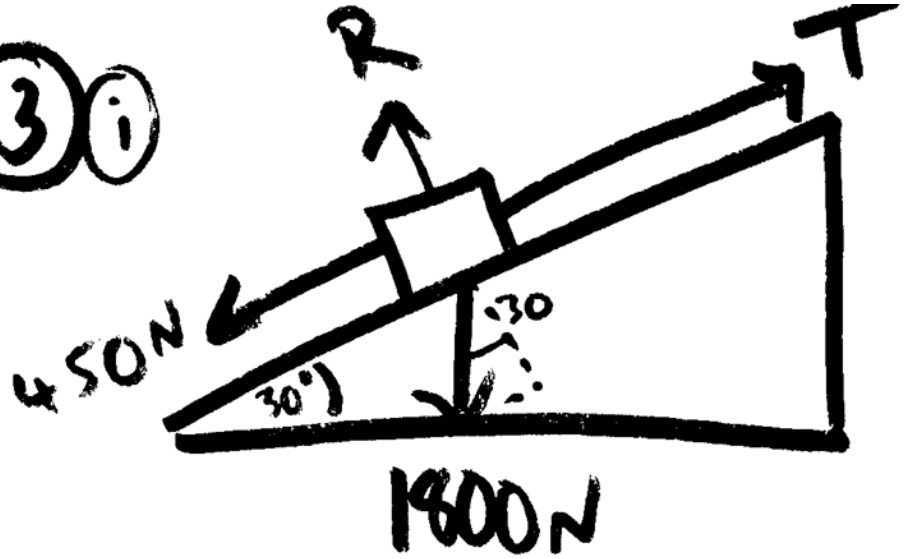
$= 1920$ W

2nd bit : 0 W

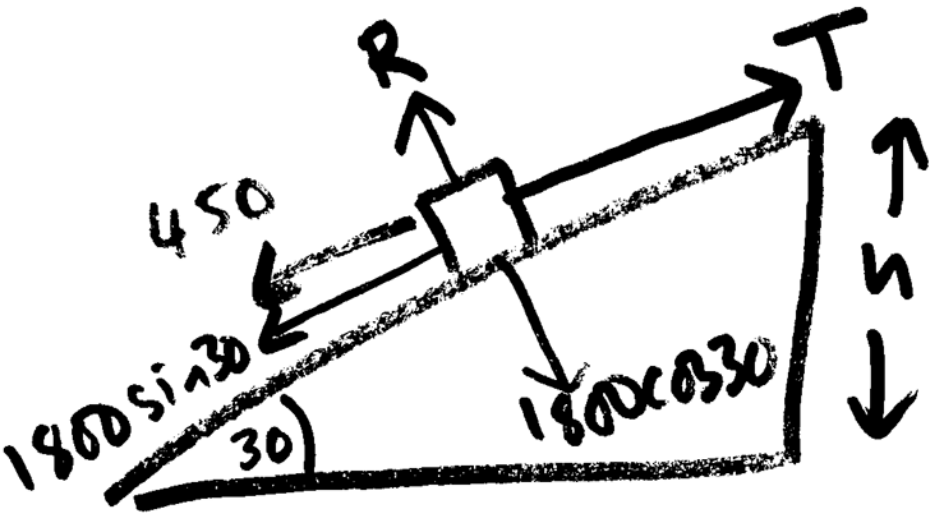
3rd bit : $(120 \times 10 \times 1.2)/0.5$

$= 2880$ W

(3) (i)



1800N



$s = ?$
$u = 1.2$
$v = 1.2$
$a = 0$
$t = 30$

$s = ut + \frac{1}{2}at^2$

$= 36m$

So $h = 36\sin 30$

$= 18m$

$PE = 180(10)18$

$= \underline{32400\ J}$

(3)(ii) $Wd_F = 450 \times 36$

$= 16200$ J

(iii) $T = 450 + 1800\sin 30$

$= 1350$

$WD_T = 1350 \times 36$

$= 48600$

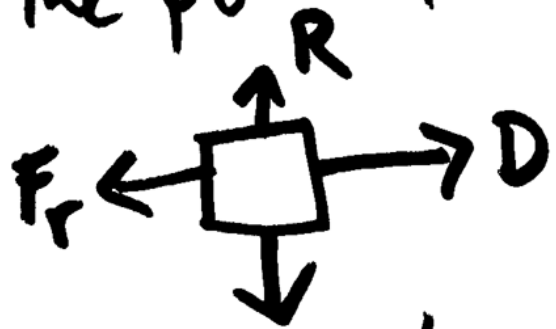
Power $= 48600/30$

$= \underline{1620\ W}$

(iv) 1350 N

(v) The power of the winch.

(4)(i)



$a = 0$

$v = 33$

Power $= 23200$ W

(ii) Mass is not needed

Power $= DV$

$D = 703$ N (3SF)

So $F_r = 703$ N (3SF) as well

(5) 

$P = FV$

$26500 = F(46)$

$F = \underline{576\,N}$ (3SF)

(6) $5\,cms^{-1} = \underline{0.05\,ms^{-1}}$

500000

$a = 0$ so $T = 500000N$

$Power = Fs$

$= 500000 \times 0.05$

$= \underline{250000W}$

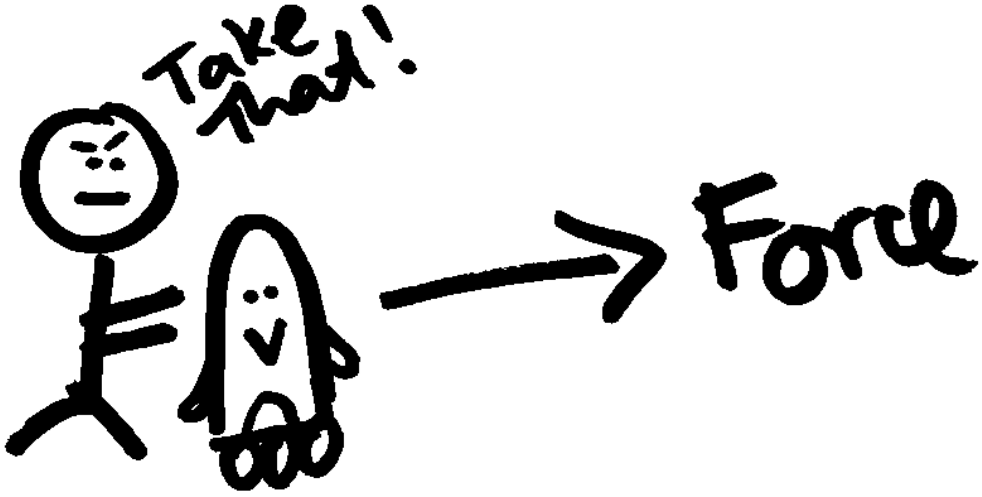
(7) (i) $70(8) = 560W$

(ii) $Power = Wd/t$

$560 = Wd/300$

$Wd = \underline{168000\,J}$

steady speed so Force of cyclist = Resistance force



(8) (i) $s = 2$, $u = 0$, $v = 3$, $a = ?$, $t = 1.5$

Using $v = u + at$

$a = 2$

Using $s = ut + \frac{1}{2}at^2$

$a = 1.78$

so a can't be constant.

(ii) At start: KE = 0 PE = 0

+ WD

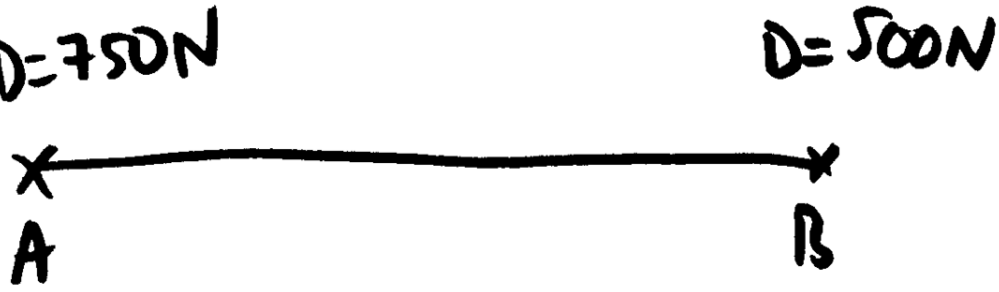
At end: $KE = \frac{1}{2}(0.015)3^2$ PE = $0.015(a)2$

$WD = 0.3675$

Power $= 0.3675 / 1.5$

$= 0.245$ W

(12)



Power = 15000W

At A $15000 = 750V$

$V = 20 ms^{-1}$

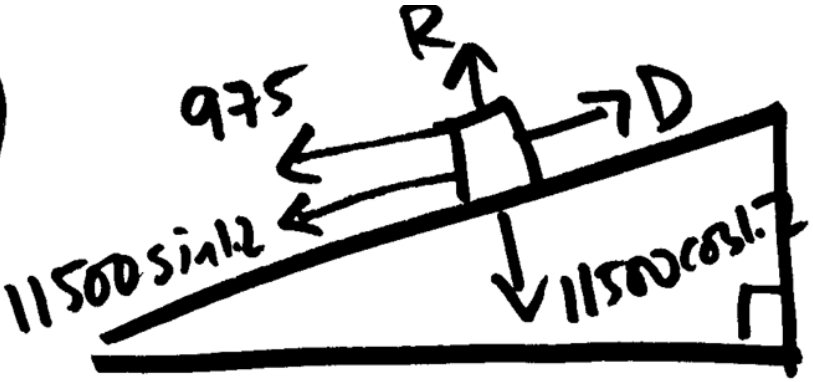
At B $15000 = 500V$

$V = 30$

Change in KE $= \frac{1}{2}(1000)30^2 - \frac{1}{2}(1000)20^2$

$= 250000$ J

(13)



Power = Dv

$35000 = D(16)$

$D = 2187.5\ N$

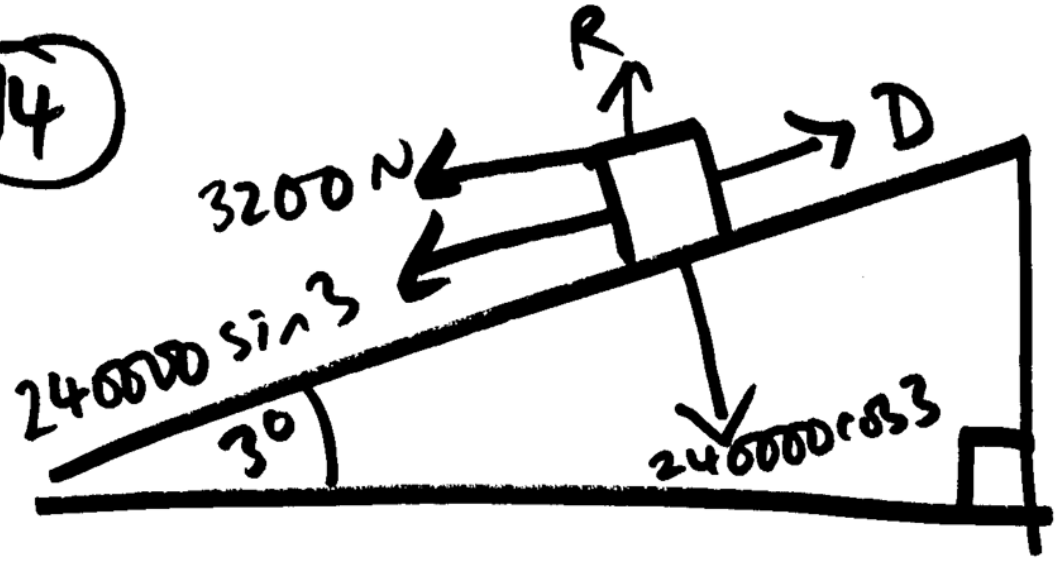
F = ma

$21875 - 975 - 11500\sin 1.2 = 1150a$

$a = 0.845\ ms^{-2}$

(3SF)

(14)



(i) $D - 3200 - 24000\sin 3 = 24000(0.2)$

$D = 20560.6295$

$P = 20560.6295(25)$

$= \underline{514000\ W}$ (3SF)

(ii) $P = Dv$

$500000 = Dv$

$v = \dfrac{500000}{D}$

$= \underline{31.7\ ms^{-1}}$

steady speed means $a = 0$ and

$D = 24000\sin 3 + 3200$

(15) (i) $PE = 160(10)20$

$= 32000\ J$

(ii) $KE = \frac{1}{2}(160)(1.25)^2$

$= 125\ J$

(iii) At start $KE = 0$ $PE = 0$

+ Wd by winding drum

− Wd by resistance

At end $32000 + 125$

so $Wd - 20000 = 32125$

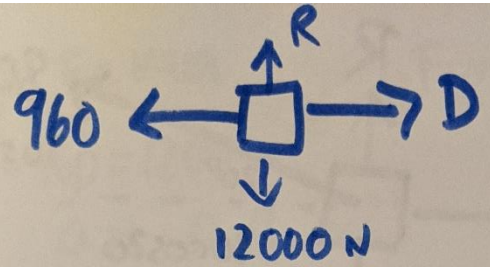
$Wd = 52125$

Power = Wd / time

$= 52125 / 41.7$

$= 1250\ W$

(16) (i)



Power = Fv

$17280 = D(12)$

$D = 1440$

$F = ma$

$1440 - 960 = 1200a$

$a = 0.4\ ms^{-2}$

(ii) With constant speed $D = 960$

Power = Dv

$17280 = 960v$

$v = 18\ ms^{-1}$ As required.

(iii) ~~$F = ma \quad 960 = 1200a \quad a = 0.8$~~

~~$s = ut + \frac{1}{2}at^2 = 18(\quad) + \frac{1}{2}(\quad)(\quad)^2$~~

(16) (iii) $F = ma$ ← For BC

$-960 = 1200a$

$a = -0.8\ ms^{-2}$

For BC acceleration is constant

$s = ?$
$u = 18$
$v = 0$
$a = -0.8$
$t = ?$

$v = u + at$

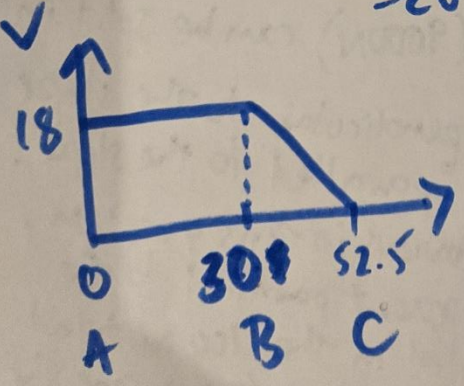
$0 = 18 + (-0.8)t$

$t = 22.5$ seconds

$s = ut + \frac{1}{2}at^2$

$= 18(22.5) + \frac{1}{2}(-0.8)(22.5)^2$

$= 202.5\ m$



Total distance

$= 30 \times 18 + 202.5$

$= 742.5\ m$