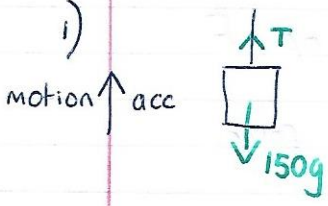
$Rf = ma$ Basic Examples 2 : Answers

1)



a) $Rf = ma$

$T - 150g = 150(0.3)$

$T = 45 + 1470$

$T = 1515\ N$

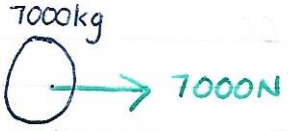
b) Constant speed means no acc. Forces up and down are equal.

$T = 150g\ N$

$T = 1470N$

2)

a)



← motion

(i) $Rf = ma$ in direction of braking force

$7000 = 7000a$

$1 m/s^2 = a$ which is the retardation.

(ii) $u = 50$

$v = 0$

$s = s$

$a = -1$

← + sign convention for all vectors

$v^2 = u^2 + 2as$

$0^2 = 50^2 + 2(-1)s$

$2s = 2500$

$s = +1250\ m$ ie 1250m to the left in the diagram.

b)

(i) ←

$u = 50$

$v = 0$

$a = a$

$s = 750$

$v^2 = u^2 + 2as$

$0 = 2500 + 2(750)a$

$\frac{-2500}{1500} = a$

$-\frac{5}{3} = -1.\dot{6}\ m/s^2 = a$

ie Retardation $= 1.\dot{6} m/s^2$

ii) $RF = ma$ with parachute

$F = 7200\left(\frac{5}{3}\right)$ in direction of F

$F = 12000\ N$ is size of drag force.

3) a) $u = 9 m/s$
$s = 75m$
$v = 0$
$a = a$

$$V^2 = u^2 + 2as$$
$$0^2 = 9^2 + 2(75)a$$

$$\frac{-81}{150} = acc$$

$0.54 m/s^2$ = retardation

b) $v = u + at$
$0 = 9 - \frac{81}{150}t$

$\frac{81}{150}t = 9$

$t = \frac{9 \times 150}{81}$

$t = 16.67$ secs.

c) ← motion

$\rightarrow a = 0.54 m/s^2$

$RF = Ma$
$F = 80(0.54)$
$F = 43.2\ N$ which is the frictional force

Now the body is moving, ∴ limiting friction:

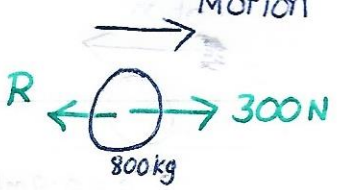
ie $F = \mu R$ ↕ $R = 80g\ N$

$43.2 = \mu(80g)$

$\frac{43.2}{80g} = \mu$

$0.055 = \mu$

4)



R = Resistance

a) $Rf = ma$
300

$u = 0$ (AT REST)
$v = 15$
$t = 50$
$a = a$

$v = u + at$
$15 = 0 + 50a$
$\frac{15}{50} = a$
$\frac{3}{10} = a$
$0.3\ m/s^2 = acc$

b) $Rf = ma$
$300 - R = 800(0.3)$

$300 - 240 = R$
$60N = Resistive\ force$

c) For last part of journey

$S = 500 -$ distance covered in 1st part

First part of journey

$s = \frac{(u+v)}{2} t$
$s = \frac{(0+15)}{2} 50$
$s = 375\ m$

∴ Last part $s = 500 - 375 = 125m$
$u = 15\ m/s$
$v = 0$
$a = a$

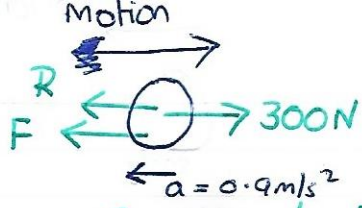
$v^2 = u^2 + 2as$
$0 = 225 + 2(125)a$
$-\frac{225}{250} = a$
$-0.9\ m/s^2 = a$

Now $\Sigma F = ma$

$60 + F = 800(0.9)$

$F = 720 - 60$

$F = 660\ N$



R original resistance
F braking force