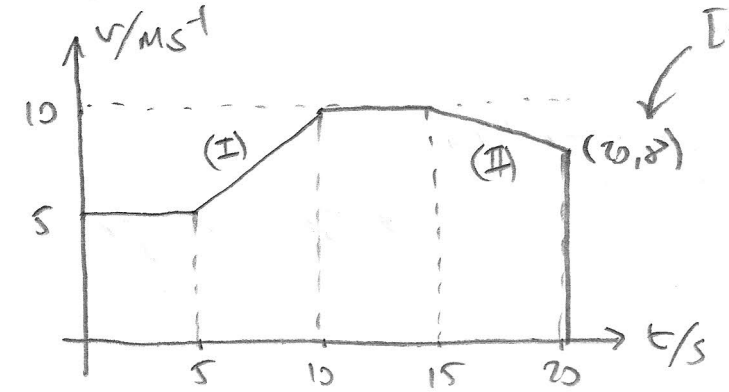
IGCSE PHYSICS – KNOW YOUR DEFINITIONS!

AR 14/1/20.

1/

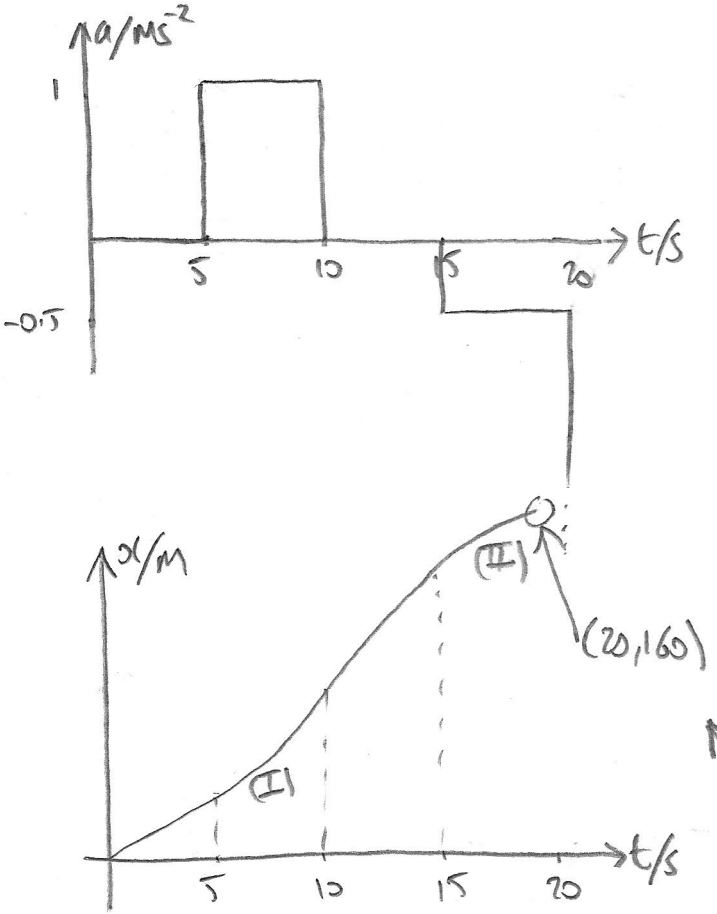


[change to 9 ms⁻¹]

Acceleration:

(I): $a = \frac{5\,ms^{-1}}{5s} = \boxed{1.0\ m/s^2}$

(II) $a = \frac{-2\,ms^{-1}}{5s} = \boxed{-0.4\ m/s^2}$



Total displacement is

$(5)(5) + \frac{1}{2}(5+10)(5)$

$+ (10)(5) + \frac{1}{2}(10+8)(5)$

$= \boxed{157.5\ m}$

[Better if last speed was $\boxed{9\ m/s}$, then

$x_{tot} = \boxed{160\ m}$

$a_{II} = -\frac{1}{5}\ ms^{-2} = -0.2\ m/s^2$]

(I), (II) are curved sections

The others are straight lines.

2/ (i) $W = Mg$

$W = 75\ kg \times 9.81\ N/kg$

$W = \boxed{736\ N}$

EARTH

(ii) $W = 75\ kg \times 3.72\ N/kg$

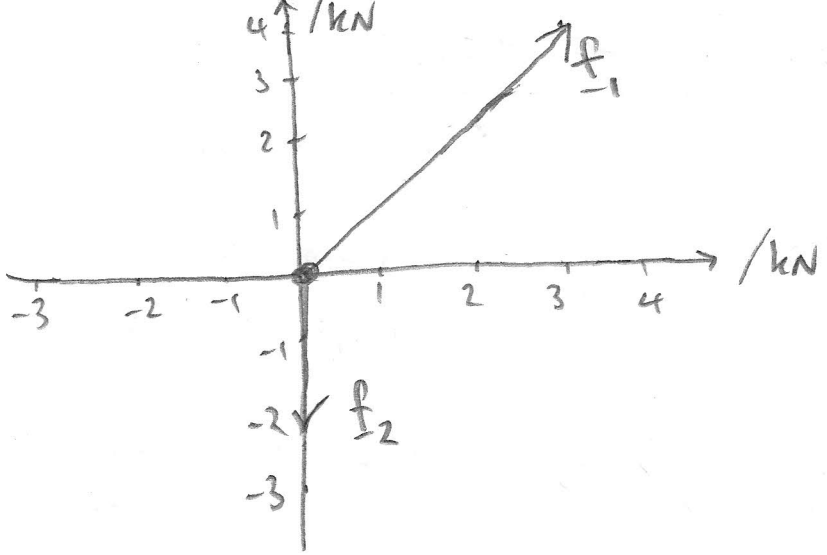
$W = \boxed{279\ N}$

MARS

3/ $1000\, g_J = 6664 \times 3.72$ $\therefore g_J = 6.664 \times 3.72\ N/kg$

$= \boxed{24.79\ N/kg}$

4/

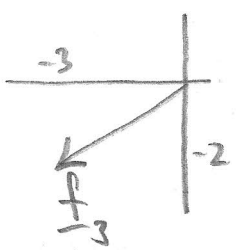


• Jedi knight

(i) if net force is $\begin{pmatrix}0\\0\end{pmatrix} = \begin{pmatrix}F_x\\F_y\end{pmatrix} + \begin{pmatrix}3\\4\end{pmatrix} + \begin{pmatrix}0\\-2\end{pmatrix}$

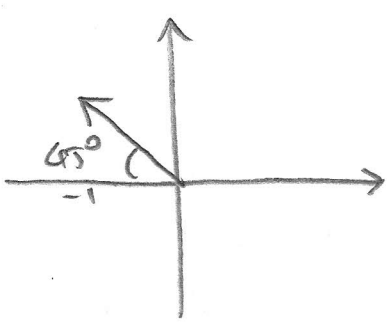
$\underline{f}_3 \quad \underline{f}_1 \quad \underline{f}_2$

$$\Rightarrow \begin{pmatrix}F_x\\F_y\end{pmatrix} = \begin{pmatrix}0\\2\end{pmatrix} - \begin{pmatrix}3\\4\end{pmatrix} = \begin{pmatrix}-3\\-2\end{pmatrix}$$



(ii) if $\underline{f}_3$ is $\begin{pmatrix}-4\\-1\end{pmatrix}$ and

$$80\begin{pmatrix}a_x\\a_y\end{pmatrix} = \begin{pmatrix}3\\4\end{pmatrix} + \begin{pmatrix}0\\-2\end{pmatrix} + \begin{pmatrix}-4\\-1\end{pmatrix} = \begin{pmatrix}-1\\1\end{pmatrix}$$



Net force is $\sqrt{2} = 1.41$ kN at a bearing of $\boxed{315°}$

if Jedi has a mass of 80kg, acceleration is $\boxed{17.7\ M/s^2}$

5/

Each spring stretches 10cm, for total stretch of 20cm.

∴ Since each spring experiences 40N of force:

$$40 = k \times 0.1$$

$$\boxed{400\,N/m = k}$$

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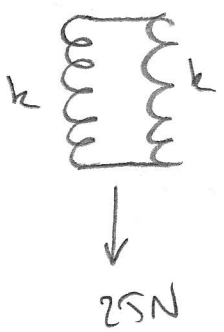

Each spring experiences a force of $\frac{25}{2}$ N

So $x = F/k = \frac{25/2}{50}$

$\therefore x = 0.25$ i.e. $\boxed{25\,cm}$

$k = 50\,N/M$

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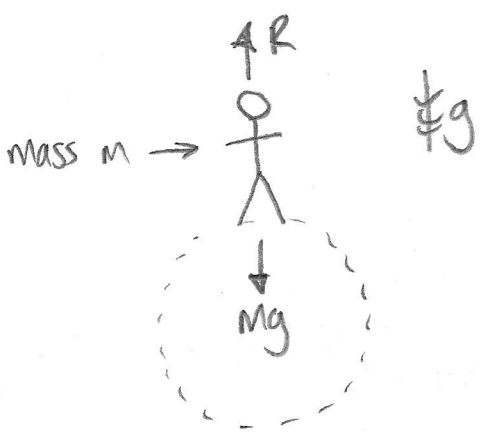
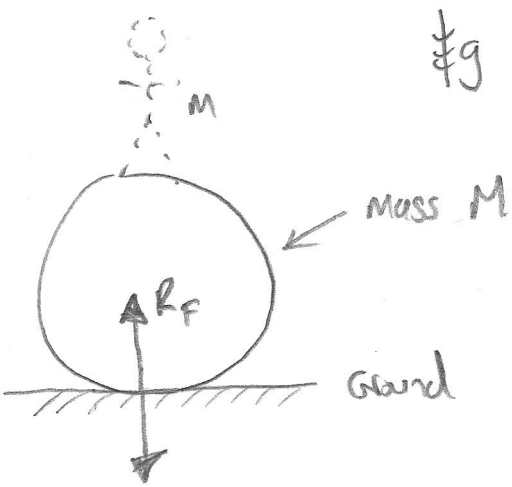


R is normal contact force

$\boxed{R = Mg}$ in eq.

NIII: The force of the gymnast on the ball is R = Mg downwards



$\boxed{R_F = (m+M)g}$ in eq.

R_F is the contact force of the ground on the ball.