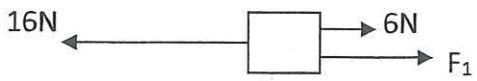
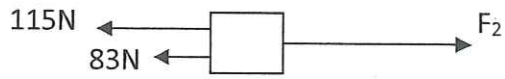
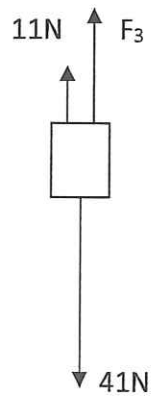
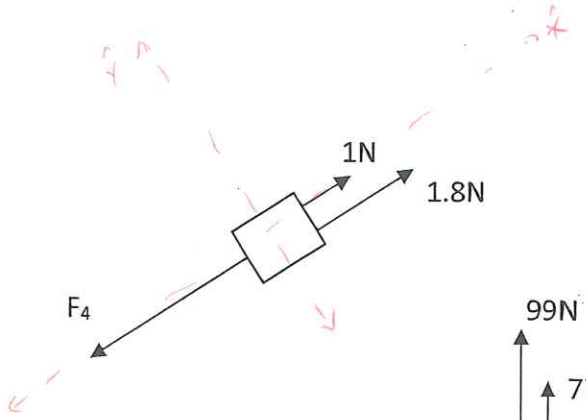
Introduction to Newtonian Dynamics

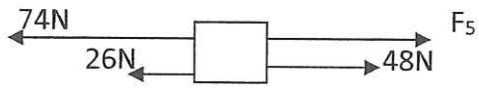
1. For each of the following the object is in equilibrium ($\vec{a}$=0). Find the unknown forces. Diagrams are not drawn to scale.

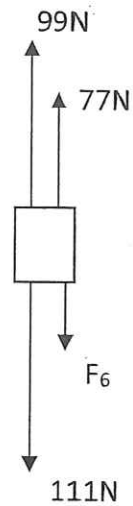


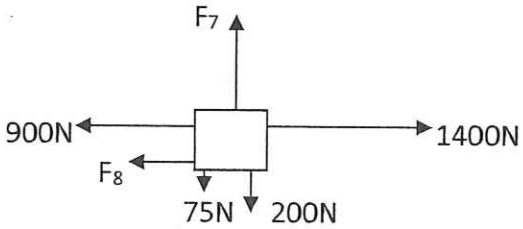


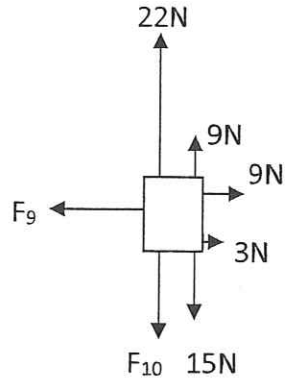










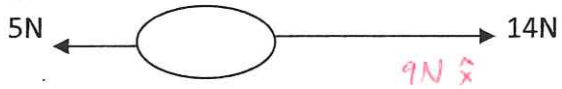


F_1	F_2	F_3	F_4	F_5	F_6	F_7	F_8	F_9	F_{10}
10N	198N	30N	3N (2.8N)	52N	65N	275N	500N	12N	16N
right	right	up	$\hat{x}$	right	down	up	left	left	down

$\vec{F}_{11}$ = 5.0N [37° below +x]

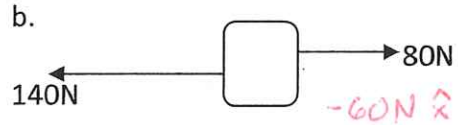
2. Find the **net force** ($\sum\vec{F}$) on each of the following. Be sure to state the direction!

a.



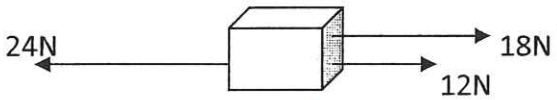
$9N\,\hat{x}$

b.



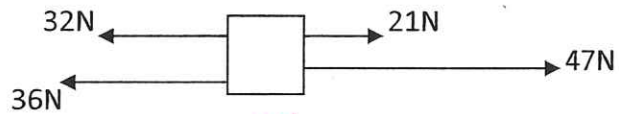
$-60N\,\hat{x}$

c.



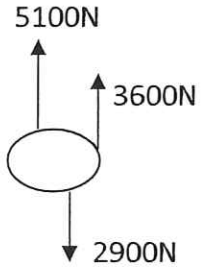
$6N\,\hat{x}$

d.



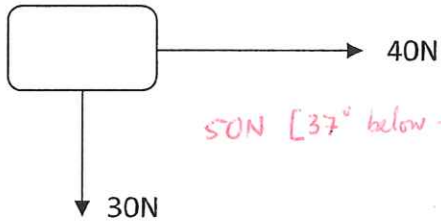
0N

e.



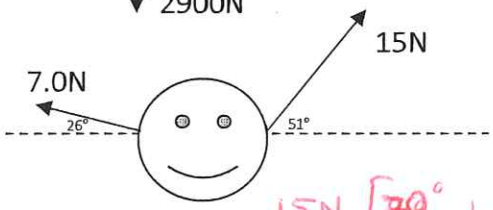
$5800N\,\hat{y}$

f.



50N [37° below +x]

g.

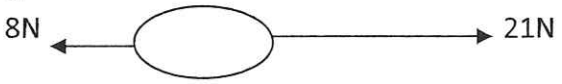


15N [78° above +x]

3. For each of the following objects the mass is 2.0kg. Find the acceleration.

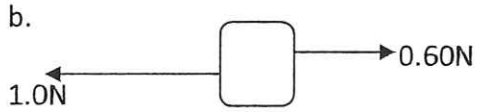
a.

$\vec{a} = 6.5\,m/s^2$ right

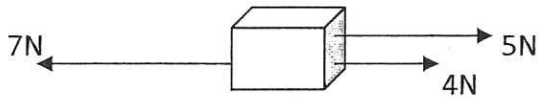


b.

$0.20\,m/s^2$ left



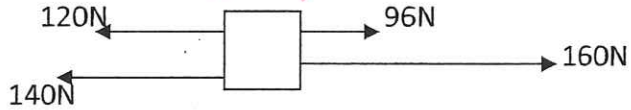
c.



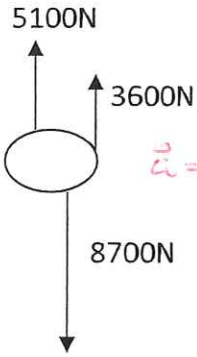
$1\,m/s^2$ right

d.

$2\,m/s^2$ right

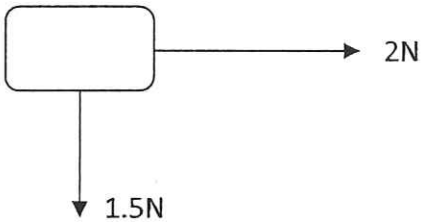


e.



$\vec{a} = 0\,m/s^2$

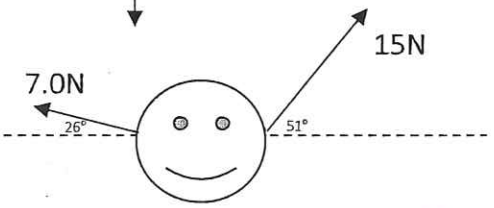
f.



$a = 1.25\,m/s^2$ [37° below +x]

$\vec{a} = 1.3\,m/s^2$ [37° below +x]

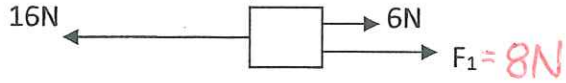
g.



$7.5\,m/s^2$ [78° above +x]

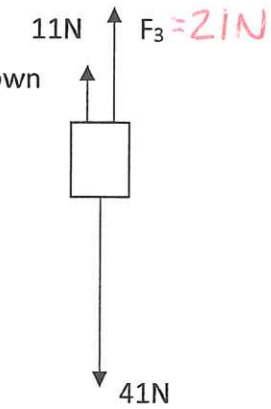
4. For each of the following find the missing force.

a. $\sum\vec{F}$=2N left

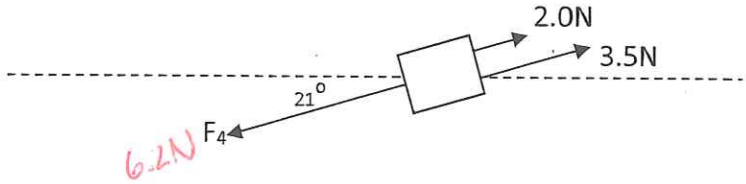


b. $\sum\vec{F}$=32N right

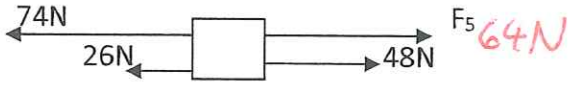
c. $\sum\vec{F}$=9N down



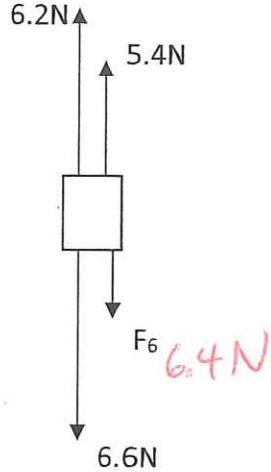
d. $\sum\vec{F}$= 0.70N [21° below –x]



e. $\sum\vec{F}$=12N **x**

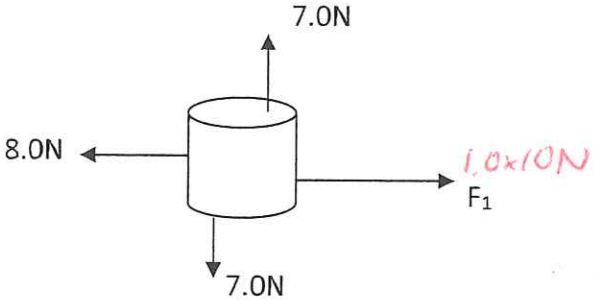


f. $\sum\vec{F}$= -1.4 N **y**

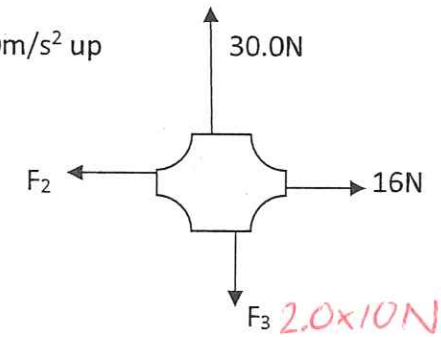


5. For each of the following find the missing force(s). Assume the mass is 5.0kg.

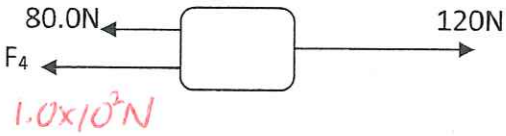
a. $\vec{a}$= 0.40m/s² right



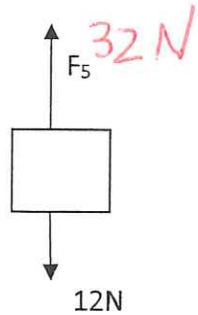
b. $\vec{a}$=2.0m/s² up



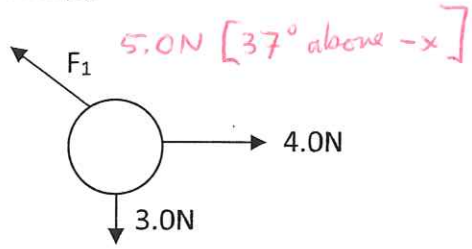
c. $\vec{a}$=-12m/s² $\hat{x}$

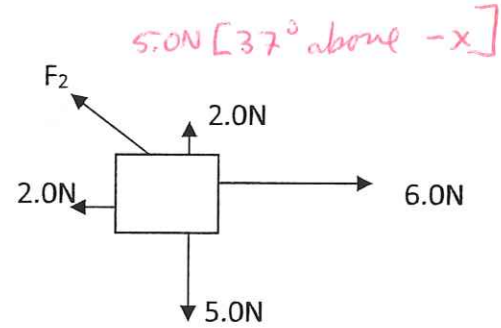


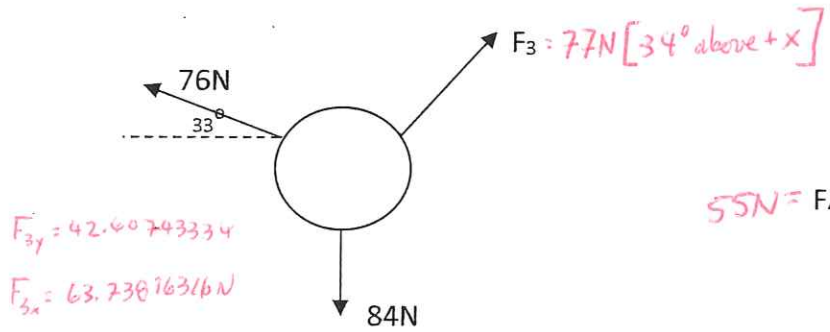
d. $\vec{a}$= 4.0m/s² $\hat{y}$

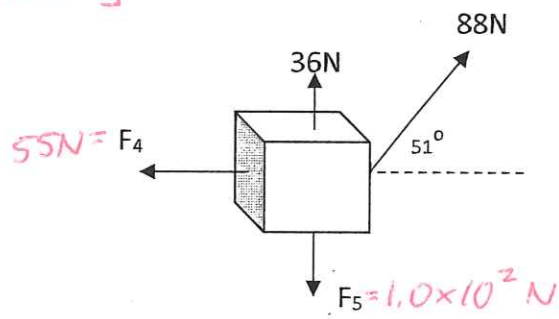


6. For the following assume the object is in equilibrium. State the magnitude ***and direction*** of the missing force(s).



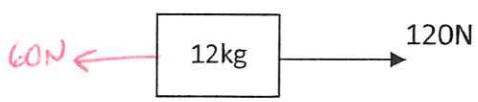




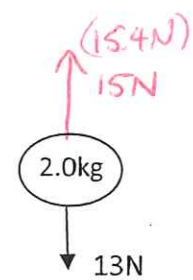


7. Find the SINGLE missing force and draw it in place.

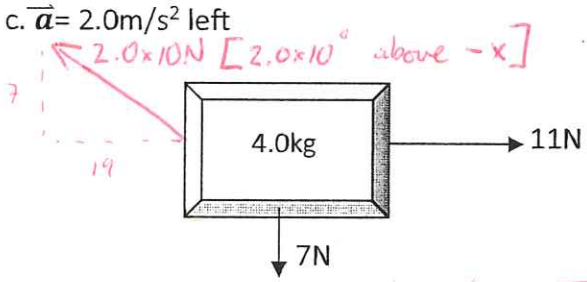
a. $\vec{a}$= 5.0m/s² right



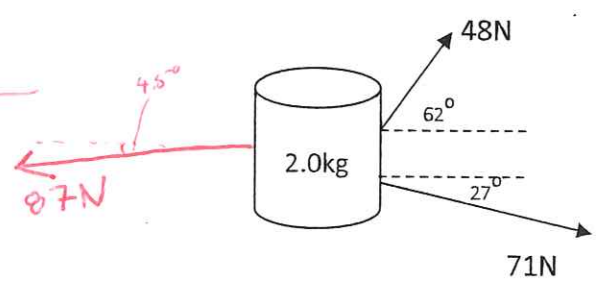
b. $\vec{a}$=1.2m/s² up



c. $\vec{a}$= 2.0m/s² left



d. $\vec{a}$= 1.8m/s² [68° above −x]



$\hat{x}$

$\Sigma \vec{F} = m\vec{a}$

$\hat{x}$: $\Sigma \vec{F}_x = m\vec{a}_x$

$48\cos 62 + 71\cos 27 + \vec{F}_{1x} = 2.0kg(-1.8 m/s^2 \cos 68°)$

$\vec{F}_{1x} = -87.14468197N$

$\hat{y}$: $\Sigma \vec{F}_y = ma_y$

$48\sin 62° - 71\sin 27° + \vec{F}_{1y} = 2.0kg(1.8\sin 68°)$

$\vec{F}_{1y} = -6.8102971N$

$\hat{Y}$

$\vec{F}_1 = 87N$ [4.5° below −x]