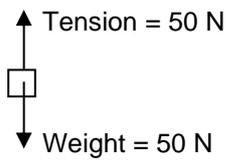




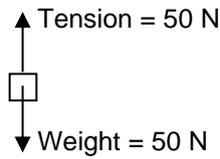
2020 Sec 3 Physics Dynamics Assignment 3.1 to 3.4
Answers

AS 3.1

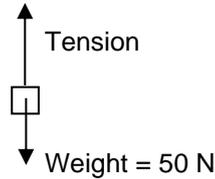
1 (i) Block P



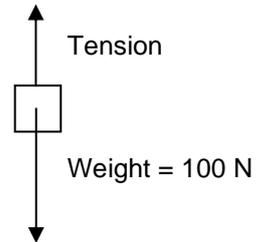
(ii) Block Q



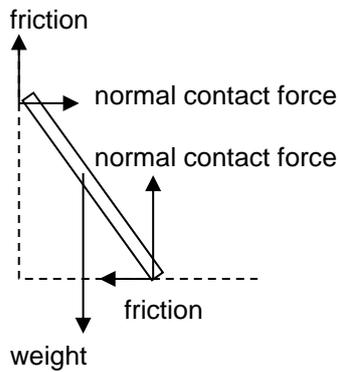
(iii) Block N



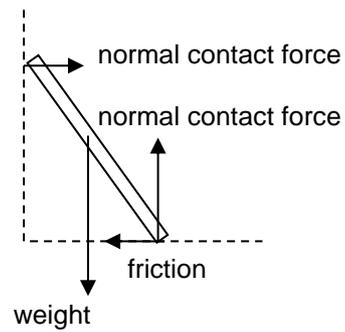
(iv) Block M



c. ladder K



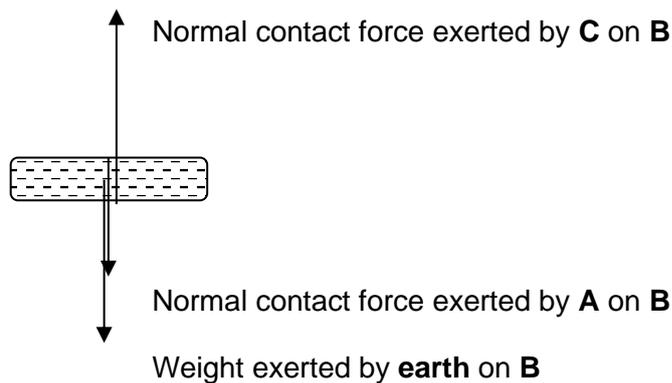
d. Ladder L

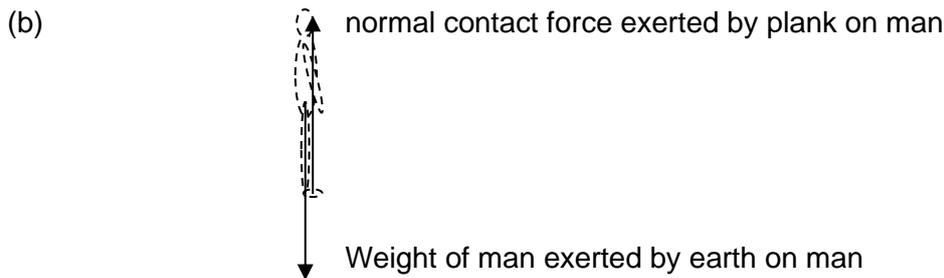
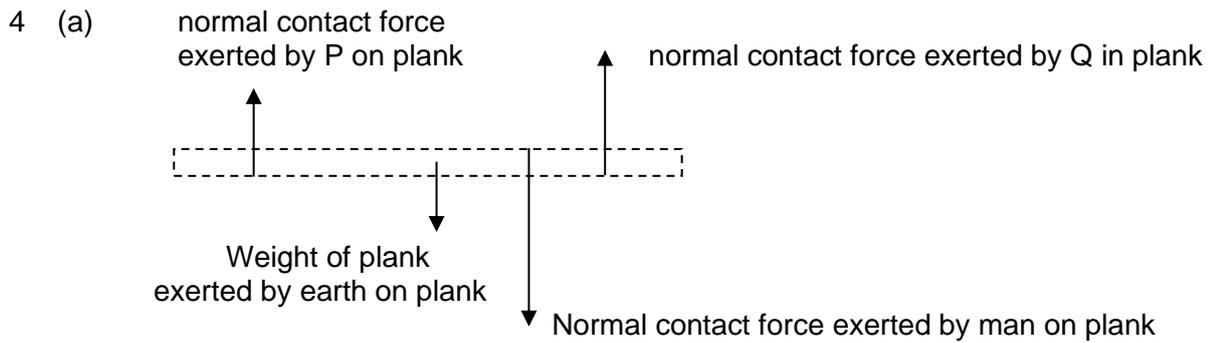


2.

<p>a.</p> <div style="text-align: center;"> </div> <p>T: Tension by string W: Weight by earth</p>	<p>b.</p> <div style="text-align: center;"> </div> <p>T: Tension by string W: Weight by earth U: Upthrust by water</p>
---------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------

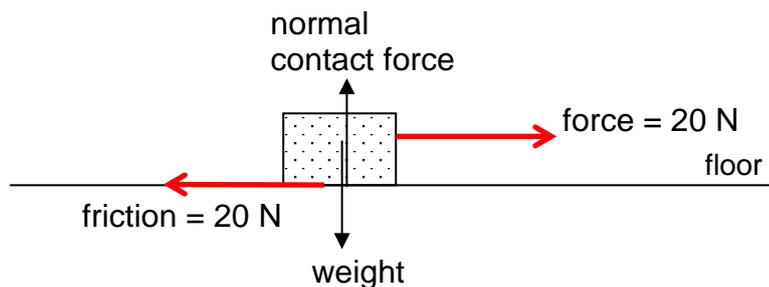
3





AS 3.2

1.



2. If the spaceship has a certain velocity v just before its engine dies, it should continue to move with the constant velocity v / it should not slow down and stop by Newton's first law of motion / since no net force acts on it in outer space.

3. (a) 0 N

The lift is moving with constant velocity, the resultant force on it is zero, according to Newton's first law of motion

(b) 0 N

The lift is still moving with constant velocity, even though it is of a greater magnitude, the resultant force on it is zero, according to Newton's first law of motion

(c) 0 N

The lift is still moving with constant velocity, even though it is in the opposite direction, the resultant force on it is zero, according to Newton's first law of motion

4. (a) The speed of the car increases, therefore, air resistance increases until a maximum value.

(b) The acceleration of the car decreases due to the increase in drag force. Eventually, the acceleration of the car will decrease to zero.

(c) The speed of the car will increase until it reaches a maximum value. It happens when the constant forward force balances the drag force.

AS 3.3

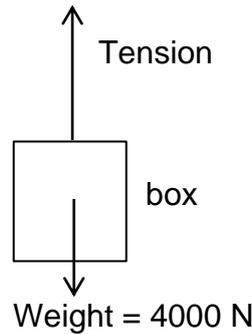
1. (a)

(b) $T - W = ma$; $Ma = T - mg$
 $a = (4100 - 4000) / 400 = 0.25 \text{ m s}^{-2}$

(c) $v = 2.5 \text{ m s}^{-1}$
 $s = 12.5 \text{ m}$

(d) $a = -0.25 \text{ m s}^{-2}$ or 0.25 m s^{-2} (downwards)

(e) 4000 N

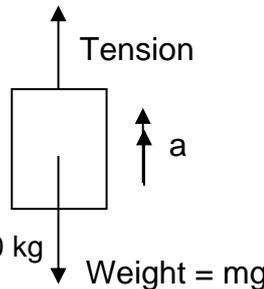


1. State equation or formula to be used. Start with $F_{net} = ma$

2. Show working/explain steps CLEARLY!

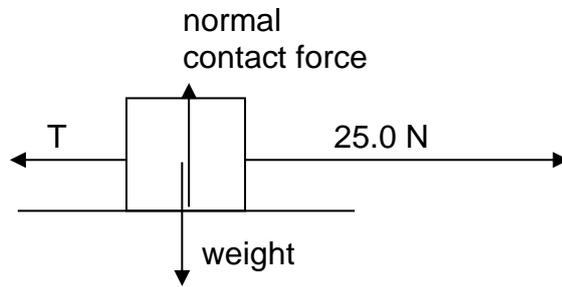
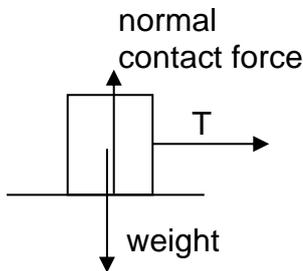
2. (a)

(b) $F_{net} = ma$
 $T - W = ma$
 $T - mg = ma$
 $m(g + a) = T$
 $m = 5750 / (10 + 2.0) = 479 = 480 \text{ kg}$



(c) $T - mg = ma$
 $T = m(g + a)$
 $T = 479(10 - 2) = 3832 = 3800 \text{ N}$

3. (a)



(b) On 3.0 kg block: $T = 3a$
 $25 - 3a = 7a$
 Therefore, $a = 2.5 \text{ m s}^{-2}$

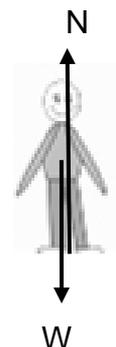
On 7.0 kg block: $25 - T = 7a$

T = 7.5 N

(c) Blocks move at constant velocity, therefore, no net force on each block. Therefore, friction acting on each block will cause all forces acting on the respective block to be balanced.
 On 3.0 kg block, $T = 7.5 \text{ N}$, therefore, friction = **7.5 N**
 On 7.0 kg block, originally, net force was $25.0 - 7.5 = 17.5 \text{ N}$ to the right, Therefore, friction = **17.5 N** in order to balance the applied force and the tension.

4. (a) N: Normal contact force exerted by the weighing scale on the man
 W: Weight of the man

Weighing scale reads the magnitude of the *normal contact force!*



- (b) As the lift accelerates upwards, the man accelerates with the lift. Therefore, the man also accelerates upwards at 2.0 m s^{-2} .

Applying Newton's 2nd Law,

Resultant force = $m a$ taking upwards as positive

$$N - W = 60 (2.0)$$

$$N - 600 = 60 (2.0)$$

$$\text{Therefore, } N = 600 + 120 = \underline{720 \text{ N.}}$$

The weighing scale reads 720 N or 72 kg.

- (c) As the lift decelerates upwards, the man also decelerates upwards at 2.0 m s^{-2}

Resultant force = $m a$ taking upwards as positive

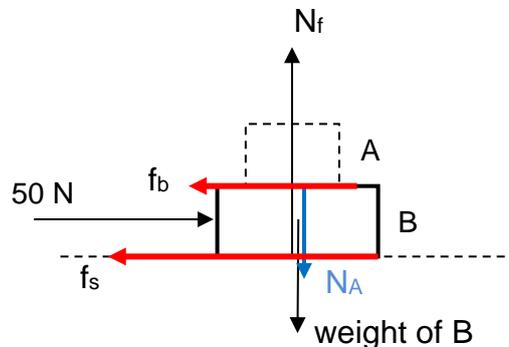
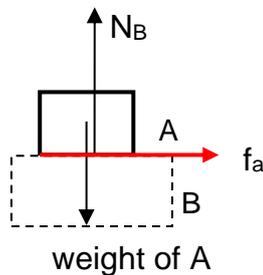
$$N - W = 60 (-2.0)$$

$$N - 600 = 60 (-2.0)$$

$$\text{Therefore, } N = 600 - 120 = \underline{480 \text{ N.}}$$

The weighing scale reads 480 N or 48 kg.

5. (a)



N_B = Normal contact force exerted by B on A

f_a = frictional force acting on A by B

N_A = Normal contact force exerted by A on B

N_f = Normal contact force exerted by surface on B

f_b = frictional force acting on B by A

f_s = frictional force acting on B due to surface

(b) $N_s = \text{Weight of A} + \text{B} = 100 + 50 = \underline{150 \text{ N}}$

(c) $f_a = ma = 5.0 \times 2.0 = \underline{10 \text{ N}}$

(d) Block B:

$$f_b = f_a = 10 \text{ N}$$

$$50 \text{ N} - (f_b + f_s) = m a$$

$$50 - 10 - f_s = 10 \times 2.0$$

$$f_s = \underline{20 \text{ N}}$$

OR

Block A & B together:

$$F_{\text{net}} = m a$$

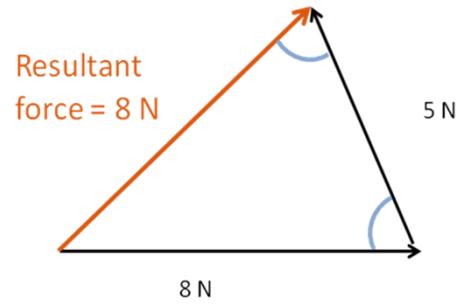
$$50 - f = (15) (2)$$

$$f = 50 - 30 = 20 \text{ N}$$

AS 3.4

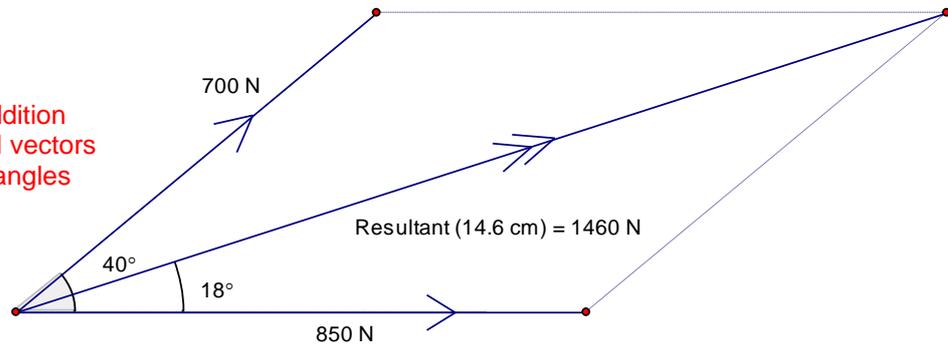
1. (a) Not possible. Maximum is 13 N.
 (b) Possible! 8 N is between minimum (3 N) and maximum (13 N)

Vector triangle is an isosceles triangle.



2. Diagram

- correct vector addition
- label arrows of all vectors
- label all suitable angles



Scale: 1.0 cm represents 100 N

Magnitude of the resultant force: 1460 N

Angle between the the resultant and that of the 850 N force: 18° anticlockwise

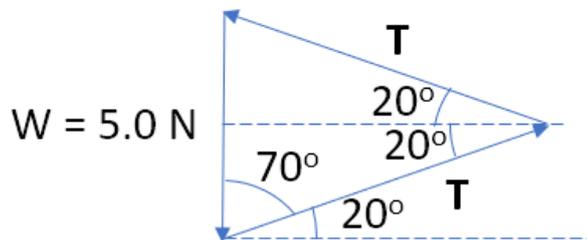
3. Vector triangle is an isosceles triangle.
 $W = 5.0 \text{ N}$

Using trigonometry,

$$\cos 70^\circ = \frac{(\frac{1}{2} W)}{T}$$

$$T = 2.5 / \cos 70^\circ$$

$$= 7.3 \text{ N (2s.f.)}$$



For scale drawing (1.0 cm: 1.0N)

Accept 7.2 – 7.4 N

4. Scale: 1.0 cm represents 10 N

$$T_1 = 87 \text{ N}$$

$$T_2 = 66 \text{ N}$$

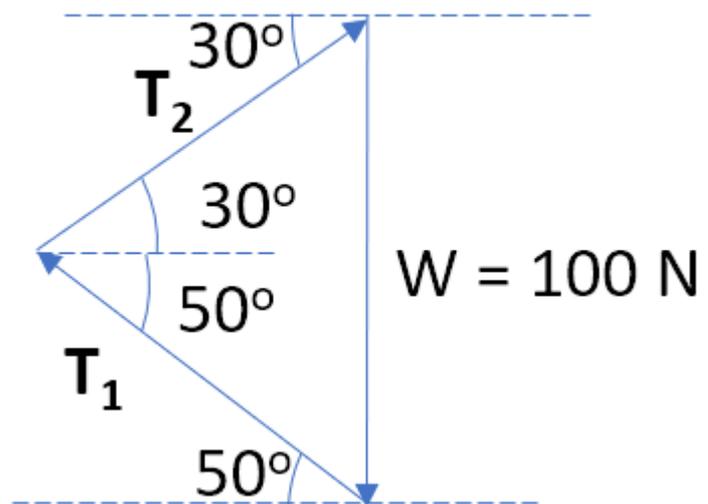


Diagram above **not** drawn to scale

5. Scale: 1.0 cm represents 0.5 N
Magnitude of third force = 7.9 N
Direction of third force = 19° south of west

