

- 1** (a) 15Nm  
(b) -22 Nm  
(c) 18 Nm  
(d) -28 Nm

**Total: 8 marks**

- 2** (a) 2.1 Nm  
(b) 6.16 Nm  
(c) 0.1 Nm  
(d) 0.73 Nm

**Total: 12 marks**

3. 29.2 N, 20.8 N (5)

4. 96.5 N, 138.5 N (5)

- 5 (a)  $P = 27.5g$ ,  $Q = 147.5g$  (3)
- (b)  $P = 2.5g$ ,  $Q = 172.5g$  (3)
- (c) If child is less than 0.95 m (2)  
from the adult,  $P < 0$  so the bench  
tips unless A is anchored to the  
ground.
- (d) The bench tips if A is not anchored. (1)

**6 (a) 1434 N (4)**

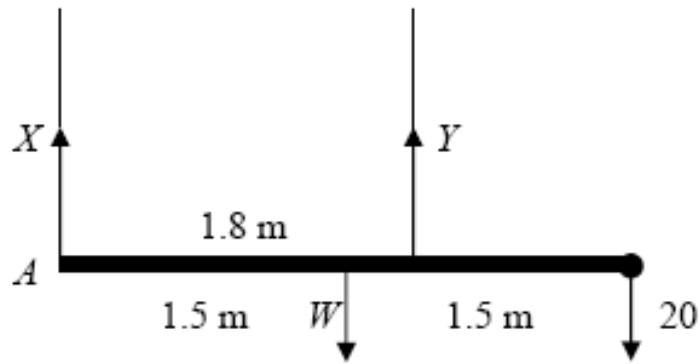
**(b) 651 N, 1644 N (4)**

**(c) 0 (4)**

**(d) (i) jib stays put,  $T = 0$  (1)**

**(ii) A drops (1)**

7 (a)



M(A)  $W \times 1.5 + 20 \times 3 = Y \times 1.8$  M1 A2 (1, 0)

$$Y = \frac{5}{6}W + \frac{100}{3} \quad \text{*} \quad \text{cso} \quad \text{A1} \quad (4)$$

(b)  $\uparrow$   $X + Y = W + 20$  or equivalent M1 A1

$$X = \frac{1}{6}W - \frac{40}{3} \quad \text{A1} \quad (3)$$

Alternative

M(C)  $X \times 1.8 + 20 \times 1.2 = W \times 0.3$  M1 A1

$$X = \frac{1}{6}W - \frac{40}{3} \quad \text{A1}$$

(c)  $\frac{5}{6}W + \frac{100}{3} = 8\left(\frac{1}{6}W - \frac{40}{3}\right)$  M1 A1 ft

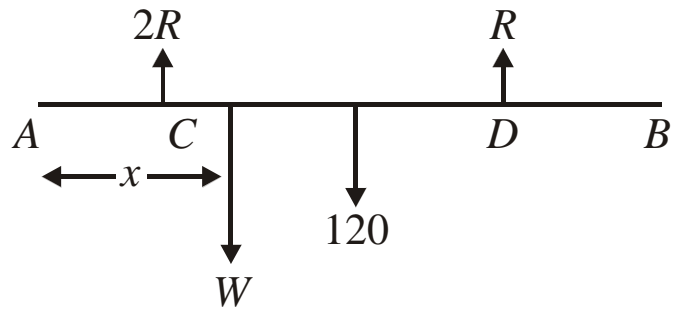
$$W = 280 \quad \text{A1} \quad (3)$$

[10]

8. 4.2 cm (towards the 60 kg mass) (5)

9. 3.33 mm from centre (4)

10



(a)  $M(A): Wx + 120 \times 1.5 = R \times 2 + 2R \times 0.5$

$R(\uparrow) \quad 3R = W + 120$

Hence  $Wx + 180 = 3R = W = 120$

$W(1 - x) = 60$

$W = \frac{60}{1 - x}$

M1 A2, 1, 0

M1 A1

M1

A1

M1 A1cso (8)

(b)  $W > 0 \Rightarrow x < 1$

M1 A1 (2)

[10]