Ex 7A, P138 (Moments)

(1)  No need for diag here

So we have $\overrightarrow{7} + \overleftarrow{12} + \overrightarrow{15} = 7 - 12 + 15$

$= 10$ Nm clockwise

(2) Ditto : /

(3) 10 Nm clockwise

(4) 10 Nm anticlockwise

(5) $16 \times 1.5 = 24$ Nm clockwise

(6) $1 \times 4 + 2 \times 2 = 8$ Nm clockwise

(7) $\overrightarrow{4 \times 3} + \overleftarrow{2 \times 2} = \overrightarrow{4 \times 3} - \overrightarrow{2 \times 2} = 8$ Nm clockwise

(8) $\overleftarrow{0.5 \times 6} = 3$ Nm anticlockwise

(9) 0 Nm since force is // to line Through A.

(10) $4 \times 3 + 0 = 12$ Nm clockwise

(*) (11) $\perp$ distance of 2N is 1m from line of action Through A

✗ $\perp$ " " 4N is 3m " " " "

So Moment is $\overrightarrow{4 \times 3} + \overrightarrow{2 \times 1} = 14$ Nm clockwise

(12) Same logic as (11).

$\overrightarrow{4\times3} + \overleftarrow{2\times1} = 4\times3 - 2\times1 = 10\ \text{Nm}$

(13) $\overrightarrow{5\times3} - \overrightarrow{6\times2} - \overrightarrow{3\times1} + \overrightarrow{4\times1} = 4\ \text{Nm}$ clockwise

(14) $\overleftarrow{12\times2} + \overrightarrow{6\times1} + \overrightarrow{6\times2} = -\overrightarrow{12\times2} + \overrightarrow{6\times1} + \overrightarrow{6\times2}$

$= -6\ \text{Nm}$ clockwise

$= 6\ \text{Nm}$ anticlockwise

(15) $\overleftarrow{12\times2} + 0\times6 - \overleftarrow{6\times1} - \overleftarrow{6\times2} = 6\ \text{Nm}$ anticlockwise

(16) $\overrightarrow{8\times5} = 40\ \text{Nm}$ clockwise

(17) The $\perp$ distance Through A is $\sqrt{5^2-3^2} = 4\ \text{m}$

So moment $= \overleftarrow{6\times4} = 24\ \text{Nm}$ anticlockwise

(18) moment $= \overrightarrow{10\times4} + \overrightarrow{8\times5} = 80\ \text{Nm}$ clockwise

(19) /

(20) $\perp$ component of 5N force is $5\sin 30$.

So

moment $= (5\sin 30).10 = 25\ \text{Nm}$ clockwise

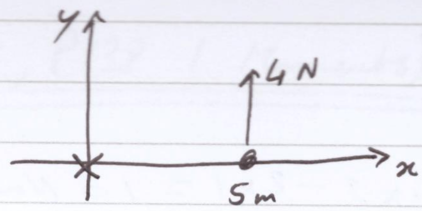
(21) $\perp$ component of force is $4\cos 30$ & $4\sin 60$

So

moment $= (4\cos 30).10 = 34.64\ \text{Nm}$ clockwise

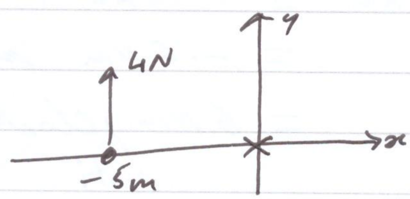
(22) – (23) : Similar to (20).

(24)



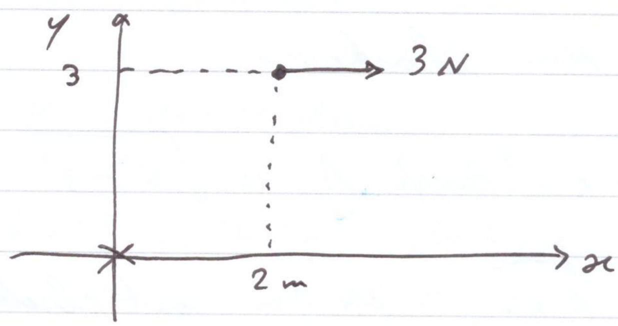
Moment about origin is $4 \times 5 = 20\,Nm$ anticlockwise

(25) Same as (24) but this time moment is anticlockwise

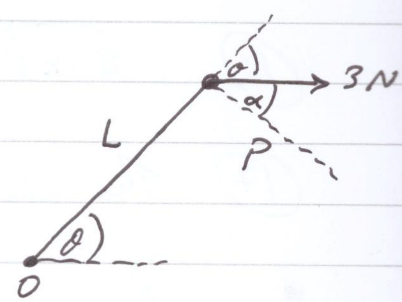


So moment $= 4 \times 5$
$= 20\,Nm$
anticlockwise

(*) (26)



i.e.



$\theta = \tan^{-1}\left(\frac{3}{2}\right) = 56{\cdot}31°$, so $\alpha = 33{\cdot}69°$.

we want α because we want P, the $\perp$ component of 3N.
we also want L because we want the line $\perp$ to P.

So $L = \sqrt{3^2 + 2^2} = \sqrt{13}$

So moment $= P \cdot L = (3 \cos 33{\cdot}69) \cdot \sqrt{13} = 9\,Nm$

clockwise