


Mechanics 1 - moments

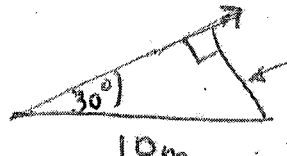
1) a) clockwise, $5 \times 2 = 10 \text{ Nm}$ b) clockwise, $4 \times 3 = 12 \text{ Nm}$

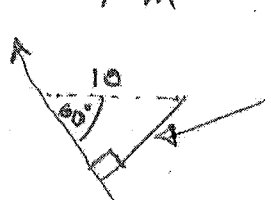
c) clockwise, $4 \times 3 - 2 \times 2 = 8 \text{ Nm}$ d) clockwise,
 $4 \times 3 + 2 \times 1 = 14 \text{ Nm}$

e) $12 \times 2 - 1 \times 6 - 2 \times 6 = 6 \text{ Nm}$ ANTI CLOCKWISE

f) $6 \times 4 = 24 \text{ Nm}$ Anti clockwise  PYTHAGORAS
 $\sqrt{5^2 - 3^2} = 4$

g) $10 \times 4 - 5 \times 8 = 0 \text{ Nm}$

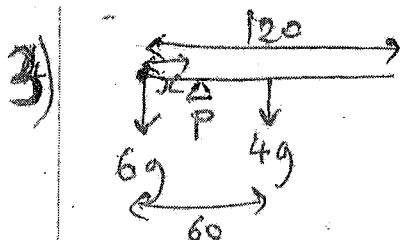
h)  $10 \sin 30^\circ = 5 \text{ m}$ $5 \times 5 = 25 \text{ Nm}$ clockwise

i)  $10 \sin 60^\circ = 8.66$ $8.66 \times 4 = 34.6 \text{ Nm}$ (22)
CLOCKWISE ✓

2) a) Taking moments about P: $10(x+10) + 5 \times 6 - 15 \times 10 = 0 \text{ V}$

b) $10x + 100 + 30 - 150 = 20 \text{ V}$ $10x + 100 + 30 - 150 = 0$
 $10x = 20 \text{ V}$ $10x = 20 \text{ V}$
 $x = 2 \text{ m}$ ✓ $x = 2 \text{ m}$ ✓

c) either $10x - 20 = 5 \text{ V}$ OR $10x - 20 = -5 \text{ V}$
 $x = 2.5 \text{ m}$ ✓ $x = 1.5 \text{ m}$ ✓ (12)



moments about P ✓

$$x \times 6g = (60 - x) \times 4g$$

$$\Rightarrow 6x = 240 - 4x \Rightarrow x = 24$$

So support 24 cm from head

(OR 96 cm from handle end)

TOTAL 40

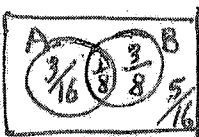
Mechanics 1 - Moments

Section 1

1) a) $\sum f_x = 407$ $\sum f_x^2 = 5429$ (from calculator)
 mean = $\frac{407}{31} = 13.129$ SD = $\sqrt{\frac{5429}{31} - (13.129)^2}$
 $= 1.66$

b) Mean for Camborne & Leuchars are similar
 SD for Camborne is less than Leuchars.

2) $s = ?$ $u = 28$ $v = 0$ $a = -9.8$ $t = ?$
 $v = u + at \Rightarrow 0 = 28 - 9.8t \Rightarrow t = \frac{2.86s}{}$
 $s = \frac{1}{2}(u+v)t \Rightarrow s = \frac{1}{2}(28+0) \times 2.8 = 40m$

3)  a) $P(A|B) = \frac{P(A \cap B)}{P(B)}$
 $\Rightarrow \frac{1}{4} = \frac{P(A \cap B)}{1/2} \Rightarrow P(A \cap B) = \frac{1}{8}$

b) from diagram: $P(B'|A) = \frac{P(B' \cap A)}{P(A)} = \frac{3/16}{5/16} = \frac{3}{5}$

c) from diagram: $P(A' \cup B) = \frac{5}{16} + \frac{3}{8} + \frac{1}{8} = \frac{13}{16}$

d) $P(A) \times P(B) = \frac{5}{16} \times \frac{1}{2} = \frac{5}{32}$

$P(A \cap B) = \frac{1}{8} \neq \frac{5}{32}$ * (t=2, s=6)

* So NOT INDEPENDENT

4) $\frac{dv}{dt} = 2kt - c = a \Rightarrow 6 = 4k - c$ ①

$s = \int v dt = \frac{1}{3}kt^3 - \frac{1}{2}ct^2 + A$ when $t=0, s=0 \Rightarrow A=0$

$0 = \frac{1}{3}k(2)^3 - \frac{1}{2}c(2)^2 \Rightarrow \frac{8}{3}k - 2c = 0$ ②
 $(t=2, s=0) \Rightarrow \frac{4}{3}k - c = 0$

① - ② $\Rightarrow 6 = 4k - \frac{4}{3}k$

$\Rightarrow k = \frac{9}{4} \Rightarrow c = 3$