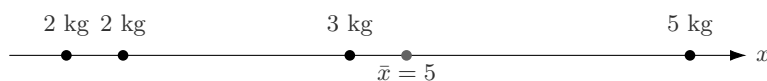
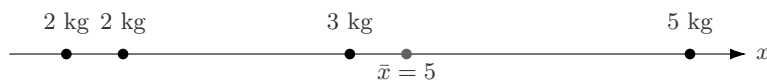


Question 6

Masses (2,3,5) kg sit at $x = 0, 4, 10$. Where must a (2)-kg mass be placed so the center is $x = 5$?



Question 6 – Solution



Step 1: Let a be the location of the new mass. The four masses are 2, 3, 5, and 2 kg, so the total mass is

$$m = 2 + 3 + 5 + 2 = 12 \text{ kg.}$$

Step 2: Write the center-of-mass equation. For point masses on a line,

$$\bar{x} = \frac{\sum m_i x_i}{\sum m_i}.$$

Requiring $\bar{x} = 5$ gives

$$5 = \frac{2(0) + 3(4) + 5(10) + 2a}{12}.$$

Step 3: Solve for a .

$$60 = 0 + 12 + 50 + 2a,$$

$$60 = 62 + 2a,$$

$$2a = -2,$$

$$a = -1.$$

Step 4: Check. The total moment is $62 + 2(-1) = 60$, and $60/12 = 5$, as required.

Place the 2-kg mass at $x = -1$.