Determining centroid of the given section

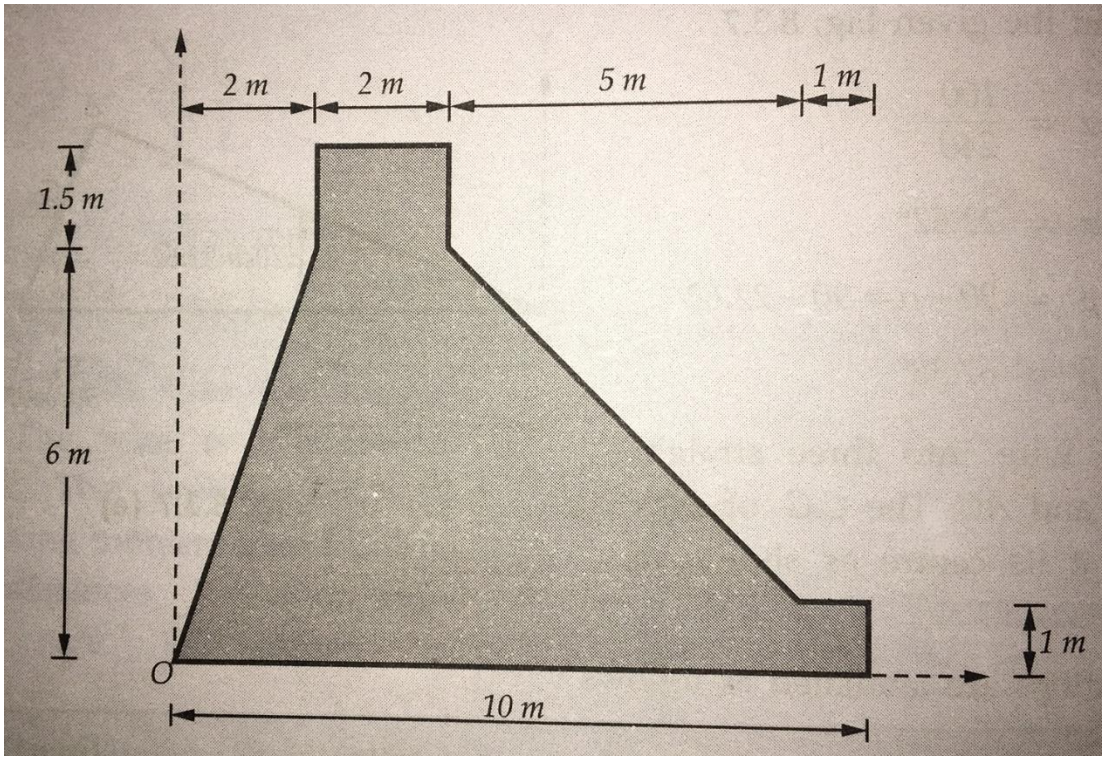
Formulas to remember

- The coordinates of the centroid $(\bar{x}, \bar{y})$ of a composite area are given by
  $\bar{x} = \frac{\sum a_i x_i}{\sum a_i} \quad \bar{y} = \frac{\sum a_i y_i}{\sum a_i}$
- The centroid of a triangle lies at *h/3* from the base, where *h* is the height of the triangle

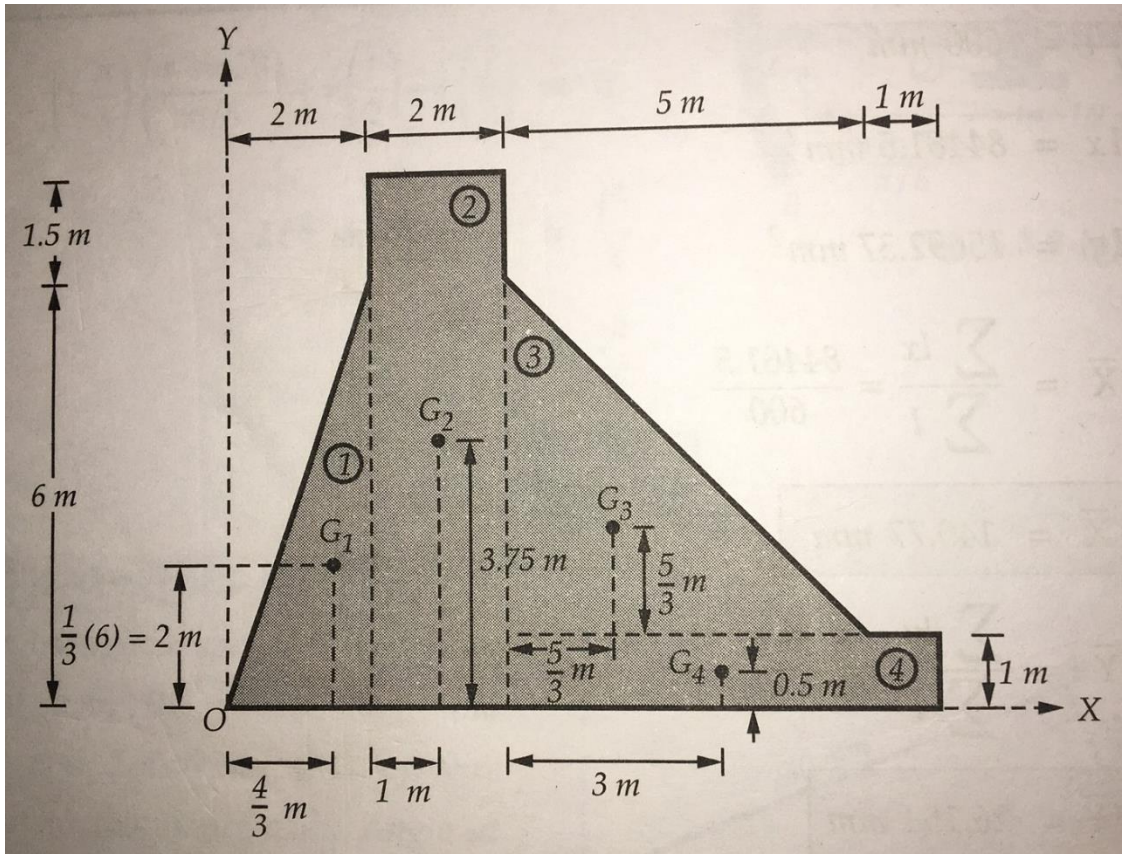
Important points to remember and understand

- The coordinates of the centroid $(\bar{x}, \bar{y})$ depend on the reference axes system chosen
- The centroid of rectangular or square area lies at the centre of these figures

Problem statement Q7: Locate the centroid of the given figure



- Given Figure with dimensions and reference axes (dashed line). Therefore, there is no need to choose a reference axes system. Use the one given
- The next step is to divide the composite into basic geometric shapes. Before proceeding, think of which basic shapes can the composite be divided into. Draw a quick rough sketch and label each basic area as a_1, a_2, a_3, … and so on
- On the rough sketch, also show the distances of the centroids of individual shapes from the reference axes (refer Fig. 4 and 5 of Q1)



- This is one of the solutions to dividing the composite into basic shapes. (There could be other ways of doing this)
- Observe that the composite is divided into only two basic shapes – two triangles and two rectangles
- The distances to the centroids of each basic shape is also shown. It is important to note that theses distances are not from the reference axes
- In the table below the distances from refence axes are determined and written

The calculations are tabulated as follows :

Component No.	Component area $A\ (m^2)$	$x\ (m)$	$y\ (m)$
1.	$\frac{1}{2}$ (2) (6)	$\frac{4}{3}$	2
2.	(2) (7.5)	3	3.75
3.	$\frac{1}{2}$ (5) (5)	$4+\frac{5}{3}$	$1+\frac{5}{3}$
4.	(6) (1)	4 + 3	0.5

To get distance from reference axes

Shown in fig. above

$$\sum A = 39.5\ m^2$$

$$\sum Ax = 165.833\ m^3$$

$$\sum Ay = 104.583\ m^3$$

$$\bar{X} = \frac{\sum Ax}{\sum A}$$

$$= \frac{165.833}{39.5}$$

$$\therefore \quad \boxed{\bar{X} = 4.198\ m}$$

$$\bar{Y} = \frac{\sum Ay}{\sum A}$$

$$= \frac{104.583}{39.5}$$

$$\therefore \quad \boxed{\bar{Y} = 2.648\ m}$$