# US418

First, we'll define three different types of vessel:

- Container Vessel;
- Tug Vessel;
- Ro-Ro Vessel;

The first one has the cabin crew in the stern. As the name suggest, it is used to transport containers. The dimensions are:

- Length: 294 m;
- Beam: 32 m;
- Draft: 12 m;
- Tare Weight: 55.000 tons;
- Height: 57.91 m;
- Cabin crew: 20m x 10m;

For calculation purposes, all calculations are done in meters (*m*) and kilograms (*kg*).

Container Ship
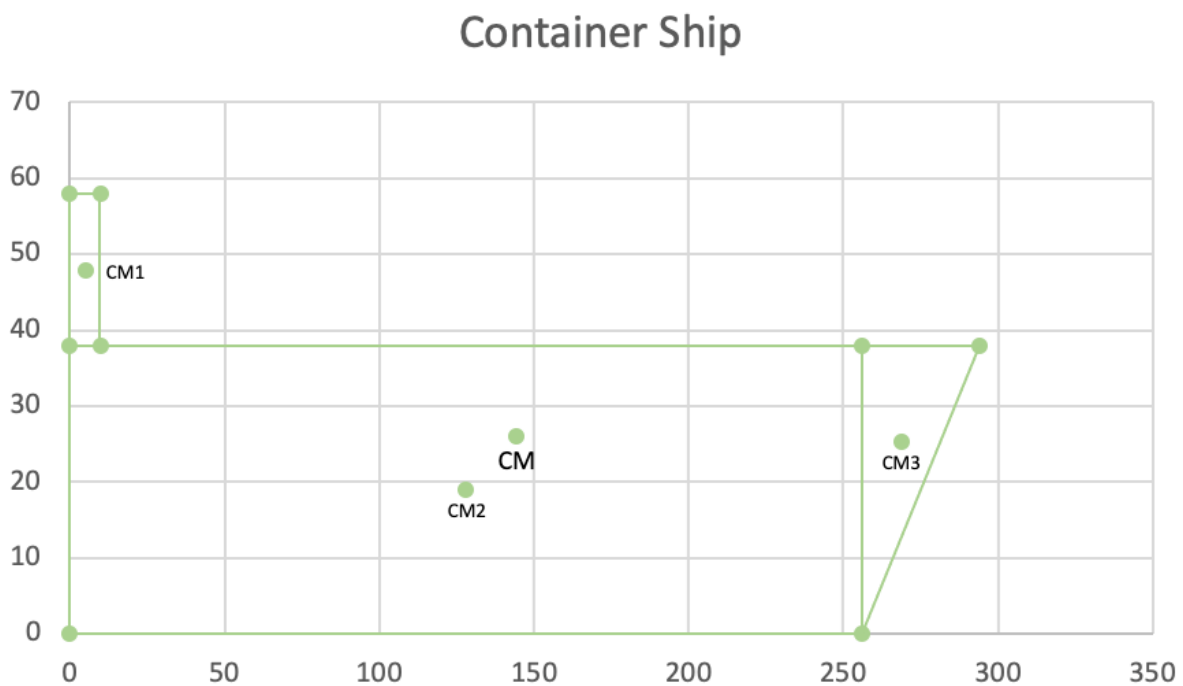
$$X_{CM} = X_{CM1} * m_1 + X_{CM2} * m_2 + X_{CM3} * m_3$$

$$= \frac{5 * 10000000 + 128.04 * 30000000 + 268.73 * 15000000}{55000000}$$

$$= 144.04$$

$$Y_{CM} = Y_{CM1} * m_1 + Y_{CM2} * m_2 + Y_{CM3} * m_3$$

$$= \frac{47.91 * 10000000 + 18.96 * 30000000 + 25.27 * 15000000}{55000000}$$

$$= 25.943 \approx 25.94$$

$$CM(144.04 , 25.94)$$

The second one, is a Tug Ship that has multiple types, but they share the same dimensions and characteristics:

- Length: 32 m;
- Beam: 11.60 m;
- Draft: 4.29 m;
- Tare Weight: 370 tons;
- Height: 14 m;
- Cabin crew: 4m x 3m;

Tug ship
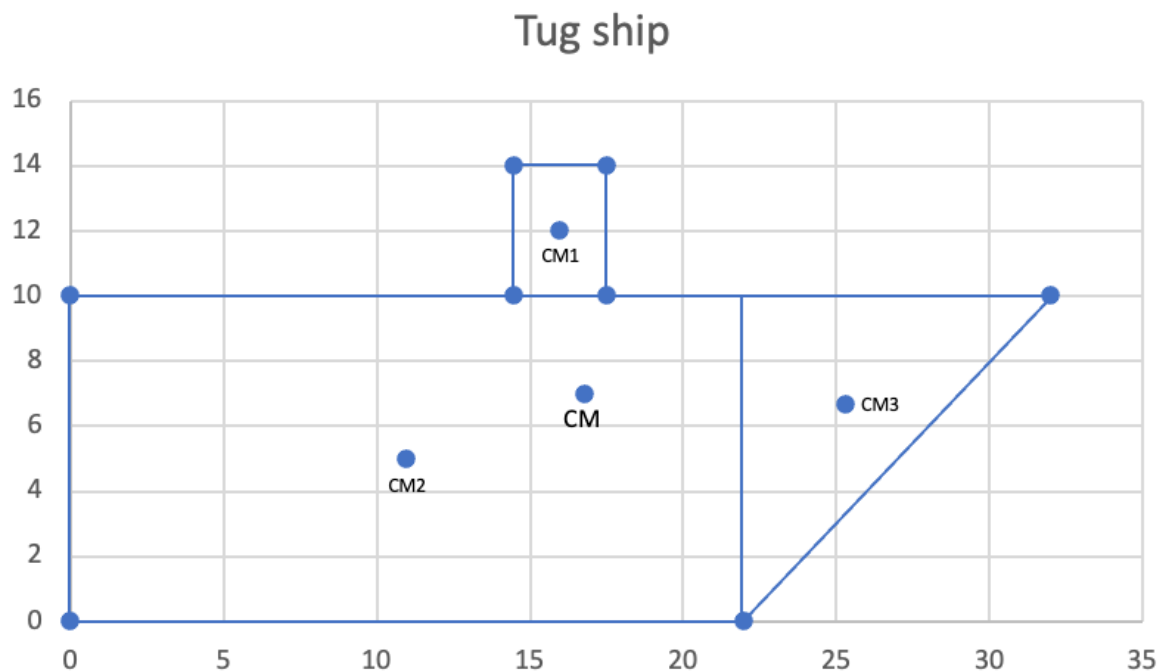
$$X_{CM} = X_{CM1} * m_1 + X_{CM2} * m_2 + X_{CM3} * m_3$$

$$= \frac{16 * 74000 + 11 * 172000 + 25.3 * 124000}{370000}$$

$$= 16.79 \approx 16.8$$

$$Y_{CM} = Y_{CM1} * m_1 + Y_{CM2} * m_2 + Y_{CM3} * m_3$$

$$= \frac{12 * 74000 + 5 * 172000 + 6.66 * 124000}{370000}$$

$$= 6.956 \approx 6.96$$

$$CM(16.8, 6.96)$$

The last one is a Ship that's used to carry vehicles. Usually, this type of ship has the cabin crew in the bow. This one has the following dimensions:
- Length: 209 m;
- Beam: 31.84 m;
- Draft: 9.8 m;
- Tare Weight: 20000 tons;
- Height: 53.34 m;
- Cabin Crew: 10m x 5m;

Ro-Ro Ship
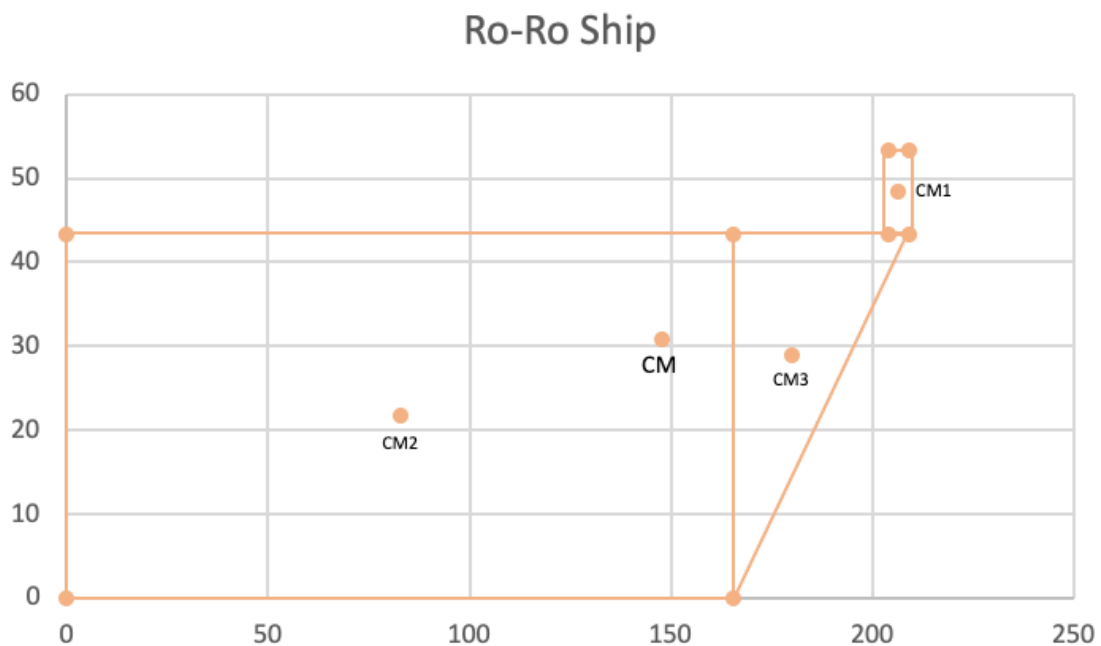
$$X_{CM} = X_{CM1} * m_1 + X_{CM2} * m_2 + X_{CM3} * m_3$$

$$= \frac{206.5 * 5000000 + 82.83 * 8000000 + 180.11 * 7000000}{20000000}$$

$$= 147.795 \approx 147.8$$

$$Y_{CM} = Y_{CM1} * m_1 + Y_{CM2} * m_2 + Y_{CM3} * m_3$$

$$= \frac{48.34 * 5000000 + 21.67 * 8000000 + 28.9 * 7000000}{20000000}$$

$$= 30.868 \approx 30.87$$

$$CM(147.8, 30.87)$$