

# Ship Stability

## Ch. 7 Inclining Test

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## Ch. 7 Inclining Test

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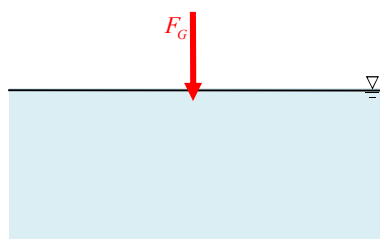
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### The Problem of Finding an Accurate Vertical Center of Gravity (KG)

The problem of finding an accurate vertical center of gravity for the ship's designer.

for a ship is a serious one



✓ Any difference in the weight of structural parts, equipment, or welds in different ship will produce a different KG.

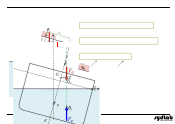
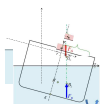


There is an accurate method of finding KG for any particular ship and that is .

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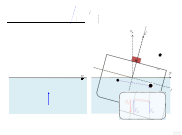
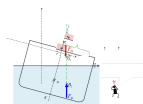
## Required Values to Find the KG (1/3)

$$\tau_r = F_B \cdot GZ$$

The purpose of the inclining test is  
in an accurately known condition.

### Required values to find the KG

- Draft
- Total weight ( $F_G$ )
- Hydrostatic values ( $KB$ ,  $BM$ )
- Weight ( $w$ )
- Distance ( $d$ )
- Angle of inclination ( $\phi$ )\*

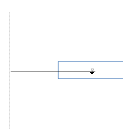
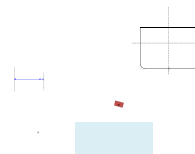


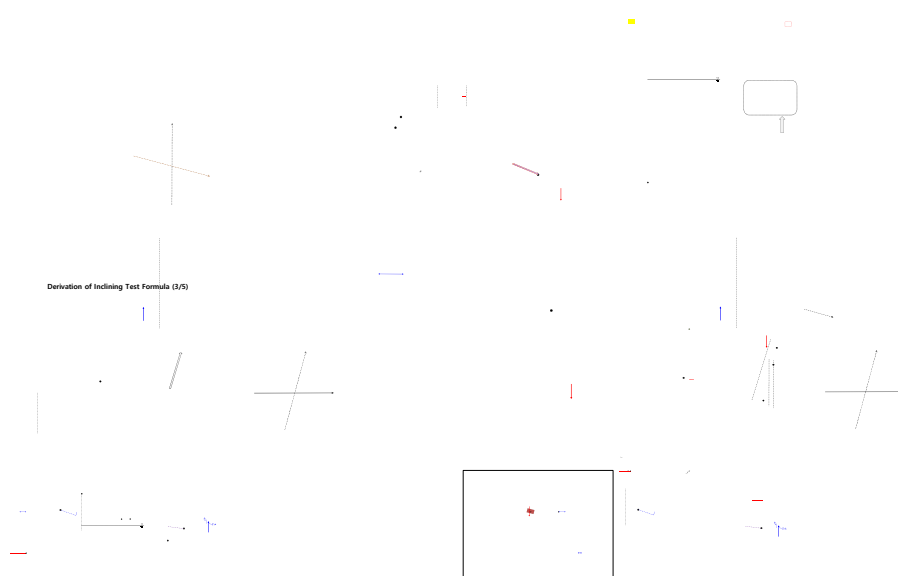
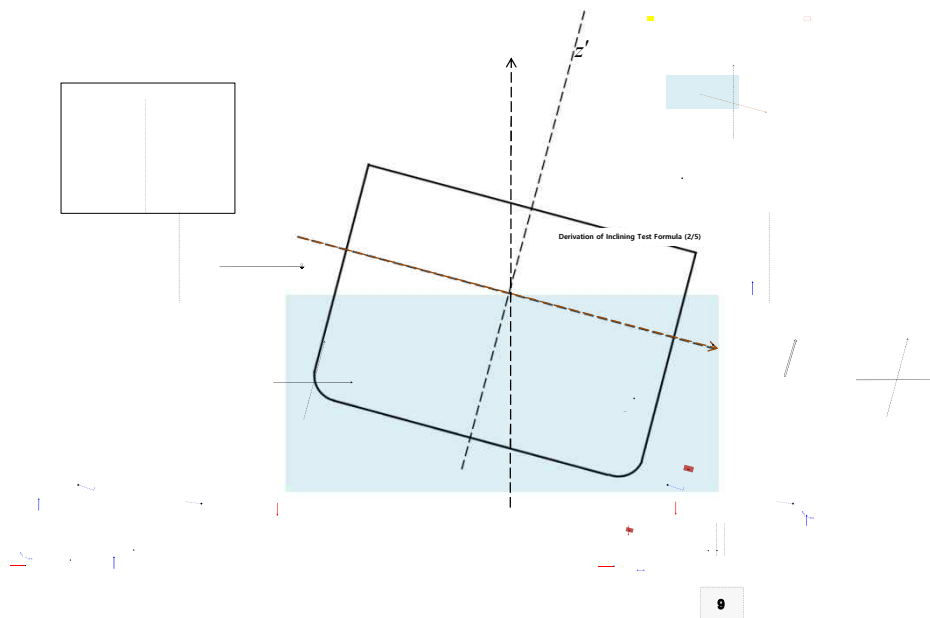
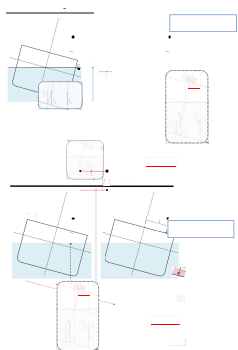
$$KG = \text{[Box]} \cdot BM - GM$$

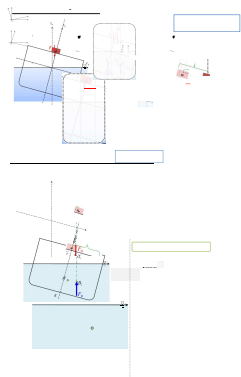
$$= \frac{\text{Required Values to Find the KG (3/3)} \cdot w \cdot d}{F_G \cdot \tan \phi}$$



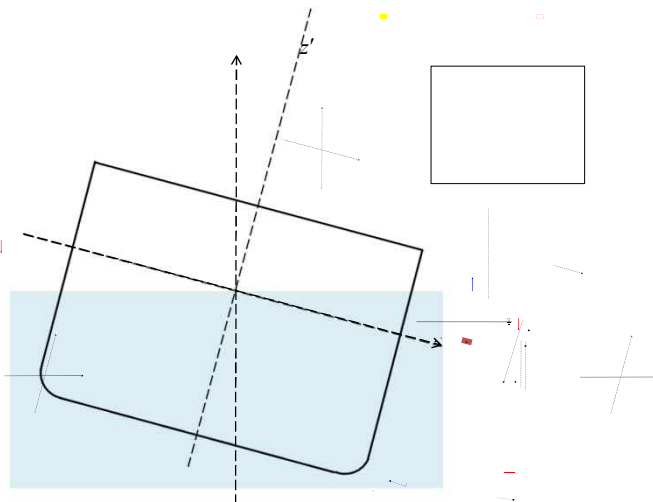
Answer that the number of  
empty is correct at 1. The  
"1" represents the righting arm.







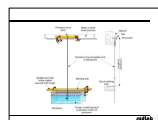
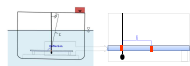
Derivation of Inclining Test Formula (4/5)



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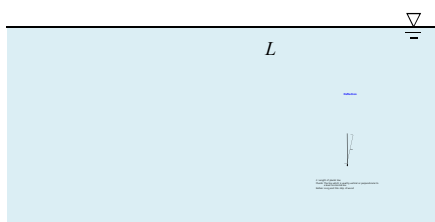


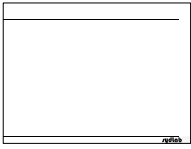
Element produced by total weight & buoy



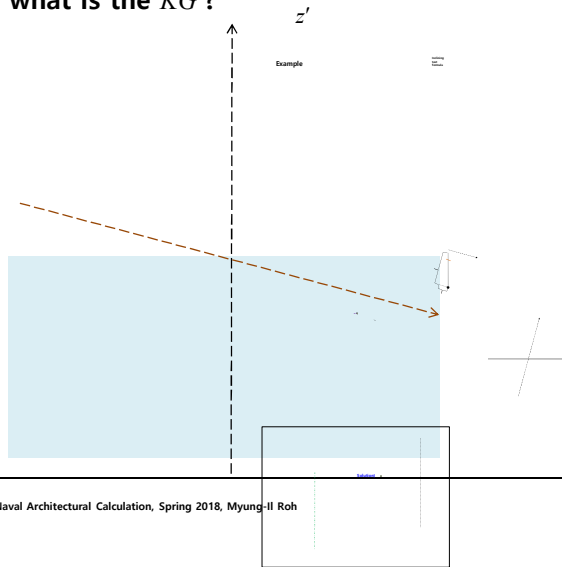
## Method of Measuring the Angle of Inclination (1/2)

How can you measure the angle of inclination when you perform the inclining test?





A ship is inclined by moving a weight of  $40\text{ tons}$  a distance  $8\text{ m}$  from the center line. A  $12\text{ m}$  pendulum shows a deflection of  $0.3\text{ m}$ . Displacement of the ship is  $3,700\text{ tons}$ . If the  $KB$  is  $5\text{ m}$  and  $BM$  is  $14\text{ m}$ , what is the  $KG$ ?



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## Various Problems Using the Inclining Test Formula

$$GM = \frac{w \cdot d}{F_G \cdot \tan \phi}$$

Inclining  
test  
formula

The inclining test formula can be used in various problems as follows:

- (1) To find the angle of heel  $\phi$ , a ship will take by moving a weight a transverse distance  $d$ .
- (2) To find the weight  $w$  necessary to remove or produce a heel by moving it a transverse distance  $d$ .
- (3) To find the distance  $d$  necessary to move a weight in order to remove or produce a heel.