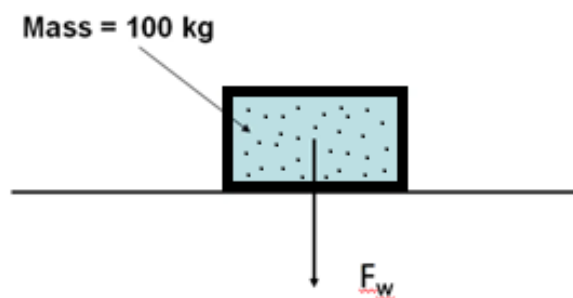


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**Chapter 1: Understanding Static Forces Tutorial**

1. Briefly describe what is a force.
2. What is the meaning of static equilibrium?
3. What do you know about dynamics ?
4. State Newton's 3 laws
5. An object shown in Figure 1.5 has a mass of 100 kg. Find the force  $F_w$  acting towards the ground. If a force of 300 N is applied to the object, calculate its acceleration.

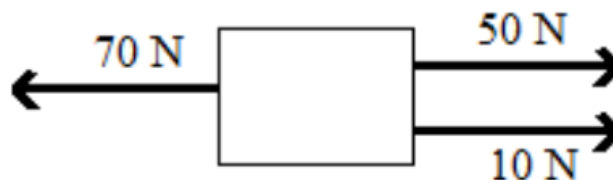


**Figure 1.5**

6. What is a scalar quantity and what is a vector quantity. List 5 scalars and 5 vectors in the table below.

	<b>Scalars (Any)</b>	<b>Vectors (Any)</b>
<b>1</b>		
<b>2</b>		
<b>3</b>		
<b>4</b>		
<b>5</b>		

7. Find the resultant force shown in Figure 1.7. Indicate the direction of the resultant force.



**Figure 1.7**

8. Find the resultant force for Figure 1.8.

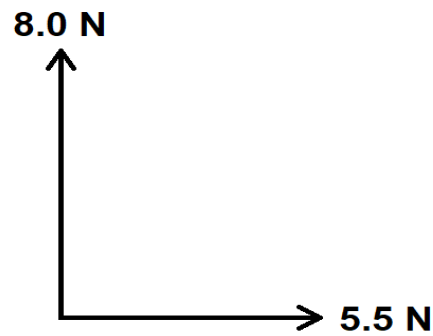
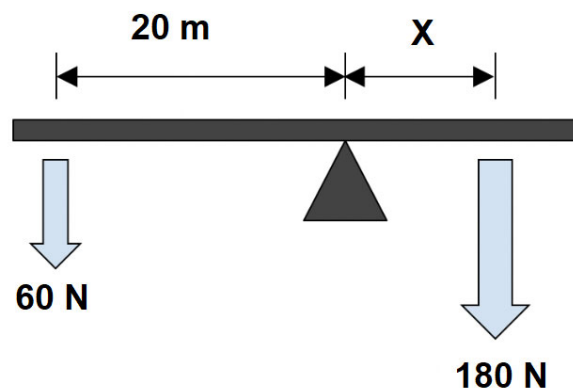


Figure 1.8

9. Calculate  $X$  in m for Figure 1.9.



10. Determine the resultant moment of the four forces acting on the bend rod in the Figure 1.10 about 'O'. Indicate whether the overall resultant is clockwise or anti clockwise.

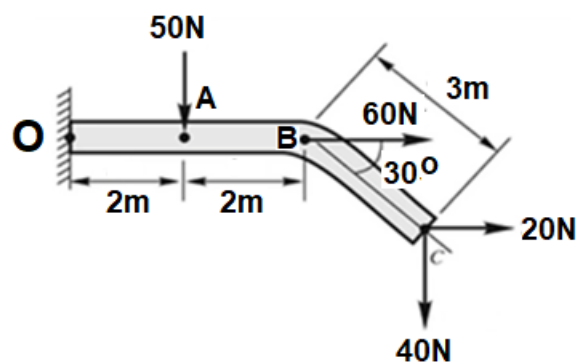


Figure 1.10

11. Briefly describe tension, compression, shear, bending, torsional forces.
12. Find the stress on a material if the force is 200N and the cross section area is  $100 \text{ cm}^2$ .
13. A 1m long metal bar extended by 2 cm when a tensile force is applied to it. Calculate the strain this bar is subjected to. If this bar returns to 1m when the tensile force is released. What type of deformation has this bar experienced ?
14. Sketch the Stress-Strain relationship and indicate clearly where is the elastic stage, plastic stage, Yield point, ultimate tensile point and the break point.
15. A 500 N force is stretching a 1.5 m long metal bar. The bar has a cross sectional area of  $2 \text{ cm}^2$  metal bar. Calculate the stress and strain experience by this bar if the bar is 1.55 m now. What is it's Young's modulus ?
16. A worker wanted to load a 100 kg of components inside a box on to a lorry. He realised that the box will not slide down if he leaves it on the  $30^\circ$  ramp as shown in Figure 1.16. Calculate the forces  $F_x$ ,  $F_y$  and  $F_z$  acting on the box. What is the frictional force,  $F_r$  ?

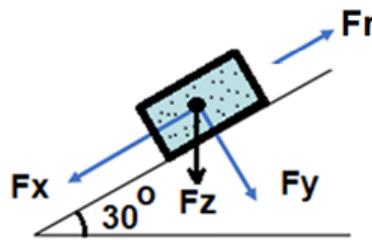


Figure 1.16