

# Engineering Statics - 01 Math Review Handout

1) Solve  $a^2 = b^2 + c^2$  for  $b$ .

2) Solve  $V = \frac{4}{3}\pi r^3$  for  $r$ .

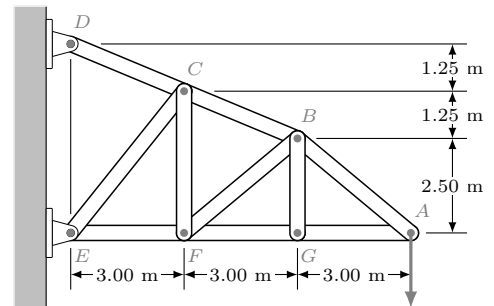
3) Solve  $c^2 = a^2 + b^2 - 2bc \cos C$  for  $\cos C$ .

4) Solve  $b^2 = a^2 + c^2 - 2ac \cos B$  for  $B$ .

$$Q = \frac{CD^{2.63} \left(\frac{h_L}{L}\right)^{0.54}}{279000}$$

5) Solve the equation for  $h_L$ , then evaluate  $h_L$  using the values  $Q = 135$ ,  $C = 120$ ,  $D = 202.7$  and  $L = 1200$

6) Use the Pythagorean Theorem to determine the lengths of  $CE$  and  $CB$



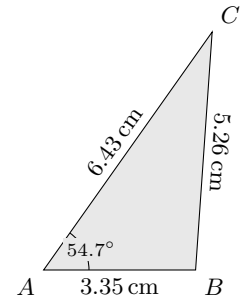
7) Use the tangent function to calculate  $\angle CEF$

8) Use  $\angle CEF$  just found and the sine rule to verify the length of  $CE$  found in 1) above.

9) Use the cosine function and the length of  $BC$  found earlier to calculate the angle between  $BC$  and the horizontal.

10) Use the tangent function to verify the previous result.

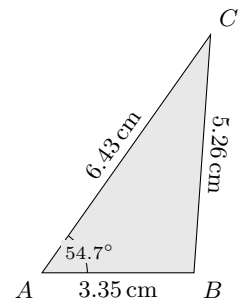
11) Using the sine rule, find  $\angle ACB$ .



12) Using the sine rule, find  $\angle ABC$ .

13) Sum the interior angles of the triangle.

- 14) Using the cosine rule, determine  $\angle ABC$   
15) Compare the value for  $\angle ABC$  with the value calculated earlier.



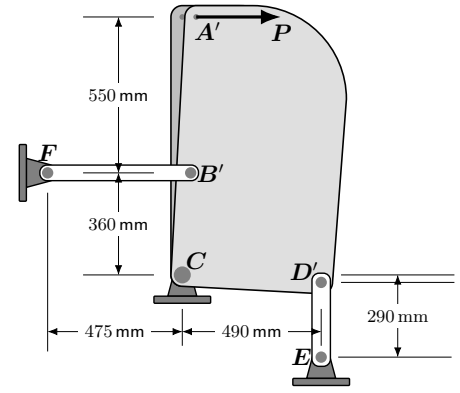
$ABCD$  is a rigid (i.e., it does not deform) plate, pinned at  $C$ .

When horizontal force  $P$  is applied at  $A$ ,  $ABCD$  rotates about  $C$  and  $A$  deflects 2.45 mm horizontally rightwards.

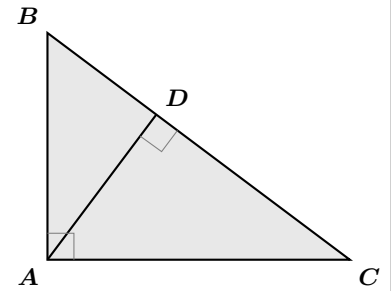
Assume that  $BF$  remains horizontal and that  $DE$  remains vertical.

16) Determine  $\delta_{BF}$ , the change in length of  $BF$ .

17) Determine  $\delta_{DE}$ , the change in length of  $DE$ .



18) Show that right triangles  $\triangle ABC$ ,  $\triangle ABD$  and  $\triangle ACD$  all have the same angles (i.e. they are all similar).



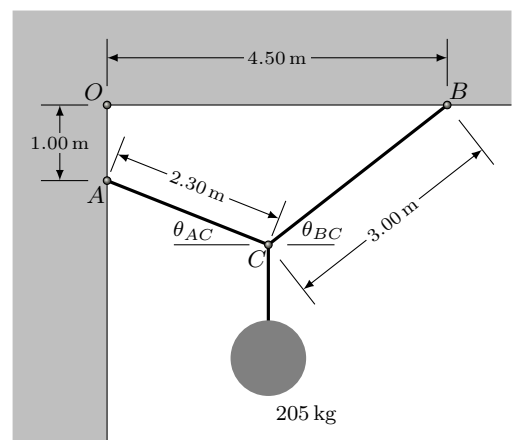
19) Given that  $AC = 100$  mm and  $AD = 65$  mm, determine  $\angle ACD$  and  $\angle ABD$ .

20) Find the remaining lengths:  $AB$ ,  $BD$  and  $CD$ .

21) Verify the lengths found above by using the Pythagorean Theorem on  $\triangle ABC$

22) Find  $\theta_{AC}$ .

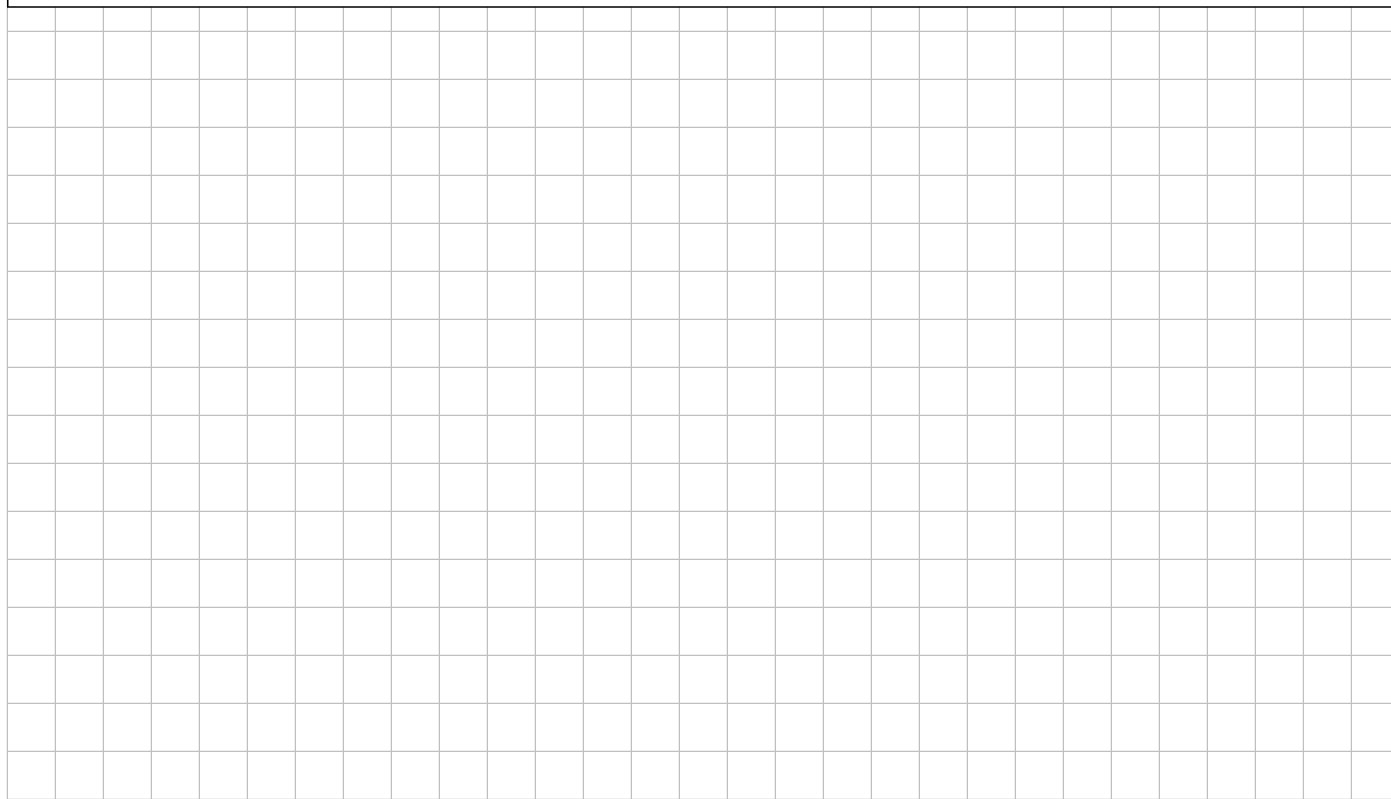
23) Find  $\theta_{BC}$ .



$$0.36911x + 0.61633y = 2011.1$$

$$0.78748y - 0.92938x = 0$$

24) and 25) Find the values of  $x$  and  $y$



$$F_{BC} \sin 15^\circ + F_{AC} \cos 35^\circ + 1030.1 = 0$$

$$F_{BC} \cos 15^\circ + F_{AC} \sin 35^\circ = 0$$

26) and 27) Determine  $F_{AC}$  and  $F_{BC}$

