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Engineering Statics - 01 Math Review Handout

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

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

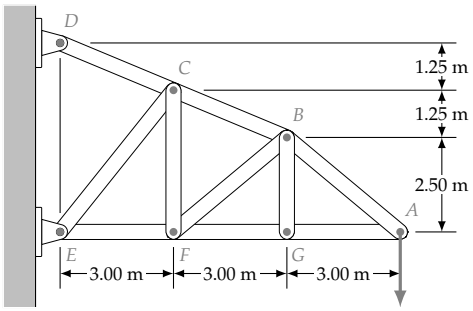
3) Solve $c^2 = a^2 + b^2 - 2bc\cos C$ for $\cos C$.

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.

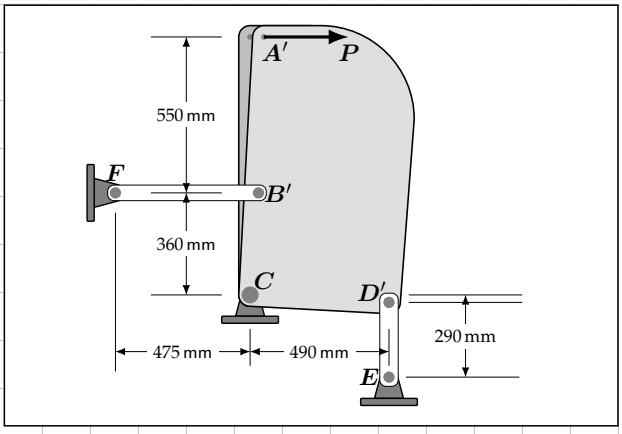
$ABCD$ is a rigid (i.e., it does not deform) plate, pinned at C.

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

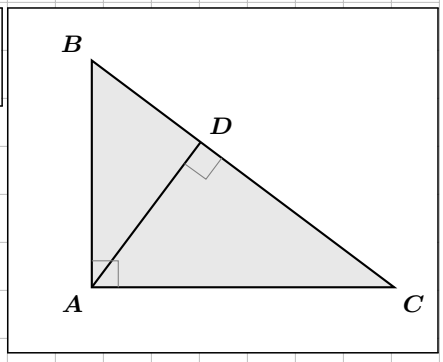
Assume that BF remains horizontal and that DE remains vertical.

16) Determine δ_{BF}, the change in length of BF.

17) Determine δ_{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).



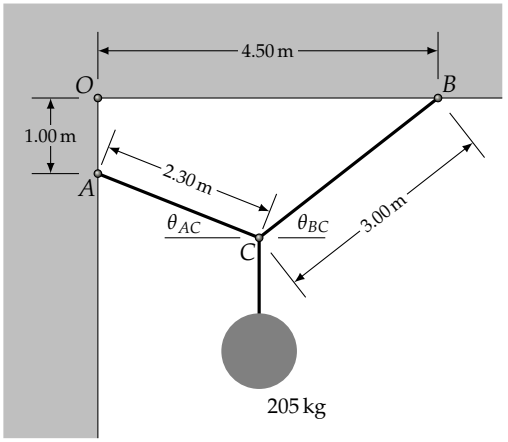
19) Given that $AC = 100$ mm and $AD = 65$ mm, determine $\angle ACD$ and $\angle ABD$.

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 θ_{AC}.

23) Find θ_{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}