Your Name (Last, First, Middle) Problem Number Date

Given: concise statement (in your own words) of the information given.

Find: concise statement (in your own words) of the information sought.

Solution:

- Draw a schematic (where appropriate, a free body diagram) of the system and label appropriate coordinate axes. Use a straight edge whenever possible.
- State mathematical formulation of basic laws or definitions to be used.
- State your initial assumptions.
- Beginning with the basic equations, carry through the analysis, simplifying as far as possible before substituting in numbers.
- Substitute in numerical values (using a consistent set of units) to obtain numerical answers.
- Check your answers to be sure that they are reasonable.
- Label your answers and include appropriate units with the answers.
- Use "over bar" notation for all vectors appearing in your solution; e.g., $\bar{F}$.

NOTE:

[1] Work problems directly on the sheet to be turned in. Give all the details of calculations.

[2] Neat work will help in avoiding careless errors (Mars Climate Orbitor).

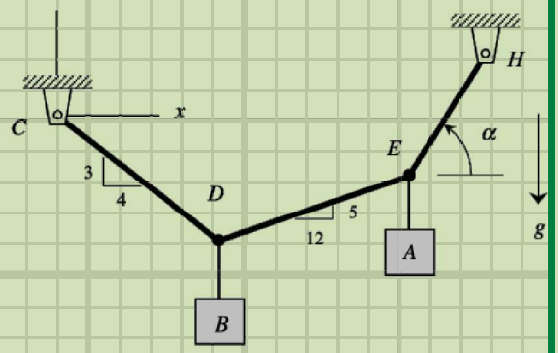
[3] Use Engineering Grid Paper for all homework problems.

[4] One problem per page working on just the light side of the paper.

[5] Make sure your name, problem number, date, etc. appears on all pages.

	Your Full Name	Problem H3.B	Date

Given: Blocks A and B each have a weight of W and are supported with the cable system shown.

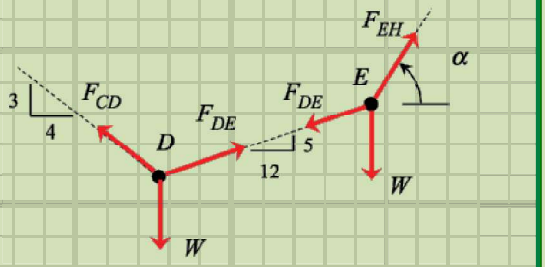


Find: If the system is in static equilibrium,

a) determine the tensions in cables CD and DE, and
b) determine the angle α.

Solution:

Free body diagrams (FBDs):



From the FBD of D:

$$\sum F_x = -\frac{4}{5}F_{CD} + \frac{12}{13}F_{DE} = 0 \;\Rightarrow\; F_{CD} = \frac{15}{13}F_{DE}$$

$$\sum F_y = \frac{3}{5}F_{CD} + \frac{5}{13}F_{DE} - W = 0 \;\Rightarrow\; \left[\frac{3}{5}\left(\frac{15}{13}\right) + \frac{5}{13}\right]F_{DE} = W \;\Rightarrow\; F_{DE} = \frac{13}{14}W$$ ← F_{DE}

$$\Rightarrow\; F_{CD} = \frac{15}{13}F_{DE} = \frac{15}{13}\left(\frac{13}{14}W\right) = \frac{15}{14}W$$ ← F_{CD}

From the FBD of E:

$$\sum F_x = -\frac{12}{13}F_{DE} + F_{EH}\cos\alpha = 0 \;\Rightarrow\; F_{EH}\cos\alpha = \frac{12}{13}\left(\frac{13}{14}W\right) = \frac{6}{7}W$$

$$\sum F_y = -\frac{5}{13}F_{DE} + F_{EH}\sin\alpha - W = 0 \;\Rightarrow\; F_{EH}\sin\alpha = W + \frac{5}{13}\left(\frac{13}{14}W\right) = \frac{19}{14}W$$

Dividing the above two equations gives:

$$\frac{F_{EH}\sin\alpha}{F_{EH}\cos\alpha} = \frac{6W/7}{19W/14} \;\Rightarrow\; \tan\alpha = \frac{12}{19} \;\Rightarrow\; \alpha = \tan^{-1}\left(\frac{12}{19}\right) = 32.3^\circ$$ ← α