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).

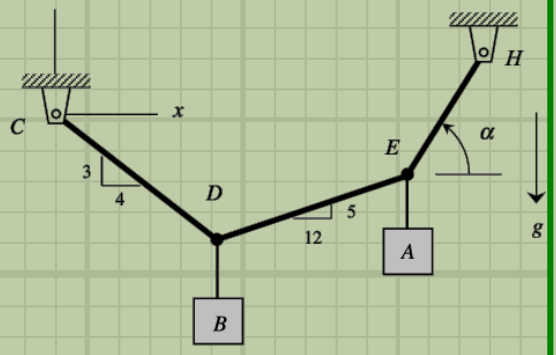
[3] Use Engineering Grid Paper for all homework problems.

[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.



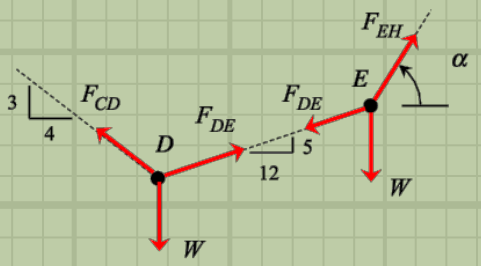
Find: If the system is in static equilibrium,

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:

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

Please also consider the following points for the HWs.

HW Submission:

1- Before uploading to Gradescope, check the quality of the scanned document. You may lose points if we are unable to read your solution. You need to ensure your submission is readable. You may find free scanner mobile apps like Genius Scan useful.
2- When you upload a HW solution, please assign solution pages and rotate your solution pages if needed *otherwise points will be taken off from the HW grade*. Also, note that *each solution page must be individually scanned otherwise your submission will be rejected*. Specifically, you cannot put all your solution pages beside each other, take a single photo of them altogether, and upload a single image in Gradescope. This is not an acceptable form of submission.

HW preparation:

1- Be organized and mark your final answers. You don't want to lose points because we couldn't find your final answers or some details of your solution.
2- Include necessary details in your solution. Some examples are: free body diagrams (the first step in most of the HWs in this course is drawing FBD), equilibrium equations, and equations used to calculate final solutions.
3- If there is a coordinate system in the problem statement, that coordinate system must be used in the HW solution.
4- Final numerical values of variables must be calculated. Solutions like "$a * \frac{b^2}{c+d}$" are not acceptable as final values. We indeed accept fractions like $\frac{1}{3}$, $\frac{1}{\sqrt{2}}$, $\frac{\sqrt{2}}{5}$, as final values.
5- Remember to include units of variables in your final solutions.
6- The given unit system in the problem statement **must be followed**. For example, if a HW problem units are defined in Metric ([N], [m], [Pa]), you cannot convert them to Imperial system ([lb], [in], [psi]) and solve the problem.