Truss Design homework instructions:

1. Complete problem 12.11

2. Use MD Solids software to design the trusses in problems 12.12 and 12. 16. Go to www.MDSolids.com. Select "download" and use Registration Code "D93C8ADC". You don't need to enter your name.

Enter the reaction forces and internal stresses directly on the truss diagrams in Figs. 12-16 and 12-17 (i.e. you don't need to fill-out each question individually, since you're using the software).

For the internal stresses, indicate (C) for compression, and (T) for tension.

3. Finally, use MD Solids for this design scenario:
"You have been asked by your Youth Camp Director to help design a 60-ft pedestrian bridge which is needed to cross a steep canyon at the Camp. The bridge will need to support the weight of two pack horses, plus several hikers".

Design criteria:
Type: wooden truss bridge
Span: 60 feet
Load: use 10,000 lbs. You can model this with 2 or 3 point loads along the bridge. As an approximation, just try to spread out the 10,000 lbs along the span somewhat evenly.
Supports: Use one at each end (no mid-span supports are allowed).

3.a. Lay-out the bridge using MD Solids in what you think is a reasonable-looking arrangement. Enter the loads and reaction forces.
3.b. Compute the internal stresses on all the members.

Deliverables - submit by the due date
1. Problem 12.11 completed
2. Fully-labeled trusses in Figs. 12-16 and 12-17 **including the backup printouts from MD Solids**
3. A complete MD Solids *design package* for the Youth Camp Bridge Project
Arrange everything in an organized package with your name/date somewhere on the cover!

Structural Analysis of Trusses

Exercise 12.3 Calculating Reactions and Internal Forces of Truss Systems

Objective

At the conclusion of this exercise, you will be able to do the following:

1. Check for static determinacy of a truss.
2. Draw a free-body diagram of a truss system.
3. Apply the equations of equilibrium to determine the internal member forces in a truss system.

Procedure

Read the section on the structural analysis of trusses (pp. 414–423) in Chapter 12 of your textbook.

Problem 12.11 Figure 12-15 illustrates four truss systems, labeled A, B, C, and D.

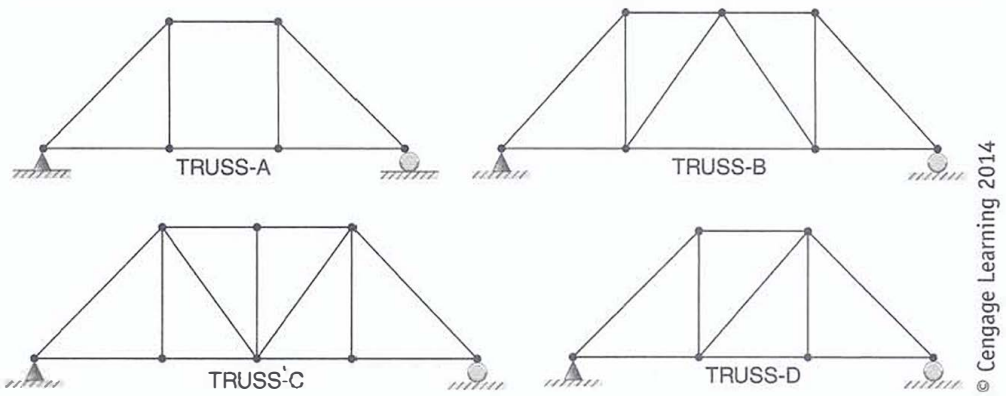

FIGURE 12-15 *Static determinacy of truss systems.*

Using the method described on page 415 of your textbook, analyze each of the truss systems to determine if it is a *statically determinate* truss. Show your math work for each truss and indicate your conclusion in the space provided.

TRUSS A—Statically determinate? Yes_____ No_____

TRUSS B—Statically determinate? Yes_____ No_____

TRUSS C—Statically determinate? Yes_____ No_____

TRUSS D—Statically determinate? Yes_____ No_____

Problem 12.12 Figure 12-16 is a statically determinate truss that has one pinned support at point A, one roller support at point C and a concentrated load applied at point B.

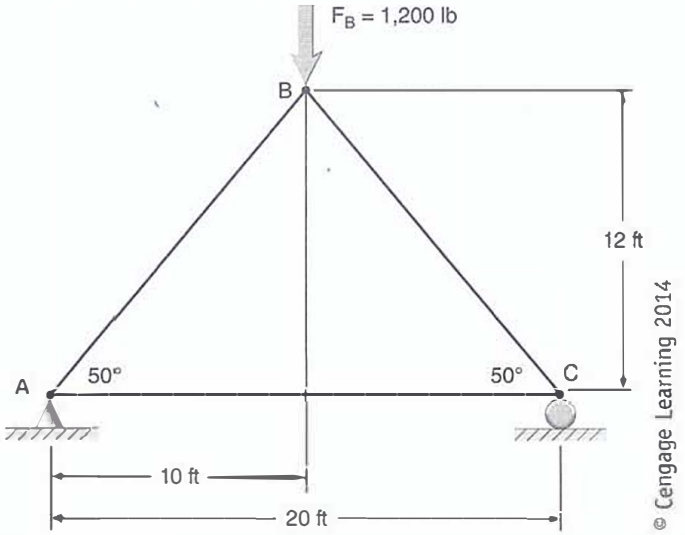

FIGURE 12-16 *A simple truss.*

1. In the space provided, draw and label a free-body diagram of the entire truss. *For reference, see Figure 12-43 on page 417 of your textbook.*

2. Calculate the vertical reaction force at point C by summing the moments about point A ($\Sigma M_A = 0$). Show your math work and record your answer in the space provided.

R_{CY} = _____ lb

3. Calculate the vertical reaction force at point A by summing the forces in the *y*-direction ($\Sigma F_Y = 0$). Show your math work and record your answer in the space provided.

R_{AY} = _____ lb

4. Calculate the horizontal reaction force at point A by summing the forces in the *x*-direction ($\Sigma F_X = 0$). Show your math work and record your answer in the space provided.

R_{AX} = _____ lb

5. In the space provided, draw and label a free-body diagram of each joint, showing all forces acting on and within the truss. *For consistency, assume all members to be in tension and draw force arrows (F_{AB}, F_{AC}, and F_{BC}) pointing away from the joints. For reference, see Figure 12-44 on page 419 of your textbook.*

6. Determine the number of unknown forces at each joint and complete Table 12-1.

Joint	Equilibrium Equation	# Unknowns
A	$\Sigma F_X = 0$	_____
A	$\Sigma F_Y = 0$	_____
B	$\Sigma F_X = 0$	_____
B	$\Sigma F_Y = 0$	_____
C	$\Sigma F_X = 0$	_____
C	$\Sigma F_Y = 0$	_____

TABLE 12.1 *Unknown Forces.*

For Problems 12.12 through 12.14, show your math work in the space provided after each problem. Record your answers in Table 12-2 and indicate whether the member is in tension or compression.

Problem 12.13 Calculate the internal member forces for truss section AB using equilibrium equation $\Sigma F_{AY} = 0$.

Problem 12.14 Calculate the internal member forces for truss section AC using equilibrium equation $\Sigma F_{AX} = 0$.

Problem 12.15 Calculate the internal member forces for truss section BC using equilibrium equation $\Sigma F_{CY} = 0$.

Truss Member	Internal Force (lb)	Tension/Compression
AB	F_{AB} = _____	_____
AC	F_{AC} = _____	_____
BC	F_{BC} = _____	_____

TABLE 12.2 *Truss Member Internal Forces.*

Problem 12.16 Figure 12-17 is a statically determinate truss that has a pinned support at point A, a roller support at point D, and a concentrated load applied at point B.

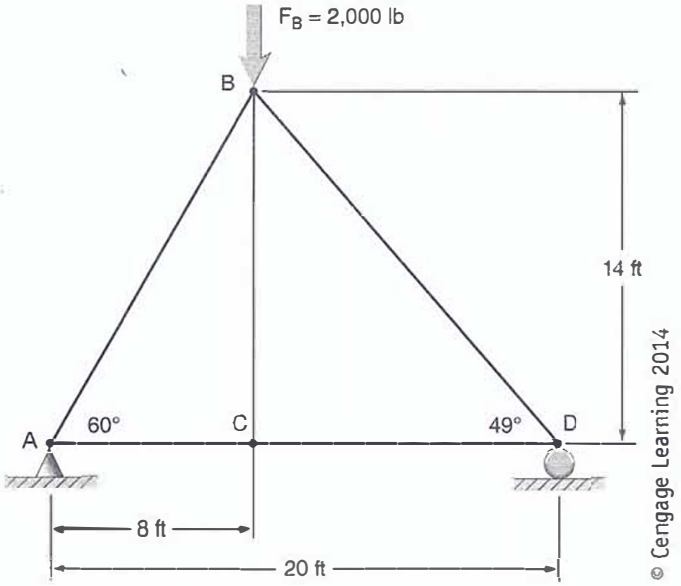

FIGURE 12-17 *A simple truss.*

1. In the space provided, draw and label a free-body diagram of the entire truss.

2. Calculate the vertical reaction force at point D by summing the moments about point A ($\Sigma M_A = 0$). Show your math work and record your answer in the space provided.

R_{DY} = _____ lb

3. Calculate the vertical reaction force at point A by summing the forces in the *y*-direction ($\Sigma F_Y = 0$). Show your math work and record your answer in the space provided.

R_{AY} = _____ lb

4. Calculate the horizontal reaction force at point A by summing the forces in the *x*-direction ($\Sigma F_X = 0$). Show your math work and record your answer in the space provided.

R_{AX} = _____ lb

5. In the space provided, draw and label a free-body diagram of each joint showing all forces acting on and within the truss. *For consistency, assume all members to be in tension, drawing arrows (F_{AB}, F_{AC}, F_{BD}, F_{CD}, and F_{BC}) pointing away from the joints. For reference, see Figure 12-49 on page 422 of your textbook.*

For Problems 12.16 through 12.20, show your math work in the space provided after each problem. Record your answers in Table 12.3 and indicate whether the member is in tension or compression.

Problem 12.17 Calculate the internal member forces for truss section AB from joint A using equilibrium equation $\Sigma F_{AY} = 0$.

Problem 12.18 Calculate the internal member forces for truss section AC from joint A using equilibrium equation $\Sigma F_{AX} = 0$.

Problem 12.19 Calculate the internal member forces for truss section BD from joint D using equilibrium equation $\Sigma F_{DY} = 0$.

Problem 12.20 Calculate the internal member forces for truss section CD from joint D using equilibrium

Problem 12.21 Calculate the internal member forces for truss section BC from joint C using equilibrium equation $\Sigma F_{CY} = 0$.