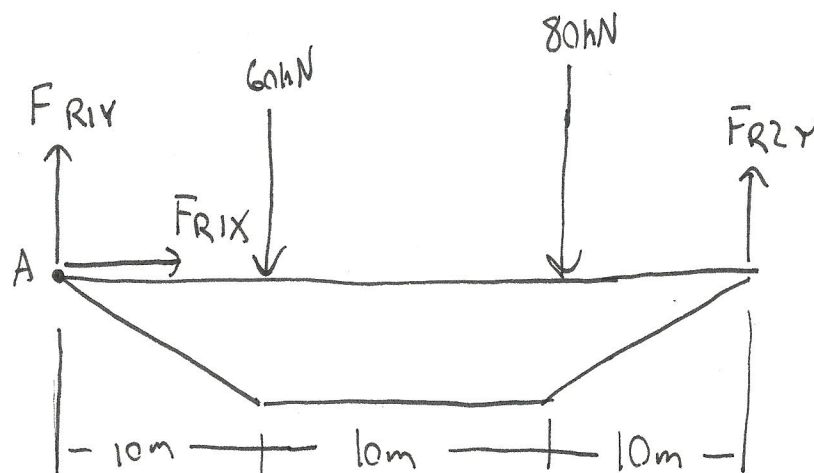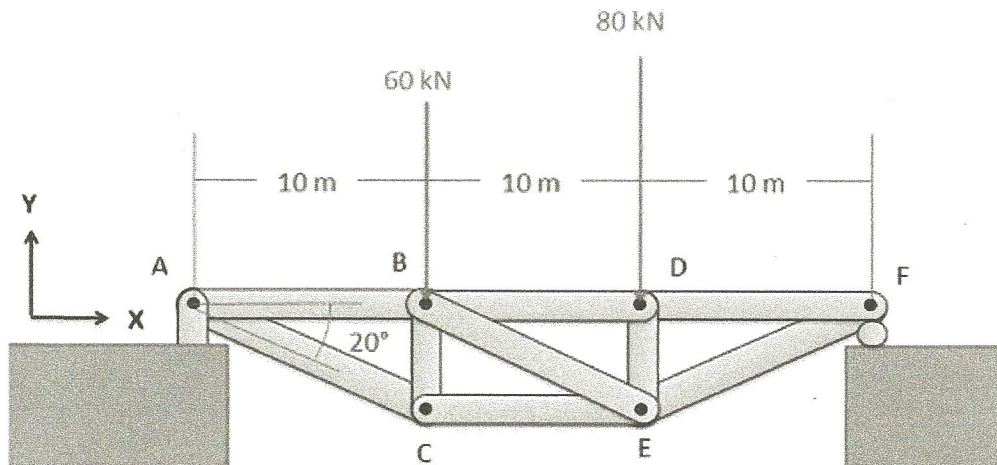# Question 1:

Find the force acting in each of the members in the truss bridge shown below. Remember to specify if each member is in tension or compression.
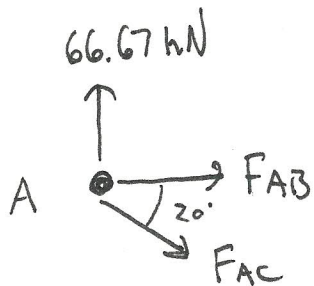

$$\Sigma F_x = F_{R1X} = 0$$

$$\Sigma F_y = F_{R1Y} + F_{R2Y} - 60 - 80 = 0$$

$$\Sigma M_A = (F_{R2Y})(30) - (60)(10) - (80)(20) = 0$$

$$F_{RIX} = 0$$

$$F_{RY2} = \frac{(60)(10) + (80)(20)}{30} = 73.33 \, kN$$
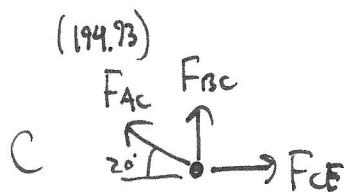
$$F_{RY1} = 60 + 80 - 73.33 = 66.67 \, kN$$

66.67 kN

A

F_{AB}

20°

F_{AC}

$$\Sigma F_x = F_{AB} + \cos(20) F_{AC} = 0$$

$$\Sigma F_y = 66.67 - \sin(20) F_{AC} = 0$$

$$F_{AC} = \frac{66.67}{\sin(20)} = \boxed{194.93 \, kN}$$

$$F_{AB} = -\cos(20)(194.93) = \boxed{-183.17 \, kN}$$
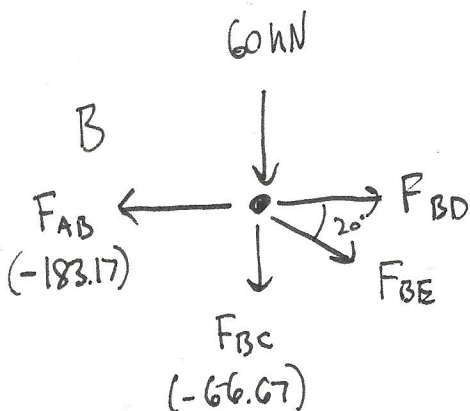
(194.93)

F_{AC} F_{BC}

C

20°

F_{CE}

$$\Sigma F_x = -194.93 \cos(20) + F_{CE} = 0$$

$$\Sigma F_y = 194.93 \sin(20) + F_{BC} = 0$$

$$F_{CE} = 194.93 \cos(20) = \boxed{183.17 \, kN}$$

$$F_{BC} = -194.93 \sin(20) = \boxed{-66.67 \, kN}$$

60 kN

B

F_{AB}
(-183.17)

F_{BD}

20°

F_{BE}

F_{BC}
(-66.67)
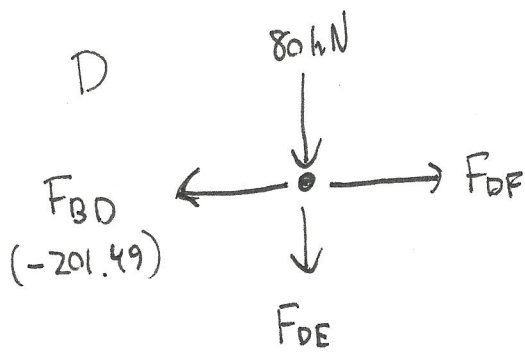
$$\Sigma F_x = 183.17 + F_{BD} + \cos(20) F_{BE} = 0$$

$$\Sigma F_y = 66.67 - 60 - \sin(20) F_{BE} = 0$$

$$F_{BE} = \frac{6.67}{\sin(20)} = \boxed{19.50 \, kN}$$

$$F_{BD} = -183.17 - \cos(20)(19.50) = \boxed{-201.49 \, kN}$$

D

80 hN

F_{BD} $\leftarrow$ •→ F_{DF}
(-201.49)

F_{DE}

$\Sigma F_x = 201.49 + F_{DF} = 0$

$\Sigma F_y = -80 - F_{DE} = 0$

$F_{DF} = -201.49 \, hN$

$F_{DE} = -80 \, hN$

F   73.33 hN

F_{DF}
(-201.49)   20°

F_{EF}
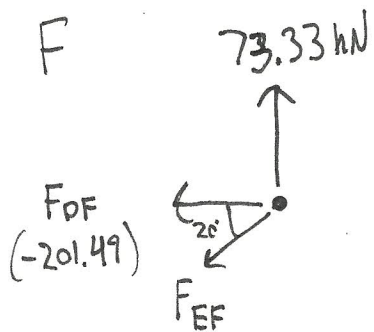
$\Sigma F_y = 73.33 - \sin(20) F_{EF} = 0$

$F_{EF} = \dfrac{73.33}{\sin(20)} = 214.40 \, hN$

Solution

$F_{AB} = 183.17 \, hN \quad C$

$F_{AC} = 194.93 \, hN \quad T$

$F_{BC} = 66.67 \, hN \quad C$

$F_{BD} = 201.49 \, hN \quad C$

$F_{BE} = 19.50 \, hN \quad T$

$F_{CE} = 183.17 \, hN \quad T$

$F_{DE} = 80.00 \, hN \quad C$

$F_{DF} = 201.49 \, hN \quad C$

$F_{EF} = 214.40 \, hN \quad T$