

ARCH 631. Assignment #1

Date: 1/16/18, due 1/25/18

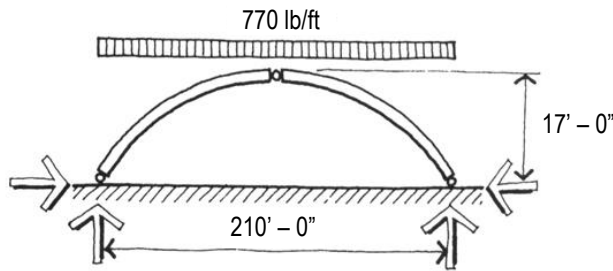
Worth 20 pts.

Problems:

1. A 24-foot-long steel beam is installed when the temperature is 45°F. How much will it expand if the temperature rises to 75°F? The coefficient of expansion of steel is 0.0000065.

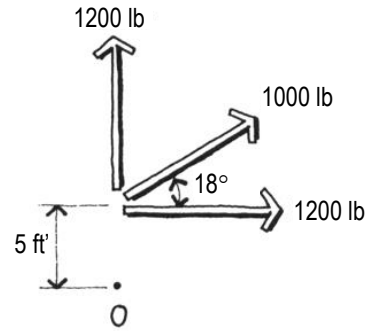
Answer: 0.056 in

2. What is the horizontal thrust at each end of the three-hinged arch shown below?



Answer: 249.7 k

- 3.



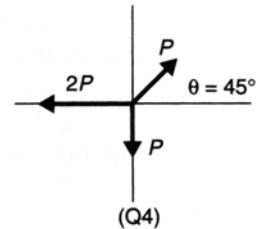
What is the moment about point O of the three forces shown above?

Answer: 10,755 lb-ft

4. Complete text problem 2.4 on page 85.

2.4 The following three forces act through a point: P at $\theta_x = 45^\circ$, $2P$ at $\theta_x = 180^\circ$, and P at $\theta_x = 270^\circ$. Find the equivalent resultant force. [See Figure 2.59(Q4).]

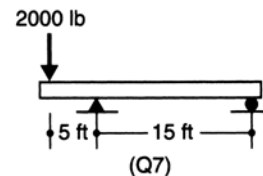
Answer: $1.33P$ at 192.8° .



5. Complete text problem 2.7 on page 85.

2.7 Determine the reactions for the structure shown in Figure 2.59(Q7).

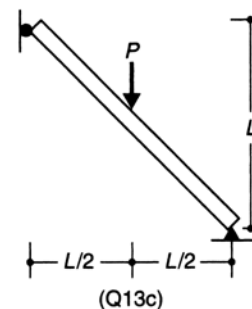
Answer: $R_A = 2667 \text{ lb } \uparrow$ and $R_B = 667 \text{ lb } \downarrow$.



6. Complete text problem 2.13 on page 85 for figure Q13c.

2.13 Determine the reactions for the beams shown in Figure 2.59(Q13).

Answer: $R_{Ax} = P/2 \rightarrow$, $R_{Bx} = P/2 \leftarrow$, $R_{By} = P \uparrow$.



7. Complete text problem 2.24 on page 86.

- 2.24** What is the unit strain present in an aluminum specimen loaded to 10,000 lb/in.²? Assume that $E_a = 11.3 \times 10^6$ lb/in.²
Answer: 0.000885 in./in.

8. Complete text problem 2.27 on page 86.

- 2.27** A steel bar that is 20 mm in diameter is 5 m long and carries a tension force of 20 kN. How much does the bar elongate? Assume that $E_s = 0.204 \times 10^6$ N/mm².
Answer: 1.56 mm.