37.16 A carnot heat pump operates during winter when the outisde air temperature is $20°F$ and inside temperature is $68°F$. During summer, the unit runs in reverse to provide cooling when when the outisde air temperature is $100°F$ and inside temperature is $72°F$. What is the coefficient of performance during summer operation?

A. 3

B. 4

C. 17

D. 19

Recall that a Carnot heat pump has the maximum theorteical Coefficient of Performance based on the temperatures of the reservoirs heat is being removed from and rejected to. In this case, winter operation may be ignored since the question is asking about the COP for summer operation only.

The COP for refrigeration for a carnot cycle is given by:

$$COP_c = \frac{T_L}{T_H - T_L}$$

Temperature units must be absolute (Rankine). The deniminator is a temperature differential and therefore may be left in Farenheit.

$$COP_c = \frac{72°F + 460°}{100°F - 72°F} = 19$$

Answer D