Chapter 10

Note: wherever possible, values used in the solutions below are taken directly from the SAS output provided in the text.

1. a Age with a correlation of 0.7752.

b i $r_{\text{SBP, SMK}|\text{AGE}} = \sqrt{0.323} = 0.568$. The value, 0.323, is taken from the SAS Squared Partial Correlation Type I provided for Problem 1.

ii $r_{\text{SBP, QUET}|\text{AGE}} = \sqrt{0.101} = 0.318$

c $H_0 : \rho_{\text{SBP, SMK}\,|\text{AGE}} = 0 \quad H_A : \rho_{\text{SBP, SMK}|\text{AGE}} \neq 0$

$$F(\text{SMK}\ |\text{AGE}) = \frac{[\text{SSR(AGE,SMK) - SSR(AGE)}]/1}{\text{MSE(AGE,SMK)}} = \frac{4689.684 - 3861.630}{\frac{1736.285}{29}} = 13.83$$

Degrees of freedom (df): 1, 29
P-value: $P < 0.001$
[Note: Instead of calculating this partial F statistic using the formula above, we could have determined it by computing the square of the appropriate partial T-statistic (3.719) on the SAS output.]
At $\alpha = 0.05$, we reject H_0 and conclude that SMK added to a model already containing AGE explains a significant amount of variation in SBP.

d $H_0 : \rho_{\text{SBP, QUET}\,|\text{AGE, SMK}} = 0 \qquad H_A : \rho_{\text{SBP, QUET}\,|\text{AGE, SMK}} \neq 0$
$T = 1.91$ (28 df) $\qquad P = 0.066$
At $\alpha = 0.05$, we do not reject H_0 and conclude that QUET added to a model already containing AGE and SMK does not explain a significant amount of variation in SBP.

e Based on the results for a-d we find that the following variables ranked in order of their significance in explaining the variation in SBP: 1) AGE, 2) SMK, 3) QUET. QUET may be considered relatively unimportant since the two other predictors, AGE and SMK explain most of the variation in SBP, with the proportions of explained variation both being significant at $\alpha = 0.05$, while QUET does not.

f $r^2_{\text{SBP(QUET,SMK}|\text{AGE)}} = \dfrac{4889.826 - 3861.630}{2564.338} = 0.401$

$H_0 : \rho_{\text{SBP (QUET, SMK)}\,|\text{AGE}} = 0 \qquad H_A : \rho_{\text{SBP (QUET, SMK)}\,|\text{AGE}} \neq 0$

$$F(\text{QUET, SMK}\ |\text{AGE}) = \frac{(4889.826 - 3861.630)/2}{1536.143/28} = 9.371 \qquad (2, 28\text{ df})$$

$P < 0.001$
The highly significant *P*-value suggests that both SMK and QUET are important variables, but there is room for debate since the increase in r^2 going from model 1, with only AGE (0.601), to model 3, with all 3 variables (0.761) is small (0.160).