Exercise 3.2

The law on public primary schools specify in § 50 for which pupils the city is obliged to provide transport to the school. The transport obligation of the city is given as the sum of the distances (as the crow flies) from home to school for those pupils who have the right of transport.

We wish to investigate the following models, which describe a school transport-obligation:

$$I\colon\ TO = a + b \cdot P \cdot \sqrt{A} + c \cdot P$$
$$II\colon\ TO = d + f \cdot P \cdot \sqrt{A} + g \cdot \sqrt{A}$$

where:

TO = transport obligation
P = number of pupils having the right of transport
A = area of school district

Assume that $TO \in N(\mu, \sigma^2 I)$. Based on the observations given later do the following (using SAS):

1. Estimate coefficients a and b.
2. Give an estimate of the residual error in model I.
3. Check if c and/or a can be assumed to be 0. First test c = 0 and then a = 0.
4. Do the same analyses (1-3) for model II, now testing i) d = 0 and ii) g = 0.
5. Is one of the models better than the other?

The data:

School no.	Pupils with right to transport	Area of school district	Transport obligation
1	286	155.0	2127
2	58	85.0	442
3	75	97.5	516
4	167	196.4	1458
5	22	24.6	130