Tomato Designs

Find the Source, df, and Expected Mean Square expression for each ANOVA table below. What error term (denominator) would be used in testing for fertilizer effects?

(a) An experiment is designed to test the effects of three fertilizers on tomato plants. A total of 18 pots are used with 6 pots for each fertilizer. The fertilizer is mixed into the soil of each pot. One plant is planted in each pot. Thus each fertilizer is used on 6 plants and there are 18 total plants.

F1 O O O O O O
F2 O O O O O O
F3 O O O O O O

(b) Essentially the same experiment is carried out except now a total of 9 pots are used with 3 pots for each fertilizer. The fertilizer is mixed into the soil of each pot. Two plants are planted in each pot. Thus each fertilizer is used on 6 plants and there are 18 total plants.

(c) Now there are 6 big pots with 3 plants in each pot. In each pot plants are chosen randomly to receive each fertilizer applied to the leaves of the plant. Again there are 18 total plants and each fertilizer is used, on 6 plants.
(d) (i) Now there are 3 big pots with 3 plants in each pot. In each pot one plant is chosen randomly to receive each fertilizer applied to the leaves of the plant. Water level is low for 3 pots and high for 3 pots. Again there are 18 total plants and each fertilizer is used on 6 plants.

![Diagram of Low Water and High Water conditions with 3 plants per pot and 3 pots, showing different fertilizer treatments.]

(ii) Now there are 3 big pots with 6 plants in each pot. In each pot 2 plants are chosen randomly to receive each fertilizer applied to the leaves of the plant. Water level is low for 3 pots and high for 3 pots. There are 36 total plants and each fertilizer is used on 6 plants.

![Diagram of Low Water and High Water conditions with 6 plants per pot and 3 pots, showing different fertilizer treatments.]
(e) Again with fertilizers and tomato plants, the 18 plants are now planted in a single field. Six plants are chosen randomly to receive each fertilizer applied in the leaves of the plant. The experiment is run for 3 weeks. Each leaf is broken into 3 parts, and the nitrogen content of a leaf on each plant is measured in triplicate. Thus each plant is measured 3 times for a total of 54 measurements.

| F1 | O O O O O O | 3 measurements from each leaf |
| F2 | O O O O O O |
| F3 | O O O O O O |

(f) Now there are 3 big pots with 6 plants in each pot. In each pot two plants are chosen randomly to receive each fertilizer applied to the leaves of the plant. Again there are 18 total plants and each fertilizer is used on 6 plants.