

1. An engineer used six furnaces to “bake” ceramic components. Components were produced varying three factors: two percentages of silicon, two percentages of calcium and two cooling processes.

A = silicon

B = calcium

C = cooling processes

Only four components could be baked in a furnace at one time, so the furnaces (which were identical) were arbitrarily paired. The furnaces, treatments and observations were:

<b>Furnace</b>					
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
(1)	ab	bc	abc	b	ac
bc	c	a	b	a	bc
abc	ac	ab	(1)	abc	ab
a	b	c	ac	c	(1)

- a.) What treatment component is confounded in Furnaces 1 and 2? Justify your answer.
- b.) What treatment component is confounded in Furnaces 3 and 4? Justify your answer.
- c.) What treatment component is confounded in Furnaces 5 and 6? Justify your answer.

2. Please answer these questions in a manner that is understandable for a beginner

- a. They want to know what the difference between a balanced incomplete block and a fractional factorial design is.
- b. They construct a quarter fraction of a  $2^5$  design for a problem and want to know whether the results, i.e., model output, depend on what fraction they use to create the study design. Explain your response.
- c. Initially they construct the above design using ABC as the base factorial. Another problem asks whether the design changes if they use ACE as the base factorial instead of ABC. Does it? If so, how?