EMSE 6035: Marketing Analytics for Design Decisions

Design of Experiments

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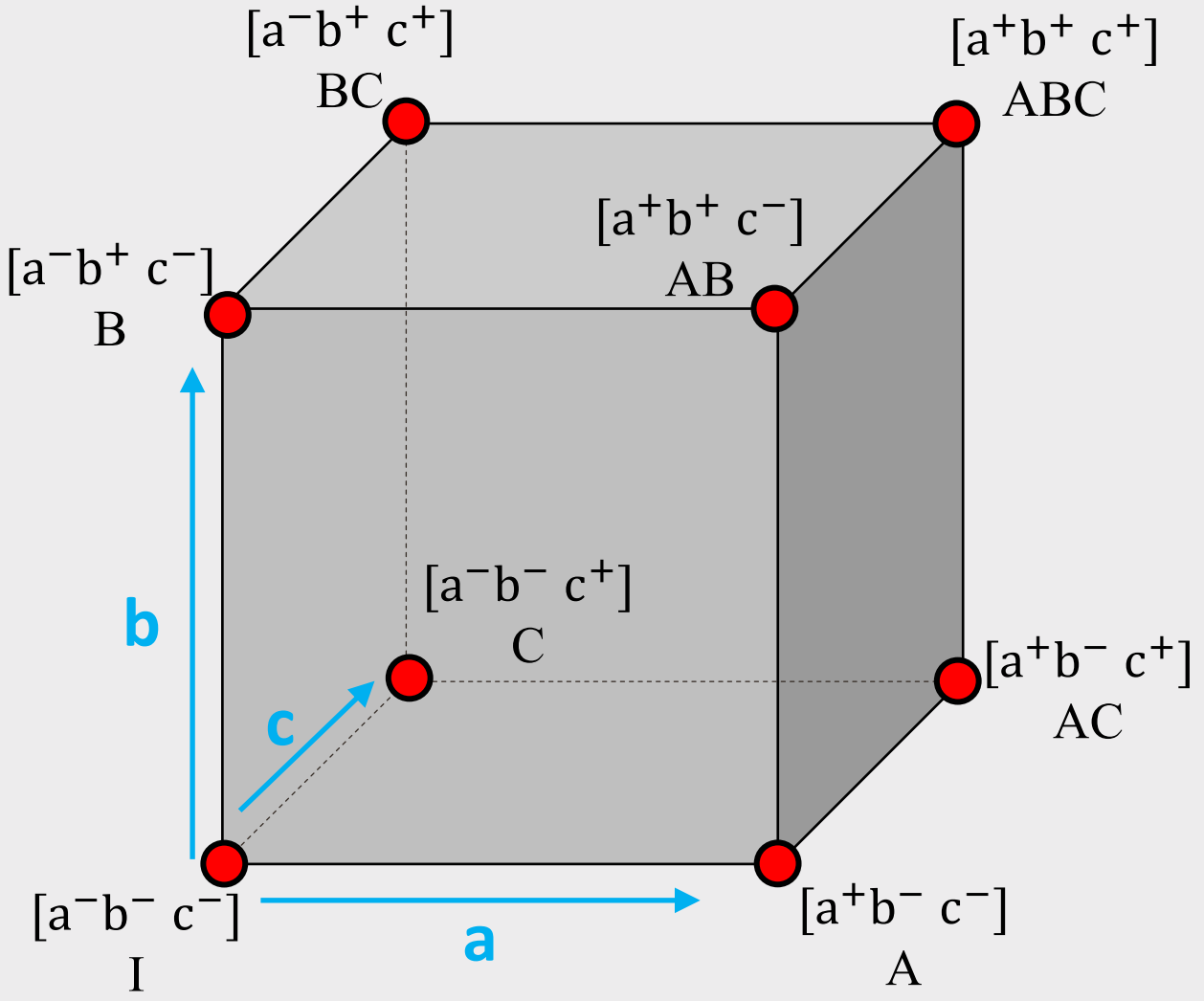
Design of experiment affects amount of available information

Design: **Full Factorial**

a	b	c	Effect
-	-	-	I
+	-	-	A
-	+	-	B
-	-	+	C
+	+	-	AB
+	-	+	AC
-	+	+	BC
+	+	+	ABC



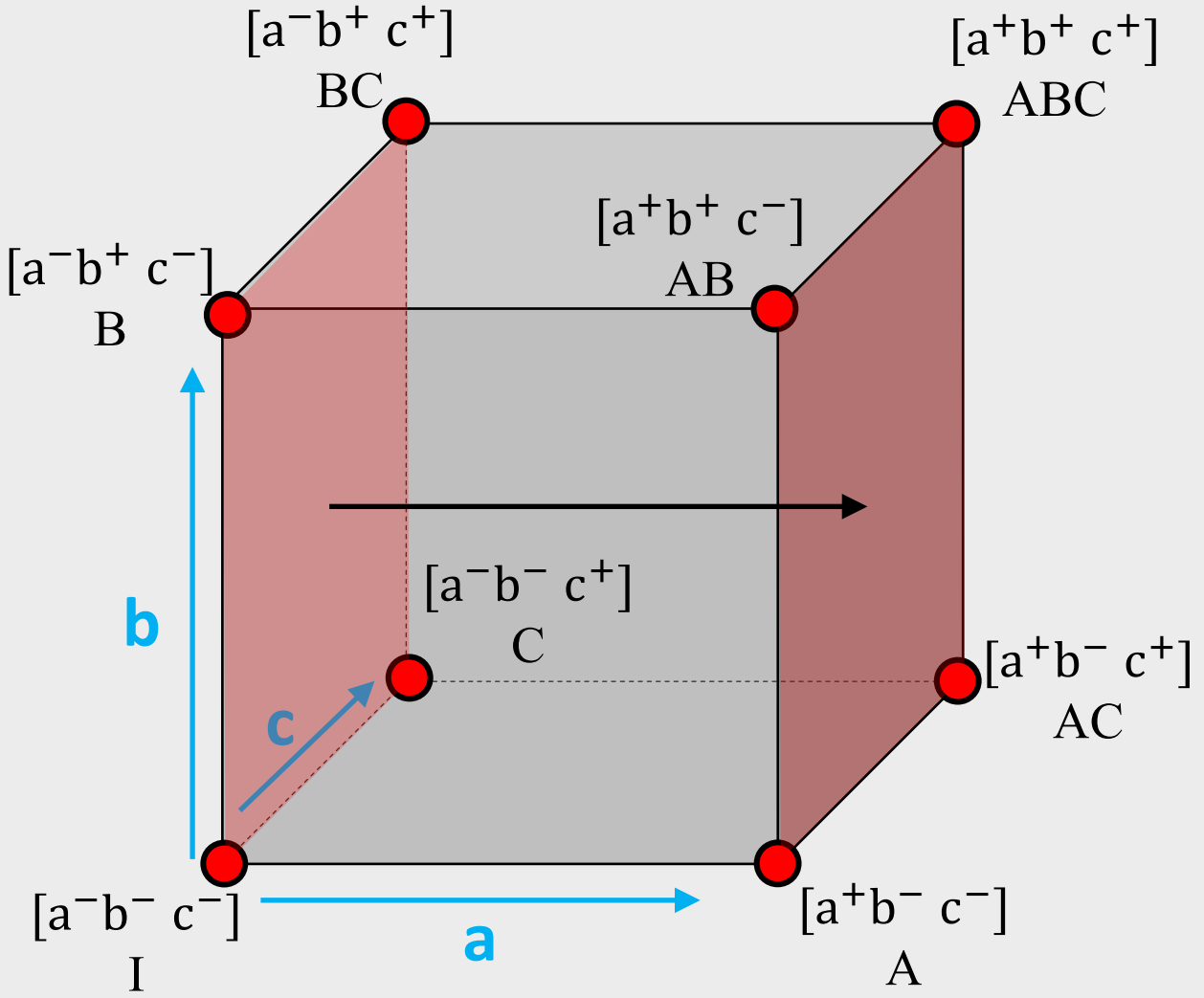
Balanced: For each attribute, all levels appear an equal number of times.

Orthogonal: For each pair of attributes, all pairs of levels appear together an equal number of times.

Main Effects: Average change in the dependent variable associated with a change in an attribute level.

Example:

$$ME(a) = \left(\frac{A + AB + AC + ABC}{4}\right) - \left(\frac{I + B + C + BC}{4}\right)$$



Main Effects: Average change in the dependent variable associated with a change in an attribute level.

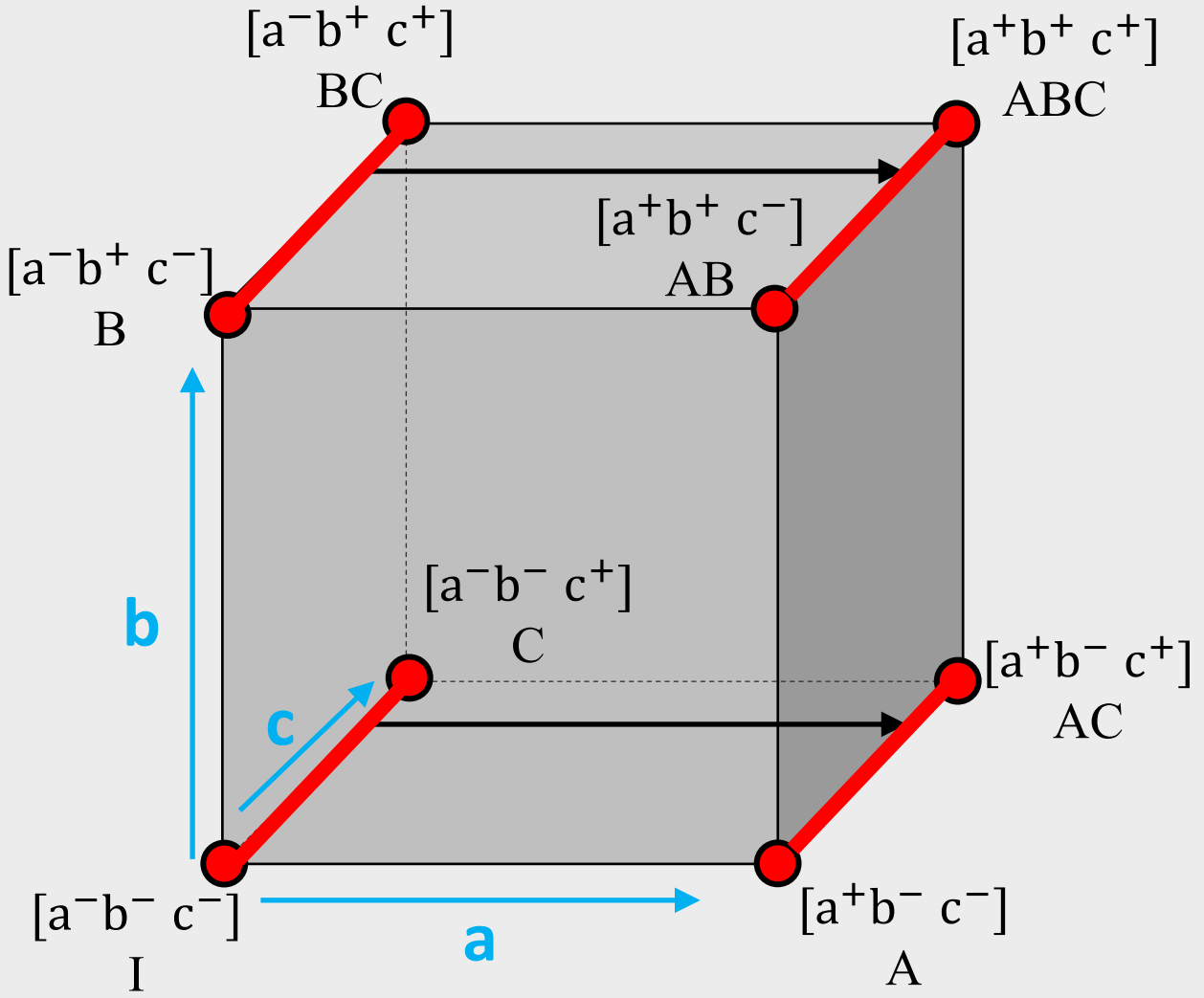
Example:

$$\mathrm{ME(a)} = \left(\frac{\mathrm{A + AB + AC + ABC}}{4}\right) - \left(\frac{\mathrm{I + B + C + BC}}{4}\right)$$

Interaction Effects: Difference in the main effect of one attribute based on the value of another attribute.

Example:

$$\mathrm{INT(ab)} = \frac{1}{2}\left[\left(\frac{\mathrm{AB + ABC}}{2}\right) - \left(\frac{\mathrm{B + BC}}{2}\right)\right] - \frac{1}{2}\left[\left(\frac{\mathrm{A + AC}}{2}\right) - \left(\frac{\mathrm{I + C}}{2}\right)\right]$$



Fractional Factorial Designs

a	b	c	Effect
-	-	-	I
-	-	+	C
+	+	-	AB
+	+	+	ABC

Balanced? Yes

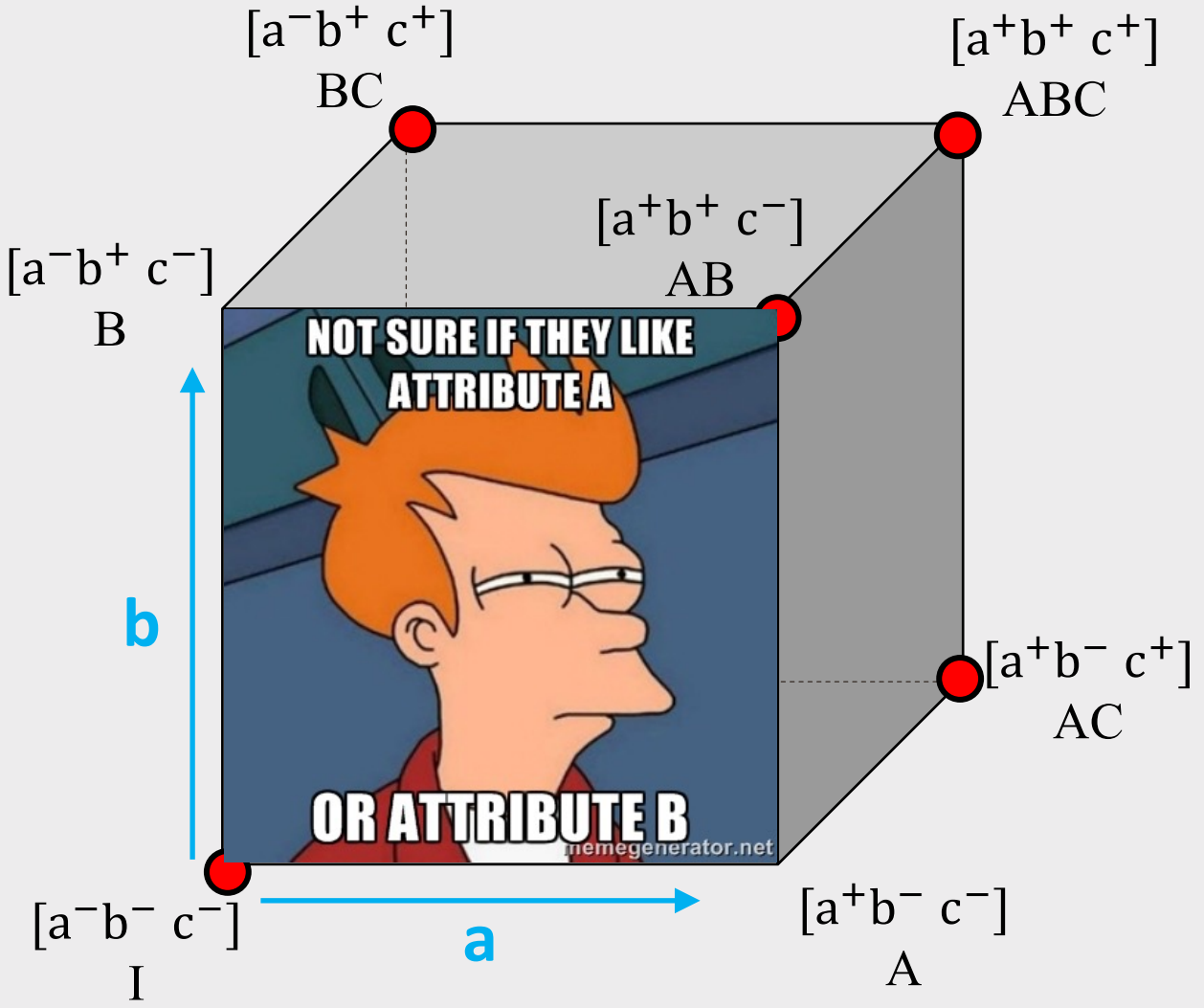
Orthogonal? No

Main effects of a and b are *confounded*

$$\mathrm{ME(a)} = \mathrm{ME(b)} = \left(\frac{\mathrm{AB} + \mathrm{ABC}}{2}\right) - \left(\frac{\mathrm{I} + \mathrm{C}}{2}\right)$$

To find other confounded effects, multiply by (a=b):

c(a=b)	ac = bc
b(a=b)	ab = I
ac(a=b)	c = abc



Fractional Factorial Designs

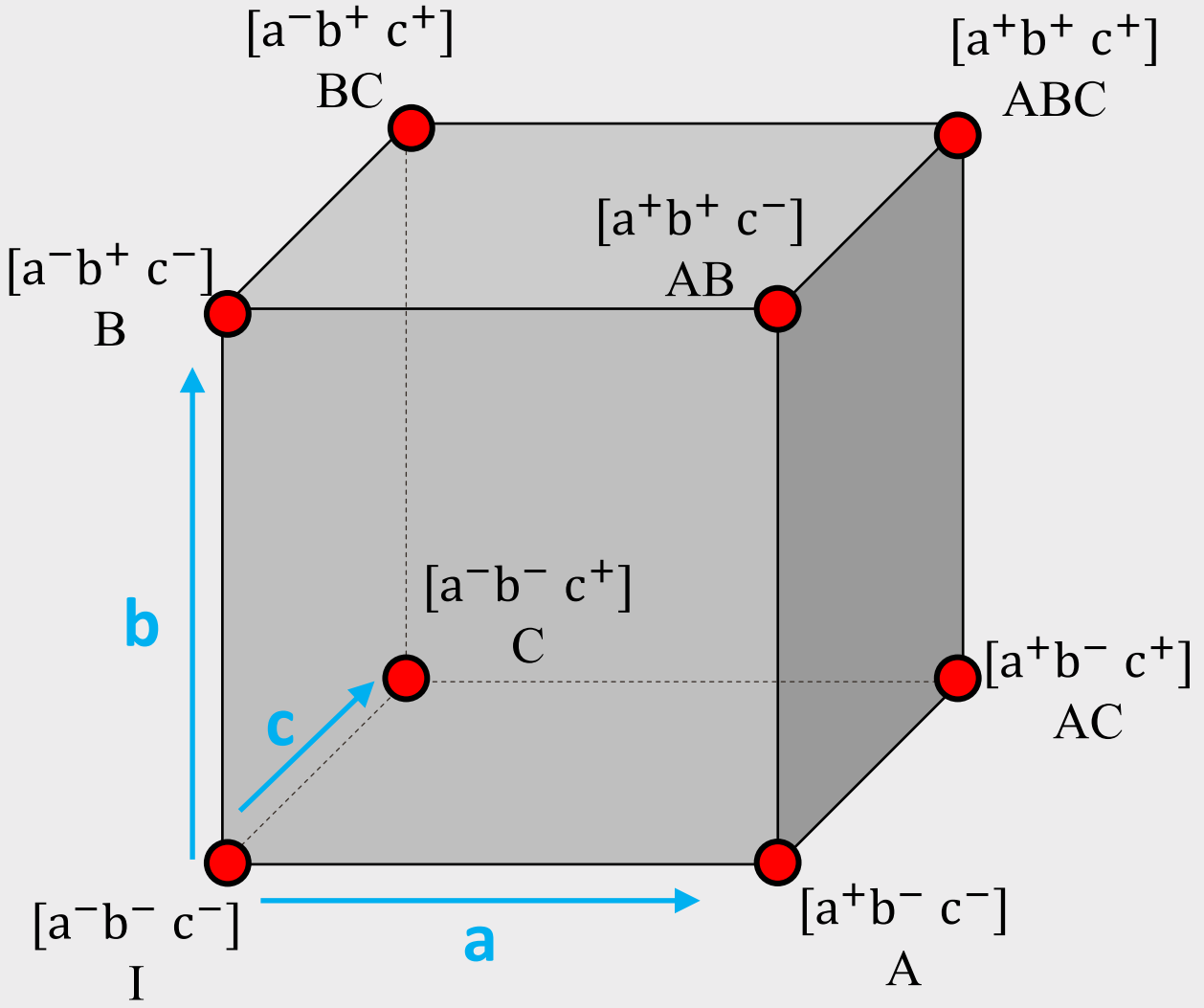
a	b	c	Effect
+	-	-	A
-	+	-	B
-	-	+	C
+	+	+	ABC

Balanced? Yes

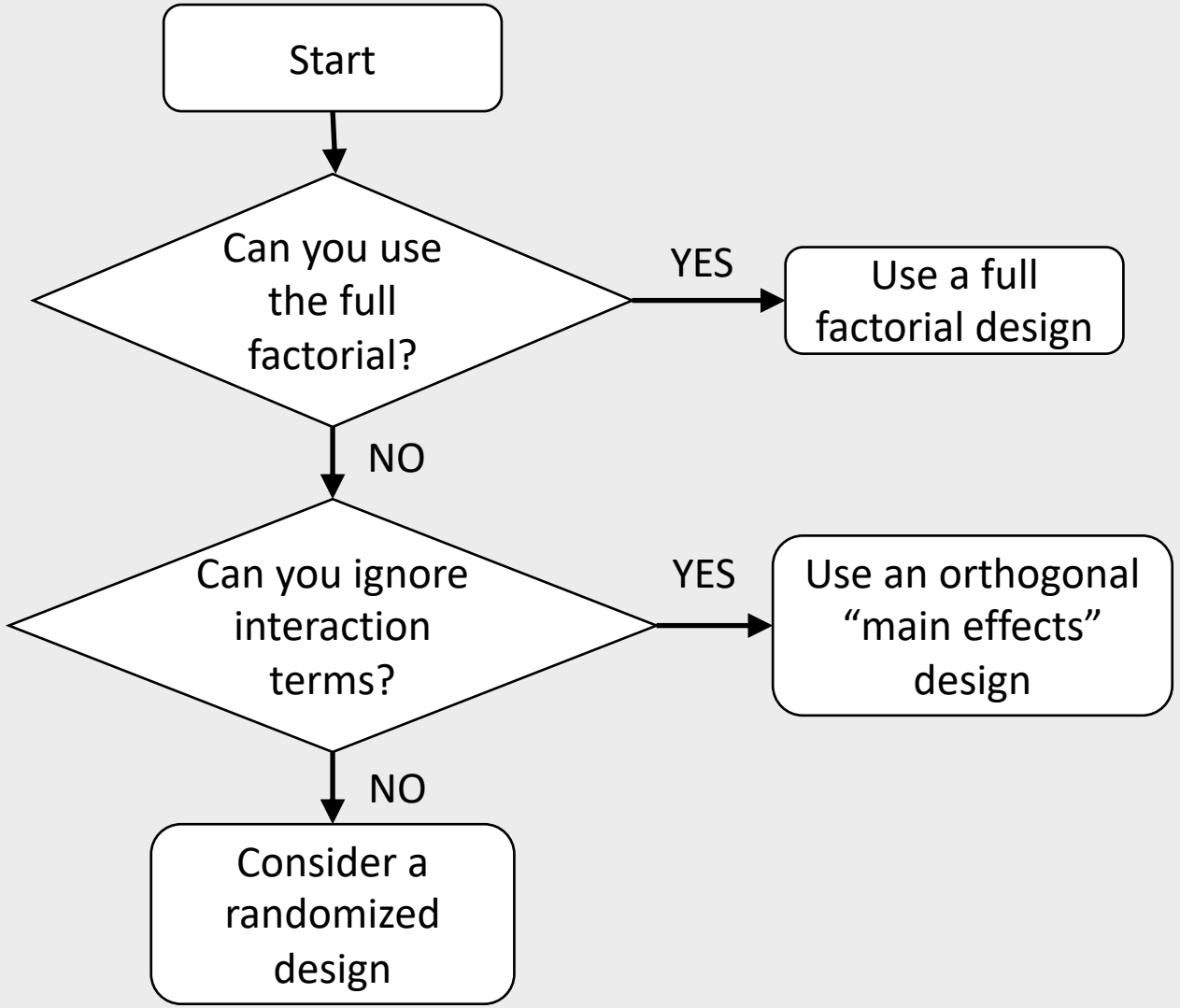
Orthogonal? Yes

None of the main effects are confounded, but each main effect is confounded with a two-way interaction:

a	bc
b	ac
c	ab
I	abc



Designing your experiment / conjoint survey



Practice Question 1

Consider the following experiment design:

a	b	c	Effect
+	-	-	A
-	+	-	B
+	-	+	AC
-	+	+	BC

a) Is the design balanced? Is it orthogonal?
b) Write out the equation to compute the main effect for a, b, and c.
c) Are any main effects confounded? If so, what are they confounded with?