# ITIS6200 EXERCISE: 04-Q2

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**Consider Multics procedures p and q. Procedure p is running and needs to invoke procedure q. Procedure q's access bracket is (5, 8) and its call bracket is (8, 11). Assume that q's access control list gives p full (read, write, append, and execute) rights to q. In which ring(s) must p execute for the following to happen? Justify your answer.**

1. **p can invoke q, but a ring-crossing fault occurs.**
2. **p can invoke q provided that a valid gate is used as an entry point.**
3. **p cannot invoke q.**
4. **p can invoke q without any ring-crossing fault occurring, but not necessarily through a valid gate.**

Given: q's access bracket (a1, a2) = (5, 8) and call bracket (c1, c2) = (8,11)

=> c1 = 8, c2 = 11, a1 = 5, a2 = 8.

Let rings = r.

When there is a call bracket, c1 = a2.

Multics procedures p and q are notated as (a1, a2, a3).

This time, c2 = a3 = 11.

- p can invoke q, but a ring–crossing fault occurs: - p must execute in r < 5.
- p can invoke q provided that a valid gate is used as an entry point: - p should execute between rings greater than 8 and less than or equal to 11 ($8 < r \leq 11$).
- p cannot invoke q: - occurs when r > 11.
- p can invoke q without any ring-crossing fault occurring, but not necessarily through a valid gate: - p should execute between rings greater than or equal to 5 and less than or equal to 8 ($5 \leq r \leq 8$)