

Instructions: Show all work. Answer each question as completely as possible. Use exact values. For counting problems you may use scientific notation (with three significant figures) for any numbers larger than a million.

1. Consider the weighted voting system [7: 5, 3, 2, 1].

a. List all the sequential coalitions.

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|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| $\langle P1, P2, P3, P4 \rangle$ | $\langle P2, P1, P3, P4 \rangle$ | $\langle P3, P1, P2, P4 \rangle$ | $\langle P4, P1, P2, P3 \rangle$ |
| $\langle P1, P2, P4, P3 \rangle$ | $\langle P2, P1, P4, P3 \rangle$ | $\langle P3, P1, P4, P2 \rangle$ | $\langle P4, P1, P3, P2 \rangle$ |
| $\langle P1, P3, P2, P4 \rangle$ | $\langle P2, P3, P1, P4 \rangle$ | $\langle P3, P2, P1, P4 \rangle$ | $\langle P4, P2, P3, P1 \rangle$ |
| $\langle P1, P3, P4, P2 \rangle$ | $\langle P2, P3, P4, P1 \rangle$ | $\langle P3, P2, P4, P1 \rangle$ | $\langle P4, P2, P1, P3 \rangle$ |
| $\langle P1, P4, P2, P3 \rangle$ | $\langle P2, P4, P1, P3 \rangle$ | $\langle P3, P4, P1, P2 \rangle$ | $\langle P4, P3, P1, P2 \rangle$ |
| $\langle P1, P4, P3, P2 \rangle$ | $\langle P2, P4, P3, P1 \rangle$ | $\langle P3, P4, P2, P1 \rangle$ | $\langle P4, P3, P2, P1 \rangle$ |

b. Underline the pivotal players in each coalition above and use that information to calculate the Shapley-Shubik power index.

$$P1: \frac{16}{24} = 67\%$$

$$P3: \frac{4}{24} = 17\%$$

$$P2: \frac{4}{24} = 17\%$$

$$P4: \frac{0}{24} = 0\%$$

c. Use the power index you calculated above and the pivotal players, to determine if there are any dictators, dummies, or players with veto power.

no dictators

P1 has veto power

P4 is a dummy