FINITE MATH: QUIZ 4 SOLUTION

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Problem 1. Consider the sample space $S = \{a, b, c, d\}$ consisting of four possible outcomes. You are given probabilities for the following events:
$$P(\{a\}) = 0.2 \qquad P(\{c\}) = 0.3 \qquad P(\{b, c\}) = 0.4$$

a) (1pt) Compute the probability of the event $\{a, b, c, d\}$.

This is the entire sample space, and $\boxed{P(S) = 1}$

b) (1pt) Compute the probability of the event $\{a, c\}$.

We add up the probabilities of the two outcomes: $\boxed{P(a) + P(c) = 0.2 + 0.3 = 0.5}$

c) (2pt) Compute the probability $P(\{b\})$.

We are given $P(\{b, c\}) = 0.4$ and $P(\{c\}) = 0.3$, and from this information we can deduce that $\boxed{P(\{b\}) = 0.1}$

d) (2pt) Compute the probability $P(\{d\})$.

Notice that we already have probabilities for $\{a\}$ and $\{b, c\}$. Their sum is $P(\{a, b, c\}) = 0.2 + 0.4 = 0.6$. Since the entire sample space must have probability 1, the only way for this to happen is if $\boxed{P(\{d\}) = 0.4}$

e) (2pt) For the event $E = \{a, c\}$, what is the probability that E does NOT occur?

The event that E does not occur is the complement, E'. Using our complement principle, we have $\boxed{P(E') = 1 - P(E) = 1 - 0.5 = 0.5}$ (notice we calculated $P(E)$ in part b of the problem).

Problem 2. (2pts) Roll a pair of die, and record the **sum** of the two numbers that come up. What is the sample space for this random experiment?

The smallest possible sum is $1 + 1 = 2$, and the largest is $6 + 6 = 12$. Any number between 2 and 12 could come up as the sum of the two dice, so the sample space is $\boxed{S = \{2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}}$

Problem 3. (BONUS + 1pt) During a survey, 1000 randomly selected participants were asked which movie was their favourite out of Alien, Predator, and Terminator (each participant could only pick one movie). The results of the survey are shown in the table below:

Movie	# of People
Alien	300
Predator	500
Terminator	200

Estimate the probability that a randomly selected citizen liked the movie Alien.
The probability in question can be estimated by doing

$$\frac{\text{\# participants who chose Alien}}{\text{total \# of participants}}$$

Hence the probability is $\boxed{P(\text{Alien}) \approx \dfrac{300}{1000} = 0.30}$