

(20 pts) NAME (printed neatly): _____

Quiz Grade: _____

1. You have a vase with 5 maroon marbles, 2 white marbles, 6 teal marbles, and 7 brown marbles. If you select 5 marbles at random, what is the *exact* probability, *as a fraction in lowest terms*, that you select

a. (10 pts) at least 1 teal marble?

$$P(\text{at least 1 teal}) = 1 - P(\text{no teal}) = 1 - \frac{C(14,5)}{C(20,5)} = 1 - \frac{2002}{15504} = \frac{6751}{7752}$$

b. (20 pts) exactly two maroon or exactly 3 brown marbles?

2M 3M^C or 3B 2B^C but double-counted 2M 3B

$$\frac{C(5,2)C(15,3) + C(7,3)C(13,2) - C(5,2)C(7,3)}{C(20,5)} = \frac{10 \cdot 455 + 35 \cdot 78 - 10 \cdot 35}{15504} = \frac{6930}{15504} = \frac{1155}{2584}$$

c. (10 pts) all purple marbles?

$$P(\text{all purple}) = P(\emptyset) = 0$$

2. A pair of fair six-sided dice is rolled. What is the *exact* probability, *as a fraction in lowest terms*, that the

a. (20 pts) product of the numbers rolled is twelve if one of the die has a six rolled?

11	12	13	14	15	16
21	22	23	24	25	<u>26</u>
31	32	33	34	35	<u>36</u>
41	42	43	44	45	46
51	52	53	54	55	56
61	<u>62</u>	63	64	65	66

$$\text{Way 1: } P(\text{product } 12 \mid 6) = \frac{2}{11} \quad [\text{using chart}]$$

$$\text{Way 2: } P(\text{product } 12 \mid 6) = \frac{P(\text{product } 12 \cap 6)}{P(6)} = \frac{\frac{2}{36}}{\frac{11}{36}} = \frac{2}{11}$$

[using formula and chart]

b. (20pts) product of the numbers rolled is 4 or one of the numbers rolled is a 2?

11	12	13	14	15	16
21	22	23	24	25	26
31	32	33	34	35	36
41	42	43	44	45	46
51	52	53	54	55	56
61	62	63	64	65	66

$$P(\text{product } 4 \cup 2) = P(\text{product } 4) + P(2) - P(\text{product } 4 \cap 2)$$

$$= \frac{3}{36} + \frac{11}{36} - \frac{1}{36} = \frac{13}{36}$$