

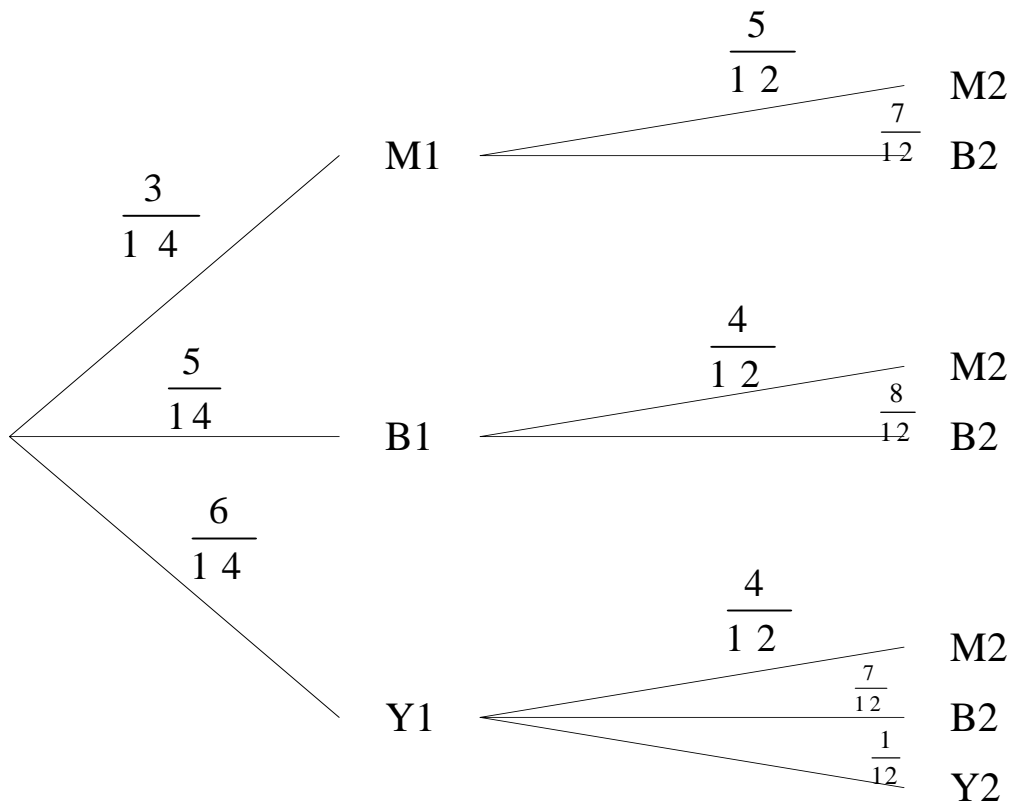
(20pts) NAME (printed neatly): \_\_\_\_\_

(10pts) Section Number (circle correct section): 503 (10:20am) 521 (11:30am) 523 (1:50pm)

Quiz Grade: \_\_\_\_\_

1. There are 3 maroon marbles, 5 blue marbles, and 6 yellow marbles in a box. There are 4 maroon marbles and 7 blue marbles in a chest. An experiment consists of randomly picking a marble from the box and putting it in the chest, and then randomly selecting a marble from the chest. For all parts of this problem, give all probabilities as *exact fractions*.

a. (10pts) Draw a probability tree that represents this experiment.



b. (10pts) What is the probability that a maroon marble is drawn from the box, if a blue marble was drawn from the chest?

$$P(M_1 | B_2) = \frac{P(M_1 \cap B_2)}{P(B_2)} = \frac{\left(\frac{3}{14}\right)\left(\frac{7}{12}\right)}{\left(\frac{3}{14}\right)\left(\frac{7}{12}\right) + \left(\frac{5}{14}\right)\left(\frac{8}{12}\right) + \left(\frac{6}{14}\right)\left(\frac{7}{12}\right)} = \frac{\left(\frac{21}{168}\right)}{\left(\frac{103}{168}\right)} = \frac{21}{103}$$

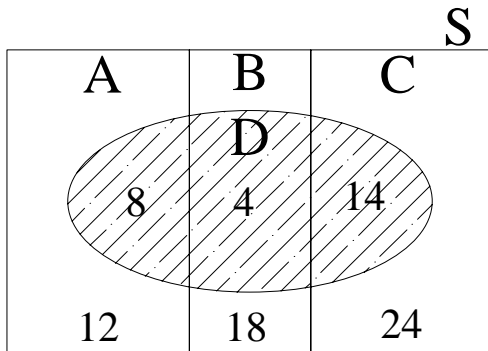
c. (10pts) Is the event “choosing a yellow marble from the box ( $Y_1$ )” independent of “choosing a blue marble from the chest ( $B_2$ )?” Mathematically justify your answer.

$$P(Y_1 \cap B_2) = \left(\frac{6}{14}\right)\left(\frac{7}{12}\right) = \frac{42}{168} = \frac{1}{4}$$

$$P(Y_1)P(B_2) = \left(\frac{6}{14}\right)\left(\frac{103}{168}\right) = \frac{618}{2352} = \frac{103}{392}$$

Since  $P(Y_1 \cap B_2) \neq P(Y_1)P(B_2)$ , the events  $Y_1$  and  $B_2$  are not independent.

2. The Venn diagram shows an experiment in which the three mutually exclusive events  $A$ ,  $B$ , and  $C$  form a partition of the uniform sample space  $S$ . Find the following probabilities as *exact fractions in lowest terms*.



a. (10pts)  $P(D^c) = \frac{12+18+24}{8+4+14+12+18+24} = \frac{54}{80} = \frac{27}{40}$

b. (10pts)  $P(A | D) = \frac{8}{8+4+14} = \frac{8}{26} = \frac{4}{13}$

c. (10pts)  $P(D | B) = \frac{4}{4+18} = \frac{4}{22} = \frac{2}{11}$

3. (10pts) If  $A = \{m, a, t_1, h, e, t_2, i, c, s\}$ , how many subsets does set  $A$  have?

$$2^{n(A)} = 2^9 = 512$$