

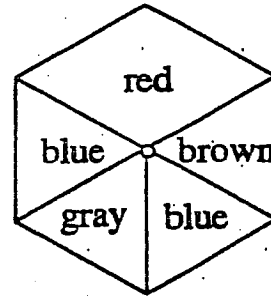
Read all questions carefully. Use complete sentences if explanations are required. Point values are indicated. Good luck!

1. (4 points) State the two conditions necessary for a probability to exist:

- i. uncertain future event
- ii. repeatability

2. (8 points) Use the spinner shown to find the theoretical probability of:

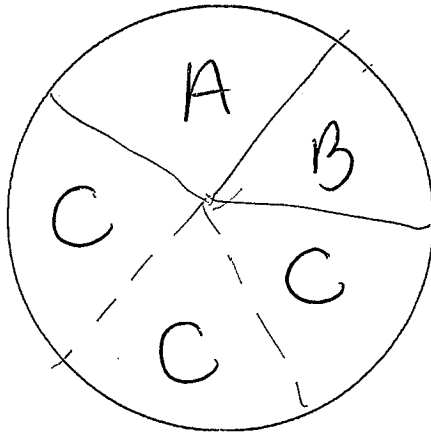
$P(\text{red}) = \frac{2}{6} = \frac{1}{3}$   
 $P(\text{Blue or Brown}) = \frac{3}{6} = \frac{1}{2}$   
 $P(\text{Blue and Red}) = \frac{0}{6}$   
 $P(\text{not Blue}) = \frac{4}{6} = \frac{2}{3}$



3. (8 points) Complete the spinner shown so that it has three outcomes. Outcome A and B are equally likely, but C is three times as likely as each of the others.

What is the measure of each of the angles?

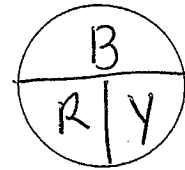
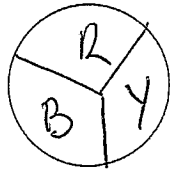
A = 72°      B = 72°      C = 216°



4. (8 points) Break each spinner into 3 sections: one red, one yellow and one blue, such that the probability of getting a red on the first spinner **and** a blue on the second spinner is  $1/6$ . (i.e.  $P(R \text{ B}) = 1/6$ ) **Explain** why your spinners would give this probability.

$$P(R) = 1/3$$

$$P(B) = 1/2$$



$$P(R \text{ B}) = \frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$$

5. (5 points) Your students are working on an experiment involving a spinner. One group comes up to you and shows you their results. They have the following probabilities:  $\frac{14}{25}$  blue,  $\frac{14}{25}$  green and  $\frac{7}{25}$  red. What can you tell about the **accuracy** of their results without knowing anything about the spinner?

not accurate since the probabilities add to  $\frac{35}{25} > 1$

6. (6 points) You toss a regular die 50 times and get the outcome "3" on 10 of the tosses.

a. What is the experimental probability of rolling a "3"?  $\frac{10}{50} = 1/5$

b. What is the theoretical probability of rolling a "3"?  $\frac{1}{6}$

7. (6 points) Bucket A contains 14 red balls and 19 black balls. Bucket B contains 9 red balls and 13 black balls.

a. The probability of drawing a red ball from bucket A =  $\frac{14}{33} \approx 42\%$

b. The probability of drawing a red ball from bucket B =  $\frac{9}{22} \approx 40\%$

- c. If you were to win a prize for drawing a red ball, which bucket would you prefer to draw from? A or B. Explain.

Bucket A has a (slightly) better chance of a red ball

8. (4 points) The probability that Mark goes to a movie each weekend is  $\frac{5}{6}$  and the probability he goes bowling each weekend is  $\frac{1}{4}$ , and the probability that he does both on a weekend is  $\frac{1}{6}$ . Find the probability that Mark will go bowling or to a movie this weekend.

$$P(M \text{ or } B) = P(M) + P(B) - P(M \text{ and } B) \\ = \frac{5}{6} + \frac{1}{4} - \frac{1}{6} = \boxed{\frac{11}{12}}$$

9. (5 points) A spinner has several sections colored blue, green, red, and yellow. The probability of landing on a blue section is  $\frac{1}{4}$ , the probability of landing on a red section is  $\frac{1}{3}$  and the probability of landing on a yellow section is  $\frac{1}{8}$ . What is the probability of landing on a green section? Write enough to make your thinking clear.

All probabilities must sum to 1

$$1 - \left(\frac{1}{4} + \frac{1}{3} + \frac{1}{8}\right) = 1 - \frac{17}{24} = \boxed{\frac{7}{24}}$$

10. (4 points) How many outcomes are possible if you roll 3 dice? 216  
Are the outcomes all equally likely? Explain.

$$6 \times 6 \times 6 = 216$$

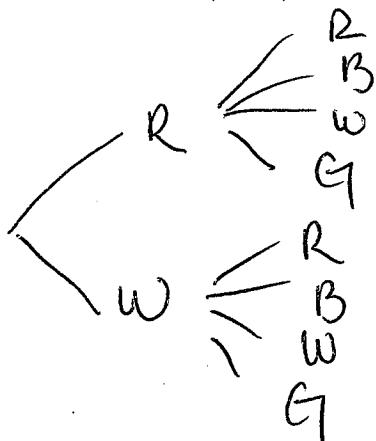
Each die has equally likely sides so the 216 outcomes are equally likely

11. (6 points) Given the following information, find the probability of the situation not happening. Use the correct formula to get your answer.

a.  $P(\text{driving to school}) = 7/10$   
 $P(\text{not driving to school}) = 1 - P(\text{driving}) = 1 - 7/10 = 3/10$

b.  $P(\text{not getting HH on a 2 coin toss}) = 1 - P(HH) = 1 - 1/4 = 3/4$

12. (16 points) Suppose that you have a colored chip, red on one side and white on the other, and you have a 4-sided die with the colors red, blue, white and green on each respective side. The game is to roll the die and toss the chip. If the colors match, player A wins. If the colors do not match player B wins. Use a tree diagram or systematic method to list the sample space for all possible outcomes.



RR  
 RB  
 RW  
 RG  
 WR  
 WB  
 WW  
 WG

(each has a probability of 1/8)

Using the tree diagram and sample space above, find the following:

a. Are the outcomes equally likely? Explain.

yes the coin is equally likely and so are the sides on the die

b.  $P(\text{matching colors}) = 2/8$

c.  $P(\text{different colors}) = 6/8$

d.  $P(\text{different colors or white on chip}) = 7/8$

e.  $P(\text{red on chip or red on die}) = 5/8$

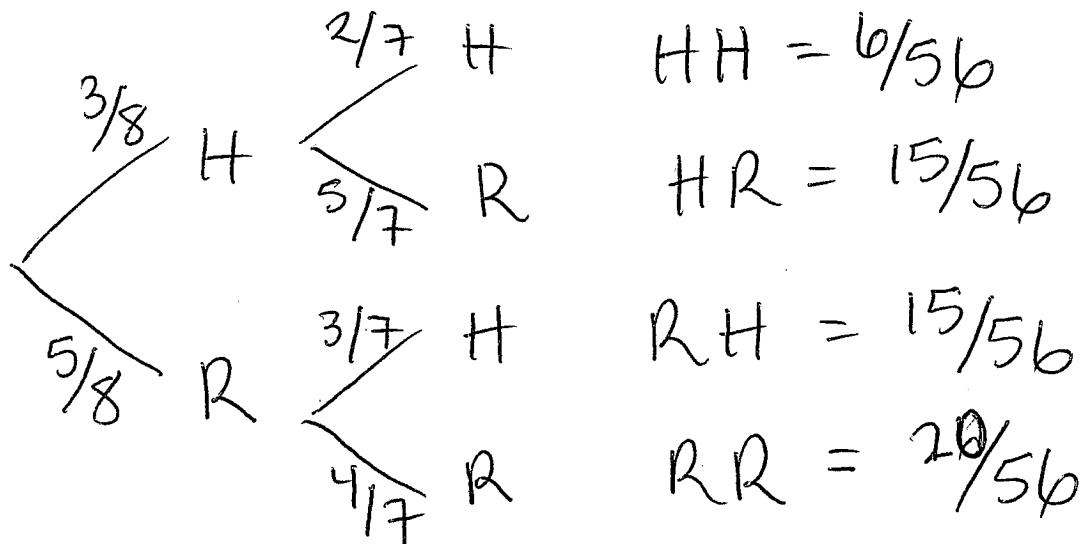
f. Is the game fair for both players? YES **NO** Explain.

$P(\text{matching colors}) \neq P(\text{different colors})$

13. (12 points) Eric has 8 eggs in his refrigerator, 3 are hard-boiled and 5 are raw. He reaches into the refrigerator and randomly draws out 2 eggs in a row. Make a tree diagram and list the sample space and probabilities for each possible outcome.

Find the following probabilities:  $20/56 = 5/14$

- a.  $P(\text{both eggs are raw}) = \underline{20/56} = 5/14$
- b.  $P(\text{one egg is raw, the other hardboiled}) = \underline{30/56} = 15/28$
- c.  $P(\text{both are raw OR both are hardboiled}) = \underline{20/56} = 5/14$



14. Answer the following True / False questions (2 points each)

a. If an experiment has 4 outcomes then the probability of each is  $1/4$ .

T  F only if equally likely

b. The theoretical and experimental probability of an event is always the same. T  F

sometimes, but not always

c. If X is an impossible event, then  $P(X) = 0$ .  T F

d. If a coin is tossed 4 times you should get 8 equally likely outcomes.

T  F  $2 \times 2 \times 2 \times 2 = 16$