Practice for Lesson 14.5

For Exercises 1–4, determine whether each situation is a binomial experiment. If not, explain why.

1. spinning a spinner until it lands on red
2. spinning four spinners 100 times and determining how many times 3 of them land on red
3. removing three 3 cards from a standard deck of 52 cards without replacement and recording whether they are red diamonds or not
4. asking 20 people their favorite color

5. A couple plans to have three children. Assuming that boys and girls have an equal chance of being born, what is the probability that the couple will have 3 boys? 2 boys? 1 boy? 0 boys?
6. Three coins are tossed. Find $P(2$ or 3 tails$)$.

1.) no! # of trials is not fixed.

2.) yes!

3.) No! Trials are not independent (b/c of no repl.)

4.) no! More than 2 outcomes.

5.) $(B+G)^3 = 1B^3 + 3B^2G + 3BG^2 + 1G^3$

$P(3 \text{ boys}) = \left(\frac{1}{2}\right)^3 = \boxed{\frac{1}{8}}$ ← use $1B^3$

$P(2 \text{ boys}) = 3B^2G = 3\left(\frac{1}{2}\right)^2\left(\frac{1}{2}\right) = \boxed{\frac{3}{8}}$

$P(1 \text{ boy}) = 3BG^2 = 3\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)^2 = \boxed{3/8}$

$P(0 \text{ boys}) = 1G^3 = 1 \cdot \left(\frac{1}{2}\right)^3 = \boxed{\frac{1}{8}}$

6.) $P(2 \text{ or } 3 \text{ tails})$ $(H+T)^3 = H^3 + 3H^2T + 3HT^2 + 1T^3$

$3HT^2 + 1T^3$

$3\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)^2 + 1\left(\frac{1}{2}\right)^3 = \boxed{\frac{1}{2}}$

For Exercises 7–10, use the following binomial expansions when needed.

$(a + b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$

$(a + b)^5 = a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + b^5$

$(a + b)^6 = a^6 + 6a^5b + 15a^4b^2 + 20a^3b^3 + 15a^2b^4 + 6ab^5 + b^6$

7. The star player on the basketball team has a $\frac{7}{8}$ probability of making a basket when he shoots a free throw. He shoots 5 free throws in the first ten minutes of the game. What is the probability that he makes exactly 4 of the free throws?
8. The spinner shown to the left is spun 6 times.
   a. What is the probability that the spinner lands on yellow exactly 2 times?
   b. What is the probability that the spinner lands on yellow at least 5 times?
9. What is the probability of guessing exactly 4 out of 5 questions correctly on a multiple-choice test if there are 3 possible choices for each question?
10. A coin is spun (rather than flipped). If the probability of it landing tails is 52%, what is the probability of spinning a coin 5 times and having it land on tails exactly 2 times?

7.) Use $(\overset{A}{\text{make}} + \overset{B}{\text{miss}})^5$

$5(\text{make})^4(\text{miss})^1$ or $5a^4b^1$

$5\left(\frac{7}{8}\right)^4\left(\frac{1}{8}\right) \approx \boxed{0.37\%}$

$(a+b)^6$ let $a =$ get yellow $b =$ not yellow

8.)a.) $15(\text{yellow})^2(\text{not yellow})^4$

$15\left(\frac{1}{4}\right)^2\left(\frac{3}{4}\right)^4 \approx \boxed{0.297}$

b.) $P(\text{yellow at least 5 times}) =$

$P(\text{yellow 5}) + P(\text{yellow 6})$

$6a^5b \qquad\qquad + \qquad a^6$

$6\left(\frac{1}{4}\right)^5\left(\frac{3}{4}\right) + \left(\frac{1}{4}\right)^6 \approx \boxed{0.0046}$

9.) $(\text{Right} + \text{Wrong})^5$ Use $(a+b)^5$

$P(\text{right}) = \frac{1}{3}$

$P(\text{wrong}) = \frac{2}{3}$

$\downarrow$

$5a^4b^1$

$P(4 \text{ out of 5 correctly}) = 5(\text{right})^4(\text{wrong})^1$

$= 5\left(\frac{1}{3}\right)^4\left(\frac{2}{3}\right)^1$

$\approx \boxed{0.041}$

$$= \mathcal{J}(\mathcal{Z})(\mathcal{G})$$

$$\neq \boxed{0.041}$$

10) $P(\text{tails}) = 52\%$.
$P(\text{heads}) = 48\%$.
* Use $(a+b)^5$

$P(\text{land on tails exactly 2 times out of 5}) = 10\,(\text{tails})^2(\text{head})^3$

$$= 10\,(.52)^2\,(.48)^3$$

$$= \boxed{0.30}$$