Name: Key Group Members: _____

# Exploration 9-9a: Rehearsal for Test

Date: _____

**Objective:** Calculate the probability of an event described.

*True-False Test Problem* (Problems 1–8): You answer six true-false questions. You are a good guesser and figure that your probability of getting any one question right is 70%.

1. What is your probability of getting the first four right and the last two wrong? (only 1 way to get the 1st 4 correct)

$.7 * .7 * .7 * .7 * .3 * .3 =$ **0.0216**

2. In how many different ways could you arrange the letters RRRRWW?

$\frac{6!}{4!2!} = 15$

3. What is your probability of getting exactly four right and the other two wrong? (don't know which 4, though)

${}_6C_4 * .7^4 * .3^2 =$ **0.324**

4. Let $P(x)$ be your probability of getting right exactly $x$ questions in the six true-false questions. Use LIST operations on your grapher to calculate $P(0)$ through $P(6)$.

$P(0) = {}_6C_0 * .7^0 * .3^6 = .000729$

$P(1) = {}_6C_1 * .7^1 * .3^5 = .010206$

$P(2) = {}_6C_2 * .7^2 * .3^4 = .059535$

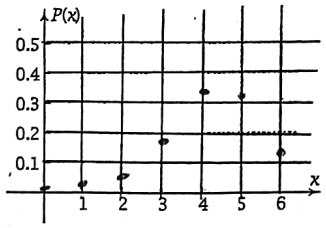
$P(3) = {}_6C_3 * .7^3 * .3^3 = .18522$

$P(4) = {}_6C_4 * .7^4 * .3^2 = .324135$

$P(5) = {}_6C_5 * .7^5 * .3^1 = .302526$

$P(6) = {}_6C_6 * .7^6 * .3^0 = .117649$

5. On the given axes, plot the graph of the probability distribution in Problem 4.




don't connect -- can't get 1.5 questions right i.e.

6. Expand the binomial power $(0.7 + 0.3)^6$, but simplify each term just enough to leave it as a coefficient times a power of 0.7 times a power of 0.3. For instance, the third term will be $15 \cdot 0.7^4 \cdot 0.3^2$

$${}_6C_0 * .7^6 * .3^0 \Rightarrow 1 * .7^6 * .3^0 +$$
$${}_6C_1 * .7^5 * .3^1 \quad 6 * .7^5 * .3^1 +$$
$${}_6C_2 * .7^4 * .3^2 \quad 15 * .7^4 * .3^2 +$$
$${}_6C_3 * .7^3 * .3^3 \quad 20 * .7^3 * .3^3 +$$
$${}_6C_4 * .7^2 * .3^4 \quad 15 * .7^2 * .3^4 +$$
$${}_6C_5 * .7^1 * .3^5 \quad 6 * .7^1 * .3^5 +$$
$${}_6C_6 * .7^0 * .3^6 \quad 1 * .7^0 * .3^6 +$$

7. Calculate each term in Problem 6, but do not add the terms.

$.117649 +$
$.302526 +$
$.324135 +$
$.18522 +$
$.059535 +$
$.010206 +$
$.000729 +$

Each term in this binomial expansion matches one of the answers in the binomial distribution (from #4)

8. The function in Problems 4 and 5 is a function of a random variable. It is an example of a probability distribution. This particular probability distribution is called a binomial distribution. Why do you think the name *binomial distribution* is used in this case?

Only 2 possible outcomes

*(Over)*

Name: _____ Group Members: _____

# Exploration 9-9a: Rehearsal for Test continued

Date: _____

*Sports Insurance Problem* (Problems 9–12): Randy Miles Insurance Agency offers a policy for student athletes. If the athlete breaks an arm, the policy pays \$500. If he or she breaks a leg, the policy pays \$800. If the athlete breaks both an arm and a leg, the policy pays \$10,000.

9. From past records, Randy's actuary figures out that an athlete has a 0.06 probability of breaking an arm and a 0.04 probability of breaking a leg in any one year. Find the probability of these events:

*P*(arm and leg) $.06 * .04 = .0024$

*P*(arm, not leg) $.06 * .96 = .0576$

*P*(leg, not arm) $.04 * .94 = .0376$

*P*(not arm and not leg) $.96 * .94 = .9024$

10. What is the mathematically expected amount the agency would have to pay out for an insured athlete?

$.0024(10{,}000) + .0576(500) + .0376(800) + .9024(0)$

\$82.88

11. In order to make money, Randy wants to charge enough so that he expects a profit of \$15 per policy that he writes. How much should he charge per policy?

$82.88 + 15$

\$97.88

12. Look up *actuary* in the dictionary. What did you find out?

*Dice Problem* (Problems 13–15): You roll two dice, a red one and a green one. The probability of a 3 on the red die is 1/6, and the probability of a 5 on the green die is also 1/6.

13. What is the probability of getting a 3 on the red die and a 5 on the green die?

$\frac{1}{6} * \frac{1}{6} = \frac{1}{36}$

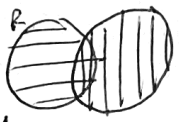
14. What is the probability of getting a 3 on the red die or a 5 on the green die?

$\frac{1}{6} + \frac{1}{6} - \frac{1}{36} = \frac{11}{36}$ ← overlap

*always consider intersection in an OR problem

15. Explain why you can't find the probability in Problem 14 just by adding 1/6 and 1/6.

must consider intersection (which gets counted twice, so we have to subtract out)




← intersection got counted in both circles

~~16. What feature characterizes outcomes of a random experiment?~~

17. What is the name for an event where there is no way of telling beforehand how the result will turn out? random

18. What is the name for the set of *all* possible outcomes for a random experiment? sample space

19. What did you learn as a result of doing this rehearsal that you did not know before?

Probability is NOT that scary IF you do your homework