Name: _____Key_____

Period: _____

#1. Expand: $(x+2y)^4$

$_4C_0\,(x)^4(2y)^0 + _4C_1\,(x)^3(2y)^1 + _4C_2\,(x)^2(2y)^2 + _4C_3\,(x)(2y)^3 + _4C_4\,(x)^0(2y)^4$

$1\,(x^4)(1) + (4)\,(x^3)(2y) + 6\,(x^2)(4y^2) + 4\,(x)(8y^3) + 1\,(1)(16y^4)$

$$\boxed{x^4 + 8x^3y + 24x^2y^2 + 32xy^3 + 16y^4}$$

#2. Expand and simplify: $(3x-5y)^3$

$_3C_0\,(3x)^3(-5y)^0 + _3C_1\,(3x)^2(-5y)^1 + _3C_2\,(3x)(-5y)^2 + _3C_3\,(3x)^0(-5y)^3$

$1\,(27x^3)(1) + 3\,(9x^2)(-5y) + 3\,(3x)(25y^2) + 1\,(1)(-125y^3)$

$$\boxed{27x^3 - 135x^2y + 225xy^2 - 125y^3}$$

#3. Determine the coefficient of x^6y^5 in the expansion of $(3x^3-2y)^7$.

$_7C_5\,(3x^3)^2(-2y)^5$ coefficient

$21\,(9x^6)(-32y^5) = \boxed{-6048}x^6y^5$

#4. How many distinguishable permutations can be made with the letters in the word MISSISSIPPI?

$\dfrac{11!}{4!\,4!\,2!} = \boxed{34650}$

$(S)\ (S)\ (P)$

#5. How many ways can you choose a captain and an equipment manage from a sports team of 20 people?

$\underset{Capt}{20} \cdot \underset{\underset{mgr}{Equip}}{19} = \boxed{380}$

#6. An astronomy group has 12 boys and 10 girls. They have the opportunity to send 6 people to Kitt Peak Observatory near Tucson, and must choose the group of 6 to send. How many ways are there to choose the group to send if:

(a) There are no restrictions?   22 total people

$_{22}C_6 = \boxed{74,613}$

(b) The group must contain an equal number of boys and girls?   3 boys + 3 girls

$_{12}C_3 \cdot {}_{10}C_3 = 220 \cdot 120 = \boxed{26,400}$

#7. A computer program is written which randomly generates an integer between 1 and 7. The program is run twice and the two numbers it generates are added together. What is the probability that the sum of the two numbers is 5?

total ways

$\dfrac{7 \cdot 7}{49}$

ways to get sum of 5:

$\left.\begin{array}{l} 1+4 \\ 2+3 \\ 3+2 \\ 4+1 \end{array}\right\} 4$

$P = \boxed{\dfrac{4}{49} = 0.0816}$

#8. A box holds 10 green, 3 red, and 4 blue marbles. If 3 marbles are drawn from the box without replacement: (17 total marbles) — total ways to draw 3 marbles $_{17}C_3 = 680$

(a) What is the probability that they will all be blue?
$$\frac{4}{17} \cdot \frac{3}{16} \cdot \frac{2}{15} = .00588 \leftarrow \text{or} \rightarrow$$
ways to get all blue $_4C_3 = 4$ $\boxed{P = \frac{4}{680} = 0.00588}$

blue 1st   blue 2nd   blue 3rd

(b) What is the probability that 2 will be green and the other will be red?

hard to do this way correctly (although it is possible)   best way: # ways to get 2G & 1R:

$$_{10}C_3 \cdot {}_3C_1 = 120 \cdot 3 = 360$$
green   red

so $\boxed{P = \frac{360}{680} = .529}$

#9. A dairy farm has 150 brown cows and 480 black cows. If a farmhand is watching the cows as they exit single-file from their pen, what is the probability that the next cow who exits will be brown?
$$\boxed{\frac{150}{630} = 0.238}$$

#10. A TV manufacturer sends a store 16 TVs. Unfortunately, 4 of the TVs in the shipment don't work. If a new sports bar buys 8 of these TVs, what is the probability that exactly 3 of these TVs will not work?

16 — 4 bad   12 good   4 bad, 12 good

ways to get $_4C_3 \cdot {}_{12}C_5$
$4 \cdot 792$
3168

ways to get 8 TVs in general
$_{16}C_8 = 12870$

$$P = \boxed{\frac{3168}{12870} = 0.246}$$

#11. A state fair ring toss game is designed so that an untrained customer has a 5% chance of getting the ring on the bottle in one throw. To win the giant stuffed animal prize, a customer must toss 3 rings and all of them must get on the bottle. If a customer tosses 3 rings, what is the probability that they will win the giant stuffed animal prize?
$$(0.05)(0.05)(0.05) = (0.05)^3 = 1.25 \cdot 10^{-4}$$
$$0.000125$$
$$(= 0.0125\%)$$

#12. One hundred people of different ages were asked, 'how do you usually hear current events?' The results are shown in the table:

	Internet	Television	Newspaper	Total
Younger than 30	27	4	1	32
30 to 50	12	18	8	38
Older than 50	4	8	18	30
Total	43	30	27	100

If a person is selected at random from these people:

(a) What is the probability the person is 30 to 50 years old and said 'internet'? $\frac{12}{100}$ (12%)

(b) What is the probability the person is older than 50 given they said 'newspaper'?
$$\frac{18}{27} = 0.666 \; (66.7\%)$$

#13. What is the probability that a letter picked at random from this set will be a vowel? $\{a, b, e, h, p, u\}$
$$\boxed{\frac{3}{6} = \frac{1}{2} \text{ or } 0.5}$$

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