

**I. Find each probability if a coin is tossed 4 times.**

1.) P (exactly 4 heads)

$$4C_4 (.5)^4 (.5)^0 = \boxed{6.25\%}$$

2.) P (0 heads)

$$4C_0 (.5)^0 (.5)^4 = \boxed{6.25\%}$$

3.) P (exactly 3 heads)

$$4C_3 (.5)^3 (.5)^1 = \boxed{25\%}$$

4.) P (exactly 2 heads)

$$4C_2 (.5)^2 (.5)^2 = \boxed{37.5\%}$$

5.) P (exactly 1 head)

$$4C_1 (.5)^1 (.5)^3 = \boxed{25\%}$$

6.) P (at least 3 heads)

$$P(3) + P(4) \rightarrow 4C_3 (.5)^3 (.5)^1 + 4C_4 (.5)^4 (.5)^0 = \boxed{31.25\%}$$

**II. Find each probability if a die is rolled 3 times.**

7.) P (exactly one 2)

$$3C_1 \left(\frac{1}{6}\right)^1 \left(\frac{5}{6}\right)^2 = \boxed{34.7\%}$$

8.) P (exactly two 2's)

$$3C_2 \left(\frac{1}{6}\right)^2 \left(\frac{5}{6}\right)^1 = \boxed{6.9\%}$$

9.) P (exactly three 2's)

$$3C_3 \left(\frac{1}{6}\right)^3 \left(\frac{5}{6}\right)^0 = \boxed{.46\%}$$

10.) P (at most one 2)

$$P(0) + P(1) \rightarrow 3C_0 \left(\frac{1}{6}\right)^0 \left(\frac{5}{6}\right)^3 + 3C_1 \left(\frac{1}{6}\right)^1 \left(\frac{5}{6}\right)^2 = \boxed{92.3\%}$$

**III. A town that presents a fireworks display during its July 4 celebration found the probability that a family with two or more children will watch the fireworks is 60%. If 5 of these families are selected at random, find each probability.**

11.) P (exactly 3 families watch the fireworks)

$$5C_3 (.6)^3 (.4)^2 = \boxed{34.6\%}$$

12.) P (exactly 2 families watch the fireworks)

$$5C_2 (.6)^2 (.4)^3 = \boxed{23\%}$$

13.) P (exactly 5 families watch the fireworks)

$$5C_5 (.6)^5 (.4)^0 = \boxed{7.8\%}$$

14.) P (no families watch the fireworks)

$$5C_0 (.6)^0 (.4)^5 = \boxed{1\%}$$

15.) P (at least 4 families watch the fireworks)

$$P(4) + P(5) \rightarrow 5C_4 (.6)^4 (.4)^1 + 5C_5 (.6)^5 (.4)^0 = \boxed{33.7\%}$$

16.) P (at most 2 families watches the fireworks)

$$P(0) + P(1) + P(2) \rightarrow 5C_0 (.6)^0 (.4)^5 + 5C_1 (.6)^1 (.4)^4 + 5C_2 (.6)^2 (.4)^3 = \boxed{31.7\%}$$

**IV. One section of a standardized English language test has 10 true/false questions.****Find each probability when a student guesses at all ten questions.**

17.) P (exactly 40% correct)

$$10C_4 (.5)^4 (.5)^6 = \boxed{20.5\%}$$

18.) P (exactly half correct)

$$10C_5 (.5)^5 (.5)^5 = \boxed{24.6\%}$$

**V. In 2001, the American Heart Association reported that 50 percent of the Americans who receive heart transplants are ages 50 – 64 and 20 percent are ages 35 – 49.**

19.) In a randomly selected group of 10 heart transplants recipients, what is the probability that at least 8 of them are ages 50 – 64?

$$P(8) + P(9) + P(10) \rightarrow 10C_8 (.5)^8 (.5)^2 + 10C_9 (.5)^9 (.5)^1 + 10C_{10} (.5)^{10} (.5)^0 = \boxed{5.5\%}$$

20.) In a randomly selected group of 5 heart transplants recipients, what is the probability that 2 of them are ages 34 – 49?

$$P(2) \rightarrow 5C_2 (.2)^2 (.8)^3 = \boxed{20.5\%}$$

**VI. Use binomial experiments to complete each problem.**21.) Expand:  $(x - 2)^3$ 

$$x^3 - 6x^2 + 12x - 8$$

22.) Expand:  $(2a + b)^6$ 

$$64a^6 + 192a^5b + 240a^4b^2 + 160a^3b^3 + 60a^2b^4 + 12ab^5 + b^6$$

23.) Expand:  $(3x - 2y)^4$ 

$$81x^4 - 216x^3y + 216x^2y^2 - 96xy^3 + 16y^4$$

24.) Find the fourth term:  $(2x + 5y)^5$ 

$$5000x^2y^3$$

25.) Find the middle term:  $(4x^2 + 3y)^8$ 

$$1451520x^2y^4$$

## Adv Function : Binomial Experiments WS

21)  $(x-2)^3$

$$3C_0 (x)^3 (-2)^0 = 1 \cdot x^3 \cdot 1$$

$$3C_1 (x)^2 (-2)^1 = 3 \cdot x^2 \cdot -2$$

$$3C_2 (x)^1 (-2)^2 = 3 \cdot x \cdot 4$$

$$3C_3 (x)^0 (-2)^3 = 1 \cdot 1 \cdot -8$$

$$\Rightarrow \boxed{x^3 - 6x^2 + 12x - 8}$$

22)  $(2a+b)^6$

$$6C_0 (2a)^6 (b)^0 = 1 \cdot 64a^6 \cdot 1$$

$$6C_1 (2a)^5 (b)^1 = 6 \cdot 32a^5 \cdot b$$

$$6C_2 (2a)^4 (b)^2 = 15 \cdot 16a^4 \cdot b^2$$

$$6C_3 (2a)^3 (b)^3 = 20 \cdot 8a^3 b^3$$

$$6C_4 (2a)^2 (b)^4 = 15 \cdot 4a^2 \cdot b^4$$

$$6C_5 (2a)^1 (b)^5 = 6 \cdot 2a \cdot b^5$$

$$6C_6 (2a)^0 (b)^6 = 1 \cdot 1 \cdot b^6$$

$$= \boxed{64a^6 + 192a^5b + 240a^4b^2 + 160a^3b^3 + 60a^2b^4 + 12ab^5 + b^6}$$

23)  $(3x-2y)^4$

$$4C_0 (3x)^4 (-2y)^0 = 1 \cdot 81x^4 \cdot 1$$

$$4C_1 (3x)^3 (-2y)^1 = 4 \cdot 27x^3 \cdot -2y$$

$$4C_2 (3x)^2 (-2y)^2 = 6 \cdot 9x^2 \cdot 4y^2$$

$$4C_3 (3x)^1 (-2y)^3 = 4 \cdot 3x \cdot -8y^3$$

$$4C_4 (3x)^0 (-2y)^4 = 1 \cdot 1 \cdot 16y^4$$

$$= \boxed{81x^4 - 216x^3y + 216x^2y^2 - 96xy^3 + 16y^4}$$

24)  $(2x+5y)^5$

$$5C_0 (2x)^5 (5y)^0$$

$$5C_1 (2x)^4 (5y)^1$$

$$5C_2 (2x)^3 (5y)^2$$

$$5C_3 (2x)^2 (5y)^3 = 10 \cdot 4x^2 \cdot 125y^3$$

Fourth term

$$= \boxed{5000x^2y^3}$$

25)  $(4x^2+3y)^8$

$$= 8C_4 (4x^2)^4 (3y)^4 \text{ (middle term)}$$

$$= 70 \cdot 256x^8 \cdot 81y^4$$

$$= \boxed{1451520x^8y^4}$$