Name **Key**   Date _____

1. Expand: $(a+b)^4 = {_4}C_0\, a^4 + {_4}C_1\, a^3 b + {_4}C_2\, a^2 b^2 + {_4}C_3\, a b^3 + {_4}C_4\, b^4$

$$= \boxed{a^4 + 4a^3 b + 6a^2 b^2 + 4ab^3 + b^4}$$

```
        1
      1   1
    1   2   1
  1   3   3   1
 1   4   6   4   1
1  5  10  10  5  1
1  6  15  20  15  6  1
```

2. Expand: $(c-d)^5 = {_5}C_0\, c^5 + {_5}C_1\, c^4(-d) + {_5}C_2\, c^3(-d)^2 + {_5}C_3\, c^2(-d)^3 + {_5}C_4\, c(-d)^4 + {_5}C_5\,(-d)^5$

$$= \boxed{c^5 - 5c^4 d + 10c^3 d^2 - 10c^2 d^3 + 5cd^4 - d^5}$$

3. Expand and simplify: $(6-k)^4 = {_4}C_0\, 6^4 + {_4}C_1\, 6^3(-k) + {_4}C_2\, 6^2(-k)^2 + {_4}C_3\, 6(-k)^3 + {_4}C_4\,(-k)^4$

$$= \boxed{1296 - 864k + 216k^2 - 24k^3 + k^4} \Longleftarrow$$

$$\text{or } \boxed{k^4 - 24k^3 + 216k^2 - 864k + 1296}$$

4. Expand and simplify: $(2b-7c)^3 = {_3}C_0\,(2b)^3 + {_3}C_1\,(2b)^2(-7c) + {_3}C_2\,(2b)(-7c)^2 + {_3}C_3\,(-7c)^3$

$$\boxed{8b^3 - 84b^2 c + 294bc^2 - 343c^3}$$

5. Write the 6th term in the expansion $(c + d)^{12}$.

$$_{12}C_5 \, c^7 d^5$$

$$\boxed{792 c^7 d^5}$$

6. Write the 8th term in the expansion $(2a - b)^{11}$.

$$_{11}C_7 \, (2a)^4 (-b)^7$$

$$-330 \cdot 16 a^4 b^7$$

$$\boxed{-5280 a^4 b^7}$$

7. Write the term in the expansion of $(x - 5y)^{10}$ that contains x^7.

$$_{10}C_3 \, (x)^7 (-5y)^3$$

$$-120 \, x^7 (125 y^3)$$

$$\boxed{-15000 \, x^7 y^3}$$

8. Find the term involving x^8 in the expansion $(2x^2 - y)^9$.

$$_9C_5 \, (2x^2)^4 (-y)^5$$

$$126 \cdot 16 \, x^8 (-1) y^5 \qquad \boxed{-2016 x^8 y^5}$$

Answer List

1. $a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$

2. $c^5 - 5c^4d + 10c^3d^2 - 10c^2d^3 + 5cd^4 - d^5$

3. $1296 - 864k + 216k^2 - 24k^3 + k^4$

4. $8b^3 - 84b^2c + 294bc^2 - 343c^3$

5. $792c^7d^5$

6. $-5280a^4b^7$

7. $-15,000x^7y^3$

8. $-2016x^8y^5$

Math Analysis
Section 9.6

Name_____

8. In how many ways can the letters MISSISSIPPI be arranged? $\frac{11!}{4!4!2!} = \frac{11\cdot10\cdot9\cdot8\cdot7\cdot6\cdot5\cdot4\cdot3\cdot2\cdot1}{4\cdot3\cdot2\cdot1\cdot4\cdot3\cdot2\cdot1\cdot2}$

$\boxed{34650}$

15. How many different ways can three chocolate, four strawberry and two butterscotch sundaes be served to nine people? $\frac{9!}{3!4!2!} = \frac{9\cdot8\cdot7\cdot6\cdot5\cdot4\cdot3\cdot2\cdot1}{3\cdot2\cdot1\cdot4\cdot3\cdot2\cdot1\cdot2\cdot1} = \boxed{1260}$

20. How many ways can an eight-question multiple choice test be answered if each question has five possible answers? $\underline{5}\ \underline{5}\cdots (5)^8 = \boxed{390625}$

21. There are 20 people in a race. Awards are given for 1st, 2nd, and 3rd places. How many different outcomes are possible?

$\underline{20}\ \underline{19}\ \underline{18} = \boxed{6840}$

23. The flags of seven different countries are to be displayed in a row. In how many different orders can they be flown?

$\underline{7}\ \underline{6}\ \underline{5}\ \underline{4}\ \underline{3}\ \underline{2}\ \underline{1} = \boxed{5040}$

28. There are seven possible digits in a phone number. How many different phone numbers are possible if the first digit cannot be 0 and no digit can be used more than once? $\underline{9}\ \underline{9}\ \underline{8}\ -\ \underline{7}\ \underline{6}\ \underline{5}\ \underline{4} = \boxed{544,320}$

35. A scrabble tray contains the tiles FERSXAI. How many different four-letter arrangements ("words") can be made?

$\underline{7}\ \underline{6}\ \underline{5}\ \underline{4} = \boxed{840}$

44. If a special at a diner offers a choice of one each of two appetizers, four entrees and five desserts, how many distinct meals are possible under the special?

$\underline{2}\ \underline{4}\ \underline{5} = \boxed{40}$

56. In how many ways can a committee consisting of two deacons and four regular church members be formed in a church that has five deacons and 120 regular members? order doesn't matter $_5C_2\cdot {}_{120}C_4 = 10\cdot 8214570 = \boxed{82145700}$

48. In how many ways can a subcommittee of five people be selected from a committee of ten people?

$_{10}C_5 = \boxed{252}$

15. How many different ways can three chocolate, four strawberry, and two butterscotch sundaes be served to nine people?

$$\frac{n!}{n_1! \cdot n_2! \cdots} \qquad \frac{9!}{3! \cdot 4! \cdot 2!} = \frac{9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{3 \cdot 2 \cdot 4 \cdot 3 \cdot 2 \cdot 2} = \boxed{1260}$$

17. A class of nine students line up single file for lunch. How many different ways can this occur if the six boys in the class must line up first?

$$\underline{6} \; \underline{5} \; \underline{4} \; \underline{3} \; \underline{2} \; \underline{1} \; \underline{3} \; \underline{2} \; \underline{1} = \boxed{4320}$$

$$_6P_6 \cdot _3P_3$$

19. An organization consisting of 36 members is going to elect three officers. No person may hold more than one office. How many different outcomes are possible? ← implies difference in offices (order matters)

$$_{36}P_3 = \boxed{42840}$$

32. A random number generator selects an integer from 1 to 50. Find the number of ways a square number can occur.

Squares 1, 4, 9, 16, 25, 36, 49 $\boxed{7}$

49. A record club offers new customers six free selections from a list of 130 different recordings. How many different introductory offers are possible?

$$_{130}C_6 = \boxed{5,963,412,000}$$

54. At a Boy Scout jamboree there are 12 senior patrol leaders, 10 assistant senior patrol leaders, 21 patrol leaders, and 84 other scouts. How many committees of two senior patrol leaders, one assistant patrol leader, three patrol leaders, and four regular scouts can be formed? order doesn't matter

$$_{12}C_2 \cdot _{10}C_1 \cdot _{21}C_3 \cdot _{84}C_4 = 66 \cdot 10 \cdot 1330 \cdot 1929501 = \boxed{1,693,715,971,000}$$
$$1.69 \cdot E12$$

9. Two cards are randomly selected from a standard deck of 52 playing cards. Find the probability that one card will be an ace **and** the other will be a 10.

and = multiply

$$\frac{4}{52} \cdot \frac{4}{51} = \frac{16}{2652} = \frac{8}{1326} = \frac{4}{663}$$

but A·10 or 10·A $\boxed{\frac{8}{663}}$

So double

12. In a group of 10 children, 3 have blond hair and 7 have brown hair. If a child is chosen at random, what is the probability that the child will have brown hair?

$$\frac{7}{10}$$

15. A bag contains nine red balls numbered 1 - 9 and six white balls numbered 10 - 15. If one ball is drawn at random, what is the probability that the number on it is even? $2,4,6,8,10,12,14$

$$\frac{7}{15}$$

22. A fair coin is tossed four times. What is the probability of getting exactly one head?   total outcomes: $2 \cdot 2 \cdot 2 \cdot 2 = 16$

ways to get 1 head   HTTT
THTT $\frac{4}{16} = \frac{1}{4}$
TTHT
TTTH

27. What is the probability that 2 people chosen at random from a group of 8 married couples are married to each other?

pick a person; all people have a spouse $P(\text{pick the spouse}) = \frac{1}{15}$

29. A box holds 12 white, 5 red, and 6 black marbles. If 2 marbles are picked at random, without replacement, what is the probability that they will both be black?

$$\frac{6}{23} \cdot \frac{5}{22} = \frac{30}{506} = \frac{15}{253}$$

34. Two six-sided dice are tossed. What is the probability that the total is ten? $6 \cdot 6 = 36 \text{ total}$

4   5   6
6   5   4 $\frac{3}{36} = \frac{1}{12}$

37. Drawing from a standard deck of 52 cards, what is the probability that the card is an eight or a face card?   or = add

$$P(8) + P(F) = \frac{4}{52} + \frac{12}{52} = \frac{16}{52} = \frac{4}{13}$$

40. A small business college has 800 seniors, 700 juniors, 900 sophomores and 1200 freshmen. If a student is randomly selected, what is the probability that the student is a freshman or a senior?

$$P(F) + P(S) = \frac{1200}{3600} + \frac{800}{3600} = \frac{2000}{3600} = \frac{20}{36} = \frac{5}{9}$$

54. A sample of nursing homes in a state reveals that 112,000 residents are female. If a nursing home resident is chosen at random from this state, what is the probability that the resident is male?   218,000 Total residents

218
-112   106000 males $\frac{106000}{218000} = \frac{106}{218} = \frac{53}{109}$

Math Analysis
Section 9.7

6. A card is drawn at random from a standard deck of 52 playing cards. Find the probability that the card is a spade.   13 spades) $P = \frac{13}{52} = \boxed{\frac{1}{4}}$

7. A card is drawn at random from a standard deck of 52 playing cards. Find the probability that the card is a 10 **or** an ace.   mutually exclusive

$P(10 \text{ or } Ace) = P(10) + P(Ace)$

$= \frac{4}{52} + \frac{4}{52} = \frac{8}{52} = \frac{4}{26} = \boxed{\frac{2}{13}}$

9. Two cards are randomly selected from a standard deck of 52 playing cards. Find the probability that one card will be an ace **and** the other will be a 10.

$A \cdot 10$ or $10 \cdot A$ $\frac{4}{52} \cdot \frac{4}{51} + \frac{4}{52} \cdot \frac{4}{51} = \frac{16}{2652} + \frac{16}{2652} = \frac{32}{2652} = \boxed{\frac{8}{663}}$

13. A bag contains four red balls and seven white balls. If a ball is drawn at random, what is the probability that it is a red ball?   rrrr wwwwwww   11 balls total

$\boxed{\frac{4}{11}}$

18. A die is tossed 3 times. What is the probability that a two will come up all three times? $\frac{1}{6} \cdot \frac{1}{6} \cdot \frac{1}{6} = \boxed{\frac{1}{216}}$

23. Two six-sided dice are tossed. What is the probability that the total is 11?

$6 \cdot 6 = 36$ total $\begin{matrix} 6 & 5 \\ 5 & 6 \end{matrix}$ $\frac{2}{36} = \boxed{\frac{1}{18}}$

28. There are 5 red and 4 black balls in a box. If 3 balls are picked without replacement, what is the probability that at least one of them is red?

comp. None are red.   chose 3 black   chose 0 red $P(\text{none red}) = \frac{4}{84} = \frac{1}{21}$

total ways to choose 3 $_9C_3 = 84$ $\frac{_4C_3 \cdot _5C_0}{} = 4 \cdot 1 = (4)$ $P(\text{at least 1 red}) = 1 - \frac{1}{21} = \boxed{\frac{20}{21}}$

38. Drawing from a standard deck of 52 cards, what is the probability that the card is an ace, king, **or** queen? $\frac{4}{52} + \frac{4}{52} + \frac{4}{52} = \frac{12}{52} = \frac{6}{26} = \boxed{\frac{3}{13}}$

49. Before an election, a sample of 120,000 people throughout the county showed that 79,386 people would vote for Candidate A. If a person from the sample is chosen at random, what is the probability that the person is one of the people who said they would not vote for Candidate A?

$\begin{array}{r} 120000 \\ -79386 \\ \hline 40614 \end{array}$ $\frac{40614}{120000} = \boxed{0.338}$

58. A sample of 100 people at a mall were asked to taste-test two colas and decide
     which they preferred. The results are shown in the table.

	Cola A	Cola B	Unsure	Total
Men	18	16	4	38
Women	38	20	4	62
Total	56	36	8	100

A person is selected at random from the sample. Find the specified probability.

a) The person preferred Cola A. $\frac{56}{100} = \boxed{\frac{14}{25}}$

b) The person is female and preferred Cola B. $\frac{20}{100} = \boxed{\frac{1}{5}}$

c) The person is male and is unsure. $\frac{4}{100} = \boxed{\frac{1}{25}}$

Name _____   Date _____

1. Expand: $(a + b)^4$

2. Expand: $(c - d)^5$

3. Expand and simplify: $(6 - k)^4$

4. Expand and simplify: $(2b - 7c)^3$

5. Write the 6th term in the expansion $(c+d)^{12}$.

6. Write the 8th term in the expansion $(2a-b)^{11}$.

7. Write the term in the expansion of $(x-5y)^{10}$ that contains x^7.

8. Find the term involving x^8 in the expansion $(2x^2-y)^9$.

Answer List

1. $a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$

2. $c^5 - 5c^4d + 10c^3d^2 - 10c^2d^3 + 5cd^4 - d^5$

3. $1296 - 864k + 216k^2 - 24k^3 + k^4$

4. $8b^3 - 84b^2c + 294bc^2 - 343c^3$

5. $792c^7d^5$

6. $-52800a^4b^7$

7. $-15,000x^7y^3$

8. $-2016x^8y^3$

Name_____

8.   In how many ways can the letters MISSISSIPPI be arranged?

15.   How many different ways can three chocolate, four strawberry and two butterscotch sundaes be served to nine people?

20.   How many ways can an eight-question multiple choice test be answered if each question has five possible answers?

21.   There are 20 people in a race. Awards are given for 1st, 2nd, and 3rd places. How many different outcomes are possible?

23.   The flags of seven different countries are to be displayed in a row. In how many different orders can they be flown?

28.   There are seven possible digits in a phone number. How many different phone numbers are possible if the first digit cannot be 0 and no digit can be used more than once?

35.   A scrabble tray contains the tiles FERSXAI. How many different four-letter arrangements ("words") can be made?

44.   If a special at a diner offers a choice of one each of two appetizers, four entrees and five desserts, how many distinct meals are possible under the special?

56.   In how many ways can a committee consisting of two deacons and four regular church members be formed in a church that has five deacons and 120 regular members?

48.   In how many ways can a subcommittee of five people be selected from a committee of ten people?

15.   How many different ways can three chocolate, four strawberry, and two butterscotch sundaes be served to nine people?

17.   A class of nine students line up single file for lunch. How many different ways can this occur if the six boys in the class must line up first?

19.   An organization consisting of 36 members is going to elect three officers. No person may hold more than one office. How many different outcomes are possible?

32.   A random number generator selects an integer from 1 to 50. Find the number of ways a square number can occur.

49.   A record club offers new customers six free selections from a list of 130 different recordings. How many different introductory offers are possible?

54.   At a Boy Scout jamboree there are 12 senior patrol leaders, 10 assistant senior patrol leaders, 21 patrol leaders, and 84 other scouts. How many committees of two senior patrol leaders, one assistant patrol leader, three patrol leaders, and four regular scouts can be formed?

9.   Two cards are randomly selected from a standard deck of 52 playing cards. Find the probability that one card will be an ace and the other will be a 10.

12. In a group of 10 children, 3 have blond hair and 7 have brown hair. If a child is chosen at random, what is the probability that the child will have brown hair?

15. A bag contains nine red balls numbered 1 - 9 and six white balls numbered 10 - 15. If one ball is drawn at random, what is the probability that the number on it is even?

22. A fair coin is tossed four times. What is the probability of getting exactly one head?

27. What is the probability that 2 people chosen at random from a group of 8 married couples are married to each other?

29. A box holds 12 white, 5 red, and 6 black marbles. If 2 marbles are picked at random, without replacement, what is the probability that they will both be black?

34. Two six-sided dice are tossed. What is the probability that the total is ten?

37. Drawing from a standard deck of 52 cards, what is the probability that the card is an eight or a face card?

40. A small business college has 800 seniors, 700 juniors, 900 sophomores and 1200 freshmen. If a student is randomly selected, what is the probability that the student is a freshman or a senior?

54. A sample of nursing homes in a state reveals that 112,000 residents are female. If a nursing home resident is chosen at random from this state, what is the probability that the resident is male? 218,000 Total residents

Math Analysis   Name_____
Section 9.7

6.   A card is drawn at random from a standard deck of 52 playing cards. Find the
      probability that the card is a spade.

7.   A card is drawn at random from a standard deck of 52 playing cards. Find the
      probability that the card is a 10 **or** an ace.

9.   Two cards are randomly selected from a standard deck of 52 playing cards. Find
      the probability that one card will be an ace **and** the other will be a 10.

13.   A bag contains four red balls and seven white balls. If a ball is drawn at random,
      what is the probability that it is a red ball?

18.   A die is tossed 3 times. What is the probability that a two will come up all three
      times?

23.   Two six-sided dice are tossed. What is the probability that the total is 11?

28.   There are 5 red and 4 black balls in a box. If 3 balls are picked without
      replacement, what is the probability that at least one of them is red?

38.   Drawing from a standard deck of 52 cards, what is the probability that the card is
      an ace, king, **or** queen?

49.   Before an election, a sample of 120,000 people throughout the county showed that
      79,386 people would vote for Candidate A. If a person from the sample is chosen
      at random, what is the probability that the person is one of the people who said
      they would not vote for Candidate A?

58. A sample of 100 people at a mall were asked to taste-test two colas and decide which they preferred. The results are shown in the table.

	Cola A	Cola B	Unsure	Total
Men	18	16	4	38
Women	38	20	4	62
Total	56	36	8	100

A person is selected at random from the sample. Find the specified probability.

a) The person preferred Cola A.
b) The person is female and preferred Cola B.
c) The person is male and is unsure.