Coles' Honors PreCalculus Name_____

Permutations, Combinations and Probability

Evaluate each expression.

1) ${}_8P_3$

2) $3 \cdot {}_7P_4$

Find the number of unique permutations of the letters in each word.

3) STREET

4) NEUTRAL

Evaluate each expression.

5) $\frac{{}_{21}C_{18}}{10}$

6) $3 \cdot {}_{14}C_8$

List all possible combinations.

7) 4, 5, 6, 7, taken two at a time

8) ☺, ☼, ♥, ▲, taken two at a time

State if each scenario involves a permutation or a combination.

9) The batting order for eight players on a 10 person team.

10) A team of 14 soccer players needs to choose two players to refill the water cooler.

11) The student body of 165 students wants to elect three representatives.

12) The student body of 125 students wants to elect a president, vice president, and secretary.

Find the number of possibilities in each scenario.

13) There are 10 students at a meeting. They each give a Valentine's Day card to everyone else. How many cards were given?

14) Kathryn has homework assignments in four subjects. She only has time to do two of them.

15) A group of 35 people are going to run a race. The top three runners earn gold, silver, and bronze medals.

16) Darryl has homework assignments in six subjects. He only has time to do three of them.

17) There are 20 athletes at a meeting. They each give a Valentine's Day card to everyone else. How many cards were given?

18) A group of 50 people are going to run a race. The top three runners earn gold, silver, and bronze medals.

19) There are 10 applicants for two Computer Programmer positions.

20) The batting order for nine players on a 12 person team.

Find the probability of each event.

21) A politician is about to give a campaign speech and is holding a stack of eight cue cards, of which the first 3 are the most important. Just before the speech, he drops all of the cards and picks them up in a random order. What is the probability that cards #1, #2, and #3 are still in order on the top of the stack?

22) A gardener has eleven identical-looking tulip bulbs, of which six will produce yellow tulips and five will become pink. She randomly selects and plants six of them and then gives the rest away. When the flowers start to bloom, what is the probability that all of them are yellow?

23) A test consists of seven true/false questions. A student who forgot to study guesses randomly on every question. What is the probability that the student answers exactly four questions correctly?

24) A basketball player has a 50% chance of making each free throw. What is the probability that the player makes exactly three out of nine free throws?

25) A basketball player has a 50% chance of making each free throw. What is the probability that the player makes at most eight out of ten free throws?

26) A fair coin is flipped fifteen times. What is the probability of the coin landing tails up at most thirteen times?

27) A meeting takes place between a diplomat and seventeen government officials. However, ten of the officials are actually spies. If the diplomat gives secret information to eight of the attendees, what is the probability that the diplomat gave secret information to exactly five spies?

28) Sarawong is carrying six pages of math homework and four pages of English homework. A gust of wind blows the pages out of his hands and he is only able to recover seven random pages. What is the probability that he recovers at least five pages of his math homework?

Answers to Permutations, Combinations and Probability

1) 336
2) 2,520
3) 180
4) 5,040
5) 133
6) 9,009
7) 45 56
46 57
47 67
8) ☺☼ ☼♥
☺♥ ☼▲
☺▲ ♥▲
9) Permutation
10) Combination
11) Combination
12) Permutation
13) 90
14) 6
15) 39,270
16) 20
17) 380
18) 117,600
19) 45
20) 79,833,600
21) $\frac{1}{336} \approx 0.298\%$
22) $\frac{1}{462} \approx 0.216\%$
23) $\frac{35}{128} \approx 27.344\%$
24) $\frac{21}{128} \approx 16.406\%$
25) $\frac{1013}{1024} \approx 98.926\%$
26) $\frac{2047}{2048} \approx 99.951\%$
27) $\frac{882}{2431} \approx 36.281\%$
28) $\frac{1}{3} \approx 33.333\%$