

1. Which of the following are proper subsets of  $\{a, e, i, o, u\}$ ?
- I.  $\{a, e, i, o, u\}$
- II.  $\{i, o, u\}$
- III.  $\{a, c, e\}$
- a) III only
- b) I and II only
- c) II only
- d) All of I, II and III
2. Which of the following is the same as the set  $\overline{\overline{A \cap B}}$ ?
- a)  $A \cup \overline{B}$
- b)  $A \cap \overline{B}$
- c)  $\overline{A} \cup B$
- d)  $\overline{A} \cap \overline{B}$
3. In a group of 25 students, 14 are taking English 101 class, 7 are taking Chemistry 13 class and 3 are taking both classes. How many are taking neither of these two classes?
- a) 1
- b) 3
- c) 7
- d) 0
4. In a class of 60 students, 21 play soccer, 28 play tennis, 10 play both soccer and tennis and 21 play neither soccer nor tennis. Is this data consistent?
- a) Yes
- b) No, because the number of students counted is less than 60.
- c) No, because the number of students counted is more than 60.
- d) There is not enough information to determine whether the data is consistent.
5. In a certain university, students id cards consist of 7 character codes where the first three characters are numerical digits and the last four are letters. How many different codes can be formed if the letters may be repeated but the numerical digits are not repeated?
- a)  $10^3 \times 26^4$
- b)  $\frac{10!}{7!} \times 26^4$
- c)  $10^3 \times \frac{26!}{22!}$
- d)  $10! \times 26!$
6. How many different outfits can you wear if you have 20 shirts, 10 pants, and 5 pairs of socks?
- a) 35
- b) 70
- c) 200
- d) 1000
7. In a club with 30 members, how many ways can a President, Secretary and Treasurer be chosen?
- a)  $3!$
- b)  $\frac{30!}{3!}$
- c)  $\frac{30!}{27!}$
- d)  $3^{30}$
8. If there are eight runners in a race, how many finishing orders of first, second and third place are possible?
- a)  $3^8$
- b)  $8^3$
- c)  $C(8, 3)$
- d)  $P(8, 3)$
9. How many different 9-letter words (real or imaginary) can be formed from the letters in "TENNESSEE"?
- a)  $9!$
- b)  $\frac{9!}{96}$
- c)  $\frac{9!}{3}$
- d)  $\frac{9!}{8}$

10. If you have three extra tickets for a concert and have fifteen friends, how many different groups of three friends can you invite?
- $15!$
  - $15^3$
  - $P(15, 3)$
  - $C(15, 3)$
11. Find the coefficient of  $x^2y^2$  in the expression of  $(2x - y)^4$ .
- 24
  - 2
  - 8
  - 8
12. Which of the following are true?
- I.  $\binom{n}{k} = \binom{n}{n-k}$
- II.  $\binom{n}{k} + \binom{n}{k-1} = \binom{n+1}{k-1}$
- I and II
  - I only
  - II only
  - Neither I nor II
13. A spinner has 8 equal-sized spaces, numbered 1 through 8, but is weighted in such a way that any odd-numbered space is twice as likely to occur as any even-numbered space. What is the probability of spinning a 1, 2 or 3 on this spinner?
- $\frac{1}{4}$
  - $\frac{1}{3}$
  - $\frac{7}{12}$
  - $\frac{5}{12}$
14. Given sample space  $S = \{a, b, c, d\}$  with  $P(a) = \frac{1}{3}$ ,  $P(b) = \frac{1}{2}$  and  $P(c) = P(d)$ , what is  $P(c)$ ?
- $\frac{1}{4}$
  - $\frac{1}{12}$
  - $\frac{1}{3}$
  - $\frac{1}{2}$
15. If the odds against an event are 12 to 4, what is the probability that the event will occur?
- $\frac{1}{4}$
  - $\frac{1}{3}$
  - $\frac{1}{6}$
  - $\frac{1}{12}$
16. Which one of the following is NOT true for all events  $E$  and  $F$  of a sample space  $S$  where  $P(E) \neq 0$  and  $P(F) \neq 0$ ?
- $P(E) - P(E \cap F) = P(E \cup F) - P(F)$
  - $P(E|F) = 1 - P(F|E)$
  - If  $E$  and  $F$  are mutually exclusive,  $P(E|F) = 0$
  - $P(F) \cdot P(E|F) = P(E \cap F)$
17. A box contains 8 green balls, 4 red balls and 10 blue balls. If two balls are drawn at random, what is the probability they are both green balls?
- $\frac{4}{11}$
  - $\frac{9}{11}$
  - $\frac{4}{33}$
  - $\frac{2}{3}$

18. A man has 7 normal fair coins and 3 two-headed coins. He selects one coin at random and tosses it. What is the probability that the coin comes up with a tail?
- $\frac{13}{20}$
  - $\frac{7}{13}$
  - $\frac{3}{7}$
  - $\frac{7}{20}$
19. What is the probability that a family with 4 children has exactly 3 girls given that the oldest child is a boy?
- $\frac{1}{4}$
  - $\frac{1}{8}$
  - $\frac{1}{10}$
  - $\frac{1}{2}$
20. A bag contains 8 red, 10 green and 5 blue marbles. A red marble is drawn and set aside. What is the probability that the next marble drawn is blue?
- $\frac{1}{3}$
  - $\frac{5}{22}$
  - $\frac{5}{23}$
  - $\frac{7}{22}$
21. If  $E$  and  $F$  are independent events with  $P(E) = 0.8$  and  $P(E \cap F) = 0.6$ , find  $P(E \cup F)$ .
- 0.25
  - 0.42
  - 0.85
  - 0.95
22. If 4% of students are predicted to get sick and miss the final exam, what is the probability that in a class of 50 students, exactly 8 will miss the final exam due to sickness?
- $\binom{50}{8} (0.04)^{42} (0.96)^8$
  - $\binom{50}{8} (0.04)^8 (0.96)^{42}$
  - $\binom{50}{42} (0.96)^{42}$
  - $\binom{50}{8} (0.04)^{42}$
23. Find the negation of the proposition, "Some students have no cell phone".
- No students have cell phones.
  - All students have cell phones.
  - Some students have cell phones.
  - At least one student has a cell phone.
24. Which one of the following is a proposition?
- Don't you own a cell phone?
  - What a nice cell phone!
  - Some students have cell phones.
  - How many of you have a cell phone?
25. Which one of the following is logically equivalent to  $p \wedge [\sim (p \wedge q)]$ ?
- $\sim (p \vee q)$
  - $p \vee (\sim q)$
  - $(\sim p) \vee (\sim q)$
  - $p \wedge (\sim q)$
26. Find the negation for "I will study hard and I will not fail the exam".
- I will not study hard or I will fail the exam.
  - I will not study hard and I will fail the exam.
  - I will study hard or I will fail the exam.
  - I will not study hard and I will not fail the exam.

27. Write the converse of the statement, "If it is raining, it is cloudy".

- a) If it is raining, it is not cloudy.
- b) If it is cloudy, it is raining.
- c) If it is cloudy, it is not raining.
- d) If it is not raining, it is dry.

28. Which of the following is contrapositive to "If my bicycle has a flat tire, I take the bus".

- a) If I don't take the bus, my bicycle does not have a flat tire.
- b) If my bicycle does not have a flat tire, I don't take the bus.
- c) If I take the bus, my bicycle does not have a flat tire.
- d) Either I ride my bicycle or take the bus.

29. In a certain argument, the premises are that the propositions  $q, p \rightarrow \sim q$  and  $\sim p \rightarrow r$  are true. Find a valid conclusion.

- a)  $p$
- b)  $r$
- c)  $\sim p \rightarrow \sim r$
- d) None of these conclusions is valid.

30. If I am sleepy, I do not study. I study or watch television. I am not watching television. What is a valid conclusion?

- a) I am sleepy.
- b) I never watch television.
- c) I always study.
- d) I am not sleepy.