

1. Two complex numbers  $a + ib$  and  $c + id$  are identical
  - a. if  $a$  and  $b$  are equal
  - b. if and only if  $c$  and  $d$  are equal
  - c. if and only if  $a = c$  and  $b = d$
  - d. if and only if  $a = b$  and  $c = d$
2. The set  $A = \{0, 2, 4, 6, 8\}$  and the set  $B = \{1, 3, 5, 7\}$ . Which of the following is not a member of the set  $A \times B$ ?
  - a. (4,3)
  - b. (1,2)
  - c. (2,1)
  - d. (6,1)
3. The number of elements in the set  $A = 1,232$ , in set  $B = 4,376$  and in set  $C = 3,128$ . Some elements of  $A$  are also found in  $B$  and  $C$ , and some are found in all of  $A$ ,  $B$  and  $C$ . The number of unique, or unshared, elements in the set  $A \cup B \cup C$  is
  - a. 8,736
  - b.  $nA + nB + nC - n(A \cap B) - n(A \cap C) - n(B \cap C)$
  - c.  $nA + nB + nC - n(A \cap B) - n(A \cap C) - n(B \cap C) - n(A \cap B \cap C)$
  - d.  $nA + nB + nC - n(A \cap B) - n(A \cap C) - n(B \cap C) + n(A \cap B \cap C)$
4. In a group of 48 people,  $1/3$  claimed to be Christians,  $3/16$  were followers of Islam,  $1/16$  were Buddhists,  $1/16$  were Hindu,  $1/48$  were Sikh,  $1/12$  were traditional Native Americans and the remainder claimed no religious affiliation. The number of individuals in each group was
  - a. 12, 4, 1, 3, 3, 9, 16
  - b. 16, 9, 3, 3, 1, 4, 12
  - c. 12, 1, 4, 3, 3, 9, 16
  - d. none of the above
5. A magician has a hat that holds two rabbits. One rabbit is black and the other is white. In his last 16 performances he has randomly pulled the black rabbit from the hat 16 times. The probability that he will pull the white rabbit from the hat in his next performance is
  - a. 0.50
  - b. 1
  - c.  $1/17$
  - d. 0
6. A bag contains 16 coins, each with a different date. The number of possible combinations of three coins from the bag is
  - a. 650
  - b. 48
  - c. 560
  - d. 6
7. Ten sample values were found to be 6, 7, 7, 9, 5, 7, 8, 2, 6 and 3. The mean and median values of these samples are
  - a. 6 and 6.5

- b. 6 and 7
  - c. 6 and 8
  - d. 6.5 and 7
8. Seven samples were obtained having the values 21, 22, 26, 29, 27, 26 and 24. The mean and standard deviation values are
- a. 22.4 and 2.6
  - b. 25 and 2.2
  - c. 25 and 2.6
  - d. 25.6 and 2.2
9. The factors  $(x - 3)$ ,  $(x - 4)$  and  $(x + 7)$  expand to give the equation
- a.  $x^3 - 12x^2 - 7x + 84$
  - b.  $x^3 + 84x^2 - 14x + 14$
  - c.  $x^3 - 37x + 84$
  - d.  $x^3 + 14x^2 - 7x + 84$
10. When multiplied together the two complex numbers  $(6 + i5)$  and  $(3 - i3)$  yield
- a.  $(18 - i15)$
  - b.  $(33 - i3)$
  - c.  $(33 - i9)$
  - d.  $(33 - i15)$

## Answers

1. The correct answer is C. For two complex numbers to be identically equivalent, both the real coefficients ( $a$  and  $c$ ) and the imaginary coefficients ( $b$  and  $d$ ) must be identically equivalent to each other, respectively.
2. The correct answer is B. The set  $A \times B = \{(0, 1), (0, 3), (0, 5), (0, 7), (2, 1), (2, 3), (2, 5), (2, 7), (4, 1), (4, 3), (4, 5), (4, 7), (6, 1), (6, 3), (6, 5), (6, 7), (8, 1), (8, 3), (8, 5), (8, 7)\}$  is formed by combining each element of  $A$  with each element of  $B$ , in order. The ordered pair  $(1, 2)$  is not a member of this solution set.
3. The correct answer is D. The total number of unique elements in the three sets combined must be equal to the total number of elements minus the elements that are shared between the pairs of sets. The final term adds back in the elements that are common to all three sets to compensate for having subtracted them twice.
4. The correct answer is B. One-third of  $48 = 16$ ; one-sixteenth of  $48 = 3$ , therefore  $3/16 = 9$ ,  $1/48$  of  $48 = 1$ ,  $1/12$  of  $48 = 4$ . This accounts for 36 individuals in the group, leaving a remainder of 12.
5. The correct answer is A. The events, if truly random, are independent of each other. There is therefore an equal probability of pulling the black rabbit or the white rabbit from the hat each time. The probability is therefore 0.50.
6. The correct answer is C. The exact method of calculating the number of ways of choosing three different items from a group of 16 different items, without repeats, is stated as "16 choose 3". The calculation is

$$N = 16! / ((16 - 3)!3!) = 16! / 13!3! = (16 \times 15 \times 14) / (3 \times 2 \times 1) = 560$$

7. The correct answer is A. The average is the sum of the values (60) divided by the number of values (10). The median value is the value at which there are equal numbers of greater and lesser values.
8. The correct answer is C. The mean value is calculated as the sum of the values (175) divided by the number of values (7). The standard deviation,  $s$ , of the sample set is calculated as the square root of the difference between the average of the actual values squared and the square of the average value.
9. The correct answer is C. Multiplication of  $(x - 3)$  by  $(x - 4)$  yields the quadratic formula  $(x^2 - 7x + 12)$ . When multiplied by the third factor  $(x + 7)$ , this produces the formula  $x^3 - 37x + 84$ .
10. The correct answer is B. Complex numbers are multiplied in exactly the same manner as algebraic factors. Here  $(6 + i5)(3 - i3) = 18 - i18 + i15 - 15i^2 = 18 + 15 - i3 - 15(-1) = 18 - i3 + 15 = 33 - i3$