

Mu Alpha Theta National Convention: Seattle, 1997
Alpha Probability Topic Test

1. Express as an ordered triplet the mean, mode, and median of the following data set:
8, 12, 7, 22, 20, 15, 3, 9, 3
(A) (11, 3, 9) (B) (3, 9, 12) (C) (11, 12, 3) (D) (12, 3, 11) (E) NOTA

2. A card is drawn from a deck. What is the probability that it is a nine or a black card?
(A) $\frac{4}{13}$ (B) $\frac{15}{26}$ (C) $\frac{29}{52}$ (D) $\frac{7}{13}$ (E) NOTA

3. My science fiction collection consists of 5 books by Larry Niven, 3 by Orson Scott Card, and 1 by Carl Sagan. If I wish to keep books by the same author together, in how many ways can I arrange the books upon a shelf?
(A) 362880 (B) 4320 (C) 60480 (D) 720 (E) NOTA

4. If each person shakes hands exactly once with each other person in a group of 17, how many handshakes will transpire?
(A) 119 (B) 136 (C) 272 (D) 289 (E) NOTA

5. Two coins are drawn from a bag which contains 3 quarters, 2 dimes, and a nickel. What is the probability that the total amount of money drawn is less than 35¢?
(A) $\frac{8}{15}$ (B) $\frac{7}{15}$ (C) $\frac{2}{5}$ (D) $\frac{1}{3}$ (E) NOTA

6. A sack contains 7 cats: 5 black and 2 white. Let A be the probability that when you choose two cats at random you get one of each color. Let B be the probability that when you choose two cats one at a time, without replacement, you get one of each color. What is the sum of A & B?
(A) $\frac{20}{21}$ (B) $\frac{19}{21}$ (C) $\frac{6}{7}$ (D) $\frac{22}{21}$ (E) NOTA

7. A student guesses at each of 30 true/false questions. What is the probability he gets at least 15 correct?
(A) $\frac{1}{2}$ (B) $1 - \frac{\binom{30}{15}}{2^{30}}$ (C) $\frac{1}{2} + \frac{\binom{30}{15}}{2^{31}}$ (D) $\frac{1}{2} + \frac{\binom{30}{15}}{2^{30}}$ (E) NOTA

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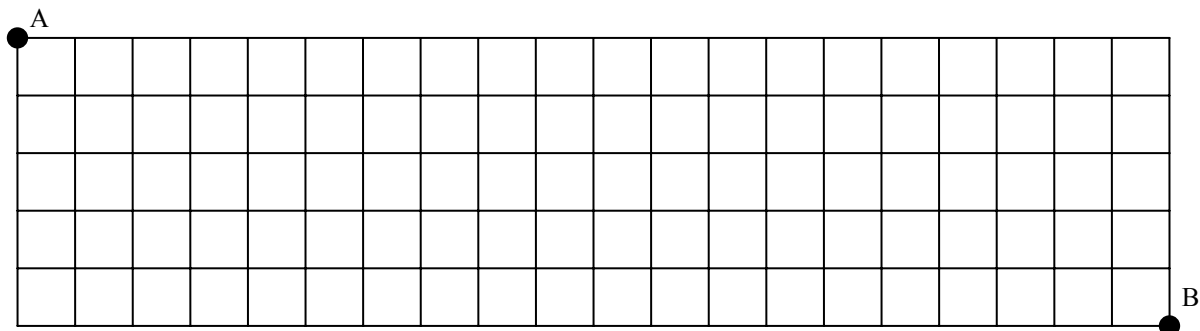
8. In a horse race, the odds are 24:1 against 'Smiling Doug' placing. In another horse race, the odds are 11:1 against 'Kev' placing. What is the probability that neither horse places?

(A) $\frac{1}{300}$ (B) $\frac{1}{264}$ (C) $\frac{22}{25}$ (D) $\frac{115}{132}$ (E) NOTA

9. Sean has a 15 problem homework assignment on which he has got the wrong answer for two of the problems. Sean's teacher is lazy, and only grades three of the problems. What is the probability that the teacher will grade a problem with the wrong answer?

(A) $\frac{2}{5}$ (B) $\frac{13}{35}$ (C) $\frac{12}{35}$ (D) $\frac{2}{7}$ (E) NOTA

10. If you must always head either down or right along the gridlines, in how many ways can you get from point A to point B?



(A) $\binom{20}{5}$ (B) $\binom{15}{5}$ (C) $\binom{25}{15}$ (D) $\binom{25}{20}$ (E) NOTA

11. Two urns contain marbles. Urn A holds 12 black marbles and 4 white marbles. Urn B contains 6 black marbles and 5 white marbles. A marble is chosen at random from Urn A and placed in Urn B. What is the probability that a marble then chosen from Urn B is black?

(A) $\frac{9}{16}$ (B) $\frac{6}{11}$ (C) $\frac{5}{11}$ (D) $\frac{13}{24}$ (E) NOTA

12. In how many ways can 4 students seat themselves in a row of 9 desks?

(A) 126 (B) 362880 (C) 15120 (D) 3024 (E) NOTA

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13. A coin is flipped seven times. What is the probability that it comes up heads at least 4 times in a row?

- (A) $\frac{11}{64}$ (B) $\frac{5}{32}$ (C) $\frac{1}{8}$ (D) $\frac{9}{64}$ (E) NOTA

14. The probability of event A is $\frac{3}{4}$. The probability of event B, given that event A occurs, is $\frac{1}{4}$. The probability of event A, given that event B occurs, is $\frac{2}{3}$. What is the probability that neither event occurs?

- (A) $\frac{1}{6}$ (B) $\frac{5}{36}$ (C) $\frac{5}{32}$ (D) $\frac{1}{8}$ (E) NOTA

15. Find the variance of the following data set:

4, 9, 13, 7, 12, 22, 9, 12

- (A) $9\sqrt{2}$ (B) 16 (C) 182 (D) 200 (E) NOTA

16. What is the coefficient of the fifth term in the expansion of $(3x^3 + 2z)^7$?

- (A) 432 (B) 1296 (C) 6048 (D) 9072 (E) NOTA

17. Three dice are rolled. At least one of them shows a 6. What is the probability that at least one of them shows a 2?

- (A) $\frac{91}{216}$ (B) $\frac{1}{3}$ (C) $\frac{30}{91}$ (D) $\frac{36}{91}$ (E) NOTA

18. Consider the data set: 3, 4, 7, 12, 18, x, y, where x equals the mean of the data set and y is the median of the data set. What is the maximum sum of x and y?

- (A) 18 (B) 17 (C) $\frac{88}{5}$ (D) $\frac{49}{3}$ (E) NOTA

19. A test is given to nine students in which their scores are integers between 0 and 100, inclusive. What is the greatest possible range of the test scores if the mean of the scores is 85 and the median is 80?

- (A) 52 (B) 55 (C) 60 (D) 62 (E) NOTA

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20. Three distinct numbers are chosen from the first nine natural numbers. What is the probability that 4 is the second largest of those chosen?
- (A) $\frac{9}{56}$ (B) $\frac{5}{168}$ (C) $\frac{5}{28}$ (D) $\frac{1}{42}$ (E) NOTA
21. A deck has 12 cards: 5 which are red on both sides, 4 which are blue on both sides, and three which are red on one side and blue on the other. A card from this deck is placed on the table in front of you with a red side showing. What is the probability that the other side of the card is also red?
- (A) $\frac{10}{13}$ (B) $\frac{5}{8}$ (C) $\frac{3}{5}$ (D) $\frac{8}{13}$ (E) NOTA
22. A certain math competition pits two teams against one another in a series of rounds until one of the teams has beaten the other in five of the rounds. In how many ways can the competition transpire if no round can result in a tie?
- (A) 504 (B) 252 (C) 126 (D) 1024 (E) NOTA
23. How many distinct orders are possible for 8 keys arranged on a key ring?
- (A) 2520 (B) 5040 (C) 40320 (D) 20160 (E) NOTA
24. The scores on this test will be normally distributed about a score of 90, with a standard deviation of 5. Using the attached table, what percentage, to the nearest tenth of a percent, of the scores will be below 82?
- (A) 5.5 % (B) 7.8 % (C) 10.7 % (D) 12.5 % (E) NOTA
25. Joe has two bags of pebbles. Bag 1 has 4 blue pebbles and 1 red pebble in it. Bag 2 contains 4 red pebbles and 3 blue ones. Joe takes one pebble from Bag 1 and places it in Bag 2, then draws a pebble from Bag 2, which happens to be blue. What is the probability that the pebble drawn from the Bag 1 was blue?
- (A) $\frac{4}{5}$ (B) $\frac{16}{19}$ (C) $\frac{4}{7}$ (D) $\frac{9}{10}$ (E) NOTA
26. Two dice are rolled. What is the expected value of the higher of the two?
- (A) $\frac{37}{9}$ (B) 4 (C) $\frac{161}{36}$ (D) $\frac{7}{2}$ (E) NOTA

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27. How many students take math and science, but not history, if, of in a school with 102 students, 58 students take math, 54 students take science, 24 take history, 33 take both science and math, 9 take history and science, and 6 take all three?
- (A) 30 (B) 27 (C) 24 (D) cannot be determined (E) NOTA
28. Tom's system administrator insists that his computer password be 6 characters long and contain exactly 4 numeric digits and 2 letters, but that no character appear more than once in the password. How many such passwords are possible?
- (A) 3276000 (B) 8258000 (C) 4388000 (D) 6760000 (E) NOTA
29. Jon will arrive home from work sometime between 5 and 6 PM, stay for ten minutes, then leave to have dinner. Joy will call Jon sometime between 5 and 6 PM, let the phone ring for 5 minutes, then give up. What is the probability that Joy will be calling while Jon is home?
- (A) $\frac{7}{26}$ (B) $\frac{67}{288}$ (C) $\frac{39}{157}$ (D) $\frac{47}{60}$ (E) NOTA
30. What is the probability that three points chosen at random on the circumference of a circle are contained in a semi-circle?
- (A) $\frac{1}{2}$ (B) $\frac{3}{4}$ (C) $\frac{5}{8}$ (D) $\frac{6}{8}$ (E) NOTA