

**Fall Classic 2003**  
**Individual Test**

1) What is the probability of randomly selecting a positive one-digit integer, and having it be a prime number?

- a)  $\frac{4}{9}$       b)  $\frac{5}{9}$       c)  $\frac{1}{3}$       d)  $\frac{1}{2}$       e) NOTA

2) How many integers are solutions to the following inequality?

$$3 < 1 - 2x \leq 15$$

- a) 4      b) 5      c) 6      d) 7      e) NOTA

3) Simplify:  $2^0 + 3 \times 4 - (6 - 2 \times 4)/2 + 4$

- a) 18      b)  $\frac{-1}{2}$       c)  $\frac{-5}{2}$       d) 12      e) NOTA

4) In a pet store,  $\frac{1}{2}$  of the animals are fish,  $\frac{1}{10}$  are dogs,  $\frac{1}{5}$  are birds and the remaining 6 are cats. How many animals are in the pet store totally?

- a) 20      b) 40      c) 60      d) unable to determine      e) NOTA

5) What is the greatest number of days possible in a century?

- a) 36,520      b) 36,522      c) 36,524      d) 36,525      e) NOTA

6) A circle is inscribed inside a square. The square has a diagonal of  $3\sqrt{2}$  cm, what is the area of the square that is not taken up by the circle? Round your answer to the nearest tenth. Use 3.14 for  $\pi$ .

- a) 2.0      b) 1.9      c) 1.8      d) 1.7      e) NOTA

7) What is the 100<sup>th</sup> number in the following arithmetic sequence?

$$3, 7, 11, 15, \dots\dots\dots$$

- a) 399      b) 401      c) 601      d) 603      e) NOTA

- 8) In terms of  $\pi$ , what is the volume of a sphere with a radius of 6cm?
- a)  $72\pi cm^3$    b)  $236\pi cm^3$    c)  $144\pi cm^3$    d)  $288\pi cm^3$    e) NOTA
- 9) What common fraction is exactly halfway between  $\frac{1}{2}$  and  $\frac{1}{5}$ ?
- a)  $\frac{1}{3.5}$    b)  $\frac{2}{7}$    c)  $\frac{7}{20}$    d)  $\frac{3}{8}$    e) NOTA
- 10) The point (a,b) is on the line  $y = -3x + 9$ . If a is increased by 2, what is the corresponding decrease in b so that the new point (a,b) is still on the line?
- a) 2   b) 3   c) 6   d) 9   e) NOTA
- 11) The base of an isosceles triangle is 12 meters long. The area of the triangle cannot exceed 48 square meters. What is the maximum number of meters in the perimeter of the triangle?
- a) 16   b) 24   c) 36   d) 48   e) NOTA
- 12) What is the sum of the following decimals represented as a fraction?
- $\bar{3}$ ,  $.1\bar{3}$ , and  $.0\bar{3}$
- a)  $\frac{2}{3}$    b)  $\frac{23}{90}$    c)  $\frac{49}{99}$    d)  $\frac{51}{99}$    e) NOTA
- 13) If you draw two cards at random from a standard deck of 52 cards, what is the probability that you draw the Jack of clubs and any Queen?
- a)  $\frac{1}{663}$    b)  $\frac{2}{663}$    c)  $\frac{12}{663}$    d)  $\frac{5}{52}$    e) NOTA
- 14) How many distinct arrangements of the letters in ALABAMA are there?
- a) 210   b) 420   c) 105   d) 7!   e) NOTA

15) The sum of the squares of three consecutive odd positive integers is 251, what is the product of the 3 integers?

- a) 315      b) 385      c) 693      d) 1,287      e) NOTA

16) What is the units digit of  $13^{25} - 13$ ?

- a) 0      b) 1      c) 2      d) 3      e) NOTA

17) The attendance at the Mu Alpha Theta National convention the past 4 years has shown the following changes:

2000: an increase of 10%

2001: a decrease of 10%

2002: an increase of 20%

2003: and increase of 15%

What is the overall percent of increase in attendance, rounded to the nearest percent?

- a) 32%      b) 34%      c) 36%      d) 38%      e) NOTA

18) In a small town of 100 women, 85 are married, 70 have a cellular phone, 75 own a car, and 80 own their own home. On this basis, what is the smallest possible number of women who are married, have a cellular phone, own their own home and their own car?

- a) 0      b) 5      c) 10      d) 20      e) NOTA

19) If  $a + b = 16$  and  $a + c = 31$  and  $b + c = 25$  what does  $a \times b \times c = ?$

- a) 400      b) 528      c) 1100      d) 1240      e) NOTA

20) Two fair six-sided dice are rolled, what is the probability that the faces will not show the same number?

- a)  $\frac{1}{36}$       b)  $\frac{1}{6}$       c)  $\frac{35}{36}$       d)  $\frac{5}{6}$       e) NOTA

21) In a triangle, the area in square centimeters is numerically equal to the perimeter in centimeters. What is the radius of the inscribed circle?

- a) 2      b) 3      c) 4      d) 5      e) NOTA

22) There are 50 men and 50 women in the same room and all the men shake all the women's hands and then all the women shake all the men's hands, how many handshakes occur?

- a) 100      b) 2500      c) 2550      d) 5000      e) NOTA

23) Compute  $5! + 8^{\frac{2}{3}} \times \left(\frac{1}{5}\right)^{-2} - \sqrt[3]{-8}$

- a) 218      b) 222      c) 3098      d) 3102      e) NOTA

24) Two sides of a triangle are 4.8cm and 10.3cm. What is the sum of all possible integer values of the third side of the triangle?

- a) 90      b) 99      c) 121      d) 137      e) NOTA

25) Five books, two of which are glued together, are placed in a row on a shelf. How many different arrangements of those five books are there?

- a) 120      b) 24      c) 48      d) 96      e) NOTA

26) The letter "e" used in logarithms is attributed in honor to which mathematician?

- a) Euclid      b) Einstein      c) Euler      d) Descartes      e) NOTA

27) If the probability that Wayne beats Michael in a tennis match is  $\frac{4}{5}$ , what is the probability that they play 3 matches and Wayne wins exactly two of the matches?

- a)  $\frac{16}{125}$       b)  $\frac{48}{125}$       c)  $\frac{64}{125}$       d)  $\frac{96}{125}$       e) NOTA

28) The volume of a circular cylinder is  $81\pi\text{ cm}^3$ , and the ratio of the height to the radius of the cylinder is  $\frac{3}{1}$ . If a circular cone has a radius that is  $\frac{1}{3}$  of the radius cylinder and a height that is twice the height of the cylinder, what is the volume of the circular cone?

- a)  $54\pi\text{ cm}^3$    b)  $48\pi\text{ cm}^3$    c)  $36\pi\text{ cm}^3$    d)  $18\pi\text{ cm}^3$    e) NOTA

29) Jacob wanted to receive an A in his math class and needed to average a 92% or better on his 5 tests in Statistics. On the first three tests he received a 98%, 88%, and a 86%. What is the lowest test score he could get on the 4<sup>th</sup> test and still have a possibility of receiving an A? (Presume a 100% is the highest possible grade on any test)

- a) 92%      b) 86%      c) 82%      d) 88%      e) NOTA

30) Jennifer needed to make change for a quarter using dimes, nickels, and/or pennies. How many different ways is this possible?

- a) 9            b) 10            c) 11            d) 12            e) NOTA

31) How many degrees are in the acute angle formed by the hands of a clock at 3:30?

- a)  $60^\circ$       b)  $75^\circ$       c)  $90^\circ$       d)  $45^\circ$       e) NOTA

32) Four distinct digits are used to form 2 two-digit numbers. What is the greatest possible product of the two numbers formed?

- a) 8342      b) 8265      c) 7488      d) 7448      e) NOTA

33) The elements of the ordered triple (a, b, c) are different positive integers less than 5. What is the probability that  $a < b < c$ ?

- a)  $\frac{1}{12}$       b)  $\frac{1}{9}$       c)  $\frac{1}{6}$       d)  $\frac{1}{3}$       e) NOTA

- 34) What is the measure in degrees of each interior angle of a regular decagon?
- a) 90      b) 120      c) 144      d) 156      e) NOTA
- 35) At Harry's Hardware, a hammer costs  $d$  dollars and  $c$  cents. What is the cost, in dollars, of  $h$  hammers?
- a)  $\frac{hd + c}{100}$       b)  $\frac{h(c + d)}{100}$       c)  $h(100c + d)$       d)  $\frac{100hd + hc}{100}$       e) NOTA
- 36) What is the value of  $a^4$  if  $a$  is positive and  $a \times a \times a = a + a + a$ ?
- a) 9      b) 6      c) 4      d) 1      e) NOTA
- 37) Aaron was 24 when his daughter Jill was born. If Aaron is now 3 times as old as Jill, how many years ago was Aaron 4 times as old as Jill?
- a) 4      b) 6      c) 8      d) 12      e) NOTA
- 38) A sequence of numbers begins with 1, 1, 1, 2, 2, 3 and then repeats this pattern forever. What is the sum of the 135<sup>th</sup>, 136<sup>th</sup> and the 137<sup>th</sup> terms in the sequence?
- a) 3      b) 4      c) 5      d) 6      e) NOTA
- 39) What is the average of  $2^{50}$  and  $2^{70}$ ?
- a)  $2^{60}$       b)  $2^{25} + 2^{35}$       c)  $2^{69}$       d)  $2^{49} + 2^{69}$       e) NOTA
- 40) If  $a$ ,  $b$ , and  $c$  are positive numbers such that  $3a = 4b = 5c$ , and if  $a + b = kc$ , what is the value of  $k$ ?
- a)  $\frac{12}{35}$       b)  $\frac{5}{7}$       c)  $\frac{10}{7}$       d)  $\frac{7}{5}$       e) NOTA

41) A woman, her brother, her son and her daughter are chess players (all relations by birth). The worst player's twin (who is one of the four players) and the best player are of opposite sex. The worst player and the best player are the same age. Who is the worst player?

- a) the woman   b) her son   c) her brother   d) her daughter   e) NOTA

42) A set of consecutive positive integers beginning with 1 is written on a blackboard. One number is erased. The average (arithmetic mean) of the remaining numbers is  $35\frac{7}{17}$ . What number was erased?

- a) 6            b) 7            c) 8            d) 9            e) NOTA

43) A box contains 2 pennies, 4 nickels and 6 dimes. Six coins are drawn without replacement, with each coin having an equal probability of being chosen. What is the probability that the value of the coins drawn is at least 50 cents?

- a)  $\frac{37}{924}$         b)  $\frac{91}{924}$         c)  $\frac{127}{924}$         d)  $\frac{132}{924}$         e) NOTA

44) A teenage boy wrote his own age after his father's age. From this new four-digit number he subtracted the absolute value of the difference of their ages to get 4,289. What is the sum of their ages?

- a) 52            b) 56            c) 59            d) 64            e) NOTA

45) A particle moves so that its speed for the second and subsequent miles varies inversely as the integral number of miles already traveled. For each subsequent mile the speed is constant. If the second mile is traversed in 2 hours, then the time, in hours, needed to traverse the  $n$ th mile is?

- a)  $\frac{2}{n-1}$         b)  $\frac{n-1}{2}$         c)  $\frac{2}{n}$             d)  $2(n-1)$     e) NOTA

46) In three dimensions, what is the set of all points for which  $x = 0$ ?

- a) the origin                      b) the x-axis                      c) a line parallel to the x-axis  
d) a plane containing the x-axis                      e) NOTA

47) Two positive numbers,  $a$  and  $b$ , are in the sequence 4,  $a$ ,  $b$ , 12. The first three numbers form a geometric sequence, and the last three numbers form an arithmetic sequence. What is  $b - a$ ?

- a) 1                      b)  $\frac{3}{2}$                       c) 2                      d)  $\frac{5}{2}$                       e) NOTA

48) How many even integers between 8,000 and 9,999 have digits that are all distinct?

- a) 495                      b) 498                      c) 502                      d) 504                      e) NOTA

49) How many distinct ordered pairs of positive integers  $(m, n)$  are there so that the sum of the reciprocals of  $m$  and  $n$  is  $\frac{1}{4}$ ?

- a) 5                      b) 6                      c) 7                      d) 8                      e) NOTA

50) When  $n$  standard 6-sided dice are rolled, the probability of obtaining a sum of 1994 is greater than zero and is the same as the probability of obtaining a sum of  $S$ . What is the smallest possible value of  $S$ ?

- a) 333                      b) 335                      c) 337                      d) 339                      e) NOTA