FMS PAPER: (10-01-2010)

SERIES 16

SECTION 4 (50 Questions)

151. For any real value of x the maximum value of $8x - 3x^2$ is :

(1) $\frac{8}{3}$ (2) 4

(3) 5 (4) $\frac{16}{3}$

152. Which of the following sets of x-values satisfy the inequality $2x^2 + x < 6$?

(1) $-2 < x < \frac{3}{2}$ (2) $x > \frac{3}{2}$ or $x < -2$

(3) $x < \frac{3}{2}$ (4) $\frac{3}{2} < x < 2$

153. If $x_{k+1} = x_k + \frac{1}{2}$ for $k = 1, 2, \ldots, n-1$ and $x_1 = 1$, find $x_1 + x_2 + \ldots + x_n$.

(1) $\frac{n+3}{2}$ (2) $\frac{n^2-1}{2}$

(3) $\frac{n^2-n}{4}$ (4) $\frac{n^2+3n}{4}$

154. A man on his way to dinner shortly after 6 : 00 p.m. observes that the hands of his watch form an angle of 110°. Returning before 7 : 00 p.m. he notices that again the hands of his watch form an angle of 110°. The number of minutes that he has been away is :

(1) $36\frac{2}{3}$ (2) 40

(3) 42 (4) 42.4

155. If both x and y are integers, how may solutions are there of the equation $(x-8)(x-10) = 2^y$?

(1) 1 (2) 2

(3) 3 (4) more than 3

156. Which one of the following points is not on the graph of $y = \frac{x}{x+1}$?

(1) (0, 0) (2) $\left(-\frac{1}{2}, -1\right)$

(3) $\left(\frac{1}{2}, \frac{1}{3}\right)$ (4) (–1, 1)

157. For what value(s) of k does the pair of equations $y = x^2$ and $y = 3x + k$ have two identical solutions ?

(1) $-\frac{4}{9}$ (2) $\frac{9}{4}$

(3) $-\frac{9}{4}$ (4) $\frac{9}{4}$ or $-\frac{9}{4}$

158. Triangle ABD is right-angled at B. On AD there is a point C for which AC = CD and AB = BC. The magnitude of angle DAB, in degrees, is :

(1) 67½ (2) 60

(3) 45 (4) 30

159. Given the four equations :

(a) $3y - 2x = 12$, (b) $-2x - 3y = 10$,

(c) $3y + 2x = 12$, (d) $2y + 3x = 10$.

The pair representing perpendicular lines is :

(1) (a) and (d) (2) (a) and (c)

(3) (a) and (b) (4) (b) and (d)

160. Three numbers a, b, c, non-zero, form an arithmetic progression. Increasing a by 1 or increasing c by 2 results in a geometric progression. Then b equals :

(1) 16 (2) 14

(3) 12 (4) 10

161. In counting n coloured balls, some red and some black, it was found that 49 of the first 50 counted were red. Thereafter, 7 out of every 8 counted were red. If, in all, 90% or more of the balls counted were red, the maximum value of n is :

(1) 225 (2) 210

(3) 200 (4) 180

162. Two men at points R and S, 76 kilometers apart, set out at the same time to walk towards each other. The man at R walks uniformly at the rate of 4½ kilometres per hour; the man at S walks at the constant rate of 3¼ kilometres per hour for the first hour, at 3¾ kilometres per hour for the second hour, and so on, in arithmetic progression. If the men meet x kilometres nearer R than S in an integral number of hours, then x is :

(1) 10 (2) 8

(3) 6 (4) 4

163. A gives B as many rupees as B has and C as many rupees as C has. Similarly, B then gives A and C as many rupees as each then has. C, similarly, then gives A and B as many rupees as each then has. If each finally has 16 rupees, with how many rupees does A start ?

(1) 26 (2) 28
(3) 30 (4) 32

164. Six straight lines are drawn in a plane with no two parallel and no three concurrent. The number of regions into which they divide the plane is :

(1) 16 (2) 20
(3) 22 (4) 24

165. A particle projected vertically upward reaches, at the end of t seconds, an elevation of s feet, where $s = 160\,t - 16t^2$. The highest elevation is :

(1) 800 (2) 640
(3) 400 (4) 320

160 − 16t

166. Given the line $y = \frac{3}{4}x + 6$ and a line L parallel to the given line and 4 units from it. A possible equation for L is :

160 − 32t

(1) $y = \frac{3}{4}x + 1$ (2) $y = \frac{3}{4}x$
(3) $y = \frac{3}{4}x - \frac{2}{3}$ (4) $y = \frac{3}{4}x - 1$

800 − 16×2

167. A person starting with 64 rupees and making 6 bets, wins three times and loses three times, the wins and loses occurring in random order. The chance for a win is equal to the chance for a loss. If each wager is for half the money remaining at the time of the bet, then the final result is :

(1) a gain of Rs. 27
(2) a loss of Rs. 37
(3) neither a gain nor a loss
(4) a gain or a loss depending upon the order in which the wins and losses occur

168. If x is a number satisfying the equation $\sqrt[3]{x+9} - \sqrt[3]{x-9} = 3$, then x^2 is between :

(1) 55 and 65 (2) 65 and 75
(3) 75 and 85 (4) 85 and 95

169. What is the value of $[\log_{10} (5 \log_{10} 100)]^2$?

(1) 25 (2) 10

(3) 2 (4) 1

170. The graph of $x^2 - 4y^2 = 0$ is :

(1) a parabola (2) an ellipse

(3) a pair of straight lines (4) none of these

171. A jobber buys an article at "Rs. 24 less 12½%". He then wishes to sell the article at a gain of $33\frac{1}{3}\%$ of his cost after allowing a 20% discount on his marked price. At what price, in rupees, should the article be marked ?

(1) 30.00 (2) 33.60

(3) 40.00 (4) none of these

172. Given $2^x = 8^{y+1}$ and $9^y = 3^{x-9}$; the value of $x + y$ is :

(1) 18 (2) 21

(3) 24 (4) 27

$x = 3y + 3$

$2y = x - 9$

173. A farmer bought 749 sheep. He sold 700 of them for the price paid for the 749 sheep. The remaining 49 sheep were sold at the same price per head as the other 700. Based on the cost, the percent gain on the entire transaction is :

(1) 6.5 (2) 6.75

(3) 7.0 (4) 7.5

174. Two numbers are such that their difference, their sum, and their product are to one another as 1 : 7 : 24. The product of the two numbers is :

(1) 6 (2) 12

(3) 24 (4) 48

175. In a ten-kilometres race First beats Second by 2 kilometres and First beats Third by 4 kilometres. If the runners maintain constant speeds throughout the race, by how many kilometres does Second beat Third ?

(1) $2\frac{1}{4}$ (2) $2\frac{1}{2}$

(3) $2\frac{3}{4}$ (4) 3

$a-b$ $a+b$ ab

176. If $\frac{a+b}{b+c} = \frac{c+d}{d+a}$, then :

(1) a must equal c

(2) $a + b + c + d$ must equal zero

(3) either $a = c$ or $a + b + c + d = 0$, or both

(4) $a(b + c + d) = c\,(a + b + d)$

177. A watch loses 2½ minutes per day. It is set right at 1 P.M. on March 15. Let n be the positive correction, in minutes, to be added to the time shown by the watch at a given time. When the watch shows 9 A. M. on March 21, n equals :

(1) $14\frac{14}{23}$

(2) $14\frac{1}{14}$

(3) $13\frac{101}{115}$

(4) $13\frac{83}{115}$

178. The number of real values of x satisfying the equation $2^{2x^2-7x+5} = 1$ is :

(1) 1

(2) 2

(3) 4

(4) more than 4

179. Consider the statements :

I : $\left(\sqrt{-4}\right)\left(\sqrt{-16}\right) = \sqrt{(-4)(-16)}$,

II : $\sqrt{(-4)(-16)} = \sqrt{64}$ and

III : $\sqrt{64} = 8$.

Of these the following is incorrect :

(1) none

(2) I only

(3) II only

(4) III only

180. The symbol 25_b represents a two-digit number in base b. If the number 52_b is double the number 25_b, then b is :

(1) 7 (2) 8

(3) 9 (4) 11

181. Let the set consisting of the squares of the positive integers be called u; thus u is the set 1, 4, 9,..... If a certain operation on one or more members of the set always yields a member of the set, we say that the set is closed under that operation. Then u is closed under :

(1) addition (2) multiplication

(3) division (4) none of these

182. Let $S = (x-1)^4 + 4(x-1)^3 + 6(x-1)^2 + 4(x-1) + 1$. Then S equals :

(1) $(x-2)^4$ (2) $(x-1)^4$

(3) x^4 (4) $(x+1)^4$

183. Let r be the result of doubling both the base and the exponent of a^b, $b \neq 0$. If r equals the product of a^b by x^b, then x equals :

(1) $2a$ (2) $4a$

(3) 2 (4) 4

184. Two tangents are drawn to a circle from an exterior point A; they touch the circle at points B and C, respectively. A third tangent intersects segment AB in P and AC in R, and touches the circle at Q. If AB = 20, then the perimeter of triangle APR is :

(1) 42

(2) 40.5

(3) 40

(4) not determined by the given information

185. Consider the graphs of $y = 2 \log x$ and $y = \log 2x$. We may say that :

(1) They intersect in one point only.

(2) They intersect in two points only.

(3) They intersect in a finite number of points but more than two.

(4) They coincide.

186. The set of points satisfying the pair of inequalities $y > 2x$ and $y > 4 - x$ is contained entirely in quadrants :

(1) I and II (2) II and III

(3) I and III (4) III and IV

187. If $3x^3 - 9x^2 + kx - 12$ is divisible by $x - 3$, then it is also divisible by :

(1) $3x^2 - 4$ (2) $3x^2 + 4$

(3) $3x - 4$ (4) $3x + 4$

188. Points P and Q are both in the line segment AB and on the same side of its midpoint. P divides AB in the ratio 2 : 3, and Q divides AB in the ratio 3 : 4. If PQ = 2, then the length of AB is :

(1) 70 (2) 75

(3) 80 (4) 85

189. Thirty-one magazines are arranged from left to right in order of increasing prices. The price of each magazine differs by Rs. 2 from that of each adjacent magazine. For the price of the magazine at the extreme right a customer can buy the middle magazine and an adjacent one. Then :

(1) The adjacent magazine referred to is at the left of the middle magazine.

(2) The middle magazine sells for Rs. 36.

(3) The most expensive magazine sells for Rs. 64.

(4) None of these is correct.

190. If $\log_{10} 2 = a$ and $\log_{10} 3 = b$, then $\log_5 12$ equals :

(1) $\dfrac{a + b}{1 + a}$ (2) $\dfrac{2a + b}{1 + a}$ log5

(3) $\dfrac{a + 2b}{1 + a}$ (4) $\dfrac{2a + b}{1 - a}$

191. In racing over a given distance d at uniform speed, A can beat B by 20 metres, B can beat C by 10 metres, and A can beat C by 28 metres. Then d, in metres, equals :

(1) 58 (2) 100

(3) 116 (4) 120

192. Any five points are taken inside or on a square of side 1. Let a be the smallest possible number with the property that it is always possible to select one pair of points from these five such that the distance between them is equal to or less than a. Then a is :

(1) $\sqrt{3}/3$ (2) $\sqrt{2}/2$

(3) $2\sqrt{2}/3$ (4) 1

193. Find the minimum value of $\sqrt{x^2 + y^2}$ if $5x + 12y = 60$.

(1) $\frac{60}{13}$ (2) $\frac{13}{5}$

(3) $\frac{13}{12}$ (4) 1

194. The expression $\sqrt{\frac{4}{3}} - \sqrt{\frac{3}{4}}$ is equal to :

$\left(\frac{4}{3}\right)^{1/2} - \left(\frac{3}{4}\right)^{1/2}$

(1) $\sqrt{3}/6$ (2) $-\sqrt{3}/6$

$\frac{\sqrt{4}}{\sqrt{3}\times 4} - \sqrt{3}$

(3) $\sqrt{-3}/6$ (4) $5\sqrt{3}/6$

195. Given the set of n numbers, $n > 1$, of which one is $1 - (1/n)$, and all the others are 1. The arithmetic mean of the n numbers is :

(1) 1 (2) $n - \frac{1}{n}$

$\frac{3\sqrt{4}}{3} - \frac{4\sqrt{3}}{6\sqrt{4}}$

(3) $n - \frac{1}{n^2}$ (4) $1 - \frac{1}{n^2}$

$\frac{12\sqrt{4} - 16\sqrt{3}}{12}$

196. A man drives 150 kilometres to the seashore in 3 hours and 20 minutes. He returns from the shore to the starting point in 4 hours and 10 minutes. Let r be the average rate for the entire trip. Then the average rate for the trip going exceeds r, in kilometres per hour, by :

(1) 5 (2) 4½

(3) 4 (4) 2

197. When $\left(1-\frac{1}{a}\right)^6$ is expanded, the sum of the last three coefficients is :

(1) 22 (2) 11

(3) 10 (4) –10

198. If $a = \log_8 225$ and $b = \log_2 15$, then a, in terms of b, is :

(1) $b/2$ (2) $2b/3$

(3) b (4) $3b/2$

199. The angles of a pentagon are in arithmetic progression. One of the angles, in degrees, must be :

(1) 108 (2) 90

(3) 72 (4) 54

200. Three machines P, Q and R, working together, can do a job in x hours. When working alone, P needs an additional 6 hours to do the job; Q, one additional hour; and R, x additional hours. The value of x is :

(1) $\frac{2}{3}$ (2) $\frac{11}{12}$

(3) $\frac{3}{2}$ (4) 2