IIFT 2006 Set B (Quant)

Section I (Part i)

Direction for Question 1 to 13: Read the information carefully and answer the questions:

1. Vijay has been invited for dinner in a club. While walking through the garden path towards the building, he observe that there is an electric rod on the top of the building. From the point where he is standing, the angles of elevation of the top of the electric rod and the top of the building are f and θ respectively. If the heights of the electric rod and the building are p and q respectively, mark <u>all</u> the correct statements.

   a. The height of the tower is $\frac{p \tan q}{\tan f - \tan q}$

   b The height of the electric rod is $\frac{q \tan q}{(\tan q - \tan f)}$

   c. The height of the tower is $\frac{p \tan f}{\tan q - \tan f}$

   d. The height of the electric rod is $\frac{q(\tan f \tan q)}{\tan q}$

2. If sum of the roots of the quadratic equation px2 + qx + r = 0 is equal to the sum of the square of their reciprocals, mark <u>all</u> the correct statements.
   a. r/p, p/q and q/r are in A. P.
   b. p/ r, q/p and r/q are in G. P.
   c. p/r, q/p and r/p are in H. P.
   d. p/r, q/p and r/q are in A. P.

3. The area of an isosceles triangle is 12 sq. cm. If one of the equal sides is 5 cm long, mark <u>all</u> the correct statements.
   a. 4 cm
   b. 6 cm
   c. 8 cm
   d. 9 cm

4. A trader forms a mixture of cement and sand weighing 40 kgs. In the mixture, cement and sand are in the ratio of 4 : 1 in weight terms. Later, when he adds more sand to the mixture, the new ratio becomes 4 : 3. Given this, mark <u>all</u> the correct statements.
   a. The second mixture formed is one and a half times heavier than the original mixture.
   b. In order to arrive at the second mixture, the trader had to add a quantity of sand weighing 16 kg.
   c. Had the original mixture been in the ratio of 8 : 3, the weight of the sand in the original would have been 12 kg.
   d. If the trader sells 7 kg of the second mixture formed by him, and added 11 kg of a new mixture of cement and sand in the ratio 7 : 4 to the residual, then the new ratio of cement to sand will become 7 : 5.

5. Ankit is appearing in a entrance examination for a profession course. In the General Knowledge section, the students are asked to match certain years in which the soccer world cup was held with the name of the champion team in that particular year. The information given was as follows:

Champion	Year
WestGermany	1966
Italy	1982
France	1990
England	1998

Now, Ankit it not being a football fan, does the matching randomly. If X denotes the number of correct answer his random matching generates. mark <u>all</u> the correct probabilities.

a. $P(X \geq 1) = \frac{5}{8}$ b. $P(X = 1) = \frac{1}{4}$ c. P (x = 3) = 0 d. $P(X = 4) = \frac{1}{24}$

6. Joshi has purchased a small shop in a city by paying an amount of Rs. 20,000. He decides to decorate the shop before starting business for which he spends Rs. 8,000 in the first month and Rs. 2,000 in the next month. However, at the beginning of the third month, he gets a good offer from Wadhwa and sells she shop to him at a profit of 20 percent. Wadhwa shortly afterwards decides that he will be better off by doing business in another location and decides to sell the shop back to Joshi. Given this, mark <u>all</u> the correct options.
   a. If Wadhawa loses a total of Rs. 7,200, his loss is not more than 20%.
   b. If Joshi had originally purchased the shop at Rs. 14,000, then by selling the shop to Wadhwa at the same price, he could have made a profit of 50%.
   c. If Joshi had sold the shop to Wadhwa at a profit of 40%, his monetary gain would have been Rs. 12,000.
   d. If Joshi had sold the shop to Wadhwa at a profit of 40%, and Wadhwa sold the shop back to him at a loss of 40%, then Joshi would have acquired the shop with a net investment of Rs. 13,200.

7. If $\frac{\log x}{b-c} = \frac{\log y}{c-a} = \frac{\log z}{a-b}$, mark <u>all</u> the correct options

a. xyz = 1 b. $x^a y^b z^c = 1$ c. $x^{+c} y^{c+a} z^{a+b} = 1$ d. $x^{b+c} y^{c+a} z^{a+b} = 0$

8. In a pizza stall, Ajay and Mohan, being the lucky customers, were given the option of drawing tickets from a pot containing x number of tickets for the knife-throwing show and y number of tickets for the talking-doll show. Both Ajay and Mohan being excited about the knife-throwing show, start drawing tickets from the pot until they get one for the show, replacing any drawn ticket for the talking-mark <u>all</u> the correct options.
   a. If the probability of Ajay first getting a ticket for the knife-throwing show is four times that for Mohan, the ratio between x and y is 3 : 1
   b. If the probability of Ajay first getting a ticket for the knife-throwing show is five times that for Mohan, the ratio between y and x is 1 : 4
   c. If the probability of Ajay first getting a ticket for the knife-throwing show is two times that for Mohan, the ratio between x and y is 1 : 1
   d. If the probability of Mohan first getting a ticket for the knife-throwing show is six times that for Ajay, the ratio between x and y is 5 : 1

9. Madan is going from Mumbai to Dehi in order to join a new job there. He has a glass memento of right circular conic shape under his possession and he does not want it to break during transportation. So, he purchases a cubic metal box from the market spending Rs. 500. The cone is exactly fitted in the metal cube in such a way that while the edges of the base of the cone are touching the edges of all the sides of the cube, the vertex of it touches the opposite face of he cube After inserting the memento in the box, he packed the metal box from outside with wallpaper costing Rs. 1.5 per sq cm. Given that the volume of the glass memento is $718\frac{2}{3}$ cc, mark <u>all</u> the correct statements

a. Madan had incurred total expenditure of Rs. 2,264 on the metal box.
b. Madan had incurred an expenditure of Rs. 1,754 on packing the metal box.
c. The area of any one side of the metal box is 196 sq. cm
d. The volume of the metal box is 2,644 cc.

10. Ranjan goes to a countryside lake for a boat ride. Standing at the ferry counter, he looked at the opposite bank and observed a tall tower on a hill downstream, the angle of elevation being 45°. Ranjan comes to know from the bystanders that the tower is a historical ruin and decides to visit it. The boat takes him directly to the opposite bank, from where the angle of elevation to the top of the tower becomes 60°. While exploring the site, he comes to know that the combined height of he tower and the hill is 300 m. If the speed of the boat by which Ranjan travelled was 2 km/hr in still waters, mark <u>all</u> the correct observations.

a. It took Ranjan $3\sqrt{6}$ minutes to cross the lake by the boat.
b. The breadth of the lake is $100\sqrt{6}$ m .
c. It took A. Ranjan $4\sqrt{3}$ minutes to cross the lake by the boat.
d. If the combined height of the hill and the tower was 450 and the speed of the boat was 1 km/hr (the angles of elevation remaining unchanged), the time taken by Ranjan to cross the lake by boat would have been $9\sqrt{6}$ minutes.

11. Sunil goes to small city in Europe on vacation, where he enjoys walking along the streets in the afternoon. He observes that there are 6 parallel roads running East - West and 5 parallel roads running North-South in the city. In order to observe the landmarks in the city, he takes different routes every time he goes out. He also observed that the distance between every consecutive pair of roads is equal. Given this, mark <u>all</u> the correct options.

a. The number of shortest possible routes that Sunil can take to travel from one corner of the city to the other diagonal end is 126.
b. The total number of possible routes that Sunil can take to travel from one corner of the city to the other diagonal end is 196.
c. The number of rectangles that can be formed with their sides along the roads is 150.
d. If the number of parallel roads running East-West and North - South increase by one each, the number of shortest possible routes that Sunil can take travel from one corner of the city to the other diagonal end would go up by 336.

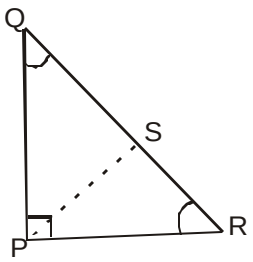
12. Laxman and Bharat decide to go from Agra to Delhi for watching a cricket match and board two different trains for that purpose. While Laxman takes the first train the leaves for Delhi, Bharat decides to wait for some time and take a faster train. On the way, Laxman sitting by the window-seat noticed that the train boarded by Bharat crossed him in 12 seconds. Now the faster train can travel 180 km in three hours, while the slower train takes twice as much time to do it. Given this, mark all the correct options.
    a. If the faster train has taken 30 seconds to cross the entire length of the slower train, the difference between the lengths of the two trains is 50 m.
    b. If the faster train had been running twice as much faster, it would have taken 10 seconds to overtake the slower train.
    c. Had the faster train taken 24 seconds to cross the entire length of the slower train, the length of the slower train would have been 100 m.
    d. If the slower train had been running at one and a half times of its current speed, the faster train would have taken 24 seconds to overtake Laxman.

13. A contractor takes up an assignment that 20 men can complete in 10 days. The same assignment could be finished by 15 women in 20 days. The contractor decides to employ 10 men and 10 women for the project. Given this, mark all the correct options.
    a. A If the wage rate for men and women are Rs. 50 and Rs. 45 respectively, the total wage bill for the project will be Rs. 11,400.
    b. If the wage rate for men and women are Rs. 45 and Rs. 40 respectively, the total wage bill for the project will be Rs. 10,200.
    c. If the wage rate for men and women are equal at Rs. 40, the total wage bill for the project will be Rs. 9,100.
    d. If the contractor decides to employ 20 men and 30 women for the project and the wage rate for men and women are Rs. 40 and Rs. 35 respectively, the total wage bill for the project will be Rs. 9,250.

SECTION I (Part ii)

Direction for Question 14 to 30: Read the information carefully and answer the questions.

14. In the right-angled triangle QPR given below, PS is the altitude to the hypotenuse. The figure is followed by three possible inferences.



I. Triangle PQS and Triangle RPS are similar.
II Triangle PSQ ant Triangle RSP are congruent.
III Triangle PSQ and Triangle RPQ are similar.
Mark the correct option

a. I and II are correct
b. I and III are incorrect
c. Only II is correct
d. All three are correct

15. The inverse of the sum of the following series up to n terms can be written as $\frac{3}{4}+\frac{5}{36}+\frac{7}{144}+.....$

a. $\frac{(n-1)^2}{n^2+2n}$
b. $\frac{n^2+2n}{(n-1)^2}$
c. $\frac{n^2+2n}{(n+1)^2}$
d. $\frac{(n+1)^2}{n^2+2n}$

16. The square root of the harmonic mean of the roots of the equation $\left(5+\sqrt{2}\right)x^2-\left(4+\sqrt{5}\right)x+8+2\sqrt{5}=0$ is.

a. ± 3
b. ± 4
c. $\sqrt{2}$
d. None of these

17. If $\alpha \neq n\pi$ and tan α is the GM of sin α and cos α, determine the square of the expression $2 - 4\sin^2\alpha + 3\sin^4\alpha - \sin^6\alpha$.

a. 1
b. 4
c. $\frac{1}{4}$
d. None of these

18. Which of the following is obtained after rationalization of the expression. $\frac{1}{\left(\sqrt{5}+\sqrt{6}+\sqrt{11}\right)}$

a. $\frac{5\sqrt{6}+6\sqrt{5}-\sqrt{330}}{60}$

b. $\frac{6\sqrt{5}-5\sqrt{6}-\sqrt{330}}{30}$

c. $\frac{5\sqrt{6}+6\sqrt{5}-\sqrt{330}}{60}$

d. $\frac{6\sqrt{5}+5\sqrt{6}-\sqrt{330}}{60}$

19. If one root is the square of the other root in the equation x2 + px + q = 0, mark the correct relationship in the following options.

a. $p^3 - q(3p + 1) + q^2 = 0$

b. $p^3 - q(3p - 1) + q^2 = 0$

c. $p^3 + q(3p - 1) + q^2 = 0$

d. $p^3 - q(3p - 1) - q^2 = 0$

20. If α, β are the roots of the quadratic equation $x^2 + mx + 1 = 0$ and γ, δ are the roots of the equation $x^2 + mx + 1 = 0$, then the value $(\alpha - \gamma)(\beta - \gamma)(\alpha + \delta)(\beta + \delta)(\beta + \delta)$ is equal to

a. $n^2 - m^2$.

b. $m^2 - n^2$.

c. $2m^2 - n^2$.

d. None of the above

21. A wire, if bent into a square, enclose an area of 484 cm^2. This wire is cut into two pieces; with the bigger piece having a length three-fourth of the original wire's length. Now, if a circle and a square are formed with the bigger and the smaller piece respectively, what should be the area enclosed by the two pieces?

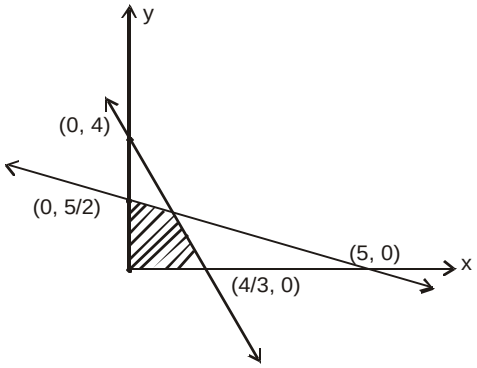
a. 464cm^2

b. 544,25 cm^2

c. 376.75 cm^2

d. 424.25cm^2.

22. Find the solution set of the shaded region in the diagram below



a. $3x + y \le 4, x + 5y \le 5, x \ge 0, y \ge 0$

b. $x + y \le 3, x + 4y \le 5, x \ge 0, y \ge 0$

c. $3x + y \le 4, x + 2y \le 5, x \ge 0, y \ge 0$

d. $3x + 2y \le 2, x + 2y \le 5, x \ge 0, y \ge 0$

23. Pavan builds an overhead tank in his house, which has three taps attached to it. While the first tap can fill the tank in 12 hours, the second one takes one and a half times more than the first one to fill it completely. A third tap is attached to the tank which empties it in 36 hours. Now one day, in order to fill the tank, Pavan opens the first tap and after two hours opens the second tap as well. However; at the end of the sixth hour, he realizes that the third tap has been kept open right from he beginning and promptly closes it. What will be the total time required to fill the tank?

a. 8 hours 48 minutes

b. 9 hours 12 minutes

c. 9 hours 36 minutes

d. 8 hours 30 minutes

24. The domain of definition of the function $y = \frac{1}{\{\log_{10}(3-x)\}} + \sqrt{x+7}$ is

a. $[-7,3) \sim \{0\}$ b. $[-7,3] \sim \{0\}$ c. $(-7,3) \sim \{0\}$ d. $(-7,3] \sim \{0\}$

25. a and b are two vectors and the angle between a and b is θ. If (a + 3b). (7a – 5b) = 0 and (a – 4 b). (7a – 2b) = 0, then the value of tan θ is

a. $\sqrt{3}$ b. 1 c. $\frac{1}{\sqrt{3}}$ d. None of the above

26. Three business entities X Ltd, and Z Ltd, with 4, 3 and 5 employees respectively, merged into XYZ Ltd in order to jointly raise the capital for setting up a new modern production plant in Jaipur. After two years, on the question of management decisions on the new venture at Jaipur, the employees started adopting differing viewpoints and began to quarrel among themselves. Given the fact that there is not quarrel among the employees of the erstwhile X Ltd, Y Ltd and Z Ltd, what could be the maximum number of quarrels that can take place within XYZ Ltd?

a. 31 b. 53 c. 47 d. 41

27. If sin + sin β = a, cos α + cos β = b, $\tan\left(\frac{a}{2}\right) * \tan\left(\frac{b}{2}\right) = c$, and $a \neq b \neq c \neq 0$, $c \neq 1$, $\frac{1-c}{1+c}$ is equal to

a. $\frac{b}{a^2+b^2}$ b. $\frac{2a}{a^2+b^2}$ c. $\frac{2b}{a^2+b^2}$ d. $\frac{a}{a^2+b^2}$

28. If a $\sin^{-1} x$ – b $\cos^{-1} x$ = c, then find the value of $\frac{a}{b}\sin^{-1} x + \frac{b}{a}\cos^{-1} x$ (Assume $-1 \leq x \leq 1$).

a. 0 b. π. c. $\frac{p\ ab + 2c(a-b)}{2ab}$ d. $\frac{p\ ab + 2c(b-a)}{2ab}$

29. If $\frac{2\sin q}{1+\sin q+\cos q} = k$, then $\frac{1-\cos q+\sin q}{1+\sin q}$ is equal to

a. k b. k + 1 c. $\frac{1}{k}$ d. None of the above

30. Amit, Sumit and Pramit go to a seaside town to spend a vacation there and on the first day every-body decides to visit different tourist locations. After breakfast, each of them boards a different tourist vehicle from t he nearest bus-beach, calls on the mobile of Pramit and claims that he has observed a shark in the waters. Pramit learns from the local guide that at that time of the year, only eight sea-creatures (including a shark) are observable and the probability of observing any creature is equal. However, Amit and Pramit later recall during their discussion that Sumit has a reputation for not telling the truth five out of six times. What is the probability that Sumit actually observed a shark in the waters?

a. $\frac{1}{36}$ b. $\frac{1}{30}$ c. $\frac{5}{36}$ d. $\frac{1}{24}$