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Name :	Batch:

MATH LECTURE - 13

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PART I: CLASS PRACTICE

MISCELLANEOUS PROBLEMS

1. A shop sells each Alpenliebe for Tk. 1. However, if any purchaser returns three empty wrappers, he/she gets one free Alpenliebe. If Tasman has a total of Tk. 15, how many Alpenliebe can he get at most?

   a. 15 b. 19 c. 20 d. 21 e. 22

2. a, b, c, d, and e are five consecutive integers in increasing order. Which one of the following expressions can never be odd?

   a. a + b + c b. ab + c c. ab + d d. ac + d e. ac + e

3. If a, b, and c are not equal to 0 or 1 and if $a^x = b$, $b^y = c$, and $c^z = a$, then xyz =?

   a. 0 b. 1 c. 2 d. abc e. None of these

4. A shop sold a pair of shoes for Tk. 1800 and a pair of sandals for Tk. 1350. It made a profit of 20% on shoes and took a loss of 10% on sandals. What is the overall profit or loss of the shop?

   a. 4% loss b. 5% loss c. 6.67% profit d. 10% profit e. None of these

5. If x is a positive integer and z is a non-negative integer such that 206^z is a divisor of 3,176,793, what is the value of $z^x - x^z$?

   a. –81 b. –1 c. 0 d. 1 e. Cannot be determined

6. Pumps A, B, and C operate at their respective constant rates. Pumps A and B, operating simultaneously, can fill a certain tank in 6/5 hours; pumps A and C, operating simultaneously, can fill the tank in 3/2 hours; and pumps B and C, operating simultaneously, can fill the tank in 2 hours. How many hours does it take pumps A, B, and C, operating simultaneously, to fill the tank?

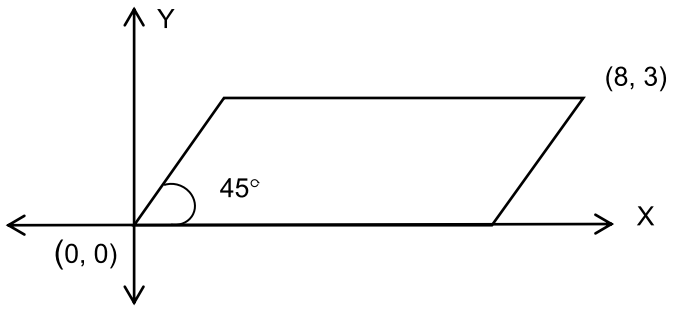
   a. 1/3 b. 1/2 c. 2/3 d. 5/6 e. 1

7. The incomes of Arefin and Saif are in the ratio 4:5 and their expenditures are in the ratio of 5:6. If Arefin saves 1/4th of his income find the ratio of their savings.

   a. 5:7 b. 4:5 c. 6:11 d. 3:5 e. Cannot be determined

8. What is the perimeter of the following parallelogram?

   a. 16
   b. $10 + 6\sqrt{2}$
   c. $6 + 10\sqrt{2}$
   d. 22
   e. None of these



9. On average, a shooter hits the target once every 3 shots. What is the probability that he will hit the target at least once in 3 shots?

   a. 1 b. $\frac{8}{27}$ c. $\frac{1}{3}$ d. $\frac{19}{27}$ e. None of these

10. If n is a multiple of 5 and $n = p^2q$, where p and q are prime numbers, which of the following must be a multiple of 25?

    a. p^2 b. q^2 c. pq d. p^2q^2 e. pq^3

11. Which one of the following numbers can be removed from the set S = {0, 2, 4, 5, 9} without changing the average of set S?

a. 0 b. 2 c. 4 d. 5 e. 9

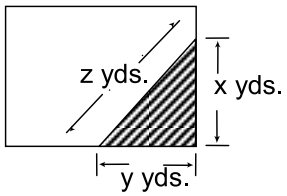
12. Mixture X is 30 percent water and 70 percent milk by weight, mixture Y is 20 percent water and 75 percent chocolate. If a mixture of X and Y contains 25 percent water, what percent of weight of the mixture is X?

a. 40% b. 33.33% c. 50% d. 66.66% e. Cannot be determined

13. Let Δn be defined for any positive integer n as the number obtained by writing the digit(s) of n in reverse order, dropping any leading zero that results. For example, $\Delta 5 = 5$, $\Delta 30 = 3$, and $\Delta 321 = 123$. Which of the following must be true for all positive integers n?

I. $\Delta(\Delta n) = n$ II. $\Delta(10n) < 10n$ III. $\Delta(1 + n) = 1 + \Delta n$

a. None b. I only c. II only d. III only e. I, II and III



14. The shaded portion of the rectangular lot shown above represents a flower bed. If the area of the bed is 24 square yards and x = y + 2, then z =?

a. $\sqrt{13}$ b. $2\sqrt{13}$ c. 6 d. 8 e. 10

15. 55 men can finish a work in 42 days. How many additional men must be engaged to complete the work 9 days earlier?

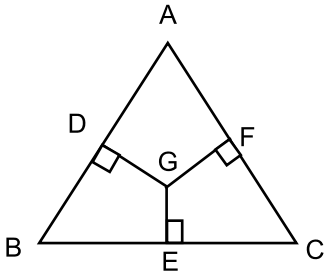
a. 15 b. 16 c. 17 d. 18 e. None of these

16. The cost of 1 unit of electricity during a 4 year period is given below. Year 1: \$1 per unit, Year 2: \$1.5 per unit, Year 3: \$1.2 per unit, and Year 4: \$2 per unit. If a factory spent equal dollars each year for electricity what was the approximate average cost per unit of electricity during the 4 year period?

a. \$1.33 b. \$1.25 c. \$1.43 d. \$1.18 e. \$1.50

17. In the figure below, point G is a point inside the equilateral triangle ABC. GD, GE and GF are perpendiculars to AB, BC, and AC respectively. The lengths of GD, GE and GF are 1, 2, and 3 respectively. What is the area of triangle ABC?

a. $36\sqrt{3}$
b. 14
c. 12
d. $92\sqrt{3}$
e. $12\sqrt{3}$



18. A box contains 11 tennis balls numbering 1 to 11. If 2 tennis balls are selected at random, what is the probability that both of them are numbered with odd numbers?

a. 3/11 b. 6/11 c. 4/11 d. 9/11 e. None of these

19. In a survey of political preferences, 78% of those asked were in favor of at least one of the proposals: I, II, and III. 50% of those asked favored proposal I, 30% favored proposal II, and 20% favored proposal III. If 5% of those asked favored all three of the proposals, what percentage of those asked favored more than one of the three proposals?

a. 5 b. 10 c. 12 d. 17 e. 22

20. Muniyat went to a fruit market with certain amount of money. With this money she can buy either 50 oranges or 40 mangoes. She retains 10% of the money for taxi fare and buys 20 mangoes. How many oranges can she buy now?

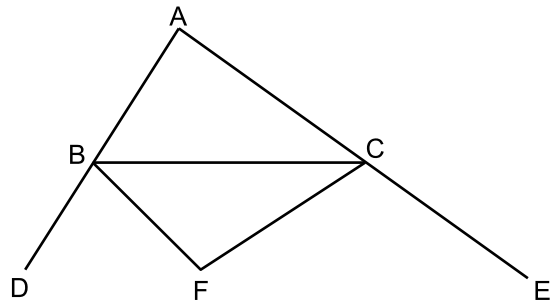
a. 25 b. 30 c. 20 d. 16 e. 12

21. A merchant marks his goods up in such a way that the profit made on selling 30 articles is equal to the cost price of 20 articles. What is the approximate % profit made by the merchant?

a. 33.33% b. 50% c. 66.67% d. 100% e. 200%

22. In the diagram below, $\angle BAC = 50^\circ$. If BF and CF are bisectors of $\angle DBC$ and $\angle ECB$ respectively, what is the measure of $\angle BFC$?

a. 50°
b. 65°
c. 85°
d. 115°
e. Cannot be determined



23. If both 11^2 and 3^3 are factors of the number $a\times4^3\times6^2\times13^{11}$, then what is the smallest possible value of a?

a. 33 b. 121 c. 363 d. 3267 e. Cannot be determined

24. If $(2x + 1)^2 = 100$, then which one of the following could equal to x?

a. –11/2 b. −9/2 c. 11/2 d. 4 e. None of these

25. A ball is dropped from 192 inches above level ground and after the third bounce it rises to a height of 24 inches. If the height to which the ball rises after each bounce is always the same fraction of the height reached on its previous bounce, what is this fraction?

a. $\frac{1}{8}$ b. $\frac{1}{4}$ c. $\frac{1}{3}$ d. $\frac{1}{2}$ e. $\frac{2}{3}$

PART II: TAKE HOME ASSIGNMENT

1. If $2a - 3b = 0$, and $b < 2$, then which of the following must be true?

   a. $a < 3$ b. $a > 4$ c. $a = 3$ d. $a > -3$ e. Cannot be determined

2. For an article, if the discount is 30%, the profit is 40%. What is the profit if the discount is 40%?

   a. 10% b. 20% c. 25% d. 30% e. None of these

3. The number of livestock in a farm at the beginning of year 2000 was 100,000. During the year, the number increased by p%. During the next year 2001, there was a famine and the number decreased by q%. A census at the end of year 2001 revealed that the number of livestock in the farm was 100,000. Which of the following expressions is correct?

   a. $p > q$

   b. $q > p$

   c. $p = q$

   d. With the exception of one instance, p will be equal to q

   e. There is no relation between p and q

4. What is the radius of the circle that circumscribes the triangle, measure of whose sides is 9, 40 and 41?

   a. 20 b. 20.5 c. 4.5 d. 41 e. Cannot be determined

5. In a 100m race, Rokon beats Rafid by 4 seconds. On the contrary, if Rokon allowed Rafid to start 16m ahead of Rokon, then Rokon and Rafid reach the finishing point at the same time. How long does Rokon take to run the 100m race?

   a. 4 seconds b. 16 seconds c. 21 seconds d. 25 seconds e. 29 seconds

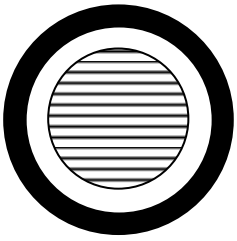
6. A car traveled 75% of the way from town A to town B at an average speed of 50 mph. The car travels at an average speed of S mph for the remaining part of the trip. The average speed for the entire trip was 40 mph. What is S?

   a. 10 b. 20 c. 25 d. 30 e. 37.5

7. In the figure below, the three circles have the same center. The radii of the circles are 3, 4, and 5. If a point in the figure below is chosen at random, what is the probability that the point lies in the non-shaded ring in the middle?

   a. $\frac{1}{5}$ b. $\frac{7}{25}$ c. $\frac{1}{3}$

   d. $\frac{8}{25}$ e. $\frac{9}{25}$



8. Two trains X and Y started simultaneously from opposite ends of a 100-mile route and traveled toward each other on parallel tracks. Train X, traveling at a constant rate, completed the 100-mile trip in 5 hours; Train Y, traveling at a constant rate, completed the 100-mile trip in 3 hours. How many miles had train X traveled when it met train Y?

   a. 37.5 b. 40 c. 60 d. 62.5 e. 77.5

9. An integer n between 1 and 99, inclusive, is to be chosen at random. What is the probability that $n(n+1)$ will be divisible by 3?

   a. 1/9 b. 1/3 c. 1/2 d. 2/3 e. 5/6

10. While teaching his students, Abir came across the inequality a > b > c and the equation a + c = b + d, which of the following cannot be true for d?

a. d > a b. d = b c. d > b d. b > d e. None of these

11. If n is a positive integer and n^2 is divisible by 96, then the largest positive integer that must divide n is

a. 6 b. 12 c. 24 d. 36 e. 48

12. By selling an article at 80% of its marked price, a merchant makes a loss of 12%. What will be the percent profit made by the merchant if he sells the article at 95% of its marked price?

a. 1% loss b. 4.5% profit c. 5% profit d. 5.5% profit e. 10% profit

13. Naomi and Afifa leave City A for City B simultaneously at 6 A.M in the morning driving in two cars at speeds of 60 mph and 80 mph respectively. As soon as Afifa reaches City B, he returns to City A along the same route and meets Naomi on the way back. If the distance between the two cities is 210 miles, how far from City A did Naomi and Afifa meet?

a. 30 miles b. 60 miles c. 120 miles d. 150 miles e. 180 miles

14. Saim bought 48 tube lights and found that 8 of the tube lights were broken during transportation. Asa result, his per unit cost was increased by Tk. 24. What was the cost of each tube light?

a. 100 b. 104 c. 112 d. 120 e. None of these

15. Turab invested Tk. 60,000 from his income at a 6% interest rate in her current account. How much should he invest in a savings account giving 10% interest so that his interest rate on the total investment becomes 8.5%?

a. 40,000 b. 80,000 c. 100,000 d. 120,000 e. 160,000

16. Two cars left, at 8 A.M., from the same point, one traveling due east at 80 mph and the other travelling due south at 60 mph. At what time will they be 300 miles apart?

a. 11:00 A.M. b. 11:51 A.M. c. 11:54 A.M. d. 12:50 P.M. e. None of these

17. In a horticultural experiment, 200 seeds were planted in plot I and 300 were planted in plot II. If 57 percent of the seeds in plot I germinated and 42 percent of the seeds in plot II germinated, what percent of the total number of planted seeds germinated?

a. 45.5% b. 46.5% c. 48.0% d. 49.5% e. 51.0%

18. A car traveled 75% of the way from town A to town B by traveling at an average speed of 'V' mph. The car travels at an average speed of 'S' mph for the remaining part of the trip. Which of the following expressions represents the average speed for the entire trip?

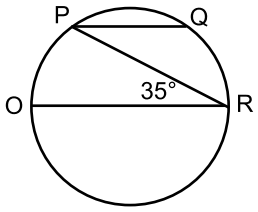
a. 0.75 V + 0.25 S b. $\frac{4VS}{3S+V}$ c. $\frac{V}{3S}$ d. $\frac{4V}{\left(\frac{V+S}{3}\right)}$ e. None

19. A hiker walked for two days. On the second day the hiker walked four hours longer and his speed was 2 miles per hour faster than that of the first day. If during the two days he walked a total of 104 miles and spent a total of 20 hours, what was his average speed in miles/hour on the first day?

a. 2 b. 4 c. 5 d. 8 e. None of these

20. If x < 4 and y < 12, which of the following cannot be the value of xy?

a. – 12 b. – 24 c. 30 d. 48 e. None of these



21. In the circle above, PQ is parallel to diameter OR, and OR has length 18 and ∠PRO = 35°. What is the length of minor arc PO?

a. 2π b. $\frac{9\pi}{4}$ c. $\frac{7\pi}{2}$ d. $\frac{9\pi}{2}$ e. 3π

22. Naabil invested a portion of $6,600 is invested at a 5% annual return, while the remainder is invested at a 3% annual return. If the annual income from the portion earning a 5% return is twice that of the other portion, how much money is invested at 5% annual return?

a. $1800 b. $2700 c. $3000 d. $3200 e. $3600

23. A school newspaper enlarged both the length and width of a rectangular photograph by 60 percent. The new photograph was too large for the space available, so its length and width were then reduced by 25 percent. The area of the final photograph was what percent greater than the area of the original?

a. 20% b. 35% c. 82% d. 85% e. 44%

24. The population of a village is 4500. $5/9^{th}$ of the villagers are males. If 40% of the males are married (none of them married more than one female and all the married people live in that village), what percent of the female population is married?

a. 25 b. 35 c. 40 d. 45 e. 50

25. In how many ways can a committee of 5 members be formed from 3 women and 5 men such that at least 1 woman is a member of the committee?

a. 54 b. 55 c. 56 d. 57 e. None