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MATH LECTURE - 11

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PART I: CLASS PRACTICE

MISCELLANEOUS PROBLEMS

1. If A is the set of prime numbers and B is the set of two-digit positive integers whose unit digit is 5, how many numbers are common to both sets?

   a. None b. One c. Two d. Five e. Nine

2. If j and k are integers and j + k = 2j + 4, which of the following must be true?

   I. j is even II. k is even III. k – j is even

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

3. Marbles are to be removed from a jar that contains 12 red marbles and 12 black marbles. What is the least number of marbles that could be removed so that the ratio of red marbles to black marbles left in the jar will be 4 to 3?

   a. 2 b. 3 c. 4 d. 8 e. 10

4. The sum of $\frac{1}{4}$ of the price of a pen and $\frac{1}{3}$ of the price of a pencil is Tk. 11. If $\frac{1}{8}$ of the price of the pen is equal to $\frac{1}{5}$ of the price of the pencil, what is the price of the pencil in Taka?

   a. 12 b. 15 c. 20 d. 24 e. None of these

5. From which of the following statements must it follow that x > y?

   a. x = 2y b. y = 2x c. x + 2 = y d. x – 2 = y e. Both a & d

6. R is the midpoint of line segment PT, and Q is the midpoint of line segment PR. If S is a point between R and T such that the length of segment QS is 10 and the length of segment PS is 19, what is the length of segment ST?

   a. 13 b. 14 c. 15 d. 16 e.17

7. If $\angle ADC = 150°$, AB = y cm and BC = x cm, find the area of parallelogram ABCD.

   a. $\frac{\sqrt{3}xy}{4}$ b. $\frac{xy}{\sqrt{2}}$ c. $\frac{2xy}{\sqrt{3}}$

   d. $\frac{3xy}{\sqrt{2}}$ e. $\frac{xy}{2}$

8. Which of the following statements is false?

   a. Any two numbers, a and b, have a sum, equal to a + b

   b. Any two numbers, a and b, have a product, equal to a × b

   c. For any two numbers, a and b, $a^2+b^2 \geq 0$

   d. Any two numbers, a and b, have a quotient, equal to $\frac{a}{b}$ only

   e. Any two numbers, a and b, have an average, equal to $\frac{a+b}{2}$

9. ΔABC is equilateral and has an area of $\frac{8}{5}$. Point D is the midpoint of side AB, point E is the midpoint of side BC, and point F is the midpoint of side AC. What is the area of parallelogram DECF?

   a. $\frac{2}{5}$ b. $\frac{2}{3}$ c. $\frac{4}{5}$ d. $\frac{13}{15}$ e. 1

10. When an integer r is divided by 5, the remainder is 2. If the product of 7 and r is divided by 5, what would the remainder be?

a. 1 b. 2 c. 3 d. 4 e. 5

11. Points X and Y are two different points on a circle. Point M is located in such a way that line segment XM and line segment YM have equal length. Which of the following could be true?

i. M is the center of the circle

ii. M is on arc XY

iii. M is outside the circle

a. i only b. ii only c. i and ii only d. ii and iii only e. i, ii, and iii

12. If an integer is subtracted from its square. The result could be which of the following?

a. A negative integer

b. An odd integer

c. The sum of two consecutive integers

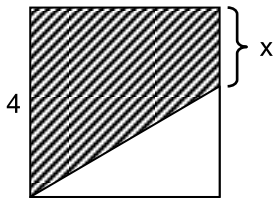
d. The product of two odd integers

e. The product of two consecutive integers

13. Nine friends went to a hotel for taking their meals. Eight of them spent Tk. 12 each for their meals and the ninth spent Tk. 8 more than the average expenditure of all the nine. Total money spent by them was

a. Tk. 182 b. Tk. 120 c. Tk. 122 d. Tk. 117 e. None of these

14. In the square beside with side 4, the ratio of $\frac{\text{area of shaded region}}{\text{area of non - shaded region}}$ =?



a. $\frac{2+x}{4}$

b. $\frac{4-x}{8}$

c. 2

d. $\frac{4+x}{4-x}$

e. None of these

15. In a certain class, a student's final grade is a function of the grades she receives on a midterm exam, a final exam, and a term paper. The term paper counts twice as much as the final exam; the final exam counts twice as much as the midterm exam. If a student receives a midterm score of 75, a final exam score of 80, and a grade of 90 on the term paper, what is the student's final grade?

a. 80 b. 85 c. 90 d. 95 e. 100

16. A certain line segment in the rectangular coordinate plane has endpoints A and B and is perpendicular to the y-axis. If point A is located at (–2, –3), which of the following could be the location of point B?

a. (–2, 3) b. (–2, –6) c. (–6, –2) d. (2, 3) e. (2, –3)

17. The first term of a sequence is –3 and every term after the first is 5 more than the term immediately preceding it. What is the value of the 101st term?

a. 505 b. 502 c. 500 d. 499 e. 497

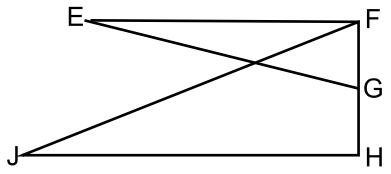
18. Two sets of 4 consecutive positive integers have exactly one integer in common. The sum of the integers in the set with greater numbers is how much greater than the sum of the integers in the other set?

a. 4 b. 7 c. 8 d. 12 e. Cannot be determined

19. The average weight of a boy in a class is 43 kilograms. Later four more boys joined whose weights are respectively 42 kg, 36.5 kg, 39 kg and 42.5 kg. The average now comes to 42.5 kg. Find the original number of boys in the class.

a. 10 b. 20 c. 30 d. 18 e. None of these

20. In the figure beside, G is the midpoint of FH and EF $\perp$ FH. If $\angle EGF = \angle JFH$, $\angle FJH = \angle FEG$, GF = 3, and JH = 8, what is the perimeter of Δ EFG?



a. 12

b. $6\sqrt{8}$

c. $11 + \sqrt{73}$

d. 24

e. None of these

21. The profit on selling 20 articles is equal to the cost of 5 articles, what is the percentage of profit?

a. 15% b. 20% c. 25% d. 40% e. 50%

22. If the sum of the consecutive integers from – 22 to x, inclusive, is 72. What is the value of x?

a. 23 b. 25 c. 50 d. 75 e. 94

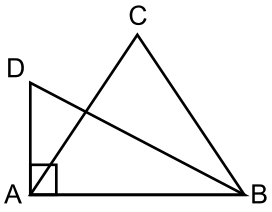
23. You have a rifle with only three bullets by which you have to shoot down a helicopter. You will shoot the bullets one after another. The probability of the first bullet to hit it is 90% and those of 2nd and 3rd one is 80% & 70% respectively. What is the probability that the helicopter will be shot-down?

a. 0.504 b. 0.80 c. 0.994 d. 2.40 e. None of these

24. Suppose you flip a fair coin six times. What is the probability that, in six flips, you get at least one head?

a. 5/8 b. 13/16 c. 15/16 d. 31/32 e. 63/64

25. In the figure below, ABC is an equilateral triangle, and $\angle DAB$ is a right triangle. Here, DA = 4, and $\angle ABD = 30°$. What is the sum of the perimeters of ΔADB and ΔACB?



a. $12 + 8\sqrt{3}$

b. $12 + 12\sqrt{3}$

c. $12 + 16\sqrt{3}$

d. $4 + 8\sqrt{3}$

e. Cannot be determined

PART II: TAKE HOME ASSIGNMENT

1. A man traveled one-fourth of the total distance of his trip by car. He traveled the remaining distance on foot. The ratio of his walking time to driving time was 15:1. Calculate the ratio of his driving speed to his walking speed?

   a. 5:2 b. 5:1 c. 1:5 d. 2:5 e. None of these

2. At the first stop on her route, a driver unloaded two-fifths of the packages in her van. After she unloaded another three packages at her next stop, one half of the original number of packages in the van remained. How many packages were there in the van before the first delivery?

   a. 10 b. 18 c. 25 d. 30 e. 36

3. A salesman bought 2 dozen television sets at $300 each. He sold two-thirds of them at a 25% profit, but was forced to take a 30% loss on the rest. What was his total profit (or loss) on the television sets?

   a. A loss of $200 b. A loss of $15 c. No profit, no loss
   d. A gain of $20 e. A gain of $480

4. Attendance for a three-game series at a baseball park averaged 25,000 spectators for three games. If the second and the third game drew crowds 1.5 and 2.5 times as large as the first game, respectively, what was the attendance for the second game?

   a. 15,000 b. 18,000 c. 22,500 d. 25,000 e. 37,500

5. What is the next term in the following series: 1, 3, 4, 8, 15, 27, ___?

   a. 39 b. 45 c. 50 d. 63 e. 75

6. Arefin, Salman and Turab started a business jointly with a total amount of Tk. 280. Arefin paid Tk. 45 more than Salman and Salman paid Tk. 70 less than Turab. If the company made a profit of Tk. 56, how much profit should Salman receive?

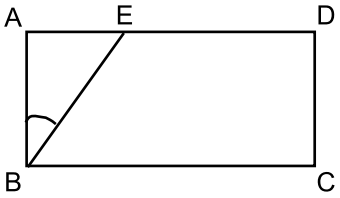
   a. 20 b. 22 c. 25 d. 27 e. None of these

7. At Govt. Laboratory High School 20% of the students are seniors. If all of the seniors attended the school play, and 60 percent of all the students attended the play, what percent of the non-seniors attended the play?

   a. 20% b. 40% c. 50% d. 60% e. 100%

8. ABCD is a rectangle. $\angle ABE = 30^\circ$, BC = 6 cm and ED = 2AE. What is the area of the Δ AEB?

   a. 4
   b. $2\sqrt{3}$
   c. $3\sqrt{2}$
   d. $8/\sqrt{3}$
   e. None of these



9. Excluding rest stops, it took Jawad a total of 10 hours to hike from the base of a mountain to the top and back down again by the same path. If he averaged 2 kilometers per hour going up and 3 kilometers per hour coming down, how many kilometers was it from the base to the top of the mountain?

   a. 8 b. 10 c. 12 d. 20 e. 24

10. Y years ago, Rafid was twice as old as Naabil. If Naabil is 18 years old now, how old is Rafid now?

    a. 36 + Y b. 18 + Y c. 18 – Y d. 36 – Y e. 36 – 2Y

11. Muniyat and Tanmee invented a board game where a square board with N number of rows with N number of squares in each row was used. Which of the following can be the possible number of squares which are not alongside the boundaries?

    a. 26 b. 8 c. 24 d. 0 e. 82

12. The figure shows one square inside another and a rectangle of diagonal T. The best approximation of the value of T, in inches, is given by which of the following inequalities?

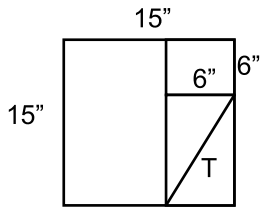
a. $8 < T < 9$

b. $9 < T < 10$

c. $10 < T < 11$

d. $11 < T < 12$

e. $12 < T < 13$



13. Saif, Saim, Rokon, and Arefin all celebrate their birthdays today. Saif is 2 years younger than Saim, Saim is 3 years older than Rokon, and Arefin is one year older than Saif. Which of the following could be the combined age of all four of them?

a. 51 years b. 52 years c. 53 years d. 54 years e. 55 years

14. A 10% rebate enables one to get a meter of cloth extra for Tk. 45. What was the original price per meter of cloth?

a. 5.00 b. 4.80 c. 5.25 d. 4.75 e. 4.50

15. A club sold an average of 92 raffle tickets per member. Among the female members, the average number sold was 84, and among the male members, the average number sold was 96. What was the ratio of the number of male members to the number of female members in the club?

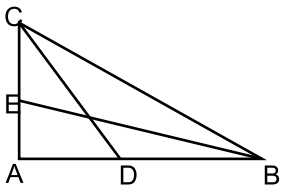
a. 1:1 b. 1:2 c. 1:3 d. 2:1 e. 3:1

16. In the figure below, E is the midpoint of AC. AC is perpendicular to AB, and AD = DB. If BC = 4 cm, what is the value of $BE^2 + CD^2$?

a. 25 b. 24

c. 20 d. 16

e. None of these



17. Rafi’s monthly expenditure for the first four months in the year was Tk. 250 on an average. For the next five months, the average monthly expenditure was Tk. 30 more than what it was during the first four months. He spent Tk. 650 in all during the remaining three months of the year. If his annual income was Tk. 3500, find out the amount that he saved.

a. Tk. 350 b. Tk. 450 c. Tk. 500 d. Tk. 650 e. None

18. The length of a line segment with endpoints M and N is an integer less than 12. Point L is the midpoint of MN, point O is the midpoint of ML and point P is the midpoint of LN. Which of the following could be the distance between points O and N?

a. 10 b. 9 c. 8 d. 7 e. 6

19. Four lecturers of Mathematics agree with their head of the department to donate towards teacher's welfare fund. They donate Tk. 25 each and the head of the department contributes Tk. 6 more than the average of all the five. What is the contribution of the head of the department?

a. 28.50 b. 30.25 c. 32.00 d. 32.50 e. None of these

20. The area of a right triangle is 12 square inches. The ratio of its legs is 2:3. Find the number of inches in the hypotenuse of this triangle?

a. $\sqrt{13}$ b. $\sqrt{26}$ c. $3\sqrt{13}$ d. $\sqrt{52}$ e. $4\sqrt{13}$

21. After the first term in a sequence of positive integers, the ratio of each term to the term immediately preceding it is 2 to 1. What is the ratio of the 8^{th} term in this sequence to the 5^{th} term?

a. 6 to 1 b. 8 to 5 c. 8 to 1 d. 64 to 1 e. 256 to 1

22. A football team had a ratio of win to loss of 3:1. After winning six games in a row, the team's ratio of win to loss became 5:1. How many games had the team won before it won the six games?

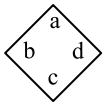
a. 24 b. 12 c. 9 d. 6 e. 3

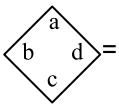
23. In redesigning a warehouse, the length is increased by 20%, the breadth is increased by 40%, and the height is decreased by 25%. What is the percent change in the volume of the redesigned warehouse compared to the previous design?

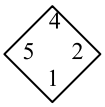
a. 20% decrease b. 25% decrease c. 15% increase d. 26% increase e. 40% increase

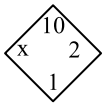
24. If a rectangle with a perimeter of 48 inches is equal in area to a right triangle with legs of 12 inches and 24 inches, what is the length of the rectangle's diagonal?

a. 12 inches b. $12\sqrt{2}$ inches c. $12\sqrt{3}$ inches d. 24 inches e. Cannot be determined

25. Let 

be defined for all numbers a, b, c and d by 

= bd – ac. If x = 

, what is the value of 

?

a. 1 b. 2 c. 18 d. 38 e. 178