13. EQUATIONS & RATIOS

- Comparison of two similar quantities is called ratio.
- If the marks obtained by two friends A and B are 20 & 25 respectively, then the ratio of their marks is 4: 5.
- If we add or subtract a constant number to/from both the terms of the ratio, ratio changes.
- If we multiply or divide both the terms of the ratio with a constant number, ratio remains same.
- For the ratio a: b, a^2:b^2 is called duplicate ratio, where as $\sqrt{a} : \sqrt{b}$ is called sub-duplicate ratio.
  Eg: If x: 9 is the duplicate ratio of 4: y, then the values of x and y are 16 and 3 respectively.
- For the ratio a: b, a^3:b^3 is called triplicate ratio, where as $\sqrt[3]{a} : \sqrt[3]{b}$ is called sub-triplicate ratio.
  Eg: If 8: y is the sub-triplicate ratio of x: 27, then the values of x and y are 512 and 3 respectively.
- Equality of two ratios is called proportion. If a: b = c: d, then a, b, c and d are said to be in proportion.
- For the four numbers to be in proportion, product of means = product of extremes. (ad = bc)
- If a: b = b: c, then a, b and c are in continued proportion and $b^2 = ac$, b is called mean proportional.

Practice Exercise

1. If A : B is 2 : 3 and B : C is 4 : 5, A : B : C is
   a) 8 : 12 : 15 b) 8 : 12 : 25
   c) 8 : 12 : 14 d) 8 : 12 : 20

2. If A: B is 3: 4, B: C is 5: 6 & C: D is 7: 8. Find A: D.
   a) 64 : 35 b) 35 : 64 c) 35 : 74 d) 35 : 37

3. If X : Y = 4 : 5, then find (3X + 4Y) : (2X – Y).
   a) 31/6 b) 6/31 c) 3/32 d) 32/3

4. If $\frac{3x^2 - 4y^2}{2x^2 - y^2} = \frac{8}{7}$ find $\frac{5x+y}{3x-y}$ (x and y are positive)
   a) 11/5 b) 3/7 c) 7/3 d) 5/11

5. Four friends took a house for rent and agreed to share the rent as follows A : B = 8 : 15, B : C = 5 : 8, C : D = 4 : 5, if the total rent is Rs. 15,400. D's share is Rs.
   a) 1000 b) 3000 c) 6000 d) 9000

6. If Rs.18500 is ditribitued among A, B and C in the ratio of 1/4: 1/5: 1/6, then the share of B is____.
   a) Rs.6000 b) Rs.5000
   c) Rs.7500 d) Rs.4800

7. Rs.P distributed among X, Y and Z in the ratio of 4:7:3 such that Y gets Rs.180 more than that of Z. Find P.
   a) 770 b) 450 c) 550 d) 630

8. Rs.9400 divided among P, Q & R such that thrice the share of P is equal to 4 times the share of Q which is equal to 5 times the share of R. What is the share of R in Rs.?
   a) 4000 b) 2400 c) 3000 d) 3600

9. In an exam marks obtained by P and Q are in the ratio 4:5 and that of Q and R are in the ratio of 3:5. If Q got 12 marks more than that of P, howmany marks R got?
   a) 60 b) 100 c) 75 d) 85

10. Find x, y in the following questions:
    (1) The duplicate ratio of 9 : y is x: 49.
    a) 81, 7 b) 3, 7 c) 81, 49 d) 8, 9
    (2) Sub-Duplicate ratio of X : 9 is 16: Y.
    a) 256, 3 b) 4, 9 c) 4, 3 d) 256, 81

11. Rs.850 is divided among 4 men, 5 women & 6 boys such that the share of a man, a woman & a boy is in the ratio 9 : 8 : 4. The share of a woman is Rs.____
    a) 62 b) 64 c) 66 d) 68

12. Total number of pens and books with Rahul is 75. Which of the following cannot be the ratio of number of pens and books with him?
    a) 2 : 3 b)12 : 13 c) 7 : 8 d) 9 : 11

13. The ratio of ages of X and Y is 3 : 1. Five years ago the ratio of their ages was 5 : 1. Find the respective present ages of X and Y.
    a)15, 5 b) 24, 8 c) 60, 10 d) 30, 10

14. The ratio of ages of three friends A, B & C is 4:6:7. If the eldest of them is of 21 years, what is the difference between the ages of C and A?
    a) 3 years b) 9 years c) 16 years d) 12 years

15. The ratio of salaries of 3 friends P, Q & R is 2:5:6. If the difference between the salaries of P & Q is Rs.7440, what is the sum of the salaries of Q & R?
    a) Rs.2480 b) 24800 c) 27280 d) 17360

16. Two numbers are in the ratio of 3:5. If 45 be subtracted from each of them, they are in the ratio of 12:23. Find the second number.
    a) 275 b) 265 c) 255 d) 245

17. Two numbers are in the ratio of 4:5. If 3 is subtracted from each of them, they are in the ratio of 15:19. The first number is
    a) 40 b) 42 c) 46 d) 48

18. The ratio of number of boys to girls in a class is 2 : 3. If 5 boys leave the class and 5 girls join the class the ratio becomes 1 : 2. Find the number of boys in the class, initially.
    a) 30 b) 20 c) 18 d) 24

19. Mr. Mohit is 7 times as old as his son. 10 years

hence he will be 3 times as old as his son. What are their present ages (in years)?
a) 4, 28 b) 5, 35 c) 3, 21 d) 6, 42

20. Rs.490 is divided among 1500 students. If each boy gets 25 paise and each girl gets 50 paise, the number of boys is
a) 1060 b) 1040 c) 1100 d) 1000

21. The annual incomes of A and B are in the ratio of 4:3 and their annual expenses are in the ratio of 3:2. If each of them saves Rs.10000, B's income is
a) Rs.20000b) Rs.30000
c) Rs.40000d) Rs.50000

22. Incomes of Anil and Mukesh are in the ratio 6: 5. Their annual expenses are in the ratio 3: 2. Given, their annual savings as Rs.3000 and Rs.4000 respectively, find the annual income of Anil.
a) 24000 b) 18000 c) 12000 d) 5000

23. The ratio of milk and water in 55 litres of adulterated milk is 7:4. How much water must be added to make the mixture 7:6?
a) 20 b) 15 c) 10 d) 5

24. The ratio of wine and water in 250 litres of mixture is 4:1. How much water must be added to make the mixture 4:3?
a) 50 b) 60 c) 80 d) 100

25. A bag contains one rupee coins, half a rupee coins and ten paise coins. The rupee and half a rupee coins are in the ratio of 2:5 and half a rupee and ten paise coins are in the ratio of 4:9. If the total amount in the bag is Rs.900. Find the number of one rupee coins.
a) 320 b) 300 c) 330 d) 800

26. Divide Rs.39, 100 into three parts proportional to the fractions $\frac{1}{2},\frac{2}{3},\frac{3}{4}$. The third part exceeds first part by_____ Rs.
a) 15, 300 b) 3, 400 c) 5, 100 d) 5, 300

27. Divide Rs.12, 150 among X, Y and Z such that if their shares be diminished by Rs.25, 50 and 75 viz., the remainders shall be in the ratio of 3:4:5. Z's share is Rs.
a) 3025 b) 4150 c) 5075 d) 6075

28. The prices of a flat and a car are in the ratio of 9:5. If a flat costs Rs.4, 20, 000 more than that of the car, the price of the flat in thousand Rs is….
a) 945 b) 845 c) 745 d) 645

29. The students in three classes are in the ratio of 2:3:5. If 40 students are increased in each class, the ratio changes to 4:5:7. The total number of students in the 3 classes before the increase was
a) 100 b) 140 c) 180 d) 200

30. The ratio of the present ages of a man and his wife is 5 : 4. Which of the following can't be a possible ratio of their ages 20 years ago?
a)7 : 5 b) 3 : 2 c) 13 : 10 d) 6 : 5

31. 19x+23y=30; 23x+19y=54; x+y=____
a) 5 b) 2 c) 6 d) -2

32. How many pairs of x and y satisfy 3x + 6y = 18 and 9x + 18y = 57?
a) 2 b) 1 c) 0 d) None of these

33. 8 less than 4 times a number is 3 times the number. Find 7 more than twice the number.
a) 21 b) 22 c) 23 d) 25

34. When 97 is added to a number, the result is 58 more than 2 times the number. Find the number.
a) 37 b) 39 c) 35 d) 32

35. The entry fee at a small fair is Rs.15 for children and Rs.40 for adults. On a certain day, 2200 people enter the fair and Rs.50500 is collected. How many children attended the fair?
a) 700 b) 1100 (c) 1500 d) 1600

36. Three CDs and four DVDs cost Rs.160. Four CDs and three DVDs cost Rs.155. Find the cost of 5 CDs and 5 DVDs.
a) 240 b) 195 c) 225 d) 245

37. A test has twenty questions worth 100 points. The test consists of True/False questions worth 3 points each and multiple choice questions worth 11 points each. How many multiple choice questions are on the test?
a) 4 b) 5 c) 3 d) 15

38. 27 years from now, Amitab will be five times as old as he was thirty three years ago. What is the present age of Amitab? (in years)
a)38 b) 48 c) 31 d) 54 e) 59

39. Akshay has an amount of Rs.7,000 in the denominations Rs.500 and Rs.100. How many Rs. 500 notes does he have, if he has a total of 22 notes with him?
a) 10 b) 12 c) 11 d) 16 e) 14

40. Sunil and Lata are two of Mr. Varun's children. Sunil has half as many brothers as sisters. Lata has as many brothers as sisters. Find the number of children of Mr.Varun.
a) 5 b) 7 c) 9 d) 11

41. A two-digit number is equal to the sum of its product of digits and sum of digits. How many such two-digit numbers are possible?
a) 8 b) 9 c) 12 d) 11

42. The difference of a two digit number and the number obtained by reversing the digits is always divisible by____
a) 7 b) 5 c) 9 d) 11

43. A two-digit number is formed by either subtracting 16 from eight times the sum of the digits or by adding 20 to 22 times the difference of the digits. Find the number.
a) 24 b) 48 c) 64 d) 82

44. A student was asked to find 3/7th of a number and he instead multiplied it by 7/3. As a result, he got an answer, which was more than the correct answer by 1680. What was the number?
a) 882 b) 273 c) 840 d) 1684

45. Today is Pragnyan's birthday. One year from today, he will be twice as old as he was 10 years ago. How old is Pragnyan today?
a) 21 b) 22 c) 23 d) 25

46. Two years ago, Harish was thrice as old as Girish. Two years later, Harish will be twice as old as Girish. What is the present age of Girish?
a) 6 b) 14 c) 12 d) 8

47. Thirteen years back, my mother was thrice my age and two years back, she was twice my age. Find my mother's present age.
a) 28 b) 46 c) 58 d) 24

48. The present ages of Divya and Bhavya differ by 7. Five years back, Bhavya was twice the age of Divya. Find the age of Divya after 4 years.
a) 25 b) 21 c) 20 d) 16

49. 5 years ago, $\frac{1}{5}$ th of Ramdev's age was equal to, $\frac{1}{7}$ th of Somdev's age. The average of their present ages is 29. Find Ramdev's age after 6 years.
a) 25 b) 39 c) 31 d) 26

50. Ten years ago, the age of Raghu was 20 years less than 6 times his son's age. Ten years hence, his age will be 30 years less than thrice his son's age. After how many years from now will their combined age be 90 years?
a) 5 b) 10 c) 15 d) 20

Equations and Ratios – Practice Exercise - 2

1. The number of students in class is 54. Which of the following cannot be the ratio of boys to girls in that class?
(1) 1:2 (2) 5:4 (3) 7:11 (4) 4:3
(5) Can't be found

2. Four added to half of one-third of one-sixth of a number is equal to one-twelfth of the number. What is the number?
(1) 48 (2) 36 (3) 72 (4) 24 (5) 54

3. The sum of the digits of a two-digit number is 8. If 18 is subtracted from the number, the digits get reversed. What is the number?
(1) 35 (2) 62 (3) 53 (4) 71
(5) Both (1) and (3)

4. If 16: x is the sub duplicate ratio of y: 25, then find x+y.
(1) 9 (2) 261 (3) 629 (4) 881
(5) None of these

5. The sum of a two digit number and the number formed by reversing the digits is always divisible by___
(1) 9 (2) 11 (3) 5 (4) 7
(5) Both (2) and (3)

6. 38 less than 6 times a number is 4 times the number. Find thrice the number.
(1) 19 (2) 38 (3) 57 (4) 45

7. In a test of 25 questions consisting of only multiple choice questions and fill in the blanks questions, each multiple choice question carry 2 marks and each fill in the blanks question carry 3 marks. If the test is for a total of 65 marks, how many multiple choice questions the test consists?
(1) 8 (2) 10 (3) 12 (4) 15

8. On a particular day, in the ground, only two wheelers and four wheelers are parked. If there are all together 42 vehicles parked in the round and there are 130 wheels, then how many four wheelers are parked in the ground?
(1) 23 (2)19 (3) 21 (4) 18

9. Akhil is older than Bhairavi by 5 years. 7 years hence, thrice Akhil's age shall be equal to four times that of Bhairavi. What is the present age of Akhil in years?
(1) 8 (2) 9 (3) 7 (4) 13

10. 15 years hence, Deepika will be four times as old as she was 15 years ago. Find her present age.
(1) 15 (2) 25 (3) 20 (4) 30

11. A mother's age is four times that of her son. Eight years before, the mother's age was sixteen times that of her son. Find the son's age.

(1) 8 (2) 12 (3) 10 (4) 40

12. The ratio of the present ages of 3 friends Amar, Antony and Akbar respectively is 3: 5: 4. If the youngest of them is of 12 years old, what is the difference between the present ages of Antony and Amar?
(1) 4 years (2) 8 years (3) 10 years
(4) 12 years (5) Can't be found

13. The ratio of the marks obtained by 3 friends Sachin, Rahul and Sourav is 4: 7: 5. If the difference between the marks obtained by Rahul and Sourav is 6 marks, then what is the sum of the marks obtained by Sachin and Rahul?
(1) 66 (2) 55 (3) 44 (4) 33
(5) Can't be found

14. Rs.X divided among three friends Geeta, Rekha and Bindu in the ratio 1/3:1/4: 1/5. If the sum of the money with Rekha and Bindu is Rs. 13500, then find X.
(1) 27000 (2) 23500 (3) 18800 (4) 32500
(5) Can't be found

15. Two numbers are in the ratio 3:4. If 6 is added to each of the numbers, the ratio of the numbers will be 7:9. Find the first number.
(1) 27 (2) 30 (3) 33 (4) 36 (5) 48

16. The ratio of the present ages a mother and her son is 9:4. If the ratio of their ages 10 years ago was 7:2, find the present age of the son.
(1) 20 (2) 16 (3) 18 (4) 14 (5) 15

17. Rs.5,600 is divided among Ajay, Bharat and Cyrus. The sum of the shares of Bharat and Cyrus is equal to thrice the share of Ajay. The sum of the shares of Ajay and Cyrus is equal to nine-fifths the share of Bharat. What is the share of Cyrus?
(1) Rs.1,400 (2) Rs.2,400
(3) Rs.2,200 (4) Rs.2,000
(5) Rs.1,800

18. The ratio of number of flowers with Nikita and Charita is 9:7. If Nikita gives 6 flowers to Charita, then both of them will have same number of flowers. Find the number of flowers with Charita.
(1) 45 (2) 36 (3) 48 (4) 54 (5) 42

19. The price of 37 apples and 41 mangoes is 427. The price of 41 apples and 37 mangoes is 431. What is the price of 8 apples and 10 mangoes?
(1) 98 (2) 100 (3) 112 (4) 108 (5) 188

20. Mukesh was asked to distribute Rs.58500 among Harika, Charika and Devika in the ratio 2:3:4. But by mistake he distributed among them in the ratio 1/2: 1/3: 1/4. How much more or less amount Charika got than the amount she supposed to get?
(1) Rs.6500 more (2) Rs.4500 more
(3) Rs.1500 more (4) Rs. 1500 less