

Ratio Formula

Ratio of two quantities: $a:b = a/b$ where:

- a = antecedent (first term)
- b = consequent (second term)

Example: $4:9 = 4/9$ If multiplied/divided by a nonzero number: $4:9 = 8:18 = 12:27$

Proportion Formula

Two equal ratios: $a:b = c:d$ or $a/b = c/d$ where:

- a, d = extremes
- b, c = means

Example: $3:5::4:8$ or $3/5 = 4/8$

Properties of Proportion

1. **Addendo:** If $a:b = c:d$, then $a+c:b+d = c+d$
2. **Subtrahendo:** If $a:b = c:d$, then $a-c:b-d = c-d$
3. **Dividendo:** If $a:b = c:d$, then $a-b:b = c-d:d$
4. **Componendo:** If $a:b = c:d$, then $a+b:b = c+d:d$
5. **Alternendo:** If $a:b = c:d$, then $a:c = b:d$
6. **Invertendo:** If $a:b = c:d$, then $b:a = d:c$
7. **Componendo and Dividendo:** If $a:b = c:d$, then $(a+b):(a-b) = (c+d):(c-d)$

Difference Between Ratio and Proportion

Ratio	Proportion
Compares two numbers of the same unit	Expresses relation between two ratios
Uses $:$ or $/$	Uses $::$ or $=$
An expression	An equation
Identified by "to every"	Identified by "out of"

Fourth, Third, and Mean Proportional

If $a:b = c:d$, then:

- d is the fourth proportional to a, b, c

- c is the third proportional to a , b
- Mean proportional: $ab\sqrt{ab}$

Comparison of Ratios

If $(a:b) > (c:d)$, then: $a/b > c/d$
 Compounded Ratio:
 $(a:b), (c:d), (e:f) = (ace : bdf)$

Duplicate Ratios

If $a:b$ is a ratio, then:

- $a^2:b^2$ = Duplicate ratio
- $a:\sqrt{a} : \sqrt{a} : b$ = Sub-duplicate ratio
- $a^3:b^3$ = Triplicate ratio

Ratio and Proportion Tricks

1. If $u/v = x/y$, then $uy = vx$
2. If $u/v = x/y$, then $u/x = v/y$
3. If $u/v = x/y$, then $v/u = y/x$
4. If $u/v = x/y$, then $(u+v)/v = (x+y)/y$
5. If $u/v = x/y$, then $(u-v)/v = (x-y)/y$
6. If $u/v = x/y$, then $(u+v)/(u-v) = (x+y)/(x-y)$
 (Componendo-Dividendo Rule)
7. If $a/(b+c) = b/(c+a) = c/(a+b)$ and $a+b+c \neq 0$, then $a=b=c$

Summary

- **Ratio** compares two or more quantities.
- **Proportion** shows equality of two ratios.
- Proportions use $=$ or $:$.
- Multiplying or dividing ratio terms by the same number doesn't affect the ratio.
- **Continued Proportion:** If $a:b = b:c$, then $b^2 = ac$.
- **Four Quantities Proportion:** If $a:b = c:d$, then $ad = bc$.

Question for Practice

1. If $a:b = 3:2$ then $(5a+2b):(3a+4b)$ is equal to?
(a) 16:15 (b) 8:7 (c) 19:17 (d) 17:14
2. If $\frac{3}{5}p + \frac{7}{9}q + \frac{4}{5}r$, then what is the ratio of p, q and r respectively?
(a) 35: 36: 15 (b) 140: 108: 105 (c) 135: 140: 105 (d) 70: 45: 63
3. If $\frac{(a+b)}{c} = \frac{23}{12}$ and $\frac{(b+c)}{a} = \frac{17}{8}$, then what is the value of $a+c$ $b =$?
(a) 9/5 (b) 116/59 (c) 107/70 (d) 16/11
4. If $(a+b):(b+c):(c+a) = 5:7:6$ and $2a - 3b + 4c = 66$ then value of c will be?
(a) 12 (b) 18 (c) 24 (d) 132/7
5. If $6a = 4b = 9c$ what is $a:b:c$?
(a) 6:4:9 (b) 9:4:6 (c) 4:9:6 (d) 6:9:4
6. Is the third proportion of 12 and 18?
(a) 3 (b) 6 (c) 27 (d) 144
7. Two numbers are in the ratio of 4:9. If both numbers increase by 12, the ratio becomes 11:21. What is the sum of the original number?
(a) 52 (b) 64 (c) 128 (d) 104
8. Two numbers are in the ratio 3:5. if 13 is subtracted from each the new numbers are in the ratio 10:21. if 15 is added to each of the original numbers then the ratio becomes?
(a) 24: 35 (b) 4: 5 (c) 23: 33 (d) 5: 7
9. The entry ticket at a fun park was increased in the ratio to 7: 9, causing footfalls to fall in the ratio of 13: 11. What is the new daily collection in rupees? if the daily collection before the price hike was rs.2,27,500.
(a) ₹237500 (b) ₹247500 (c) ₹232500 (d) ₹242500
10. The railway fares of air-conditioned sleepers and ordinary sleeper classes are in the ratio of 4: 1. The number of passengers traveling by air-conditioned sleepers and ordinary sleeper classes was in the ratio of 3: 25. if the total collection was rs.74000. how much did air conditioner sleeper passengers pay?
(a) ₹30000 (b) ₹32000 (c) ₹20000 (d) ₹24000
11. Two numbers are in the ratio 29: 20. Diminishing each of them by 420 makes the ratio 17: 11. What is the difference between the numbers?
(a) 1000 (b) 1080 (c) 960 (d) 1440
12. When the ticket prices of a water park are increased in the ratio of 11: 12, the number of daily visitors to the park falls in the ratio of 8: 7. If the daily revenue before the increase in the ticket price was ₹1,76,000, then find the daily revenues after the increase in the ticket price.
(a) ₹264000 (b) ₹112000 (c) ₹192000 (d) ₹168000

13. A sum of X rupees is divided among A, B, and C such that the ratio of the shares of A and B is 6:7 and that of B and C is 3:2. if the difference of the shares of A and C is ₹540 then the value of X is?
 (a) ₹7155 (b) ₹7290 (c) ₹7020 (d) ₹7425
14. ₹33630 are divided among Arun Varun and Shivam in such a manner that the ratio of the amount of Arun to that of Varun is 3:7 and the ratio of the amount of Varun to that of Shivam is 6:5. the amount of money received by Varun is?
 (a) ₹14868 (b) ₹16252 (c) ₹13290 (d) ₹12394
15. A sum of ₹86700 is to be divided among Reena Seema and Anita in such a manner that for every rupee that Reena gets Seema gets 90 paise and for every rupee that Seema gets Anita gets 110 paise. Seema's share will be?
 (a) ₹26010 (b) ₹27000 (c) ₹28000 (d) ₹28090
16. A sum is divided among Amit, Babita, Chirayu, and Dhiraj such that the ratio of the shares of Amit and Babita is 2:3 that of Babita and Chirayu is 1:2 and that of Chirayu and Dheeraj is 3:4. if the difference between the shares of Amit and Dhiraj is ₹648 Then the sum of their shares is?
 (a) ₹1944 (b) ₹2484 (c) ₹2052 (d) ₹2160
17. ₹70200 is divided among A, B, and C such that A receives $\frac{4}{5}$ the sum of (B+C). Find the amount C receives if B receives $\frac{2}{11}$, which is the sum of (A+C).
 (a) ₹28200 (b) ₹29140 (c) ₹32940 (d) ₹25850
18. If a man divides his properties so that his sons share with his wife's share and his wife shares with his daughters in a ratio of 5:2, and the daughter gets ₹29400 less than the son, then what is the value of the whole property?
 (a) ₹54600 (b) ₹56000 (c) ₹52650 (d) ₹58500
19. ₹555 was to be divided among A, B, and C in the ratio of $\frac{1}{4}$: $\frac{1}{5}$: $\frac{1}{6}$ but by mistake, it was divided in the ratio of 4: 5: 6. The amount in excess received by C was?
 (a) ₹72 (b) ₹75 (c) ₹92 (d) ₹52
20. Each member of the club contributes as much rupees and as much Paisa as the number of members of the club is. If the total contribution is ₹3636, then the number of members of the club is.
 (a) 60 (b) 45 (c) 55 (d) 50
21. On the whole surface of the earth the ratio of land and water is 3:5 the land and water in the Northern hemisphere is 7:9. what is the ratio of land and water in the Southern Hemisphere?
 (a) 6: 7 (b) 5: 11 (c) 9: 2 (d) 3: 2
22. The ratio of the total amount distributed in all males and females as salary is 6:5 while the ratio of salary of each male and female is 4:3. find the ratio of the number of males and females.
 (a) 9: 5 (b) 9: 10 (c) 7: 5 (d) 7: 9
23. Between two consecutive years my income is in the ratio of 2: 3 and expenses in the ratio of 5: 9 if my income in the second year is ₹45000 and my expenses in the first year is ₹25000. my total savings for 2 years is?

(a) ₹14000 (b) ₹15000 (c) ₹10000 (d) ₹5000

24. The ratio of A's income to that of B is 5:7. A and B save ₹4000 and ₹5000, respectively. If A's expenditures are equal to 66.66% of B's expenditures, then the total income of A and B is?
 (a) ₹28800 (b) ₹26400 (c) ₹25200 (d) ₹24000
25. A and B have their monthly incomes in the ratio 8: 5 while their monthly expenditure is in the ratio 5: 3. If they have saved ₹12000 and ₹10000 respectively then the difference in their monthly income is?
 (a) ₹52000 (b) ₹42000 (c) ₹44000 (d) ₹46000
26. The expenditure in a hostel is partly variable and directly proportional to the number of students rest being a fixed amount. if the expenditure were ₹8400 for 120 students and ₹10,000 for 150 students what would be the expenditure for 330 students?
 (a) ₹22400 (b) ₹19600 (c) ₹18000 (d) ₹21500
27. C1, C2, C3, C4, and C5 are five companies the profits made by C1, C2, and C3 are in the ratio 9:10:8 while the profits made by C2, C4, and C5 are in the ratio 18:19:20. If the profit difference between C5 and C1 is 19 lacs then find the profit made by all companies.
 (a) 4.38cr (b) 4.35cr (c) 4.47cr (d) 4.59cr
28. A bag contains 50p, 25p and 10p coins in the ratio of 7:8:3 amounting to ₹87. find the number of 10p coins?
 (a) 30 (b) 45 (c) 60 (d) 50
29. Bag contains 1 rupee, 50p and 25p coins in the ratio 5:6:7. if the total amount is ₹390 then find the number of coins of each kind.
 (a) 240,270,290 (b) 200,240,280 (c) 200,220,280 (d) 180,250,290
30. A, B, and C have few coins. 8 times the number of coins that A has is equal to 5 times the number of coins B has while 7 times the number of coins B has is equal to 11 times the number of coins C has. What is the minimum number of coins with A, B, and C put together?
 (a) 31 (b) 199 (c) 186 (d) 97
31. The ratio of ages of father and mother was 11:10 when their son was born. the ratio of ages of father and mother will be 19:18 when the son will be twice his present age. what is the ratio of present ages of father and mother?
 (a) 15: 14 (b) 14: 15 (c) 16: 15 (d) 17: 16
32. In a zoo there are rabbits and pigeons if the head are counted there are 340 heads and if the legs are counted there are 1060 legs. how many pigeons are there?
 (a) 120 (b) 150 (c) 180 (d) 170
33. Mrs Giri purchased one dozen bangles 1 day she slipped on the floor and fell. what cannot be the ratio of broken to unbroken bangles?
 (a) 1: 2 (b) 1: 3 (c) 2: 3 (d) 1: 5

34. Some amount of money has to be distributed among A B and C in the ratio 9:8:6 but by mistake, it is distributed in the ratio $\frac{1}{9}:\frac{1}{8}:\frac{1}{6}$ due to this being losses of 1000 rupees. find the total money which has to be distributed.
 (a) 27840 (b) 21924 (c) 33350 (d) 26680
35. The number of boys in a school was 30 more than the number of girls subsequently a few more girls joined the same school consequently the ratio of boys and girls became 3:5. find the minimum number of girls who joined subsequently.
 (a) 51 (b) 52 (c) 53 (d) 55

ANSWERS

Ratio and Proportion:-

1 c	6 c	11 b	16 c	21 b	26 b	31 a	
2 b	7 d	12 d	17 a	22 b	27 a	32 b	
3 b	8 a	13 a	18 a	23 d	28 b	33 c	
4 c	9 b	14 a	19 a	24 d	29 b	34 d	
5 d	10 d	15 b	20 a	25 b	30 b	35 b	