

Chapter 1

Ratio, Proportion, Indices, Logarithm

Past Trends

Attempt	Ratio & Proportion	Indices	Log	Total
May 2018	2	1	2	5
Nov 2018	2	1	1	4
Jun 2019	1	2	2	5
Nov 2019	2	2	1	5
Nov 2020	3	1	2	6
Jan 2021	3	1	1	5
Jul 2021	3	1	1	5
Dec 2021	3	4	2	9
Jun 2022	2	1	3	6
Dec 2022	2	1	2	5
Jun 2023	0	2	2	4

Ratio Basics

Definition	<ul style="list-style-type: none"> A ratio is a comparison of the sizes of two or more quantities of the same kind by division.
Terms	<ul style="list-style-type: none"> The quantities a and b are called the terms of the ratio, a is called the first term or antecedent and b is called the second term or consequent.
Simplest Form of Ratio	<ul style="list-style-type: none"> Both terms of a ratio can be multiplied or divided by the same (non-zero) number. Usually, a ratio is expressed in lowest terms (or simplest form).
Order of Terms	<ul style="list-style-type: none"> The order of the terms in a ratio is important.
Quantities of same kind	<ul style="list-style-type: none"> Ratio exists only between quantities of the same kind. Example: There is no ratio between the weight of one child and age of another
Quantities of same unit	<ul style="list-style-type: none"> Quantities to be compared (by division) must be in the same units. Example: 150 gm and 2 kg cant be directly compared, convert 2kg into 2000 gm
Equivalent like fractions	<ul style="list-style-type: none"> To compare two ratios, convert them into equivalent like fractions i.e. ratios with same denominator

Increase or Decrease of quantity by ratios	<ul style="list-style-type: none"> If a quantity increases or decreases in the ratio $a : b$ then new quantity is b/a times of original quantity The fraction by which the original quantity is multiplied (i.e. b/a) to get a new quantity is called the factor multiplying ratio.
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Properties of Ratio

Inverse Ratio	<ul style="list-style-type: none"> One ratio is the inverse of another if their product is 1. Thus $b : a$ is the inverse of $a : b$ and vice-versa.
Compounding	<ul style="list-style-type: none"> The ratio compounded of the two ratios $a : b$ and $c : d$ is $ac : bd$. Compounding two or more ratios means multiplying them
Duplicate Ratio, Triplicate Ratio	<ul style="list-style-type: none"> A ratio compounded of itself is called its duplicate ratio. $a^2 : b^2$ is the duplicate ratio of $a:b$ $a^3 : b^3$ is the triplicate ratio of $a:b$
Sub-Duplicate Ratio, Sub-Triplicate Ratio	<ul style="list-style-type: none"> $\sqrt{a} : \sqrt{b}$ is the sub-duplicate ratio of $a:b$ $\sqrt[3]{a} : \sqrt[3]{b}$ is the sub-triplicate ratio of $a:b$
Commensurable	<ul style="list-style-type: none"> If the ratio of two similar quantities can be expressed as a ratio of two integers, the quantities are said to be commensurable. Otherwise, they are said to be incommensurable Example of Incommensurable - $\sqrt{3} : \sqrt{2}$
Continued Ratio	<ul style="list-style-type: none"> Continued Ratio: is the relation or comparison between the magnitudes of three or more quantities of same kind. The continued ratio of three similar quantities a, b, c can be written as $a:b:c$

		Study Mat
(1)	The inverse ratio of $11 : 15$	
a.	$15 : 11$	b. $\sqrt{11} : \sqrt{15}$
c.	$121 : 225$	d. None of these
		Study Mat
(2)	The ratio of two quantities is $3 : 4$. If the antecedent is 15, the consequent is	
a.	16	b. 60
c.	22	d. 20
		Study Mat
(3)	The ratio of the quantities is $5 : 7$. If the consequent of its inverse ratio is 5, the antecedent is	
a.	5	b. $\sqrt{5}$
c.	7	d. None of these

		Study Mat
(4)	The ratio compounded of 2 : 3, 9 : 4, 5 : 6, and 8 : 10 is	
	a. 1 : 1	b. 1 : 5
	c. 3 : 8	d. None of these
		Study Mat
(5)	The duplicate ratio of 3 : 4 is	
	a. $\sqrt{3} : 2$	b. 4 : 3
	c. 9 : 16	d. None of these
		Study Mat
(6)	The sub-duplicate ratio of 25 : 36 is	
	a. 6 : 5	b. 36 : 25
	c. 50 : 72	d. 5 : 6
		Study Mat
(7)	The triplicate ratio of 2 : 3 is	
	a. 8 : 27	b. 6 : 9
	c. 3 : 2	d. None of these
		Study Mat
(8)	The sub-triplicate ratio of 8 : 27 is	
	a. 27 : 8	b. 24 : 81
	c. 2 : 3	d. None of these
		Study Mat
(9)	The ratio compounded of 4 : 9 and the duplicate ratio of 3 : 4 is	
	a. 1 : 4	b. 1 : 3
	c. 3 : 1	d. None of these
		Study Mat
(10)	The ratio compounded of 4 : 9, the duplicate ratio of 3 : 4, the triplicate ratio of 2 : 3 and 9 : 7 is	
	a. 2 : 7	b. 7 : 2
	c. 2 : 21	d. None of these
		Study Mat
(11)	The ratio compounded of duplicate ratio of 4 : 5, triplicate ratio of 1 : 3, sub duplicate ratio of 81 : 256 and sub-triplicate ratio of 125 : 512 is	
	a. 4 : 512	b. 3 : 32
	c. 1 : 12	d. None of these
		Study Mat
(12)	If $a : b = 3 : 4$, the value of $(2a + 3b) : (3a + 4b)$ is	
	a. 54 : 25	b. 8 : 25
	c. 17 : 24	d. 18 : 25
		Study Mat
(13)	Two numbers are in the ratio 2 : 3. If 4 be subtracted from each, they are in the ratio 3 : 5. The numbers are	
	a. (16, 24)	b. (4, 6)
	c. (2, 3)	d. None of these

	Study Mat	
(14)	The angles of a triangle are in ratio 2 : 7 : 11. The angles are	
	a. (20°, 70°, 90°)	b. (30°, 70°, 80°)
	c. (18°, 63°, 99°)	d. None of these
	Study Mat	
(15)	Division of ₹ 324 between X and Y is in the ratio 11: 7. X & Y would get Rupees	
	a. (204, 120)	b. (200, 124)
	c. (180, 144)	d. None of these
	Study Mat	
(16)	Anand earns ₹ 80 in 7 hours and promode ₹ 90 in 12 hours. The ratio of their earnings is	
	a. 32 : 21	b. 23 : 12
	c. 8 : 9	d. None of these
	Study Mat	
(17)	The ratio of two numbers is 7 : 10 and their difference is 105. The number are	
	a. (200, 305)	b. (185, 290)
	c. (245, 350)	d. None of these
	Study Mat	
(18)	P, Q and R three cities. The ratio of average temperature between P and Q is 11 : 12 and that between P and R is 9 : 8. The ratio between average temperature of Q and R is $\frac{4}{5}x^2$	
	a. 22 : 27	b. 27 : 22
	c. 32 : 33	d. None of these
	Study Mat	
(19)	If $x : y = 3 : 4$, the value of $x^2y + xy^2 : x^3 + y^3$ is	
	a. 13 : 12	b. 12 : 13
	c. 21 : 31	d. None of these
	Study Mat	
(20)	If $p : q$ is the sub-duplicate ratio of $p - x^2 : q - x^2$ then x^2 is	
	a. $\frac{p}{p+q}$	b. $\frac{q}{p+q}$
	c. $\frac{pq}{p+q}$	d. None of these
	Study Mat	
(21)	If $2s : 3t$ is the duplicate ratio of $2s - p : 3t - p$ then	
	a. $p^2 = 6st$	b. $P = 6st$
	c. $2p = 3st$	d. None of these
	Study Mat	
(22)	If $p : q = 2 : 3$ and $x : y = 4 : 5$, then the value of $5px + 3qy : 10px + 4qy$ is	
	a. 71 : 82	b. 27 : 28
	c. 17 : 28	d. None of these
	Study Mat	
(23)	The number which when subtracted from each of the terms of the ratio 19 : 13 reducing it to 1 : 4 is	
	a. 15	b. 5
	c. 1	d. None of these

Study Mat

- (24) Daily earnings of two persons are in the ratio 4 : 5 and their daily expenses are in the ratio 7 : 9. If each saves ₹ 50 per day, their daily earnings in ₹ are
- | | | | |
|----|------------|----|---------------|
| a. | (40, 50) | b. | (50, 40) |
| c. | (400, 500) | d. | None of these |

Study Mat

- (25) The ratio between the speeds of two trains is 7 : 8. If the second train runs 400 kms in 5 hours, the speed of the first train is
- | | | | |
|----|-----------|----|---------------|
| a. | 10 km/ hr | b. | 50 km/ hr |
| c. | 70 km/ hr | d. | None of these |

PYQ Dec. 21

- (26) In a department, the number of males and females are in the ratio 3 : 2. If 2 males and 5 females join the department, then the ratio becomes 1 : 1. Initially, the number of females in the department is
- | | | | |
|----|---|----|---|
| a. | 9 | b. | 6 |
| c. | 3 | d. | 8 |

MTP Nov 20

- (27) A bag contains ₹187 in the form 1 rupee, 50 paise and 10 paise coins in the ratio 3:4:5.
★ Find the number of each type of coins.
- | | |
|----|---------------|
| a. | 102, 136, 170 |
| b. | 136, 102, 170 |
| c. | 170, 102, 136 |
| d. | None of these |

PYQ Dec. 21

- (28) Incomes of R and S are in the ratio 7 : 9 and their expenditures are in the ratio 4 : 5.
★ Their total expenditure is equal to income of R. What is the ratio of their savings?
- | | | | |
|----|---------|----|---------|
| a. | 23 : 36 | b. | 28 : 41 |
| c. | 31 : 43 | d. | 35 : 46 |

PYQ July 21

- (29) A vessel contained a solution of acid and water in which water was 64%. Four liters of the solution were taken out of the vessel and the same quantity of water was added. If the resulting solution contains 30% acid, the quantity (in liters) of the solution, in the beginning in the vessel, was
- | | | | |
|----|----|----|----|
| a. | 12 | b. | 36 |
| c. | 24 | d. | 2 |

PYQ Nov. 20

- (30) The ratio of number of boys and the number of girls in a school is found to be 15 : 32.
★ How many boys and equal number of girls should be added to bring the ratio to 2/3?
- | | | | |
|----|----|----|----|
| a. | 19 | b. | 20 |
| c. | 23 | d. | 27 |

PYQ Dec 22

- (31) A group of 400 soldiers posted at border area had a provision for 31 days. After 28 days 280 soldiers from this group were called back. Find the number of days for which the remaining ration will be sufficient?
- | | | | |
|----|---|----|----|
| a. | 3 | b. | 6 |
| c. | 8 | d. | 10 |

Proportion Basics

Definition	<ul style="list-style-type: none"> An equality of two ratios is called a proportion. Four quantities a, b, c, d are said to be in proportion if $a : b = c : d$ or $a : b :: c : d$
Terms	<ul style="list-style-type: none"> The quantities a, b, c, d are called terms of the proportion; a, b, c and d are called its first, second, third and fourth terms respectively. Terms or proportion can also be called as Proportional First and fourth terms are called extremes (or extreme terms). Second and third terms are called means (or middle terms).
Cross Product Rule	<ul style="list-style-type: none"> If $a : b = c : d$ are in proportion then $ad = bc$ Product of Extremes = Product of Means
Continued Proportion	<ul style="list-style-type: none"> Three quantities a, b, c of the same kind (in same units) are said to be in continuous proportion if $a : b = b : c$ $\frac{a}{b} = \frac{b}{c} \Rightarrow b^2 = ac$ <p>$a =$ first proportional, $c =$ third proportional and b is mean proportional (because b is GM of a and c)</p>

Properties of Proportion

Invertendo	If $a : b = c : d$, then $b : a = d : c$
Alternendo	If $a : b = c : d$, then $a : c = b : d$
Componendo	If $a : b = c : d$, then $a + b : b = c + d : d$
Dividendo	If $a : b = c : d$, then $a - b : b = c - d : d$
Componendo and Dividendo	If $a : b = c : d$, then $\frac{a+b}{a-b} = \frac{c+d}{c-d}$ or $\frac{a-b}{a+b} = \frac{c-d}{c+d}$
Addendo	If $a:b = c:d = e:f = \dots = k$, then $\frac{a+c+e+\dots}{b+d+f+\dots} = k$
Subtrahendo	If $a:b = c:d = e:f = \dots = k$, then $\frac{a-c-e-\dots}{b-d-f-\dots} = k$

				Study Mat
(32)	The fourth proportional to 4, 6, 8 is			
	a. 12	b. 32		
	c. 48	d. None of these		
				Study Mat
(33)	The third proportional to 12, 18 is			
	a. 24	b. 27		
	c. 36	d. None of these		
				Study Mat
(34)	The mean proportional between 25, 81 is			
	a. 40	b. 50		
	c. 45	d. None of these		
				Study Mat
(35)	The number which has the same ratio to 26 that 6 has to 13 is			
	a. 11	b. 10		
	c. 21	d. None of these		
				Study Mat
(36)	The fourth proportional to $2a, a^2, c$ is			
	a. $ac/2$	b. ac		
	c. $2/ac$	d. None of these		
				Study Mat
(37)	If four numbers $1/2, 1/3, 1/5, 1/x$ are proportional then x is			
	a. $6/5$	b. $5/6$		
	c. $15/2$	d. None of these		
				Study Mat
(38)	The mean proportional between $12x^2$ and $27y^2$ is			
	a. $18xy$	b. $81xy$		
	c. $8xy$	d. None of these		
				Study Mat
(39)	If $A = B/2 = C/5$, then $A : B : C$ is			
	a. $3 : 5 : 2$	b. $2 : 5 : 3$		
	c. $1 : 2 : 5$	d. None of these		
				Study Mat
(40)	If $a/3 = b/4 = c/7$, then $a + b + c/c$ is			
	a. 1	b. 3		
	c. 2	d. None of these		
				Study Mat
(41)	If $p/q = r/s = 2.5/1.5$, the value of $ps : qr$ is			
	a. $3/5$	b. 1:1		
	c. $5/3$	d. None of these		
				Study Mat
(42)	If $x : y = z : w = 2.5 : 1.5$, the value of $(x + y) / (y + w)$ is			
	a. 1	b. $3/5$		
	c. $5/3$	d. None of these		

		Study Mat
(43)	If $(5x - 3y) / (5y - 3x) = 3/4$, the value of $x : y$ is	
	a. 2:9	b. 7:2
	c. 7:9	d. None of these
		Study Mat
(44)	If $A : B = 3 : 2$ and $B : C = 3 : 5$, then $A : B : C$ is	
	a. 9 : 6 : 10	b. 6 : 9 : 10
	c. 10 : 9 : 6	d. None of these
		Study Mat
(45)	If $x/2 = y/3 = z/7$, then the value of $(2x - 5y + 4z)/2y$ is	
	a. 6/23	b. 23/6
	c. 3/2	d. 17/6
		Study Mat
(46)	If $x : y = 2 : 3$, $y : z = 4 : 3$ then $x : y$ is	
	a. 2 : 3 : 4	b. 4 : 3 : 2
	c. 3 : 2 : 4	d. None of these
		Study Mat
(47)	Division of ₹ 750 into 3 parts in the ratio 4 : 5 : 6 is	
	a. (200, 250, 300)	b. (250, 250, 250)
	c. (350, 250, 150)	d. 8 : 12 : 9
		Study Mat
(48)	The sum of the ages of 3 persons is 150 years. 10 years ago their ages were in the ratio 7 : 8 : 9. Their present ages are	
	a. (45, 50, 55)	b. (40, 60, 50)
	c. (35, 45, 70)	d. None of these
		Study Mat
(49)	The numbers 14, 16, 35, 42 are not in proportion. The fourth term for which they will be in proportion is	
	a. 45	b. 40
	c. 32	d. None of these
		Study Mat
(50)	If $x/y = z/w$, implies $y/x = w/z$, then the process is called	
	a. Dividendo	b. Componendo
	c. Alternendo	d. None of these
		Study Mat
(51)	If $p/q = r/s = p - r/q - s$, the process is called	
	a. Subtrahendo	b. Addendo
	c. Invertendo	d. None of these
		ICAI SM
(52)	If $a/b = c/d$, implies $(a + b) / (a - b) = (c + d) / (c - d)$, the process is called	
	a. Componendo	
	b. Divinendo	
	c. Componendo & Divinendo	
	d. none of these	

		Study Mat
(53)	If $u/v = w/p$, then $(u - v) = (w - p) / (w + p)$. This process is called	
	a. Invertendo	b. Alternendo
	c. Addedndo	d. None of these
		Study Mat
(54)	12, 16, *, 20 are in proportion. Then * is	
	a. 25	b. 14
	c. 15	d. None of these
		Study Mat
(55)	4, *, 9, $13 \frac{1}{2}$ are in proportion. Then * is	
	a. 6	b. 8
	c. 9	d. None of these
		Study Mat
(56)	The mean proportional between 1.4 gms and 5.6 gms is	
	a. 28 gms	b. 2.8 gms
	c. 3.2 gms	d. None of these
		Study Mat
(57)	If $\frac{a}{4} = \frac{b}{5} = \frac{c}{9}$ then $\frac{a+b+c}{c}$ is	
	a. 4	b. 2
	c. 7	d. None of these
		Study Mat
(58)	Two numbers are in the ratio 3 : 4; if 6 be added to each terms of the ratio, then the new ratio will be 4 : 5, then the numbers are	
	a. 14, 20	b. 17, 19
	c. 18, 24	d. None of these
		Study Mat
(59)	If $\frac{a}{4} = \frac{b}{5}$ then	
	a. $\frac{a+4}{a-4} = \frac{b-5}{b+5}$	b. $\frac{a+4}{a-4} = \frac{b+5}{b-5}$
	c. $\frac{a-4}{a+4} = \frac{b+5}{b-5}$	d. None of these
		Study Mat
(60)	If $a : b = 4 : 1$ then $\sqrt{\frac{a}{b}} + \sqrt{\frac{b}{a}}$ is	
	a. $5/2$	b. 4
	c. 5	d. None of these
		Study Mat
(61)	If $\frac{x}{b+c-a} = \frac{y}{c+a-b} = \frac{z}{a+b-c}$ then $(b - c)x + (c - a)y + (a - b)z$ is	
	a. 1	b. 0
	c. 5	d. None of these

		PYQ Jan. 21
(62)	In a certain business A and B received profit in a certain ratio B and C received profits in the same ratio. If A gets ₹ 1600 and C gets ₹ 2500 then how much does B get?	
a.	₹ 2,000	b. ₹ 2,500
c.	₹ 1,000	d. ₹ 1,500
		PYQ May 18
(63)	The mean proportional between 24 and 54 is:	
a.	33	b. 34
c.	35	d. 36
		MTP March 21
(64)	Which of the numbers are not in proportions?	
a.	6,8,5,7	b. 7,3,14,6
c.	18,27,12,18	d. 8,6,12,9

Indices Basics

Base	Number which is raised to some power is called as Base
Power	Number of times Base is multiplied by itself
Index	Entire Number including Base and Power is Index
Indices	Plural of Index
Example	$3^4 = 81$ Here Base is 3, Power is 4 and Index is 3^4 and 81 is the result
Base	Number which is raised to some power is called as Base
Standard Results	<ul style="list-style-type: none"> Any base raised to the power zero is defined to be 1 $a^0 = 1$ Roots can also be expressed in the form of power $\sqrt[r]{a} = a^{\frac{1}{r}}$
Power Shifting Punch	<ul style="list-style-type: none"> If $6^3 = x \Rightarrow 6 = x^{\frac{1}{3}}$ If $5^{\frac{3}{2}} = y \Rightarrow 5 = y^{\frac{2}{3}}$

Law of Indices

Law 1	If two or more terms with same base are multiplied, we can make them one term having the same base and power as sum of all powers. $a^m \times a^n = a^{m+n}$
Law 2	If two or more terms with same base are in division, we can make them one term having the same base and power as difference of power. $\frac{a^m}{a^n} = a^{m-n}$
Law 3	If a term having power is raised to another power, we can do product of powers to simplify the expression

	$(a^m)^n = a^{m \times n}$
Law 4	<p>If a product of two or more terms is raised to power, we can split the two terms with same individual power to each one of them.</p> $(a \times b)^n = a^n \times b^n$

		Study Mat
(65)	$4x^{-1/4}$ is expressed as	
a.	$-4x^{1/4}$	b. x^{-1}
c.	$4/x^{1/4}$	d. None of these
		Study Mat
(66)	The value of $8^{1/3}$ is	
a.	$\sqrt[3]{2}$	b. 4
c.	2	d. None of these
		Study Mat
(67)	The value of $2 \times (32)^{1/5}$ is	
a.	2	b. 10
c.	4	d. None of these
		Study Mat
(68)	The value of $4/(32)^{1/5}$ is	
a.	8	b. 2
c.	4	d. None of these
		Study Mat
(69)	The value of $(8/27)^{1/3}$ is	
a.	$2/3$	b. $3/2$
c.	$2/9$	d. None of these
		Study Mat
(70)	The value of $2(256)^{-1/8}$ is	
a.	1	b. 2
c.	$1/2$	d. None of these
		ICAI SM
(71)	$2^{1/2}, 4^{3/4}$ is equal to	
a.	A fraction	
b.	A negative integer	
c.	A positive integer	
d.	None of these	
		Study Mat
(72)	$\left\{\frac{81x^4}{y^{-8}}\right\}^{1/4}$ has simplified value equal to	
a.	xy^2	b. x^2y
c.	$9xy^2$	d. None of these
		Study Mat
(73)	$x^{a-b} \times x^{b-c} \times x^{c-a}$ is equal to	
a.	x	b. 1
c.	0	d. None of these

		Study Mat
(74)	The value of $\left\{\frac{2p^2q^3}{3xy}\right\}^0$ where $p, q, x, y \neq 0$ is equal to	
a.	0	b. 2/3
c.	1	d. None of these
		Study Mat
(75)	$\{(3^3)^2 \times (4^2)^3 \times (5^3)^2\} / \{(3^2)^3 \times (4^3)^2 \times (5^2)^3\}$ is	
a.	$\frac{3}{4}$	b. $\frac{4}{5}$
c.	$\frac{4}{7}$	d. 1
		Study Mat
(76)	Which is True?	
a.	$2^0 > (1/2)^0$	b. $2^0 < (1/2)^0$
c.	$2^0 = (1/2)^0$	d. None of these
		Study Mat
(77)	If $x^{1/p} = y^{1/q} = z^{1/r}$ and $xyz = 1$, then the value of $p + q + r$ is	
a.	1	b. 0
c.	$1/2$	d. None of these
		Study Mat
(78)	The value of $y^{a-b} \times y^{b-c} \times y^{c-a} \times y^{-a-b}$ is	
a.	y^{a+b}	b. y
c.	1	d. $1/y^{a+b}$
		Study Mat
(79)	The True option is	
a.	$x^{2/3} = \sqrt[3]{x^2}$	b. $x^{2/3} = \sqrt{x^3}$
c.	$x^{2/3} > \sqrt[3]{x^2}$	d. $x^{2/3} < \sqrt[3]{x^2}$
		Study Mat
(80)	The simplified value of $16x^{-3}y^2 \times 8^{-1}x^3y^{-2}$ is	
a.	$2xy$	b. $xy/2$
c.	2	d. None of these
		Study Mat
(81)	The value of $(8/27)^{-1/3} \times (32/243)^{-1/5}$ is	
a.	$9/4$	b. $4/9$
c.	$2/3$	d. None of these
		Study Mat
(82)	The value of $\left\{(x+y)^{2/3}(x-y)^{2/3}/\sqrt{x+y} \times \sqrt{(x-y)^3}\right\}^6$ is	
a.	$(x+y)^2$	b. $(x-y)$
c.	$x+y$	d. None of these
		Study Mat
(83)	Simplified value of $(125)^{2/3} \times \sqrt{25} \times \sqrt[3]{5^3} \times 5^{1/2}$	
a.	5	b. $1/5$
c.	1	d. None of these

		Study Mat
(84)	$\left[\left\{ (2)^{\frac{1}{2}} \cdot (4)^{\frac{3}{4}} \cdot (8)^{\frac{5}{6}} \cdot (16)^{\frac{7}{8}} \cdot (32)^{\frac{9}{10}} \right\}^4 \right]^{3/25}$ is	
a.	A fraction	b. An integer
c.	1	d. None of these
		Study Mat
(85)	$[1 - \{1 - (1 - x^2)^{-1}\}^{-1}]^{-1/2}$ is equal to	
a.	x	b. $1/x$
c.	1	d. None of these
		Study Mat
(86)	$[(x^n)^{n-\frac{1}{n}}]^{n+1}$ is equal to	
a.	x^n	b. x^{n+1}
c.	x^{n-1}	d. None of these
		Study Mat
(87)	If $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$, then the simplified form of $\left[\frac{x^l}{x^m}\right]^{l^2+lm+m^2} \times \left[\frac{x^m}{x^n}\right]^{m^2+mn+n^2} \times \left[\frac{x^n}{x^l}\right]^{l^2+ln+n^2}$	
a.	0	b. 1
c.	x	d. None of these
		ICAI SM
(88)	If $(a - b)^3 = a^3 - b^3 - 3ab(a - b)$ tick the correct of these when $x = p^{1/3} - p^{-1/3}$	
a.	$x^3 + 3x = p + 1/p$	
b.	$x^3 + 3x = p - 1/p$	
c.	$x^3 + 3x = p + 1$	
d.	None of these	
		Study Mat
(89)	On simplification, $1/(1 + a^{m-n} + a^{m-p}) + 1/(1 + a^{n-m} + a^{n-p}) + 1/(1 + a^{p-m} + a^{p-n})$ is equal to	
a.	0	b. a
c.	1	d. $1/a$
		Study Mat
(90)	The value of $\left[\frac{x^a}{x^b}\right]^{a+b} \times \left[\frac{x^b}{x^c}\right]^{b+c} \times \left[\frac{x^c}{x^a}\right]^{c+a}$	
a.	1	b. 0
c.	2	d. None of these
		Study Mat
(91)	If $x = 3^{\frac{1}{3}} + 3^{\frac{1}{3}}$, then $3x^3 - 9x$ is	
a.	15	b. 10
c.	12	d. None of these
		Study Mat
(92)	If $a^x = b, b^y = c, c^z = a$, then xyz is	
a.	1	b. 2
c.	3	d. None of these

		Study Mat
(93)	The value of $\left(\frac{x^a}{x^b}\right)^{(a^2+ab+b^2)} \times \left(\frac{x^b}{x^c}\right)^{(b^2+bc+c^2)} \times \left(\frac{x^c}{x^a}\right)^{(c^2+ca+a^2)}$	
a.	1	b. 0
c.	-1	d. None of these
		Study Mat
(94)	If $2^x = 3^y = 6^{-z}$, $\frac{1}{x} + \frac{1}{y} + \frac{1}{z}$ is	
a.	1	b. 0
c.	2	d. None of these
		PYQ Dec. 21
(95)	The value of $\frac{6^{n+4} + 3^{n+3} \times 2^{n+3}}{5 \times 6^n + 6^n}$ is	
a.	232	b. 242
c.	252	d. 262
		PYQ Nov. 19
(96)	If $X = \sqrt{3} + \frac{1}{\sqrt{3}}$ then $\left(X - \frac{\sqrt{126}}{\sqrt{42}}\right) \left(X - \frac{1}{x - \frac{2\sqrt{3}}{3}}\right) = ?$	
★		
a.	5/6	b. 6/5
c.	2/3	d. -3/5
		PYQ Jun 23
(97)	If $x = y^a, y = z^b, z = x^c$, then the value of abc is	
a.	1	b. 2
c.	3	d. 4
		MTP Oct 21
(98)	Find the value of $\sqrt{6561} + \sqrt[4]{6561} + \sqrt[8]{6561}$	
a.	81	b. 93
c.	121	d. 243
		MTP June 22
(99)	If $(25)^{150} = (25x)^{50}$, then the value of x will be:	
a.	5^3	b. 5^4
c.	5^2	d. 5

Logarithm Basics

Meaning of Log	The logarithm of a number to a given base is the index or the power to which the base must be raised to produce the number, i.e. to make it equal to the given number
Mathematical Explanation of Log	If $a^x = n$ then $\log_a n = x$ Example: If $3^4 = 81$ then $\log_3 81 = 4$

Conditions under Logarithm Function	<ul style="list-style-type: none"> Log can be calculated only for Positive Number Base should be positive and not equal to 1 $n > 0, a > 0, a \neq 1$
Standard Results	<ul style="list-style-type: none"> Log of a number with same base as number is equal to 1 $\log_a a = 1$ Log of 1 (one) for any base is equal to zero $\log_a 1 = 0$

Law of Logarithm

Law 1	<ul style="list-style-type: none"> Logarithm of the product of two numbers is equal to the sum of the logarithms of the numbers to the same base $\log_a mn = \log_a m + \log_a n$
Law 2	<ul style="list-style-type: none"> The logarithm of the quotient of two numbers is equal to the difference of their logarithms to the same base $\log_a \frac{m}{n} = \log_a m - \log_a n$
Law 3	<ul style="list-style-type: none"> Logarithm of the number raised to the power is equal to the index of the power multiplied by the logarithm of the number to the same base $\log_a m^n = n \log_a m$
Change of Base Theorem	<ul style="list-style-type: none"> If the logarithm of a number to any base is given, then the logarithm of the same number to any other base can be determined from the following relation $\log_b m = \frac{\log m}{\log b} = \frac{\log_a m}{\log_a b}$
Special Relation	$\log_b a \times \log_a b = 1$

		Study Mat
(100)	Log 6 + log 5 is expressed as	
a.	log 11	b. log 30
c.	log 5/6	d. None of these
		Study Mat
(101)	$\log_2 8$ is equal to	
a.	2	b. 8
c.	3	d. None of these
		Study Mat
(102)	Log 32/4 is equal to	
a.	$\log 32 / \log 4$	b. $\log 32 - \log 4$
c.	2^3	d. None of these

				ICAI SM
(103)	Log $(1 \times 2 \times 3)$ is equal to			
	a.	$\log 1 + \log 2 + \log 3$		
	b.	$\log 3$		
	c.	$\log 2$		
	d.	None of these		
				Study Mat
(104)	The value of log 0.0001 to the base of 0.1 is			
	a.	-4	b.	4
	c.	$\frac{1}{4}$	d.	None of these
				Study Mat
(105)	If $2 \log x = 4 \log 3$, the x is equal to			
	a.	3	b.	9
	c.	2	d.	None of these
				Study Mat
(106)	$\log_{\sqrt{2}} 64$ is equal to			
	a.	12	b.	6
	c.	1	d.	None of these
				Study Mat
(107)	$\log_{\sqrt[3]{3}} 1728$ is equal to			
	a.	$2\sqrt{3}$	b.	2
	c.	6	d.	None of these
				Study Mat
(108)	Log $(1/81)$ to the base 9 is equal to			
	a.	2	b.	$1/2$
	c.	-2	d.	None of these
				Study Mat
(109)	Log 0.0625 o the base 2 is equal to			
	a.	4	b.	5
	c.	1	d.	None of these
				Study Mat
(110)	Given $\log 2 = 0.3010$ and $\log 3 = 0.4771$ the value of log 6 is			
	a.	0.9030	b.	0.9542
	c.	0.7781	d.	None of these
				Study Mat
(111)	The value of $\log_2 \log_2 \log_2 16$			
	a.	0	b.	2
	c.	1	d.	None of these
				Study Mat
(112)	The value of $\log_{\frac{1}{3}}$ to the base 9 is			
	a.	$-1/2$	b.	$1/2$
	c.	1	d.	None of these
				Study Mat
(113)	If $\log x + \log y = \log (x + y)$, y can be expressed as			
	a.	$x-1$	b.	x
	c.	$x/x-1$	d.	None of these

		Study Mat
(114)	The value of $\log_2[\log_2\{\log_3(\log_3 2^7)\}]$ is equal to	
a.	1	b. 2
c.	0	d. None of these
		Study Mat
(115)	If $\log_2 x + \log_4 x + \log_{16} x = 21/4$, then x is equal to	
a.	8	b. 4
c.	16	d. None of these
		Study Mat
(116)	Given that $\log_{10} 2 = x$ and $\log_{10} 3 = y$, the value of $\log_{10} 60$ is expressed as	
a.	$x - y + 1$	b. $x + y + 1$
c.	$x - y - 1$	d. None of these
		Study Mat
(117)	Given that $\log_{10} 2 = x$ and $\log_{10} 3 = y$, the value of $\log_{10} 1.2$ is expressed in terms of x and y as	
a.	$x + 2y - 1$	b. $x + y - 1$
c.	$2x + y - 1$	d. None of these
		Study Mat
(118)	Given that $\log x = m + n$ and $\log y = m - n$, the value of $\log 10x/y^2$ is expressed in terms of m and n as	
a.	$1 - m + 3n$	b. $m - 1 + 3n$
c.	$m + 3n + 1$	d. None of these
		Study Mat
(119)	The simplified value of $2 \log_{10} 5 + \log_{10} 8 - \frac{1}{2} \log_{10} 4$ is	
a.	$1/2$	b. 4
c.	2	d. None of these
		Study Mat
(120)	$\log [1 - \{1 - (1 - x^2)^{-1}\}^{-1}]^{-1/2}$ can be written as	
a.	$\log x^2$	b. $\log x$
c.	$\log 1/x$	d. None of these
		Study Mat
(121)	The simplified value of $\log \left(\sqrt[4]{729^3 \sqrt{9^{-1} \cdot 27^{-4/3}}} \right)$ is	
a.	$\log 3$	b. $\log 2$
c.	$\log 1/2$	d. None of these
		Study Mat
(122)	The value of $(\log_b a \times \log_c b \times \log_a c)^3$ is equal to	
a.	3	b. 0
c.	1	d. None of these
		Study Mat
(123)	The logarithm of 64 to the base $2\sqrt{2}$ is	
a.	2	b. $\sqrt{2}$
c.	$1/2$	d. None of these
		Study Mat
(124)	The value of $\log_8 25$ given is $\log^{10} 2 = 0.3010$	
a.	1	b. 2
c.	1.5482	d. None of these

