

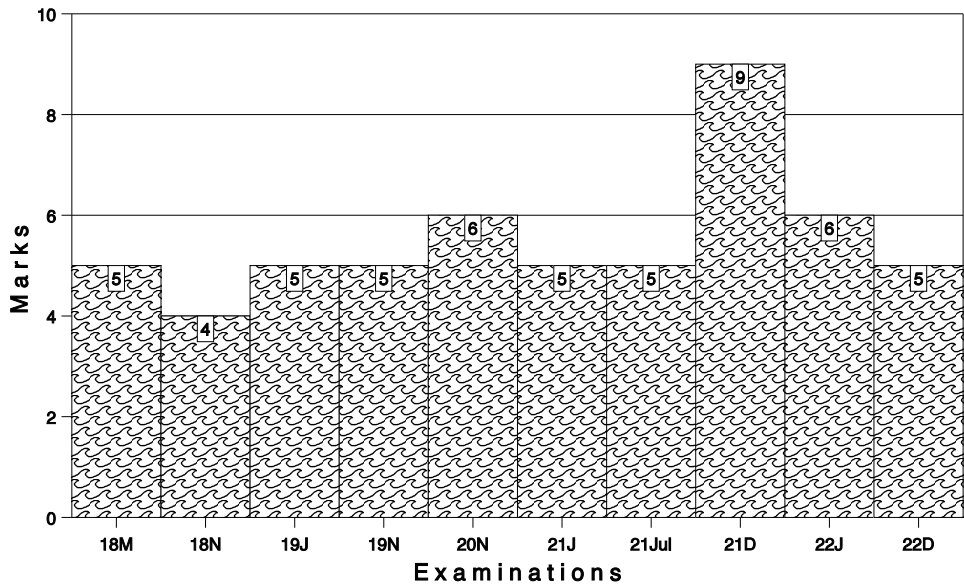
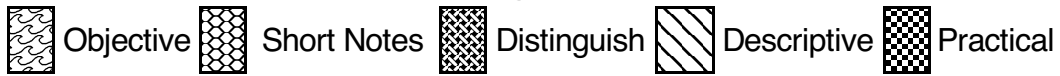
**Part - A**  
**Business Mathematics**



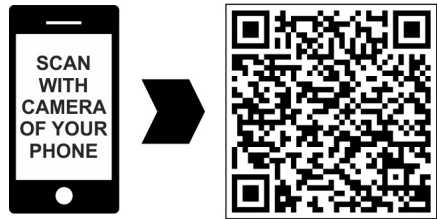
<b>CHAPTER</b>	<b>RATIO AND PROPORTION, INDICES AND LOGARITHMS</b>
<b>1</b>	

Marks of Objective, Short Notes, Distinguish Between, Descriptive & Practical Questions

**Legend**



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**MULTIPLE CHOICE QUESTIONS AND ANSWERS**

**2009 - JUNE**

[1] If  $\frac{p}{q} = -\frac{2}{3}$  then the value of  $\frac{2p+q}{2p-q}$  is :

- (a) 1
  - (b) -1/7
  - (c) 1/7
  - (d) 7
- (1 mark)

**Answer:**

(c)  $\frac{p}{q} = -\frac{2}{3}$

So,  $P = \frac{-2q}{3}$  .....(i)

Now,  $\frac{2p+q}{2q-p}$

Substituting the value of p from (i)

$$= \frac{2\left(\frac{-2q}{3}\right)+q}{2\left(\frac{-2q}{3}\right)-q}$$



**3.6**

<b>■ Solved Scanner CA Foundation Paper - 3A</b>
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$$x^3 = 3 + 3^{-1} + 3 \times 3^{1/3} \times \frac{1}{3^{1/3}} (3^{1/3} + 3^{-1/3})$$

$$x^3 = 3 + \frac{1}{3} + 3(3^{1/3} + 3^{-1/3})$$

$$x^3 = 3 + \frac{1}{3} + 3x \quad [\text{Using (1)}]$$

$$x^3 - 3x = \frac{9+1}{3}$$

$$3(x^3 - 3x) = 10$$

$$\therefore 3x^3 - 9x = 10$$

[4] Find the value of :  $[1 - \{1 - (1 - x^2)^{-1}\}^{-1}]^{-1/2}$

(a)  $1/x$

(b)  $x$

(c)  $1$

(d) None of these.

(1 mark)

**Answer:**

**(b)**  $[1 - \{1 - (1 - x^2)^{-1}\}^{-1}]^{-1/2}$

$$= \left[ 1 - \left\{ 1 - \frac{1}{1 - x^2} \right\}^{-1} \right]^{-1/2}$$

$$= \left[ 1 - \left\{ \frac{1 - x^2 - 1}{1 - x^2} \right\}^{-1} \right]^{-1/2}$$

$$= \left[ 1 - \left\{ \frac{-x^2}{1 - x^2} \right\}^{-1} \right]^{-1/2}$$

$$= \left[ 1 - \left\{ \frac{1 - x^2}{x^2} \right\}^{-1} \right]^{-1/2}$$

$$= \left[ 1 + \frac{1 - x^2}{x^2} \right]^{-1/2} = \left[ \frac{x^2 + 1 - x^2}{x^2} \right]^{-1/2}$$

$$= \left[ \frac{1}{x^2} \right]^{-1/2} = (x^2)^{1/2}$$

$$= x$$

[5]  $\log(m + n) = \log m + \log n$ ,  $m$  can be expressed as :

(a)  $m = \frac{n}{n-1}$

(b)  $m = \frac{n}{n+1}$

(c)  $m = \frac{n+1}{n}$

(d)  $m = \frac{n+1}{n-1}$

(1 mark)

**Answer:**

(a)  $\log(m + n) = \log m + \log n$

$\log(m + n) = \log(mn)$  [  $\because \log(ab) = \log a + \log b$  ]

Taking Antilog on both side

Antilog [  $\log(m + n)$  ] = Antilog [  $\log mn$  ]

$\therefore m + n = mn$

$mn - m = n$

$m(n - 1) = n$

$m = \frac{n}{n-1}$

[6]  $\log_4(x^2 + x) - \log_4(x+1) = 2$ .

Find  $x$

(a) 16

(b) 0

(c) - 1

(d) None of these.

(1 mark)

**Answer:**

(a)  $\text{Log}_4(x^2 + x) - \text{Log}_4(x + 1) = 2$

$\text{Log}_4\left(\frac{x^2 + x}{x + 1}\right) = 2$  [  $\because \log_a m - \log_a n = \log_a\left(\frac{m}{n}\right)$  ]

$4^2 = \frac{x^2 + x}{x + 1}$

$16 = \frac{x^2 + x}{x + 1}$

$16x + 16 = x^2 + x$

$x^2 - 15x - 16 = 0$

$x^2 - 16x + x - 16 = 0$

$$\begin{aligned}
 x(x - 16) + 1(x - 16) &= 0 \\
 (x + 1)(x - 16) &= 0 \\
 x = -1 \text{ or } x &= 16 \\
 \text{Since } x = -1 &\text{ is not possible therefore } x = 16
 \end{aligned}$$

**2009 - DECEMBER**

- [7]  $\frac{2^n + 2^{n-1}}{2^{n+1} - 2^n}$
- (a)  $\frac{1}{2}$
  - (b) -3
  - (c)  $\frac{2}{3}$
  - (d)  $\frac{1}{3}$  (1 mark)

**Answer:**

(b)  $2n + 2n - 1/2n - 1 - 2n$   
 $2n + 2n^2 - 1/2n^2 - 1 - 2n$   
 $2n(1 + 2 - 1)/2n(2 - 1 - 1)$   
 $= 3/2$

- [8] If  $2^x \times 3^y \times 5^z = 360$  Then what is the value of x, y, z,?
- (a) 3, 2, 1
  - (b) 1, 2, 3
  - (c) 2, 3, 1
  - (d) 1, 3, 2 (1 mark)

**Answer:**

(a)  $2^x \times 3^y \times 5^z = 360$ . .....(1)  
 The factors of 360 are:  
 $2^3 \times 3^2 \times 5$ .  
 $\therefore 2^3 \times 3^2 \times 5^1 = 360$ .....(2)  
 On comparing (1) and (2), we get;  
 $x = 3, y = 2$  and  $z = 1$



[9] Find the value of  $[\log_{10} \sqrt{25} - \log_{10} (2)^3 + \log_{10} (4)^2]^x$

- (a) x
- (b) 10
- (c) 1
- (d) None.

(1 mark)

**Answer:**

$$\begin{aligned}
 \text{(c)} \quad & [\log_{10} \sqrt{25} - \log_{10} (2^3) + \log_{10} (4^2)]^x \\
 &= [\log_{10} 5 - 3 \log_{10} 2 + \log_{10} (2^4)]^x \\
 &= [\log_{10} 5 - 3 \log_{10} 2 + 4 \log_{10} 2]^x \\
 &= [\log_{10} 5 + \log_{10} 2]^x \\
 &= [\log_{10} (5 \times 2)]^x \quad [ \because \log (mn) = \log m + \log n ] \\
 &= [\log_{10} 10]^x \\
 &= 1^x \quad [ \because \log_a a = 1 ] \\
 &= 1
 \end{aligned}$$

2010 - JUNE

[10] If  $\log_a b + \log_a c = 0$  then

- (a)  $b = c$
- (b)  $b = -c$
- (c)  $b = c = 1$
- (d) b and c are reciprocals. (1 mark)

**Answer:**

$$\text{(d)} \quad \log_a b + \log_a c = 0$$

$$\log_a bc = 0$$

$$a^0 = bc$$

$$bc = 1$$

$$\therefore b = \frac{1}{c}$$

So, b and c are reciprocals.

[11] What must be added to each term of the ratio 49 : 68, so that it becomes 3 : 4 ?

- (a) 3
- (b) 5
- (c) 8
- (d) 9

(1 mark)

**Answer:**

(c) Let the number added be x

$$\frac{49 + x}{68 + x} = \frac{3}{4}$$

$$196 + 4x = 204 + 3x$$

$$x = 8$$

[12] The students of two classes are in the ratio 5 : 7, if 10 students left from each class, the remaining students are in the ratio of 4 : 6 then the number of students in each class is:

(a) 30, 40

(b) 25, 24

(c) 40, 60

(d) 50, 70

(1 mark)

**Answer:**

(d) Let the ratio be 5x : 7x

If 10 student left, Ratio became 4 : 6

$$\frac{5x - 10}{7x - 10} = \frac{4}{6}$$

$$30x - 60 = 28x - 40$$

$$2x = 20$$

$$x = 10$$

∴ No. of students in each class is 5x and 7x

i.e. 50, 70

<b>2010 - DECEMBER</b>
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[13] The value of

$$2 \log x + 2 \log x^2 + 2 \log x^3 + \dots +$$

$$2 \log x^n$$
 will be :
(a)  $\frac{n(n+1)\log x}{2}$ (b)  $n(n+1) \log x$ (c)  $n^2 \log x$ 

(d) None of these.

(1 mark)

**Answer:**(b)  $2 \log x + 2 \log x^2 + 2 \log x^3 + \dots$ 

$$2[\log x + \log x^2 + \log x^3 + \dots]$$





$$= \log_n^n$$

$$= 1$$

[18] In a film shooting, A and B received money in a certain ratio and B and C also received the money in the same ratio. If A gets ₹ 1,60,000 and C gets ₹ 2,50,000. Find the amount received by B ?

- (a) ₹ 2,00,000 (b) ₹ 2,50,000  
 (c) ₹ 1,00,000 (d) ₹ 1,50,000 (1 mark)

**Answer:**

(a) Given : A : B = B : C

$$\Rightarrow B^2 = A \times C$$

$$\text{or } B = \sqrt{A \times C}$$

$$\& A = 1,60,000 ; C = 2,50,000$$

$$\therefore B = \sqrt{1,60,000 \times 2,50,000}$$

$$B = 2,00,000$$

**2011 - DECEMBER**

[19] The ratio Compounded of 4:5 and sub-duplicate of "a":9 is 8:15. Then Value of "a" is:

- (a) 2 (b) 3  
 (c) 4 (d) 5 (1 mark)

**Answer:**

(c) Sub duplicate ratio of a : 9 =  $\sqrt{a} : \sqrt{9}$ , Compound Ratio (C.R.) = 8:15

Compound Ratio of 4 : 5 and sub duplicate ratio of a : 9 is given by

$$\text{C.R} = \frac{4}{5} \times \frac{\sqrt{a}}{\sqrt{9}}$$

$$\frac{8}{15} = \frac{4}{5} \times \frac{\sqrt{a}}{\sqrt{9}}$$

**3.14****■ Solved Scanner CA Foundation Paper - 3A**

$$\sqrt{a} = \frac{8 \times 5 \times \sqrt{9}}{15 \times 4}$$

$$\sqrt{a} = \frac{8 \times 5 \times 3}{15 \times 4}$$

$$\sqrt{a} = 2$$

$$\text{On squaring } (\sqrt{a})^2 = 2^2$$

$$a = 4$$

[20] If  $\log_2 x + \log_4 x = 6$ , then the Value of x is :

(a) 16

(b) 32

(c) 64

(d) 128

(1 mark)

**Answer:**

(a) If  $\log_2 x + \log_4 x = 6$

$$\frac{\log x}{\log 2} + \frac{\log x}{\log 4} = 6$$

$$\frac{\log x}{\log 2} + \frac{\log x}{\log 2^2} = 6$$

$$\frac{\log x}{\log 2} + \frac{\log x}{2 \log 2} = 6$$

$$\frac{\log x}{\log 2} \left[ 1 + \frac{1}{2} \right] = 6$$

$$\frac{\log x}{\log 2} \times \frac{3}{2} = 6$$

$$\frac{\log x}{\log 2} = 6 \times \frac{2}{3}$$

$$\frac{\log x}{\log 2} = 4$$

$$\log x = 4 \log 2$$

$$\log x = \log 2^4$$

$$x = 2^4$$

$$x = 16$$

[21] If X Varies inversely as square of Y and given that Y = 2 for X = 1, then the Value of X for Y = 6 will be:

- (a) 3 (b) 9  
(c) 1/3 (d) 1/9 (1 mark)

**Answer:**

(d) Given x varies inversely as square of y

$$\text{i. e. } x \propto \frac{1}{y^2}$$

$$x = k \frac{1}{y^2}$$

$$x = \frac{k}{y^2} \dots \dots \dots (1)$$

Given x = 1, y = 2 then

$$1 = \frac{k}{(2)^2} \Rightarrow k = 1 \times 4 = 4$$

Now putting y = 6, k = 4 in equation (1)

$$x = \frac{4}{6^2}$$

$$x = \frac{4}{36} = \frac{1}{9}$$

2012 - JUNE

[22] The value of  $\frac{(3^{n+1} + 3^n)}{(3^{n+3} - 3^{n+1})}$  is equal to:

- (a) 1/5 (b) 1/6  
(c) 1/4 (d) 1/9 (1 mark)

**Answer:**

$$\begin{aligned} \text{(b)} \quad \frac{3^{n+1} + 3^n}{3^{n+3} - 3^{n+1}} &= \frac{3^n \cdot 3^1 + 3^n}{3^n \cdot 3^3 - 3^n \cdot 3^1} \\ &= \frac{3^n (3^1 + 1)}{3^n (3^3 - 3)} \end{aligned}$$

$$\begin{aligned}
 &= \frac{(3 + 1)}{(27 - 3)} \\
 &= \frac{4}{24} \\
 &= \frac{1}{6}
 \end{aligned}$$

[23] If  $\log_x y = 100$  and  $\log_2 x = 10$ , then the value of 'y' is :

- (a)  $2^{10}$
- (b)  $2^{100}$
- (c)  $2^{1,000}$
- (d)  $2^{10,000}$

(1 mark)

**Answer:**

(c) Given  $\log_x y = 100$  .....(1)

$\log_2 x = 10$ .....(2)

Multiply eq (1) & (2)

$$\log_x y \cdot \log_2 x = 100 \times 10$$

$$\frac{\log y}{\log x} \times \frac{\log x}{\log 2} = 1,000$$

$$\log y = 1,000 \log 2$$

$$\log y = \log 2^{1,000}$$

$$\Rightarrow y = 2^{1,000}$$

[24] Which of the numbers are not in proportion ?

- (a) 6, 8, 5, 7
- (b) 7, 3, 14, 6
- (c) 18, 27, 12, 18
- (d) 8, 6, 12, 9

(1 mark)

**Answer:**

(a) If say a, b, c, d are in proportion they bear a common ratio that is

$$\Rightarrow \frac{a}{b} = \frac{c}{d}$$

Option (A)  $\frac{6}{8} \neq \frac{5}{7}$



Option (B)  $\frac{7}{3} = \frac{14}{6}$

Option (C)  $\frac{18}{27} = \frac{12}{18}$

Option (D)  $\frac{8}{6} = \frac{12}{9}$

**2012 - DECEMBER**

[25] Find the value of x, if  $x(x)^{1/3} = (x^{1/3})^x$

- (a) 3 (b) 4  
(c) 2 (d) 6

(1 mark)

**Answer:**

(b) If  $x^1(x)^{1/3} = (x^{1/3})^x$

$$x^{1+1/3} = x^{\frac{1}{3}x}$$

$$\Rightarrow x^{4/3} = x^{\frac{1}{3}x}$$

on comparing

$$\frac{4}{3} = \frac{x}{3}$$

$$3x = 12 \Rightarrow x = 4$$

[26] Which of the following is true.

If  $\frac{1}{ab} + \frac{1}{bc} + \frac{1}{ca} = \frac{1}{abc}$

(a)  $\log(ab + bc + ca) = abc$  (b)  $\log\left(\frac{1}{a} + \frac{1}{b} + \frac{1}{c}\right) = abc$

(c)  $\log(abc) = 0$  (d)  $\log(a + b + c) = 0$  (1 mark)

**Answer:**

(d) Given

$$\frac{1}{ab} + \frac{1}{bc} + \frac{1}{ca} = \frac{1}{abc}$$



$$y = \sqrt[3]{6 \times 6 \times 6 \times 6 \times 6 \times 6}$$

$$y = 6 \times 6$$

$$y = 36$$

Putting  $y = 36$  in equation (1)

$$x = \frac{324}{36} = 9$$

$$x = 9, y = 36$$

2013 - JUNE

[28] For what value of  $x$ , the equation  $(\log_{\sqrt{x}} 2)^2 = \log_x^2$  is true?

(a) 16

(b) 32

(c) 8

(d) 4

(1 mark)

**Answer:**

(a) Given

~~$$(\log_{\sqrt{x}} 2)^2 = \log_x^2$$~~

~~$$\left(\frac{\log 2}{\log \sqrt{x}}\right)^2 = \left(\frac{\log 2}{\log x}\right)^2$$~~

~~$$\left(\frac{\log 2}{\log x^{1/2}}\right)^2 = \frac{\log 2}{\log x}$$~~

~~$$\left(\frac{\log 2}{\frac{1}{2} \log x}\right)^2 = \frac{\log 2}{\log x}$$~~

~~$$\left(\frac{2 \log 2}{\log x}\right)^2 = \left(\frac{\log 2}{\log x}\right)^2$$~~

~~$$4 \left(\frac{\log 2}{\log x}\right)^2 = \left(\frac{\log 2}{\log x}\right)^2$$~~

~~$$4 \frac{\log 2}{\log x} = 1$$~~

~~$$4 \log 2 = \log x$$~~

~~$$\log 2^4 = \log x$$~~

~~$$\Rightarrow 2^4 = x \Rightarrow x = 16$$~~

[29] The mean proportional between 24 and 54 is :  
 (a) 33 (b) 34  
 (c) 35 (d) 36 (1 mark)

**Answer:**  
 (d) Mean Proportion =  $\sqrt{24 \times 54}$   
 $= \sqrt{1296}$   
 $= 36$

[30] The triplicate ratio of 4 : 5 is:  
 (a) 125 : 64 (b) 16 : 25  
 (c) 64 : 125 (d) 120 : 46 (1 mark)

**Answer:**  
 (c) The triplicate Ratio of 4 : 5 =  $4^3 : 5^3$   
 $= 64 : 125$

**2013 - DECEMBER**

[31] If  $3\sqrt[3]{a} + 3\sqrt[3]{b} + 3\sqrt[3]{c} = 0$  then the value of  $\left(\frac{a+b+c}{3}\right)^3 = 0$   
 (a) abc (b) 9abc  
 (c)  $\frac{1}{abc}$  (d)  $\frac{1}{9abc}$  (1 mark)

**Answer:**  
 (a) If  $3\sqrt[3]{a} + 3\sqrt[3]{b} + 3\sqrt[3]{c} = 0$   
 $a^{1/3} + b^{1/3} + c^{1/3} = 0$   
 $a^{1/3} + b^{1/3} = -c^{1/3}$  ..... (i)

Cube on both side  
 $(a^{1/3} + b^{1/3})^3 = (-c^{1/3})^3$   
 $(a^{1/3})^3 + (b^{1/3})^3 + 3 \cdot a^{1/3} \cdot b^{1/3} (a^{1/3} + b^{1/3}) = -c$   
 $a + b + 3a^{1/3} \cdot b^{1/3} \cdot (-c^{1/3}) = -c$   
 $a + b - 3a^{1/3} \cdot b^{1/3} \cdot c^{1/3} = -c$   
 $a + b + c = 3a^{1/3} \cdot b^{1/3} \cdot c^{1/3}$   
 $\left(\frac{a+b+c}{3}\right) = \frac{3a^{1/3} \cdot b^{1/3} \cdot c^{1/3}}{3}$



**3.22** ■ *Solved Scanner* **CA Foundation Paper - 3A**

$$= \frac{2 \log 3}{2 \log 2} \cdot \frac{\log 2}{\log 3}$$

$$= 1$$

[34] The value of  $(\log_y x \cdot \log_z y \cdot \log_x z)^3$  is

- (a) 0
- (b) -1
- (c) 1
- (d) 3

(1 mark)

**Answer:**

(c)  $(\log_y x \cdot \log_z y \cdot \log_x z)^3$

$$= \left( \frac{\log x}{\log y} \cdot \frac{\log y}{\log z} \cdot \frac{\log z}{\log x} \right)^3$$

$$= (1)^3$$

$$= 1$$

[35] Divide 80 into two parts so that their product is maximum, then the numbers are:

- (a) 25, 55
- (b) 35, 45
- (c) 40, 40
- (d) 15, 65

(1 mark)

**Answer:**

(c) The sum of two No. = 80

First No. = x

Second No. = (80 - x)

Product two No = x. (80 - x)

$P = 80x - x^2$  ..... (1)

w.r.f. (x)

$\frac{dp}{dx} = 80 - 2x$  ..... (2)

$\frac{d^2p}{dx^2} = -2$  ..... (3)

For max/minima

$\frac{dp}{dx} = 0$

$80 - 2x = 0$

$2x = 80$

$x = 40$



$$\Rightarrow 25^{100} = x^{50}$$

$$\Rightarrow (5^2)^{100} = x^{50}$$

$$\Rightarrow 5^{200} = x^{50}$$

$$\Rightarrow (5^4)^{50} = x^{50}$$

$$\Rightarrow 5^4 = x$$

$$\Rightarrow x = 5^4$$

[38] The value of  $\left(\frac{y^a}{y^b}\right)^{a^2+ab+b^2} \times \left(\frac{y^b}{y^c}\right)^{b^2+bc+c^2} \times \left(\frac{y^c}{y^a}\right)^{c^2+ac+a^2}$  is equal to \_\_\_\_ .

(a)  $y$

(b)  $-1$

(c)  $1$

(d) None of these

(1 mark)

**Answer:**

$$\begin{aligned} \text{(c)} \quad & \left(\frac{y^a}{y^b}\right)^{a^2+ab+b^2} \left(\frac{y^b}{y^c}\right)^{b^2+bc+c^2} \cdot \left(\frac{y^c}{y^a}\right)^{c^2+ac+a^2} \\ &= (y^{a-b})^{a^2+ab+b^2} \cdot (y^{b-c})^{b^2+bc+c^2} \cdot (y^{c-a})^{c^2+ac+a^2} \\ &= y^{a^3-b^3} \cdot y^{b^3-c^3} \cdot y^{c^3-a^3} \\ &= y^{a^3-b^3+b^3-c^3+c^3-a^3} \\ &= y^0 = 1 \end{aligned}$$

[39] If the salary of P is 25% lower than that of Q and the salary of R is 20% higher than that of Q, the ratio of the salary of R and P will be:

(a)  $5 : 8$

(b)  $8 : 5$

(c)  $5 : 3$

(d)  $3 : 5$

(1 mark)

**Answer:**

(b) Let Salary of Q = 100

$$\begin{aligned} \text{Salary of P} &= 100 - 25\% \text{ of } 100 \\ &= 100 - 25 \\ &= 75 \end{aligned}$$

$$\begin{aligned} \text{Salary of R} &= 100 + 20\% \text{ of } 100 \\ &= 100 + 20 \\ &= 120 \end{aligned}$$

$$\text{Ratio of salary of R and P} = 120 : 75 = 8 : 5$$



[40] If  $x^2 + y^2 = 7xy$ , then  $\log \frac{1}{3}(x+y) = \underline{\hspace{2cm}}$ .

- (a)  $(\log x + \log y)$
- (b)  $\frac{1}{2} (\log x + \log y)$
- (c)  $\frac{1}{3} (\log x / \log y)$
- (d)  $\frac{1}{3} (\log x + \log y)$

(1 mark)

**Answer:**

(b) If  $x^2 + y^2 = 7xy$   
 $x^2 + y^2 + 2xy = 7xy + 2xy$   
 $(x + y)^2 = 9xy$   
 taking log on both side  
 $\log (x + y)^2 = \log 9xy$   
 $2 \log (x + y) = \log 9 + \log x + \log y$   
 $2 \log (x + y) = \log 3^2 + \log x + \log y$   
 $2 \log (x + y) = 2 \log 3 + \log x + \log y$   
 $2 \log (x + y) - 2 \log 3 = \log x + \log y$   
 $2 \left[ \log \frac{(x + y)}{3} \right] = \left[ \log \frac{(x + y)}{3} \right]$   
 $= \log x + \log y$   
 $\log \frac{(x + y)}{3} = \frac{1}{2} [\log x + \log y]$

[41] A person has assets worth ₹ 1,48,200. He wish to divide it amongst his wife, son and daughter in the ratio 3 : 2 : 1 respectively. From this assets, the share of his son will be:

- (a) ₹ 24,700
- (b) ₹ 49,400
- (c) ₹ 74,100
- (d) ₹ 37,050

(1 mark)

**Answer:**

(b) A person has Assets worth = ₹ 1,48,200  
 Ratio of share of wife, son & daughter  
 $= 3 : 2 : 1$   
 Sum of Ratio =  $3 + 2 + 1 = 6$

**3.26**■ *Solved Scanner* **CA Foundation Paper - 3A**

$$\begin{aligned}\text{Share of Son} &= \frac{2}{6} \times 1,48,200 \\ &= 49,400\end{aligned}$$

[42] If  $x = \log_{24} 12$ ,  $y = \log_{36} 24$  and  $z = \log_{48} 36$ , then  $xyz + 1 =$  \_\_\_\_\_

(a)  $2xy$ (b)  $2xz$ (c)  $2yz$ (d)  $2$ 

(1 mark)

**Answer:**

(c) If  $x = \log_{24} 12$ ,  $y = \log_{36} 24$  and  $z = \log_{48} 36$  then  
 $XYZ + 1$

$$= \log_{24} 12 \times \log_{36} 24 \times \log_{48} 36 + 1$$

$$= \frac{\log 12}{\log 24} \cdot \frac{\log 24}{\log 36} \cdot \frac{\log 36}{\log 48} + 1$$

$$= \frac{\log 12}{\log 48} + 1$$

$$= \frac{\log 12 + \log 48}{\log 48}$$

$$= \frac{\log(12 \times 48)}{\log 48}$$

$$= \frac{\log(576)}{\log 48}$$

$$= \frac{\log 24^2}{\log 48}$$

$$= \frac{2 \log 24}{\log 48}$$

$$= 2 \cdot \frac{\log 24}{\log 36} \cdot \frac{\log 36}{\log 48}$$

$$= 2 \cdot \log_{36} 24 \cdot \log_{48} 36$$

$$= 2 y z$$

2014 - DECEMBER

[43] If  $\log x = a + b$ ,  $\log y = a - b$  then the value of  $\log \frac{10x}{y^2} =$  \_\_\_\_\_.

- (a)  $1 - a + 3b$  (b)  $a - 1 + 3b$   
 (c)  $a + 3b + 1$  (d)  $1 - b + 3a$  (1 mark)

**Answer:****(a)** Given  $\log x = a + b$ ,  $\log y = a - b$ 

$$\begin{aligned} \log \left( \frac{10x}{y^2} \right) &= \log 10x - \log y^2 \\ &= \log 10 + \log x - 2\log y \\ &= 1 + (a + b) - 2(a - b) \\ &= 1 + a + b - 2a + 2b \\ &= 1 - a + 3b \end{aligned}$$

[44] If  $x = 1 + \log_p qr$ ,  $y = 1 + \log_q rp$  and  $z = 1 + \log_r pq$  then the value of

$$\frac{1}{x} + \frac{1}{y} + \frac{1}{z} =$$

- (a) 0 (b) 1  
 (c) -1 (d) 3 (1 mark)

**Answer:****(b)** If  $x = 1 + \log_p qr$ ,  $y = 1 + \log_q rp$ ,  $z = 1 + \log_r pq$ 

$$x = 1 + \frac{\log qr}{\log p}$$

$$x = \frac{\log p + \log qr}{\log p}$$

$$x = \frac{\log pqr}{\log p}$$

$$\frac{1}{x} = \frac{\log p}{\log pqr}$$

Similarly

$$\frac{1}{y} = \frac{\log q}{\log pqr}$$



2015 - JUNE

[46] A dealer mixes rice costing ₹ 13.84 per Kg. with rice costing ₹ 15.54 and sells the mixture at ₹ 17.60 per Kg. So, he earns a profit of 14.6% on his sale price. The proportion in which he mixes the two qualities of rice is:

- (a) 3 : 7 (b) 5 : 7  
(c) 7 : 9 (d) 9 : 11 (1 mark)

**Answer:**

(a) Let SP of mixture is ₹ 100

$$\begin{aligned} \text{Then Profit} &= 14.6\% \text{ of } 100 \\ &= 14.6 \end{aligned}$$

$$\begin{aligned} \text{CP of mixture} &= (100 - 14.6) \\ &= 85.4 \end{aligned}$$

$$\therefore \text{ If SP is ₹ 100 then CP} = 85.4$$

$$\therefore \text{ If SP is ₹ 1 then CP} = \frac{85.4}{100}$$

$$\begin{aligned} \therefore \text{ If SP is ₹ 17.60 then CP} &= \frac{85.4}{100} \times 17.60 \\ &= 15.0304 \end{aligned}$$

$$\therefore \text{ CP of the Mixture per kg} = ₹ 15.0304$$

$$\begin{aligned} 2^{\text{nd}} \text{ difference} &= \text{Profit by SP 1 kg of } 2^{\text{nd}} \text{ kind @ ₹ 15.0304} \\ &= 15.54 - 15.0304 \\ &= 0.5096 \end{aligned}$$

$$\begin{aligned} 1^{\text{st}} \text{ difference} &= ₹ 15.0304 - 13.84 \\ &= ₹ 1.1904 \end{aligned}$$

$$\begin{aligned} \text{The Require Ratio} &= (2^{\text{nd}} \text{ difference}) : (1^{\text{st}} \text{ difference}) \\ &= 0.5096 : 1.1904 \\ &= 3 : 7 \end{aligned}$$

[47] If  $p^x = q$ ,  $q^y = r$  and  $r^z = p^6$ , then the value of  $xyz$  will be:

- (a) 0 (b) 1  
(c) 3 (d) 6 (1 mark)

**3.30****Solved Scanner CA Foundation Paper - 3A****Answer:**

$$\begin{aligned}
 \text{(d) If } p^x = q, q^y = r \text{ and } r^z &= p^6 \\
 q = p^x, q^y = r \text{ and } r^z &= p^6 \\
 (q^y)^z &= p^6 \\
 [(p^x)^y]^z &= p^6 \\
 p^{xyz} = p^6 &= xyz = 6
 \end{aligned}$$

[48] If  $\log x = m + n$  and  $\log y = m - n$ , then  $\log (10x/y^2) =$ 

- (a)  $3n - m + 1$  (b)  $3m - n + 1$   
 (c)  $3n + n + 1$  (d)  $3m + n + 1$  (1 mark)

**Answer:****(a)**  $\log x = m + n$  and  $\log y = m - n$ 

$$\begin{aligned}
 \text{Then } \log \left( \frac{10x}{y^2} \right) &= \log 10x - \log y^2 \\
 &= \log 10 + \log x - 2 \log y \\
 &= 1 + \log x - 2 \log y \\
 &= 1 + (m + n) - 2(m - n) \\
 &= 1 + m + n - 2m + 2n \\
 &= 3n - m + 1
 \end{aligned}$$

[49] If  $15(2p^2 - q^2) = 7pq$ , where  $p$  and  $q$  are positive, then  $p : q$  will be:

- (a)  $5 : 6$  (b)  $5 : 7$   
 (c)  $3 : 5$  (d)  $8 : 3$  (1 mark)

**Answer:**

$$\begin{aligned}
 \text{(a) If } 15(2p^2 - q^2) &= 7pq \\
 30p^2 - 15q^2 &= 7pq \\
 30p^2 - 7pq - 15q^2 &= 0 \\
 30p^2 - 25pq + 18pq - 15q^2 &= 0 \\
 5p(6p - 5q) + 3q(6p - 5q) &= 0 \\
 (6p - 5q)(5p + 3q) &= 0 \\
 \text{If } 6p - 5q = 0 \text{ and } 5p + 3q &= 0 \\
 6p = 5q \quad 5p = -3q \\
 \frac{p}{q} = \frac{5}{6} = p : q = 5 : 6 \quad \frac{p}{q} = \frac{-3}{5} \\
 \text{(not possible)}
 \end{aligned}$$

2015 - DECEMBER

[50] The ratio of third proportion of 12, 30 to the mean proportion of 9, 25 is:

- (a) 2:1 (b) 5:1  
(c) 7:15 (d) 3:5

(1 mark)

**Answer:****(b)** The third proportion of 12,30

$$c = \frac{b^2}{a} = \frac{(30)^2}{12} = \frac{900}{12} = 75$$

The Mean proportion of 9,25

$$b = \sqrt{ac} = \sqrt{9 \times 25} = \sqrt{225} = 15$$

Ratio of third proportion of 12, 30  
and Mean proportion of 9, 25 = 75:15  
= 5:1

[51] The value of  $\log_5 3 \times \log_3 4 \times \log_2 5$ .

- (a) 0 (b) 1  
(c) 2 (d)  $\frac{1}{2}$

(1 mark)

**Answer:****(c)**  $\log_5 3 \times \log_3 4 \times \log_2 5$ 

$$= \frac{\log 3}{\log 5} \times \frac{\log 4}{\log 3} \times \frac{\log 5}{\log 2}$$

$$= \frac{\log 4}{\log 2}$$

$$= \frac{\log 2^2}{\log 2}$$

$$= \frac{2 \log 2}{\log 2} = 2$$

**3.32**■ *Solved Scanner* **CA Foundation Paper - 3A**

[52] What number must be added to each of the numbers 10, 18, 22, 38 to make the numbers is proportion?

- (a) 2 (b) 4  
(c) 8 (d) None of these. (1 mark)

**Answer:****(a)** Let  $x$  to be addedThen  $(10 + x)$ ,  $(18 + x)$ ,  $(22 + x)$ ,  $(38 + x)$  are in prop.

Product of Extremes = Product of Mean

$$(10 + x)(38 + x) = (18 + x)(22 + x)$$

$$380 + 10x + 38x + x^2 = 396 + 18x + 22x + x^2$$

$$48x + 380 = 396 + 40x$$

$$48x - 40x = 396 - 380$$

$$8x = 16$$

$$x = 2$$

[53] The value of  $\frac{2^n + 2^{n-1}}{2^{n+1} - 2^n}$  is :

- (a)  $\frac{1}{2}$  (b)  $\frac{3}{2}$   
(c)  $\frac{2}{3}$  (d) 2 (1 mark)

**Answer:**

$$(b) \frac{2^n + 2^{n-1}}{2^{n+1} - 2^n} = \frac{2^n + 2^n \cdot 2^{-1}}{2^n \cdot 2^1 - 2^n}$$

$$= \frac{2^n(1 + 2^{-1})}{2^n(2^1 - 1)}$$

$$= \frac{\left(\frac{1}{1} + \frac{1}{2}\right)}{(2 - 1)}$$

$$= \frac{\left(\frac{2 + 1}{2}\right)}{1}$$

$$= \left(\frac{3}{2}\right)$$



2016 - JUNE

- [54] The integral part of a logarithm is called \_\_\_\_\_ and the decimal part of a logarithm is called \_\_\_\_\_.
- (a) Mantissa, Characteristic      (b) Characteristic, Mantissa  
 (c) Whole, Decimal                  (d) None of these.                  (1 mark)

**Answer:**

- (b) The integral part of a logarithms is called **Characteristic** and the decimal part of a logarithm is called **mantissa**.

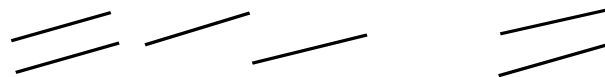
- [55] The value of  $\left[ \frac{x^2 - (y-z)^2}{(x+z)^2 - y^2} + \frac{y^2 - (x-z)^2}{(x+y)^2 - z^2} + \frac{z^2 - (x-y)^2}{(y+z)^2 - x^2} \right]$  is
- (a) 0    (b) 1  
 (c) -1    (d)  $\infty$     (1 mark)

**Answer:**

$$\begin{aligned}
 \text{(b)} \quad & \frac{x^2 - (y-z)^2}{(x+z)^2 - y^2} + \frac{y^2 - (x-z)^2}{(x+y)^2 - z^2} + \frac{z^2 - (x-y)^2}{(y+z)^2 - x^2} \\
 &= \frac{(x+y-z)(x-y+z)}{(x+z+y)(x+z-y)} + \frac{(y+x-z)(y-x+z)}{(x+y+z)(x+y-z)} + \frac{(z+x-y)(z-x+y)}{(y+z+x)(y+z-x)} \\
 &= \frac{x+y-z}{x+y+z} + \frac{y+z-x}{x+y+z} + \frac{z+x-y}{x+y+z} \\
 &= \frac{x+y-z + y+z-x + z+x-y}{x+y+z} \\
 &= \frac{x+y+z}{x+y+z} = 1
 \end{aligned}$$

- [56] X, Y, Z together starts a business. If X invests 3 times as much as Y invests and Y invests two third of what Z invests, then the ratio of capitals of X, Y, Z is:
- (a) 3:9:2    (b) 6:3:2  
 (c) 3:6:2    (d) 6:2:3    (1 mark)

**Answer:**



**3.34**■ *Solved Scanner* **CA Foundation Paper - 3A****(d)** Given  $x = 3y$  and  $y = \frac{2}{3}z$ 

$$\frac{x}{y} = \frac{3}{1} \text{ and } \frac{y}{z} = \frac{2}{3}$$

$$x : y = 3 : 1 \text{ and } y : z = 2 : 3$$

$$= 3 \times 2 : 1 \times 2$$

$$= 6 : 2$$

$$x : y : z = 6 : 2 : 3$$

[57] If  $\log_4(x^2 + x) - \log_4(x + 1) = 2$ , then the value of X is:

(a) 2

(b) 3

(c) 16

(d) 8

(1 mark)

**Answer:****(c)** If  $\log_4(x^2 + x) - \log_4(x + 1) = 2$ 

$$\Rightarrow \log_4 \left\{ \frac{(x^2 + x)}{(x + 1)} \right\} = 2$$

$$\Rightarrow \log_4 \left\{ \frac{x(x + 1)}{(x + 1)} \right\} = 2$$

$$\Rightarrow \log_4 x = 2$$

$$x = 4^2$$

$$x = 16$$

[58] Value of  $\frac{1}{\log_3^{60}} + \frac{1}{\log_4^{60}} + \frac{1}{\log_5^{60}}$  is :

(a) 0

(b) 1

(c) 5

(d) 60

(1 mark)

**Answer:**

$$\text{(b)} \quad \frac{1}{\log_3 60} + \frac{1}{\log_4 60} + \frac{1}{\log_5 60}$$

$$= \log_{60} 3 + \log_{60} 4 + \log_{60} 5$$

$$\because \left[ \frac{1}{\log_a b} = \log_b a \right]$$

$$\begin{aligned}
 &= \log_{60}(3 \times 4 \times 5) \\
 &= \log_{60} 60 \\
 &= 1
 \end{aligned}$$

2016 - DECEMBER

[59] If  $3^x = 5^y = 75^z$ , then

(a)  $x + y - z = 0$

(b)  $\frac{2}{x} + \frac{1}{y} = \frac{1}{z}$

(c)  $\frac{1}{x} + \frac{2}{y} = \frac{1}{z}$

(d)  $\frac{2}{x} + \frac{1}{z} = \frac{1}{y}$

(1 mark)

**Answer:**

(c) If  $3^x = 5^y = 75^z = k$  (let)

then  $3^x = k, 5^y = k, 75^z = k$

$$3 = k^{1/x}, 5 = k^{1/y}, 75 = k^{1/z}$$

we know that

$$75 = 3 \times 5 \times 5$$

$$k^{1/z} = k^{1/x} \cdot k^{1/y} \cdot k^{1/y}$$

$$k^{1/z} = k^{1/x + 1/y + 1/y}$$

on comparing

$$\frac{1}{z} = \frac{1}{x} + \frac{1}{y} + \frac{1}{y}$$

$$\frac{1}{z} = \frac{1}{x} + \frac{2}{y}$$

$$\frac{1}{x} + \frac{2}{y} = \frac{1}{z}$$

[60] If  $\log 2 = 0.3010$  and  $\log 3 = 0.4771$ , then the value of  $\log 24$  is:

(a) 1.0791

(b) 1.7323

(c) 1.3801

(d) 1.8301

(1 mark)

**Answer:**

**3.36****Solved Scanner CA Foundation Paper - 3A**

(c) If  $\log 2 = 0.3010$  and  $\log 3 = 0.4771$   
 then  $\log 24 = \log (2 \times 2 \times 2 \times 3)$   
 $= \log 2 + \log 2 + \log 2 + \log 3$   
 $= 3 \log 2 + \log 3$   
 $= 3 \times 0.3010 + 0.4771$   
 $= 0.9030 + 0.4771$   
 $= 1.3801$

[61] If  $abc = 2$ , then the value of  $\frac{1}{1+a+2b^{-1}} + \frac{1}{1+\frac{1}{2}b+c^{-1}} + \frac{1}{1+c+a^{-1}}$  is:

- (a) 1 (b) 2  
 (c) 3 (d)  $\frac{1}{2}$  (1 mark)

**Answer:**

(a) If  $abc = 2$

$$ab = \frac{2}{c} = 2c^{-1} \quad a = \frac{2}{bc} = 2b^{-1}c^{-1}$$

$$bc = \frac{2}{a} = 2a^{-1} \quad b = \frac{2}{ca} = 2c^{-1}a^{-1}$$

$$ca = \frac{2}{b} = 2b^{-1} \quad c = \frac{2}{ab} = 2a^{-1}b^{-1}$$

Given  $\frac{1}{1+a+2b^{-1}} + \frac{1}{1+\frac{1}{2}b+c^{-1}} + \frac{1}{1+c+a^{-1}}$

$$= \frac{1}{1+a+2b^{-1}} + \frac{2b^{-1}}{2b^{-1}(1+\frac{1}{2}b+c^{-1})} + \frac{a}{a(1+c+a^{-1})}$$

$$= \frac{1}{(1+a+2b^{-1})} + \frac{2b^{-1}}{2b^{-1}+1+2b^{-1}c^{-1}} + \frac{a}{a+ac+1}$$

$$= \frac{1}{1+a+2b^{-1}} + \frac{2b^{-1}}{2b^{-1}+1+a} + \frac{a}{a+2b^{-1}+1}$$

$$= \frac{1 + 2b^{-1} + a}{1 + a + 2b^{-1}}$$

$$= 1$$

[62] There are total 23 coins of ₹ 1, ₹ 2 and ₹ 5 in a bag. If their value is ₹ 43 and the ratio of coins of ₹ 1 and ₹ 2 is 3:2. Then the number of coins of ₹ 1 is:

- (a) 12 (b) 5  
(c) 10 (d) 14 (1 mark)

**Answer:**

(a) Total no. of coins = 23  
 Ratio of ₹ 1 coin : ₹ 2 coins = 3 : 2  
 let No. of ₹ 1 coins = 3x  
 No. of ₹ 2 coins = 2x  
 No. of ₹ 5 coins = 23 - 3x - 2x  
 = 23 - 5x

Total value of all coins = 43

$$3x \times 1 + 2x \times 2 + (23 - 5x) \times 5 = 43$$

$$3x + 4x + 115 - 25x = 43$$

$$-18x = 43 - 115$$

$$-18x = -72$$

$$x = \frac{-72}{-18} = 4$$

No. of ₹ 1 coins = 3x = 3 × 4 = 12

**2017 - JUNE**

[63] If a : b = 2 : 3, b : c = 4 : 5 and c : d = 6 : 7, then a : d is:

- (a) 24 : 35 (b) 8 : 15  
(c) 16 : 35 (d) 7 : 15 (1 mark)

**Answer:**

(c) a : b = 2 : 3 ⇒  $\frac{a}{b} = \frac{2}{3}$  \_\_\_\_\_(i)

**3.38**

■ <i>Solved Scanner</i> <b>CA Foundation Paper - 3A</b>
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$$b : c = 4 : 5 \Rightarrow \frac{b}{c} = \frac{4}{5} \text{ _____ (ii)}$$

$$c : d = 6 : 7 \Rightarrow \frac{c}{d} = \frac{6}{7} \text{ _____ (iii)}$$

Multiply equation (i) & (ii) & (iii)

$$\frac{a}{b} \times \frac{b}{c} \times \frac{c}{d} = \frac{2}{3} \times \frac{4}{5} \times \frac{6}{7} = \frac{16}{35}$$

[64] The value of  $\log (1^3 + 2^3 + 3^3 + \dots + n^3)$  is equal to:

(a)  $3 \log 1 + 3 \log 2 + \dots + 3 \log n$

(b)  $2 \log n + 2 \log (n+1) - 2 \log 2$

(c)  $\log n + \log (n+1) + \log (2n+1) - \log 6$

(d) 1

(1 mark)

**Answer:**

(b)  $\log (1^3 + 2^3 + 3^3 + \dots + n^3)$

$$= \log (On^3)$$

$$= \log \left[ \frac{n(n+1)}{2} \right]^2$$

$$= 2 \log \left[ \frac{n(n+1)}{2} \right]$$

$$= 2 [\log n + \log (n+1) - \log 2]$$

$$= 2 \log n + 2 \log (n+1) - 2 \log 2$$

[65] If  $a = \frac{\sqrt{6} + \sqrt{5}}{\sqrt{6} - \sqrt{5}}$  and  $b = \frac{\sqrt{6} - \sqrt{5}}{\sqrt{6} + \sqrt{5}}$  then the value of  $\frac{1}{a^2} + \frac{1}{b^2}$  is equal to:

(a) 480

(b) 482

(c) 484

(d) 486

(1 mark)

**Answer:**

(b) If  $a = \frac{\sqrt{6} + \sqrt{5}}{\sqrt{6} - \sqrt{5}}$  and  $b = \frac{\sqrt{6} - \sqrt{5}}{\sqrt{6} + \sqrt{5}}$

$$a + b = \frac{\sqrt{6} + \sqrt{5}}{\sqrt{6} - \sqrt{5}} + \frac{\sqrt{6} - \sqrt{5}}{\sqrt{6} + \sqrt{5}}$$

$$\begin{aligned}
 &= \frac{(\sqrt{6} + \sqrt{5})^2 + (\sqrt{6} - \sqrt{5})^2}{(\sqrt{6} - \sqrt{5})(\sqrt{6} + \sqrt{5})} \\
 &= \frac{6 + 5 + 2\sqrt{30} + 6 + 5 - 2\sqrt{30}}{(\sqrt{6})^2 - (\sqrt{5})^2} \\
 &= \frac{22}{6 - 5} = \frac{22}{1} = 22 \\
 a \cdot b &= \left( \frac{\sqrt{6} + \sqrt{5}}{\sqrt{6} - \sqrt{5}} \right) \left( \frac{\sqrt{6} - \sqrt{5}}{\sqrt{6} + \sqrt{5}} \right) = 1 \\
 \frac{1}{a^2} + \frac{1}{b^2} &= \frac{b^2 + a^2}{a^2 b^2} = \frac{(a + b)^2 - 2ab}{(ab)^2} \\
 &= \frac{(22)^2 - 2 \times 1}{(1)^2} = \frac{484 - 2}{1} = 482
 \end{aligned}$$

**2017 - DECEMBER**

[66] The ratio of the number of ₹ 5 coins and ₹ 10 coins is 8 : 15. If the value of ₹ 5 coins is ₹ 360, then the number of ₹ 10 coins will be:

- (a) 72 (b) 120  
 (c) 135 (d) 185 (1 mark)

**Answer:**

(c) Ratio of ₹ 5 coins and ₹ 10 coins = 8 : 15

$$\begin{aligned}
 \text{Let the No. of ₹ 5 coins} &= 8x \\
 \text{and the No. of ₹ 10 coins} &= 15x \\
 \text{The value of ₹ 5 coins} &= ₹ 5 \times 8x \\
 360 &= 40x \\
 x &= \frac{360}{40} \\
 x &= 9
 \end{aligned}$$

$$\begin{aligned}
 \text{No. of ₹ 10 coins} &= 15x \\
 &= 15 \times 9 \\
 &= 135
 \end{aligned}$$

[67] If  $\log_3 [\log_4 (\log_2 x)] = 0$ , then the value of 'x' will be:

- (a) 4 (b) 8  
(c) 16 (d) 32 (1 mark)

**Answer:**

(c) If  $\log_3 [\log_4 (\log_2 x)] = 0$

$$\log_4 (\log_2 x) = 3^0 \quad [\because \log_a b = x \Rightarrow b = a^x]$$

$$\log_4 (\log_2 x) = 1$$

$$\log_2 x = 4^1$$

$$\log_2 x = 4$$

$$x = 2^4$$

$$x = 16$$

[68] If  $\log \left( \frac{x-y}{2} \right) = \frac{1}{2} (\log x + \log y)$ , then the value of  $x^2 + y^2 =$  \_\_\_\_\_.

- (a) 2xy (b) 4xy  
(c)  $2x^2y^2$  (d) 6xy (1 mark)

**Answer:**

(d) If  $\log \left( \frac{x-y}{2} \right) = \frac{1}{2} (\log x + \log y)$

$$2 \log \left( \frac{x-y}{2} \right) = \log x + \log y$$

$$\log \left( \frac{x-y}{2} \right)^2 = \log (xy)$$

$$\Rightarrow \left( \frac{x-y}{2} \right)^2 = xy$$

$$\Rightarrow \left( \frac{x-y}{4} \right)^2 = xy$$

$$\Rightarrow x^2 + y^2 - 2xy = 4xy$$

$$\Rightarrow x^2 + y^2 = 4xy + 2xy$$

$$\Rightarrow x^2 + y^2 = 6xy$$



[69] If  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{5}$  and  $\frac{1}{x}$  are in proportion, then the value of 'x' will be:

(a)  $\frac{15}{2}$

(b)  $\frac{6}{5}$

(c)  $\frac{10}{3}$

(d)  $\frac{5}{6}$

(1 mark)

**Answer:**

(a) If  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{5}$ ,  $\frac{1}{x}$  are in proportion

then, product of extremes = Product of means

$$\frac{1}{2} \times \frac{1}{x} = \frac{1}{3} \times \frac{1}{5}$$

$$\frac{1}{2x} = \frac{1}{15}$$

$$2x = 15$$

$$x = 15/2$$

2018 - MAY

[70] 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)  $\frac{qp}{p-q}$

(d) None.

(1 mark)

**Answer:**

(d) Sub duplicate ratio of  $(p - x^2) : (q - x^2) = \sqrt{p - x^2} : \sqrt{q - x^2}$

$$p : q = \sqrt{p - x^2} : \sqrt{q - x^2}$$

$$\frac{P}{q} = \frac{\sqrt{p - x^2}}{\sqrt{q - x^2}}$$

an squaring both side

**3.42****Solved Scanner CA Foundation Paper - 3A**

$$\frac{p^2}{q^2} = \frac{p - x^2}{q - x^2}$$

$$p^2 (q - x^2) = q^2 (p - x^2)$$

$$p^2 q - p^2 x^2 = q^2 p - q^2 x^2$$

$$p^2 q - q^2 p = p^2 x^2 - q^2 x^2$$

$$pq (p - q) = (p^2 - q^2) x^2$$

$$pq (p - q) = (p + q)(p - q) x^2$$

$$x^2 = \frac{pq(p - q)}{(p + q)(p - q)}$$

$$x^2 = \frac{pq}{(p + q)}$$

[71] The value of the expression :

$$a^{\log_a b} \cdot \log_b^c \cdot \log_c^d \cdot \log_d t$$

(a) t

(b) abcdt

(c) (a + b + c + d + t)

(d) None

(1 mark)

**Answer:**

$$(a) a^{\log_a b} \cdot \log_b^c \cdot \log_c^d \cdot \log_d t$$

$$= a \frac{\log^b}{\log^a} \cdot \frac{\log^c}{\log^b} \cdot \frac{\log^d}{\log^c} \cdot \frac{\log^t}{\log^d}$$

$$= a \frac{\log^t}{\log^a}$$

$$= a \log_a^t \quad [ \because e^{\log_e x} = x ]$$

$$= t$$

[72] The mean proportional between 24 and 54 is:

(a) 33

(b) 34

(c) 35

(d) 36

(1 mark)

**Answer:**

$$(d) \text{ Mean proportion } b = \sqrt{ac}$$

$$= \sqrt{24 \times 54}$$

$$= \sqrt{1,296}$$

$$= 36$$

[73] The value of  $\log_4 9 \cdot \log_3 2$  is:

- (a) 3 (b) 2  
(c) 9 (d) 1

(1 mark)

**Answer:**

$$\begin{aligned} \text{(d)} \log_4 9 \cdot \log_3 2 &= \frac{\log 9}{\log 4} \cdot \frac{\log 2}{\log 3} \\ &= \frac{\log 3^2}{\log 2^2} \cdot \frac{\log 2}{\log 3} \\ &= \frac{2 \log 3}{2 \log 2} \cdot \frac{\log 2}{\log 3} \\ &= 1 \end{aligned}$$

[74]  $\frac{2^n + 2^{n-1}}{2^{n+1} - 2^n}$

- (a)  $\frac{1}{2}$   
(b)  $\frac{3}{2}$   
(c)  $\frac{2}{3}$   
(d)  $\frac{1}{3}$

(1 mark)

**Answer:**

$$\begin{aligned} \text{(b)} \frac{2^n + 2^{n-1}}{2^{n+1} - 2^n} &= \frac{2^n + 2^n \cdot 2^{-1}}{2^n \cdot 2^1 - 2^n} \\ &= \frac{2^n + (1 + 2^{-1})}{2^n \cdot (2 - 1)} \\ &= \frac{\left(1 + \frac{1}{2}\right)}{1} \end{aligned}$$

**3.44**■ *Solved Scanner* CA Foundation Paper - 3A

$$= \frac{3}{2}$$

$$= \frac{3}{1}$$

$$= \frac{3}{2}$$

**2018 - NOVEMBER**

[75]  $\frac{3x-2}{5x+6}$  is the duplicate ratio of  $\frac{2}{3}$  then find the value of x:

- (a) 2 (b) 6  
(c) 5 (d) 9

(1 mark)

**Answer:**

(b) ∴  $\frac{3x-2}{5x+6}$  is the duplicate ratio of  $\frac{2}{3}$

i.e.  $\frac{3x-2}{5x+6} = \frac{2^2}{3^2}$

$$\Rightarrow \frac{3x-2}{5x+6} = \frac{4}{9}$$

$$27x - 18 = 20x + 24$$

$$27x - 20x = 24 + 18$$

$$7x = 42$$

$$X = 6$$

[76]  $\frac{2^{m+1} \times 3^{2m-n+3} \times 5^{n+m+4} \times 6^{2n+m}}{6^{2m+n} \times 10^{n+1} \times 15^{m+3}}$

- (a)  $3^{2m-2n}$  (b)  $3^{2n-2m}$   
(c) 1 (d) None of the above

(1 mark)

**Answer:**

(c)  $\frac{2^{m+1} \times 3^{2m-n+3} \times 5^{n+m+4} \times 6^{2n+m}}{6^{2m+n} \times 10^{n+1} \times 15^{m+3}}$

$$= \frac{2^{m+1} \times 3^{2m-n+3} \times 5^{n+m+4} \times (2 \times 3)^{2n+m}}{(2 \times 3)^{2m+n} \times (2 \times 5)^{n+1} \times (3 \times 5)^{m+3}}$$

$$\begin{aligned}
 &= \frac{2^{m+1} \times 3^{2m-n+3} \times 5^{n+m+4} \times 2^{2n+m} \times 3^{2n+m}}{2^{2m+n} \times 3^{2m+n} \times 2^{n+1} \times 5^{n+1} \times 3^{m+3} \times 5^{m+3}} \\
 &= \frac{2^{m+1+2n+m} \times 3^{2m-n+3+2n+m} \times 5^{n+m+4}}{2^{2m+n+n+1} \times 3^{2m+n+m+3} \times 5^{n+1+m+3}} \\
 &= \frac{2^{2m+2n+1} \times 3^{3m+n+3} \times 5^{m+n+4}}{2^{2m+2n+1} \times 3^{3m+n+3} \times 5^{m+n+4}} = 1
 \end{aligned}$$

[77] If  $x : y : z = 7 : 4 : 11$  then  $\frac{x + y + z}{z}$  is:

- (a) 2 (b) 3  
(c) 4 (d) 5

(1 mark)

**Answer:**

(a) If  $x : y : z = 7 : 4 : 11$

Let  $x = 7k, y = 4k, z = 11k$

$$\frac{x + y + z}{z} = \frac{7k + 4k + 11k}{11k} = \frac{22k}{11k} = 2$$

[78]  $\log_2 \log_2 \log_2 16 = ?$

- (a) 0 (b) 3  
(c) 1 (d) 2

(1 mark)

**Answer:**

$$\begin{aligned}
 \text{(c)} \quad &\log_2 \log_2 \log_2^{16} \\
 &= \log_2 \log_2 (\log_2^{24}) \\
 &= \log_2 \log_2^4 \log_2^2 \\
 &= \log_2 \log_2^4 \quad (\because \log_2^2 = 1) \\
 &= \log_2 \log_2^{2^2} \\
 &= \log_2^2 \cdot \log_2^2 \\
 &= 1 \times 1 \\
 &= 1
 \end{aligned}$$

2019 - JUNE

- [79] If the ratio of two numbers is 7 : 11. If 7 is added to each number then the new ratio will be 2 : 3 then the numbers are.
- (a) 49, 77  
 (b) 42, 45  
 (c) 43, 42  
 (d) 39, 40
- (1 mark)

**Answer:****(a)** Ratio of two Numbers = 7 : 11

Let I<sup>st</sup> No = 7x

II<sup>nd</sup> No = 11x

Given Condition

$$(7x + 7) : (11x + 7) = 2 : 3$$

$$\frac{7x + 7}{11x + 7} = \frac{2}{3}$$

$$21x + 21 = 22x + 14$$

$$21 - 14 = 22x - 21x$$

$$7 = x$$

I<sup>st</sup> No = 7x = 7 × 7 = 49

II<sup>nd</sup> No = 11x = 11 × 7 = 77

- [80] If  $2^{x^2} = 3^{y^2} = 12^{z^2}$  then

(a)  $\frac{1}{x^2} + \frac{1}{y^2} = \frac{1}{z^2}$

(b)  $\frac{1}{x^2} + \frac{2}{y^2} = \frac{1}{z^2}$

(c)  $\frac{2}{x^2} + \frac{1}{y^2} = \frac{1}{z^2}$

(d) None

(1 mark)

**Answer:**

**(c)** If  $2^{x^2} = 3^{y^2} = 12^{z^2} = K$

$$2^{x^2} = K, 3^{y^2} = K, 12^{z^2} = K$$

$$2 = K^{\frac{1}{x^2}}, 3 = K^{\frac{1}{y^2}}, 12 = K^{\frac{1}{z^2}}$$

Now,

$$12 = 2 \times 2 \times 3$$

$$K^{\frac{1}{z^2}} = K^{\frac{1}{x^2}} \times K^{\frac{1}{x^2}} \times K^{\frac{1}{y^2}}$$

$$K^{\frac{1}{z^2}} = K^{\frac{1}{x^2} + \frac{1}{x^2} + \frac{1}{y^2}}$$

On comparing

$$\frac{1}{z^2} = \frac{1}{x^2} + \frac{1}{x^2} + \frac{1}{y^2}$$

$$\frac{1}{z^2} = \frac{2}{x^2} + \frac{1}{y^2}$$

[81] The value of

$$\log_5 \left( 1 + \frac{1}{5} \right) + \log_5 \left( 1 + \frac{1}{6} \right) + \dots + \log_5 \left( 1 + \frac{1}{624} \right)$$

- (a) 2
- (b) 3
- (c) 5
- (d) 0

(1 mark)

**Answer:**

$$\begin{aligned} \text{(b) If } & \log_5 \left( 1 + \frac{1}{5} \right) + \log_5 \left( 1 + \frac{1}{6} \right) + \dots + \log_5 \left( 1 + \frac{1}{624} \right) \\ &= \log \left( \frac{6}{5} \right) + \log \left( \frac{7}{6} \right) + \log \left( \frac{8}{7} \right) + \dots + \log \left( \frac{625}{624} \right) \\ &= \log_5 \left( \frac{6}{5} \times \frac{7}{6} \times \frac{8}{7} \times \dots \times \frac{624}{623} \times \frac{625}{624} \right) \\ &= \log_5 \left( \frac{625}{5} \right) \\ &= \log_5 (125) = \log_5 5^3 = 3 \log_5 5 \\ &= 3 \times 1 \\ &= 3 \end{aligned}$$

3.48

Solved Scanner CA Foundation Paper - 3A

[82]  $\log_{2\sqrt{2}}(512) : \log_{3\sqrt{2}} 324 =$

- (a) 128 : 81
- (b) 2 : 3
- (c) 3 : 2
- (d) None

(1 mark)

**Answer:**

$$\begin{aligned} \text{(c)} \quad \log_{2\sqrt{2}} 512 & : \log_{3\sqrt{2}} 324 \\ & = \frac{\log 512}{\log 2\sqrt{2}} : \frac{\log 324}{\log 3\sqrt{2}} \\ & = \frac{\log (8)^3}{\log \sqrt{2} \times 2 \times 2} : \frac{\log 18^2}{\log \sqrt{3} \times 3 \times 2} \\ & = \frac{\log (8)^3}{\log (8)^{1/2}} : \frac{\log (18)^2}{\log (18)^{1/2}} \\ & = \frac{3 \log 8}{1/2 \log 8} : \frac{2 \log 18}{1/2 \log 18} \\ & \quad (3 \times 2) : (2 \times 2) \\ & = 6 : 4 \\ & = 3 : 2 \end{aligned}$$

[83] If  $P = x^{1/3} + x^{-1/3}$  then  $P^3 = 3P =$

- (a) 3
- (b)  $\frac{1}{2} \left( x + \frac{1}{x} \right)$
- (c)  $\left( x + \frac{1}{x} \right)$
- (d)  $2 \left( x + \frac{1}{x} \right)$

(1 mark)

**Answer:**

(c) If  $P = x^{1/3} + x^{-1/3}$  then  $P^3 = 3P =$   
Given  $P = x^{1/3} + x^{-1/3}$  .....(1)  
Cube on both side  
 $P^3 = (x^{1/3} + x^{-1/3})^3$



$$P^3 = (x^{1/3})^3 + (x^{-1/3})^3 + 3x^{1/3} \cdot x^{-1/3} (x^{1/3} + x^{-1/3})$$

$$= x + x^{-1} + 3 \times 1 \times P$$

$$P^3 = x + \frac{1}{x} + 3P$$

$$P^3 - 3P = x + \frac{1}{x}$$

2019 - NOVEMBER

[84] The ratio of two numbers are 3 : 4. The difference of their squares is 28 Greater no. is:

- (a) 8
- (b) 12
- (c) 24
- (d) 64.

(1 mark)

**Answer:**

(a) Let the two numbers be x and y

Greater no.  $\Rightarrow$  y

Smaller no.  $\Rightarrow$  x

According to question,

$$\frac{x}{y} = \frac{3}{4} \quad \text{--- Eq 1}$$

and

$$y^2 - x^2 = 28 \quad \text{--- Eq 2}$$

Further solving Eq 1

$$x = \frac{3}{4}y \quad \text{--- Eq 3}$$

Put Eq 3 in Eq 2

$$y^2 - \left(\frac{3}{4}y\right)^2 = 28$$

$$\frac{y^2}{1} - \frac{9y^2}{16} = 28$$

**3.50**■ *Solved Scanner* CA Foundation Paper - 3A

$$\frac{7y^2}{16} = 28$$

$$y^2 = \frac{28 \times 16}{7}$$

$$y^2 = 64$$

$$\Rightarrow y = 8$$

{square root both sides}

So, the greater number i.e. y is equal to 8.

- [85] The price of scooter and moped are in the ratio 7 : 9. The price of moped is ₹ 1,600 more than that of scooter. Then the price of moped is:

- (a) ₹ 7,200  
(b) ₹ 5,600  
(c) ₹ 800  
(d) ₹ 700

(1 mark)

**Answer:**

(a)  $\frac{\text{Price of scooter}}{\text{Price of Moped}} = \frac{7}{9}$

Let; the price of scooter = 7x

and price of moped = 9x

According to question

$$9x = 7x + 1600$$

$$\Rightarrow 2x = 1600$$

$$\Rightarrow x = ₹ 800$$

So, price of moped = 9x = 9 (800) = ₹ 7200

- [86]  $\log_{0.01} 10,000 = ?$

- (a) 2  
(b) -2  
(c) 4  
(d) -4

(1 mark)

**Answer:**

(b)  $\log_{0.01} 10,000$

$$\Rightarrow \frac{\log 10,000}{\log 0.01} \text{ Since } \log_a b = \frac{\log b}{\log a}$$

$$\begin{aligned} &\Rightarrow \frac{\log (10)^4}{\log \left( \frac{1}{100} \right)} && \therefore \log a^n = n \log a \\ &\Rightarrow \frac{4 \times \log 10}{\log 1 - \log 100} && \therefore \log \left( \frac{b}{a} \right) = \log b - \log a \\ &\Rightarrow \frac{4 \times 1}{0 - \log (10)^2} && \log 10 = 1 \\ &\Rightarrow \frac{4}{-2 \log 10} = \frac{4}{-2 \times 1} = -2 && \log 1 = 0 \end{aligned}$$

[87] Value of  $\left[ \frac{9^{n+\frac{1}{4}} \cdot \sqrt{3 \cdot 3^n}}{3 \cdot \sqrt{3^{-n}}} \right]^{\frac{1}{n}}$

- (a) 9
- (b) 27
- (c) 81
- (d) 3

(1 mark)

**Answer:**

$$\begin{aligned} \text{(b)} &= \left[ \frac{9^{n+\frac{1}{4}} \cdot \sqrt{3^{(n+1)}}}{3 \cdot \sqrt{3^{-n}}} \right]^{\frac{1}{n}} \\ &= \left[ \frac{3^{2n+\frac{1}{2}} \cdot 3^{\frac{(n+1)}{2}}}{3 \cdot 3^{-n/2}} \right]^{\frac{1}{n}} \\ &= \left[ \frac{3^{2n+\frac{1}{2}+\frac{n}{2}+\frac{1}{2}}}{3^{1-n/2}} \right]^{\frac{1}{n}} \\ &= \left[ (3)^{\frac{5n}{2}+1-1+\frac{n}{2}} \right]^{\frac{1}{n}} \\ &= \left[ (3)^{\frac{6n}{2}} \right]^{\frac{1}{n}} \\ &= (3)^3 \\ &= 27 \end{aligned}$$

**3.52**■ *Solved Scanner* **CA Foundation Paper - 3A**

[88] 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

(1 mark)

**Answer:**

(a)  $x = \sqrt{3} + \frac{1}{\sqrt{3}}$  -----Equation (1)

$= (x - \sqrt{3}) = \frac{1}{\sqrt{3}}$  ----- Equation (2)  $\left(x - \frac{1}{\sqrt{3}}\right) = \sqrt{3}$  - Equation (3)

$$\left(x \frac{\sqrt{126}}{\sqrt{42}}\right) \left(x \frac{-1}{\left(x - \frac{2\sqrt{3}}{\sqrt{3}}\right)}\right)$$

$$\left(x \frac{-3\sqrt{14}}{\sqrt{3} \times \sqrt{14}}\right) \left(x \frac{-1}{\frac{x-1}{\sqrt{3}} - \frac{1}{\sqrt{3}}}\right)$$

$$(x - \sqrt{3}) \left(x \frac{-1}{\sqrt{3} - \frac{1}{\sqrt{3}}}\right)$$

{from Equation (2) &amp; (3)}

$$\frac{1}{\sqrt{3}} \times \left(x - \frac{\sqrt{3}}{2}\right)$$

$$\frac{1}{\sqrt{3}} x - \frac{1}{2}$$

$$\frac{1}{\sqrt{3}} \left(\sqrt{3} + \frac{1}{\sqrt{3}}\right) - \frac{1}{2}$$

$$1 + \frac{1}{3} - \frac{1}{2}$$

$$= \frac{5}{6}$$

2020 - NOVEMBER

[89] if  $a : b = 3 : 7$ , then  $3a + 2b : 4a + 5b = ?$

- (a) 23 : 47
- (b) 27 : 43
- (c) 24 : 51
- (d) 29 : 53

(1 mark)

**Answer:**

(a) If  $a : b = 3 : 7$

let  $a = 3k$ ,  $b = 7k$

$$\frac{3a + 2b}{4a + 5b} = \frac{3 \times 3k + 2 \times 7k}{4 \times 3k + 5 \times 7k} = \frac{9k + 14k}{12k + 35k}$$

$$= \frac{23k}{47k}$$

$$= 23 : 47$$

[90] if  $\log_a \sqrt{3} = 1/6$ , find the value of Q:

- (a) 9
- (b) 81
- (c) 27
- (d) 3

(1 mark)

**Answer:**

(c) If  $\log_a \sqrt{3} = \frac{1}{6}$

$$\sqrt{3} = a^{1/6}$$

$$a^{1/6} = \sqrt{3}$$

$$a^{1/6} = 3^{1/2}$$

$$a = (3^{1/2})^6$$

$$a = 3^3$$

$$a = 27$$

[91]  $\log 9 + \log 5$  is expressed as:

- (a)  $\log 4$
- (b)  $\log 9/5$
- (c)  $\log 5/9$
- (d)  $\log 45$

(1 mark)

**Answer:**

$$\begin{aligned} \text{(d)} \quad \log 9 + \log 5 &= \log (9 \times 5) \\ &= \log 45 \end{aligned}$$

$$\therefore [\log m + \log n = \log (m \times n)]$$

[92] if  $a : b = 9 : 4$ , then  $\sqrt{\frac{a}{b}} + \sqrt{\frac{b}{a}} = ?$

- (a)  $3/2$
- (b)  $2/3$
- (c)  $6/13$
- (d)  $13/6$

(1 mark)

**Answer:****(d)** If  $a : b = 9 : 4$ 

$$\text{let } a = 9k, b = 4k$$

$$\begin{aligned} \sqrt{\frac{a}{b}} + \sqrt{\frac{b}{a}} &= \sqrt{\frac{9k}{4k}} + \sqrt{\frac{4k}{9k}} \\ &= \frac{3}{2} + \frac{2}{3} = \frac{9+4}{6} = \frac{13}{6} \end{aligned}$$

[93] 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

(1 mark)

**Answer:****(a)** On calculator, we find that  $2/3 = 0.67$ Let the number added to each term of the ratio  $15 : 32$  be  $x$ .

Now, try the options.

Option (a) → 19

$$\frac{15 + 19}{32 + 19} = 0.67$$

Therefore, option (a) is the answer.

[94] Find the value of a from the following:

$$\sqrt{(9)}^{-5} \times \sqrt{(3)}^{-7} = \sqrt{(3)}^{-a}$$

- (a) 11
- (b) 13
- (c) 15
- (d) 17

(1 mark)

**Answer:**

$$(d) (\sqrt{9})^{-5} \times (\sqrt{3})^{-7} = (\sqrt{3})^{-a}$$

$$3^{-5} \times \left(3^{\frac{1}{2}}\right)^{-7} = \left(3^{\frac{1}{2}}\right)^{-a}$$

$$3^{-5} \times 3^{-\frac{7}{2}} = 3^{-\frac{a}{2}}$$

$$3^{-5-\frac{7}{2}} = 3^{-\frac{a}{2}}$$

$$3^{-\frac{10-7}{2}} = 3^{-\frac{a}{2}}$$

$$3^{-\frac{17}{2}} = 3^{-\frac{a}{2}}$$

$$-\frac{17}{2} = -\frac{a}{2}$$

$$a = 17$$

**3.56**■ *Solved Scanner* CA Foundation Paper - 3A

[95] Find the value of  $\frac{3t^{-1}}{t^{-1/3}}$

(a)  $\frac{3}{t^{2/3}}$

(b)  $\frac{3}{t^{3/2}}$

(c)  $\frac{3}{t^{1/3}}$

(d)  $\frac{3}{t^2}$

(1 mark)

**Answer:**

(a)  $\frac{3t^{-1}}{t^{-1/3}} = \frac{3}{t^{1-\frac{1}{3}}} = \frac{3}{t^{\frac{2}{3}}}$

[96] If  $\log_a(ab) = x$ , then  $\log_b(ab)$  is

(a)  $1/x$

(b)  $\frac{x}{1+x}$

(c)  $\frac{x}{x-1}$

(d) None of these

(1 mark)

**Answer:**

(c)  $\log_a(ab) = x$

$$\log_a a + \log_a b = x \text{ [As } \log_a m + \log_a n = \log_a mn]$$

$$1 + \log_a b = x$$

$$\log_a b = x - 1 \text{ ... Eq. (1)}$$

$$\text{We know that } \log_a b \times \log_b a = 1$$

Putting the value of  $\log_a b$  from eq. (1), we get:

$$(x - 1) \times \log_b a = 1$$

$$\log_b a = \frac{1}{x-1}$$



$$\log_a (ab) = \frac{\log_b(ab)}{\log_b a} \text{ [As per Base Change Formula]}$$

$$\log_b (ab) = \log_a (ab) \times \log_b a$$

$$\log_b (ab) = x \times \left( \frac{1}{x-1} \right) \left[ \text{As } \log_b (ab) = x \text{ and } \log_b a = \frac{1}{x-1} \right]$$

$$\log_a (ab) = \frac{x}{x-1}$$

- [97] 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
- (1 mark)

**Answer:**

$$(a) \frac{A}{B} = \frac{B}{C}$$

$$B^2 = A \times C$$

$$B = \sqrt{A \times C} = \sqrt{1,600 \times 2,500} = 2,000$$

- [98] The ratio of two quantities is 15 : 17. If the consequent of its inverse ratio is 15, then the antecedent is;
- (a) 15  
 (b)  $\sqrt{15}$   
 (c) 17  
 (d) 14
- (1 mark)

**Answer:**

$$(c) \text{ Inverse Ratio} = \frac{17}{15}$$

Therefore, antecedent = 17

- [99] The salaries of A, B and C are in the ratio 2 : 3 : 5. If increments of 15%, 10% and 20% are allowed respectively to their salary, then what will be the new ratio of their salaries?
- (a) 3 : 3 : 10  
(b) 10 : 11 : 20  
(c) 23 : 33 : 60  
(d) Cannot be determined (1 mark)

**Answer:**

- (c) Since the ratio of the salaries of A, B and C is 2 : 3 : 5, let the salaries be 200, 300, and 500 respectively.  
A's new salary =  $200 + (15\% \text{ of } 200) = 230$   
B's new salary =  $300 + (10\% \text{ of } 300) = 330$   
C's new salary =  $500 + (20\% \text{ of } 500) = 600$   
Therefore, clearly, the new ratio is 23 : 33 : 60.

**2021 - JULY**

- [100] The salaries of A, B, and C are in the ratio 2 : 3 : 5. If increments of 15%, 10% and 20% are allowed respectively to their salary, then what will be the new ratio of their salaries?
- (a) 23 : 33 : 60  
(b) 33 : 23 : 60  
(c) 23 : 60 : 33  
(d) 33 : 60 : 23 (1 mark)

**Answer:**

- (a) Since the ratio of the salaries of A, B and C is 2 : 3 : 5, let the salaries be 200, 300, and 500 respectively.  
A's new salary =  $200 + (15\% \text{ of } 200) = 230$   
B's new salary =  $300 + (10\% \text{ of } 300) = 330$   
C's new salary =  $500 + (20\% \text{ of } 500) = 600$   
Therefore, clearly, the new ratio is 23 : 33 : 60.

[101] If  $A : B = 5 : 3$ ,  $B : C = 6 : 7$  and  $C : D = 14 : 9$  then the value of  $A : B : C : D$  is:

- (a)  $20 : 14 : 12 : 9$
- (b)  $20 : 9 : 12 : 14$
- (c)  $20 : 9 : 14 : 12$
- (d)  $20 : 12 : 14 : 9$

(1 mark)

**Answer:**

(d) We have  $\frac{A}{B} = \frac{5}{3}$  and  $\frac{B}{C} = \frac{6}{7}$ .

To make the Bs same, let's multiply  $\frac{A}{B} = \frac{5}{3}$  with  $\frac{2}{2}$

Now,  $\frac{A}{B} = \frac{5}{3} \times \frac{2}{2} = \frac{10}{6}$  and  $\frac{B}{C} = \frac{6}{7}$ .

Also, we have  $\frac{C}{D} = \frac{14}{9}$ .

To make the Cs same, let's multiply  $\frac{B}{C} = \frac{6}{7}$  with  $\frac{2}{2}$ .

Therefore,  $\frac{B}{C} = \frac{6}{7} \times \frac{2}{2} = \frac{12}{14}$ .

Now, we have  $\frac{A}{B} = \frac{10}{6}$ ;  $\frac{B}{C} = \frac{12}{14}$ ;  $\frac{C}{D} = \frac{14}{9}$ .

Again, to make the Bs same, let's multiply  $\frac{A}{B} = \frac{10}{6}$  with  $\frac{2}{2}$ .

Therefore,  $\frac{A}{B} = \frac{10}{6} \times \frac{2}{2} = \frac{20}{12}$ .

So, now we have  $\frac{A}{B} = \frac{20}{12}$ ;  $\frac{B}{C} = \frac{12}{14}$ ;  $\frac{C}{D} = \frac{14}{9}$ .

Therefore,  $A : B : C : D = 20 : 12 : 14 : 9$

[102] A vessel contained a solution of acid and water in which water was 64%. Four litres 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 litres) of the solution, in the beginning, was

- (a) 12
- (b) 36

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(c) 24

(d) 2

(1 mark)

**Answer:****(c)** Let the initial total volume be  $V$ .Water =  $0.64V$ ; Acid =  $0.36V$ 

Now, 4 litres were taken out.

Remaining Water =  $0.64V - (0.64 \times 4) = 0.64V - 2.56$ Remaining Acid =  $0.36V - (0.36 \times 4) = 0.36V - 1.44$ To the above, 4 litres of water was added. Therefore, the total volume of the vessel would be  $V - 4\text{litres} + 4\text{ litres} = V$ .

Now, it is given that this resulting solution contains 30% of acid.

Therefore,  $\frac{0.36V - 1.44}{V} = 0.30$ 

$$\Rightarrow 0.36V - 1.44 = 0.30V$$

$$\Rightarrow 0.36V - 0.30V = 1.44$$

$$\Rightarrow 0.06V = 1.44$$

$$\Rightarrow V = \frac{1.44}{0.06} = 24$$

[103] If  $xy + yz + zx = -1$  then the value of  $\left( \frac{x+y}{1+xy} + \frac{z+y}{1+zy} + \frac{x+z}{1+zx} \right)$  is:

(a)  $xyz$ (b)  $\frac{-1}{yz}$ (c)  $\frac{1}{xyz}$ (d)  $\frac{1}{x+y+z}$ 

(1 mark)

**Answer:****(c)** Given  $xy + yz + zx = -1$ This means  $1 + xy = -yz - zx \dots$  Eq. (1) $1 + yz = -xy - zx \dots$  Eq. (2) $1 + zx = -xy - yz \dots$  Eq. (3)

$$\frac{x+y}{1+xy} + \frac{z+y}{1+zy} + \frac{x+z}{1+zx}$$

Substituting the values of  $1 + xy$ ,  $1 + zy$ , and  $1 + zx$  above from Eqs. (1), (2), and (3), we get:

$$\begin{aligned} & \frac{x+y}{-yz-zx} + \frac{z+y}{-xy-zx} + \frac{x+z}{-xy-yz} \\ \Rightarrow & \frac{x+y}{-z(y+x)} + \frac{z+y}{-x(y+z)} + \frac{x+z}{-y(x+z)} \\ \Rightarrow & \frac{-1}{z} + \frac{-1}{x} + \frac{-1}{y} \\ \Rightarrow & -\left(\frac{1}{z} + \frac{1}{x} + \frac{1}{y}\right) \\ \Rightarrow & -\left(\frac{xy+yz+zx}{xyz}\right) \\ \Rightarrow & -\left(\frac{-1}{xyz}\right) \\ \Rightarrow & \frac{1}{xyz} \end{aligned}$$

[104] If  $\log_4 x + \log_{16} x + \log_{64} x + \log_{256} x = \frac{25}{6}$  then the value of  $x$  is

- (a) 64
- (b) 4
- (c) 16
- (d) 2

(1 mark)

**Answer:**

$$\begin{aligned} \text{(c)} \quad & \log_4 x + \log_{16} x + \log_{64} x + \log_{256} x = \frac{25}{6} \\ \Rightarrow & \log_{2^2} x + \log_{2^4} x + \log_{2^6} x + \log_{2^8} x = \frac{25}{6} \\ \Rightarrow & \frac{1}{2} \log_2 x + \frac{1}{4} \log_2 x + \frac{1}{6} \log_2 x + \frac{1}{8} \log_2 x = \frac{25}{6} \end{aligned}$$

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$$\Rightarrow \log_2 x \left( \frac{1}{2} + \frac{1}{4} + \frac{1}{6} + \frac{1}{8} \right) = \frac{25}{6}$$

$$\Rightarrow \log_2 x \left( \frac{12+6+4+3}{24} \right) = \frac{25}{6}$$

$$\Rightarrow \log_2 x \left( \frac{25}{24} \right) = \frac{25}{6}$$

$$\Rightarrow \log_2 x = \frac{25}{6} \times \frac{24}{25}$$

$$\Rightarrow \log_2 x = 4$$

$$\Rightarrow x = 2^4 = 16$$

**2021 - DECEMBER**

[105] Let  $a = (\sqrt{5} + \sqrt{3})/(\sqrt{5} - \sqrt{3})$  and  $b = (\sqrt{5} - \sqrt{3})/(\sqrt{5} + \sqrt{3})$ . What is the value of  $a^2 + b^2$ ?

- (a) 64
- (b) 62
- (c) 60
- (d) 254

(1 mark)

**Answer:**

$$(b) \ a = \frac{\sqrt{5} + \sqrt{3}}{\sqrt{5} - \sqrt{3}} = \frac{3.9681}{0.5040} = 7.8732$$

$$b = \frac{\sqrt{5} - \sqrt{3}}{\sqrt{5} + \sqrt{3}} = \frac{0.5040}{3.9681} = 0.1270$$

$$a^2 + b^2 = (7.8732)^2 + (0.1270)^2 = 62$$

[106] 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 (1 mark)

**Answer:**

- (d) Let the incomes of R and S be in  $7x$  and  $9x$  respectively, and their expenditures be  $4y$  and  $5y$  respectively.

$$\text{Savings of R} = 7x - 4y$$

$$\text{Savings of S} = 9x - 5y$$

Also, it is given that their total expenditures is equal to the income of R.

$$\text{Therefore, } 4y + 5y = 7x$$

$$\Rightarrow 9y = 7x$$

$$\Rightarrow x = \frac{9y}{7} \dots \text{Eq. (1)}$$

$$\text{Ratio of their expenditures} = \frac{7x - 4y}{9x - 5y}$$

Putting the value of  $x = \frac{9y}{7}$  from Eq. (1)

above:

$$\frac{7\left(\frac{9y}{7}\right) - 4y}{9\left(\frac{9y}{7}\right) - 5y}$$

$$= \frac{5y}{\frac{81y}{7} - 5y}$$

$$= \frac{5y}{\frac{81y - 35y}{7}}$$

$$= \frac{5y}{\frac{46y}{7}}$$

$$= \frac{7 \times 5y}{46y}$$

$$= \frac{35}{46}$$

- [107] A bag contains 105 coins containing some 50 paise, and 25 paise coins. The ratio of the number of these coins is 4 : 3 . The total value (in ₹) in the bag is
- (a) 43.25  
 (b) 41.25  
 (c) 39.25  
 (d) 35.25

(1 mark)

**Answer:**

(b) No. of 50 paise coins =  $\frac{4}{7} \times 105 = 60$

No. of 25 paise coins =  $\frac{3}{7} \times 105 = 45$

Value of 1 50-paise coin = ₹ 0.50

Therefore, value of 60 50-paise coins =  $60 \times ₹ 0.50 = ₹ 30$

Value of 1 25-paise coin = ₹ 0.25

Therefore, value of 45 25-paise coins =  $45 \times ₹ 0.25 = ₹ 11.25$

Therefore, total value = ₹ 30 + ₹ 11.25 = ₹ 41.25

- [108] If  $\log_{10} 3 = x$  and  $\log_{10} 4 = y$ , then the value of  $\log_{10} 120$  can be expressed as
- (a)  $x - y + 1$   
 (b)  $x + y + 1$   
 (c)  $x + y - 1$   
 (d)  $2x + y - 1$

(1 mark)

**Answer:**

(b)  $\log_{10} 120 = \log_{10} (3 \times 4 \times 10)$   
 $= \log_{10} 3 + \log_{10} 4 + \log_{10} 10$   
 $= x + y + 1$

- [109] Find the value of  $\log(x^6)$ , if  $\log(x) + 2 \log(x^2) + 3 \log(x^3) = 14$ .
- (a) 3  
 (b) 4  
 (c) 5  
 (d) 6

(1 mark)



**Answer:**

$$\begin{aligned}
 \text{(d)} \quad & \log(x) + 2 \log(x^2) + 3 \log(x^3) = 14 \\
 & \Rightarrow \log x + (2 \times 2) \log x + (3 \times 3) \log x = 14 \\
 & \Rightarrow \log x + 4 \log x + 9 \log x = 14 \\
 & \Rightarrow 14 \log x = 14 \\
 & \Rightarrow \log x = \frac{14}{14} = 1
 \end{aligned}$$

$$\text{Log}(x^6) = 6 \log x = 6 \times 1 = 6$$

[110] 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

(1 mark)

**Answer:**

(c) We can see that none of the options are in terms of  $n$ . This means that  $n$  is ultimately going to get cancelled out. Therefore, we can take any value and put it in place of  $n$ , and we'll get the same answer. For the sake of simplicity, let  $n = 1$ .

Now,

$$\begin{aligned}
 & \frac{6^{n+4} + 3^{n+3} \times 2^{n+3}}{5 \times 6^n + 6^n} \\
 &= \frac{6^{1+4} + 3^{1+3} \times 2^{1+3}}{5 \times 6^1 + 6^1} \\
 &= \frac{6^5 + 3^4 \times 2^4}{5 \times 6 + 6} \\
 &= \frac{7,776 + 81 \times 16}{30 + 6} \\
 &= \frac{7,776 + 1,296}{36}
 \end{aligned}$$

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$$= \frac{9,072}{36}$$
$$= 252$$

- [111] 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
- (1 mark)

**Answer:**

- (b) Let the initial number of males and females be  $3x$  and  $2x$  respectively.

As per the question,  $\frac{3x+2}{2x+5} = \frac{1}{1}$

$$\Rightarrow 3x + 2 = 2x + 5$$

$$\Rightarrow 3x - 2x = 5 - 2$$

$$\Rightarrow x = 3$$

Therefore, initial number of females =  $2 \times 3 = 6$

- [112] If,  $\left(\frac{3a}{2b}\right)^{2x-4} = \left(\frac{2b}{3a}\right)^{2x-4}$ , for some  $a$  and  $b$ , then the value of  $x$  is

- (a) 8  
(b) 6  
(c) 4  
(d) 2
- (1 mark)

**Answer:**

- (d) Looking at the options, you'll find that if  $x$  is 2, then the power of the LHS as well as RHS will become 0. Therefore, LHS and RHS both will be 1, and hence, be equal.

[113] The value of  $\left(1 - \sqrt[3]{0.027} \left(\frac{5}{6}\right) \left(\frac{1}{2}\right)^2\right)$  is:

- (a) 11/16
- (b) 13/16
- (c) 15/16
- (d) 1

(1 mark)

**Answer:**

$$\begin{aligned}
 \text{(c)} \quad & \left(1 - \sqrt[3]{0.027} \left(\frac{5}{6}\right) \left(\frac{1}{2}\right)^2\right) \\
 &= \left(1 - \sqrt[3]{\frac{27}{1000}} \left(\frac{5}{6}\right) \left(\frac{1}{4}\right)\right) \\
 &= \left(1 - \sqrt[3]{\frac{27}{1000}} \left(\frac{5}{24}\right)\right) \\
 &= \left(1 - \left(\frac{3}{10}\right) \left(\frac{5}{24}\right)\right) \\
 &= \left(1 - \left(\frac{1}{2} \times \frac{1}{8}\right)\right) \\
 &= 1 - \frac{1}{16} \\
 &= \frac{16 - 1}{16} = \frac{15}{16}
 \end{aligned}$$

Alternatively,

On calculator, calculate  $\sqrt[3]{0.027}$ , or  $(0.027)^{\frac{1}{3}}$ . Follow the following steps.

First, enter 0.027 on the calculator, then press the square root button 12 times. You'll get 0.99911857266.

Then, from this, subtract 1, i.e., press - 1.

You'll get - 0.00088142734.

Then, multiply this number with the power, i.e., 1/3. Press  $\times 1 \div 3 =$ . You'll get - 0.00029380911.

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Then add 1 to it, i.e., press + 1. You'll get 0.99970619089.  
Then press the buttons ( $\times =$ ) 12 times. You'll get 0.30010617315.

This is  $(0.027)^{\frac{1}{3}}$ .

Now, multiply this number with  $\left\{\frac{5}{6} \left(\frac{1}{2}\right)^2\right\}$ .

You'll get 0.0625221194. Then press M+.

This will save this number in the memory of your calculator.

Then press 1 - MRC =. You'll get 0.9374778806.

This is your final answer.

Now, try the options.

Option (a)  $\rightarrow 11/16$

$$11 \div 16 = 0.6875 \neq 0.9375$$

Option (b)  $\rightarrow 13/16$

$$13 \div 16 = 0.8125 \neq 0.9375$$

Option (c)  $\rightarrow 15/16$

$$15 \div 16 = 0.9375$$

Therefore, option (c) is the answer.

**2022 - JUNE**

[114]  $\log \left(\frac{p^2}{qr}\right) + \log \left(\frac{q^2}{pr}\right) + \log \left(\frac{r^2}{pq}\right)$  is:

(a) pqr

(b) 0

(c) 1

(d) None

(1 mark)

**Answer:**

(b)  $\log \left(\frac{p^2}{qr}\right) + \log \left(\frac{q^2}{pr}\right) + \log \left(\frac{r^2}{pq}\right)$

$$= \log \left(\frac{p^2}{qr} \times \frac{q^2}{pr} \times \frac{r^2}{pq}\right)$$

$$= \log \left(\frac{p^2 q^2 r^2}{p^2 q^2 r^2}\right)$$

$$= \log 1$$

- = 0
- [115]  $\log_{\sqrt{3}} a = 6$  base a, then 'a' will be:  
 (a) 27 (b) 36  
 (c) 15 (d) 1 (1 mark)

**Answer:**

(a) Here  $\log_{\sqrt{3}} a = 6$  ( $\because \log_a b = n \Rightarrow b = a^n$ )

$$\Rightarrow a = (\sqrt{3})^6$$

$$\Rightarrow a = (3^{1/2})^{6 \times 2}$$

$$a = 3^6$$

$$a = 27$$

- [116] A box contains 25 paise coins and '10' paise coins and 5 paise coins in ratios 3:2:1 and total money is ₹40. How many '5' paise coins are there?  
 (a) 65 (b) 55  
 (c) 40 (d) 50 (1 mark)

**Answer:**

(c) The Ratio of No. of 25p coins, 10p coins and 5p coins = 3:2:1

Let No. of 25p coins = 3x

No. of 10p coins = 2x

No. of 5p coins = x

Total value of all coins = 4000 paise

$$25p \times 3x + 10p \times 2x + 5p \times x = 4000 \text{ p}$$

$$(75x + 20x + 5x)p = 4000 \text{ p}$$

$$100x = 4000$$

$$x = \frac{4000}{100}$$

$$x = 40$$

No. of 5 paise coins = x = 40

- [117] If  $x : y = 4 : 6$  and  $z : x = 4 : 16$  find Y?  
 (a) 4 (b) 6  
 (c) 16 (d) 1 (1 mark)

**Answer:**

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- (b) If  $x:y = 4:6$  and  $z:x = 4:16$  find  $y$   
 $\Rightarrow z:x = 1:4$   
 so,  $y:x = 6:4$  and  $x:z = 4:1$   
 $y:x:z = 6:4:1$   
 so,  $y = 6$

[118] If  $(\sqrt{3})^{18} = (\sqrt{9})^x$ , find  $x$ ?

- (a) 18 (b) 9  
 (c) 8 (d) 19

(1 mark)

**Answer:**

(b) If  $(\sqrt{3})^{18} = (\sqrt{9})^x$

$$\left(\frac{1}{3^{\frac{1}{2}}}\right)^{18} = (3)^x$$

$$3^9 = 3^x$$

On comparing  
 $9 = x$

[119]  $\log_{\sqrt{2}} 64$  is equal to:

- (a) 12 (b) 6  
 (c) 1 (d) 8

(1 mark)

**Answer:**

(a)  $\log_{\sqrt{2}} 64 = \frac{\log 64}{\log \sqrt{2}} = \frac{\log 2^6}{\log (2)^{\frac{1}{2}}} = \frac{6 \log 2}{\frac{1}{2} \log 2} = 6 \times 2 = 12$

**2022 - DECEMBER**

[120] If  $\log_{10} 2 = y$  and  $\log_{10} 3 = x$ , then the value of  $\log_{10} 15$  is:

- (a)  $x - y + 1$  (b)  $x + y + 1$   
 (c)  $x - y - 1$  (d)  $y - x + 1$

(1 mark)

**Answer:**

(a) Here,  $\log_{10} 2 = y$  and  $\log_{10} 3 = x$   
 then  $\log_{10} 15 = \log_{10} (3 \times 5)$   
 $= \log_{10} 3 + \log_{10} 5$   
 $= \log_{10} 3 + \log_{10} (10/2)$



[123] By simplifying  $(2a^3 b^4)^6 / (4a^3 b)^2 \times (a^2 b^2)$ , the answer will be:

(a)  $4a^2 b^3$

(b)  $4a^6 b^4$

(c)  $4a^{10} b^{10}$

(d)  $4a^{10} b^{20}$

(1 mark)

**Answer:**

$$\begin{aligned} \text{(d) Here, } \frac{(2a^3 b^4)^6}{(4a^3 b)^2 \times (a^2 b^2)} &= \frac{2^6 a^{18} b^{24}}{(4^2 a^6 b^2 \times a^2 b^2)} \\ &= \frac{64 a^{18} b^{24}}{16 a^8 b^4} \\ &= 4a^{10} \cdot b^{20} \end{aligned}$$

[124] 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

(1 mark)

**Answer:**

(d) Here, Total men = 400, No. of days = 31

Total No. of unit of food for 400 men in 31 days  
 $= 400 \times 31 = 12400$  unit

Total No. of unit of food for 400 men in 28 days  
 $= 400 \times 28 = 11200$  unit

Rest food  $= 12400 - 11200 = 1200$  unit

Remain men after 28 days  $= 400 - 280 = 120$

No. of days for which the remaining food will be sufficient

$$= \frac{\text{Total Rest food}}{\text{No. of Remaining men}}$$

$$= \frac{1200}{120}$$

$$= 10 \text{ days}$$



