MATHS

BOOKS - CALCUTTA BOOK HOUSE MATHS (BENGALI ENGLISH)

RATIO AND PROPORTION

Examples Very Short Answer Type Questions Multiple Choice Questions

1. The ratio between the quantities 6 months and 1 year 8 months is -

A. $2:5$

B. $3:10$

C. $10:3$

D. $5:2$

Answer: B

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2. The mixed ratio of the ratios $\frac{x}{y}:z, \frac{y}{z}:x$ and $\frac{z}{a}:y$ is

A. $1:xyz$

B. $xyz:1$

C. $x^2y^2z^2:1$

D. $1:x^2y^2z^2$.

Answer: A

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3. The compound ratio of the inverse ratios of the ratios $\frac{bc}{a}:a^2, \frac{ca}{b}:b^2$ and $\frac{ab}{c}:c^2$ is -

A. $1 : abc$

B. $1 : a^2b^2c^2$

C. $a : a^3b^3c^3$

D. $abc : 1$

Answer: D

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4. If $A : B = 3 : 4, B : C = 5 : 6$ and $C : D = 7 : 8,$ then $A : D =$

A. $3 : 8$

B. $35 : 64$

C. $8 : 3$

D. $64 : 35$

Answer: B

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Examples Very Short Answer Type Questions True Or False

1. Write True or false :

(a) The duplicate ratio of 1 : ab is $1 : a^2b^2$

(b) The sub-duplicate ratio of 4:9 is 3:2.

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Examples Very Short Answer Type Questions Fill In The Blanks

1. Fill in the blanks :

(a) The triplicate ratio of $2^{\frac{1}{3}} : 3^{\frac{1}{3}}$ is _____

(b) The sub - triplicate ratio of $8 : 27$ is _____

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Examples Short Answer Type Questions

1. Express the following quantities as a ratio . Also write which of them are ratios of equality, which are ratios of greater inequalities and which are ratios of less inequalities :

(a) 4 months and 1 year 6 months , (b) 75 paise and 1 rupes 25 paise.

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2. Find the mixed ratios of the ratios $\frac{a}{b}:c, \frac{b}{c}:a, \frac{c}{a}:b.$

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3. Calculate what ratio and $x^2:yz$ will form the mixed ratio $xy:z^2$.

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4. Find the compound ratio of the inverse ratios of the ratios $x^2 : \frac{yz}{x}, y^2 : \frac{zx}{y}$ and $z^2 : \frac{xy}{z}$.

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5. Find the compound ratio of the ratios $(x+y):(x-y), \left(x^2+y^2\right):(x+y)^2$ and $\left(x^2-y^2\right)^2 : \left(x^4-y^4\right)$.

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6. If $A:B = 2:3, B:C = 4:5$ and $C:D = 6:7$, then find $A:D$.

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7. If $x:y = 2:3, y:z = 4:7$, then find $x:y:z$.

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8. If $x : y = 3 : 4$, then find $(3y - x) : (2x + y)$.

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9. If $p : q = 5 : 7$ and $p - q = -4$, then find the value of $(3p + 4q)$.

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10. If $(5x - 3y) : (2x + 4y) = 11 : 12$, then find $x : y$.

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11. If $(10x + 3y) : (5x + 2y) = 9 : 5$, then show that $(2x + y) : (x + 2y) = 11 : 13$.

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12. What term should be subtracted each of the ratio $a:b$ to make the ratio $m:n$?

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13. What term should be added to antecedent and subtracted from consequent of ratio $4:7$to make a compound ratio of $2:3 \text{ and } 5:4$?

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14. If $\frac{a}{2}=\frac{b}{3}=\frac{c}{4}=\frac{2a-3b+4c}{p}$, then find the value of P .

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15. If $\frac{3x-5y}{3x+5y}=\frac{1}{2}$. Then find the value of $\frac{3x^2-5y^2}{3x^2+5y^2}$.

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16. If $a:b=3:4$ and $x:y=5:7$, then find the value of $(3ax-by):(4by-7ax)$.

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17. If $x, 12, y, 27$ are in continued proportion, then find the positive value of x and y .

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18. If $a:b=3:2$ and $b:c=3:2$, then find the value of the ratio $(a+b):(b+c)$.

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19. Find the mean - proportional of $(a+b)^2$ and $(a-b)^2$.

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Examples Long Answer Type Questions

1. If $a:b=3:4$ and $x:y=4:5$, then find the value of $\frac{3ax-by}{5by-7ax}$

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2. What number should be added to each term of the ratio $2a:3b$ so that the ratio of the additions will be $c:d$?

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3. For what value of x, the duplicate ratio of $\frac{x+a}{x+b}$ is $\frac{a}{b}$?

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4. If the triplicate of the ratio $(x+a):(x+b)$ is $a:b$, then prove that $x^3 - 3abx - ab(a+b) = 0$.

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Examples Very Short Answer Type Questions Mcqs

1. The fourth proportional of 3, 4 and 6 is

A. 8

B. 10

C. 12

D. 24

Answer: A

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2. Third proportional of 8 and 12 is

A. 12

B. 16

C. 18

D. 20

Answer: C

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3. The mean - proportional of 16 and 25 is

A. 400

B. 100

C. 20

D. 40

Answer: C

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4. A is a positive number and if $a : \frac{27}{64} = \frac{3}{4} : a$, then the value of a will be

A. $\frac{81}{256}$

B. 9

C. $\frac{9}{16}$

D. $\frac{16}{9}$

Answer: C

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5. If $2a = 3b = 4c$, then $a : b : c$ will be

A. $3:4:6$

B. $4:3:6$

C. $3:6:4$

D. $6:4:3$

Answer: D

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Examples True Or False

1. The compound ratio of the ratios $ab:c^2$, $bc:a^2$ and $ca:b^2$ is $1:1$

.

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2. x^3y, x^2y^2 and xy^3 are in continued proportional.

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Examples Fill In The Blanks

1. If the product of three continued proportional positive numbers be 64, then their mean proportional is ____ .

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2. If $a:2=b:5=c:8$, then 50% of a = 20% of b = _____ % of c .

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3. If mean - proportional of (x - 2) and (x - 3) be x, then the value of x is _____ .

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Examples Long Answer Type Questions

1. If a : b = c : d, then show that $\sqrt{a^2+c^2}:\sqrt{b^2+d^2}=(pa+qc):(pb+qd)$

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2. If $x:a=y:b=z:c$, then prove that

$$\frac{x^3}{a^2}+\frac{y^3}{b^2}+\frac{z^3}{c^2}=\frac{(x+y+z)^3}{(a+b+c)^2}$$

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3. If $x:a=y:b=z:c$, then prove that

$$\left(a^2+b^2+c^2\right)\left(x^2+y^2+z^2\right)=(ax+by+cz)^2$$

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4. If $a:b=c:d=e:f$, then prove that $\left(a^2+c^2+e^2\right)\left(b^2+d^2+f^2\right)=(ab+cd+ef)^2\Big)$

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5. If $a:b=b:c$, then prove that

$$a^2b^2c^2=\left(\frac{1}{a^3}+\frac{1}{b^3}+\frac{1}{c^3}\right)=a^3+b^3+c^3$$

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6. If $a:b=b:c$, then prove that

$$\frac{abc(a+b+c)^3}{(ab+bc+ca)^3}=1$$

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7. If a, b, c, d are in continued proportion, then prove that $(b-c)^2+(c-a)^2+(b-d)^2=(a-d)^2$

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8. If $\frac{a}{b}=\frac{x}{y}$, then show that $(a+b)\left(a^2+b^2\right)x^3=(x+y)\left(x^2+y^2\right)a^3$

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9. If $\frac{x}{lm-n^2}=\frac{y}{mn-l^2}=\frac{z}{nl-m^2}$, then prove that $lx+my+nz=0.$

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10. If $\frac{x}{b+c-a} = \frac{y}{c+a-b} = \frac{z}{a+b-c}$, then show that $(b-c)x + (c-a)y + (a-b)z = 0$.

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11. If $\frac{x}{y} = \frac{a+2}{a-2}$, then show that $\frac{x^2-y^2}{x^2+y^2} = \frac{4a}{a^2+4}$.

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12. If $x = \frac{8ab}{a+b}$, then find the value of $\left(\frac{x+4a}{x-4a} + \frac{x+4b}{x-4b}\right)$.

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13. If $\frac{a}{q-r} = \frac{b}{r-p} = \frac{c}{p-q}$, then prove that $a+b+c = 0 = pa+qb+rc$.

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14. If $\frac{ax+by}{a}=\frac{bx-ay}{b}$, then show that each ratio is equal to x .

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15. If $\frac{a+b}{b+c}=\frac{c+d}{d+a}$, that prove that $c=a \text{ or, } a+b+c+d=0.$

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16. If $\frac{x}{b+c}=\frac{y}{c+a}=\frac{z}{a+b}$, then show that $\frac{a}{y+z-x}=\frac{b}{z+x-y}=\frac{c}{x+y-z}$.

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17. If $\frac{x+y}{3a-b}=\frac{y+z}{3b-c}=\frac{z+x}{3c-a}$, then show that $\frac{x+y+z}{a+b+c}=\frac{ax+by+cz}{a^2+b^2+c^2}$

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18. If $\frac{x}{a}=\frac{y}{b}=\frac{z}{c}$, then show that $\frac{x^2-yz}{a^2-bc}=\frac{y^2-zx}{b^2-ca}=\frac{z^2-xy}{c^2-ab}$

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19. If

$(a+b+c+d):(a+b-c-d)=(a-b+c-d):(a-b-c+d)$

, then prove that $a:b=c:d$.

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20. If $\frac{a^2}{b+c} = \frac{b^2}{c+a} = \frac{c^2}{a+b} = 1$, then show that $\frac{1}{1+a} + \frac{1}{1+b} + \frac{1}{1+c} = 1.$

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21. If $x^2 : (by + cz) = y^2 : (cz + ax) = z^2 : (ax + by) = 1$, then show that $\frac{a}{a+x} + \frac{b}{b+y} + \frac{c}{c+z} = 1.$

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22. If $\frac{x}{xa + yb + zc} = \frac{y}{ya + zb + xc} = \frac{z}{za + xb + yc}$ and $x + y + z \neq 0$, then show that each ratio $= \frac{1}{a+b+c}$

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23. If $\frac{a}{y+z}=\frac{b}{z+x}=\frac{c}{x+y}$, then prove that $\frac{a(b-c)}{y^2-z^2}=\frac{b(c-a)}{z^2-x^2}=\frac{c(a-b)}{x^2-y^2}$.

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24. If $\frac{b}{a+b}=\frac{a+c-b}{b+c-a}=\frac{a+b+c}{2a+b+2c}$ (where $a+b+c\neq 0$), then prove that $\frac{a}{2}=\frac{b}{3}=\frac{c}{4}$.

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25. If $\frac{x}{y+z}=\frac{y}{z+x}=\frac{z}{x+y}$, then prove that the value of each ratio is equal to $\frac{1}{2}$ or (-1).

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Exercise 2 1 Very Short Answer Type Questions Mcqs

1. The ratio between the quantities 1.5 kg and 80 gms is -

A. $4:75$

B. $75:4$

C. $2:25$

D. $4:25$

Answer: B

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2. The ratio between the quantities 15 dcm and 15 mm is -

A. $100:1$

B. $1:1$

C. $1:100$

D. $2:25$

Answer: A

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3. If $x : y = 1 : 2$, then the value of the ratio $(x + 2y) : (2x + 9y)$ is -

A. $3 : 1$

B. $4 : 5$

C. $1 : 4$

D. $5 : 4$

Answer: C

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4. If $(7x + 5y) : (3x + 9y) = 5 : 7$, then $x : y =$

A. $17:5$

B. $5:11$

C. $5:13$

D. $5:17$

Answer: D

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Exercise 2 1 True Or False

1. Write true of false :

(a) The compound ratio of the ratios $xy:z^2$ and $z:y$ is $x:z$.

(b) The sub - duplicate ratio of the ratio $\sqrt{a}:\sqrt{b}$ is $a:b$.

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Exercise 2 1 Fill In The Blanks

1. Fill in the blanks :

(a) The bus-triplicate ratio of the inverse ratio of $27 : 64$ is _____.

(b) The compound ratio of the inverse of the ratio $(x + y) : (x - y)$ and $\left(x^2 - y^2\right) : (x + y)^2$

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Exercise 2 1 Short Answer Type Questions

1. Express the following quantities as ratios and also write what type of ratios they are :

(a) $1 \cdot 2$ kg and 60 gms.

(b) 60 cm and $0 \cdot 6$ m

(c) 1 month 15 days and 25 days.

(d) 10 dcm and 10 mm.

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2. What is the ratio of p kg and q gms ?

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3. (a) Find the compound ratio of the ratios $xz : y^2$ and $x^2 : yz$.

(b) Find the compond ratio of the ratios $a : 2b$, $2b : 3c$and $c : a$.

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4. (a) If $x : y = 3 : 4$, then find the value of the ratio $(2x + y) : (9x - 2y)$.

(b) If $x : y = 5 : 4$, then find the value of the ratio $(x^2 + xy) : (x^2 - xy)$.

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5. (a) If $(9x - 3y) : (3x + 4y) = 21 : 32$, then find $x : y$.

(b) If $(3x + 7y) : (5x - 3y) = 5 : 3$, then find $x : y$.

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Exercise 2 1 Long Answer Type Questions

1. For what value of x, the duplicate of $\frac{x + a}{x + b}$ is $\frac{a}{b}$?

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2. If the triplicate of $\frac{x + a}{x + b}$ is $\frac{a}{b}$, that show that $x^3 - 3abx - ab(a + b) = 0$.

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3. What term should be subtracted from the terms of the ratio $c:d$ so that the ratio of the results of subtractions will be $a:b$?

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4. The ratio of two numbers is $11:13$. If 3 is subtracted from each number, the ratio of the results of the subtractions is $5:6$. Find the numbers .

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5. If 1 is added to each term of a ratio, it becomes $2:3$ and if 4 is subtracted from each term of the ratio, then it becomes $1:2$. Find the ratio .

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Exercise 2 2 Very Short Answer Type Questions Mcqs

1. The fourth proportional of 4, 6, 10 is

A. 10

B. 15

C. 20

D. 22

Answer: B

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2. The third proportional of 8 and 12 is

A. 18

B. 20

C. 22

D. 24

Answer: A

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3. The mean - proportional of $\frac{1}{2}$ and $\frac{1}{8}$ is

A. $\pm\frac{1}{3}$

B. $\pm\frac{1}{5}$

C. $\pm\frac{1}{4}$

D. $\pm\frac{1}{8}$

Answer: C

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4. The mean - proportional of $(a+b)^2$ and $(a-b)^2$ is

A. $\pm(a+b)^2$

B. $\pm(a-b)^2$

C. $\pm(a+b)$

D. $\pm\left(a^2-b^2\right)$

Answer: D

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5. The fourth proportional of $x-y, x^2-y^2$ and x^2-xy+y^2 is

A. $x+y$

B. $x-y$

C. x^3+y^3

D. x^3-y^3.

Answer: C

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6. What quantity should be subtracted from each of the numbers a, b, c and d so that the results of the subtractions are in continued proportional ?

A. $\frac{ab - cd}{a + b + c + d}$

B. $\frac{ad - bc}{a - b - c + d}$

C. $\frac{ad - bc}{a + b + c + d}$

D. $\frac{ad - bc}{a - b - c + d}$

Answer: B

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7. The sub-duplicate ratio of $\left(7+4\sqrt{3}\right):\left(7-4\sqrt{3}\right)$ is

A. $\left(7+4\sqrt{3}\right):1$

B. $\left(7-4\sqrt{3}\right):1$

C. $4\sqrt{3}:1$

D. None of these.

Answer: A

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8. The sub-triplicate ratio of the ratio $\left(7+5\sqrt{2}\right):\left(7-5\sqrt{2}\right)$ is

A. $-\left(3-2\sqrt{2}\right):1$

B. $\left(3+2\sqrt{2}\right):1$

C. $-\left(3+2\sqrt{2}\right):1$

D. None of these.

Answer: C

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9. The mean - proportional of x^2y and yz^2 is

A. xyz

B. $-xyz$

C. $\pm xyz$

D. $\pm x^2y^2z^2$

Answer: C

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10. The triplicate ratio of the ratio $x^{\frac{1}{3}}y^{\frac{1}{3}} : y^{\frac{1}{3}}z^{\frac{1}{3}}$ is

A. $x : z$

B. $x : y$

C. $y : z$

D. $z : x$

Answer: A

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Exercise 2 2 True Or False

1. (a) The mean-proportional of a^3b^2 and $\frac{c^2}{a}$ is $\pm(abc)$.

(b) The third proportional of a and $\sqrt{b}$ is $\frac{a}{b}$.

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Exercise 2 2 Fill In The Blanks

1. (a) The fourth-proportional of 8, 10 and 12 is _____ .

(b) The value of p when $\frac{a}{\sqrt{3}} = \frac{b}{\sqrt{5}} = \frac{c}{\sqrt{7}} = \frac{\sqrt{3a} + \sqrt{5b} - \sqrt{7c}}{p}$ is _____ .

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Exercise 2 2 Short Answer Type Questions

1. Find the mean - proportional of (-3) and (-27).

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2. Find the third proportional of x and $\sqrt{y}$

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3. What number should be added to the numbers 6, 7, 15 and 17 so that the results of the additions are in continued proportional ?

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4. Find the fourth proportional of $\sqrt{2}, \sqrt{3}, \sqrt{5}$.

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5. Find the value of p, when $\frac{a}{\sqrt{2}} = \frac{b}{\sqrt{3}} = \frac{c}{\sqrt{5}} = \frac{\sqrt{2a} - \sqrt{3b} + \sqrt{5c}}{p}$.

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6. If $\frac{2a - 3b}{2a + 3b} = \frac{1}{3}$, then find the value of $\frac{2a^3 - 3b^3}{2a^3 + 3b^3}$.

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7. If $\sqrt{a}:\sqrt{b}=\sqrt{3}:\sqrt{2}$ and $\sqrt{b}:\sqrt{c}=\sqrt{3}:\sqrt{2}$, then find the value of $(\sqrt{a}+\sqrt{b}):(\sqrt{b}+\sqrt{c})$.

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8. If $a:b=4:5$ and $x:y=5:7$ then find the value of $(5ax-3by):(by+2ax)$.

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9. If $a:5=b:2=2c:25$, then 20% of $a=50\%$ of b = _____ % of c .

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10. If a be a positive number and $\sqrt[3]{a} : \frac{4}{27} = \frac{8}{9} : \sqrt{a}$, then find the value of a .

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Exercise 2 2 Long Answer Type Questions

1. If $a : b = c : d$, then prove that $(a + c) : (b + d) = \sqrt{a^2 - c^2} : \sqrt{b^2 - d^2}$

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2. If $(a + b + c + d)(a - b - c + d) = (a + b - c - d)(a - b + c - d)$, then prove that $a : b = c : d$

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3. If $\frac{x}{y} = \frac{y}{z}$, then simplify $\frac{xyz(x+y+z)^3}{(xy+yz+zx)^3}$.

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4. If $\frac{a}{b} = \frac{c}{d} = \frac{e}{f}$, then show that each ratio $= \left(\frac{la^n + mc^n + pe^n}{lb^n + md^n + pf^n}\right)^{\frac{1}{n}}$.

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5. If $\frac{a}{b} = \frac{b}{c} = \frac{c}{d}$, then prove that $\left(a^2+b^2+c^2\right)\left(b^2+c^2+d^2\right) = (ab+bccd)^2$

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6. If $\frac{x}{b+c} = \frac{y}{c+a} = \frac{z}{a+b}$, then prove that $(b-c)x + (c-a)y + (a-b)z = 0$.

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7. If $\frac{a}{b+c} = \frac{b}{c+a} = \frac{c}{a+b}$ and $a+b+c \neq 0$, then prove that a = b = c .

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8. If $\frac{ay-bx}{c} = \frac{cx-az}{b} = \frac{bz-cy}{a}$, then prove that $\frac{x}{a} = \frac{y}{b} = \frac{z}{c}$.

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9. If $\frac{a}{b} = \frac{c}{d}$,then show that $bd\left(\frac{a+b}{b} + \frac{c+d}{d}\right)^2 = 4(a+b)(c+d)$

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10. If $\frac{y+z-x}{b+c-a}=\frac{z+x-y}{c+a-b}=\frac{x+y-z}{a+b-c}$, then prove that $\frac{x}{a}=\frac{y}{b}=\frac{z}{c}$.

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11. If $\frac{x}{a}=\frac{y}{b}=\frac{z}{c}$, then show that $\frac{x^3}{a^3}+\frac{y^3}{b^3}+\frac{z^3}{c^3}=3\left(\frac{x+y+z}{a+b+c}\right)^3$.

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12. If $a:b=c:d$, then prove that the - proportional of $\left(a^2+c^2\right)$ and $\left(b^2+d^2\right)$ is $(ab+cd)$.

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13. If $\frac{x}{lm-n^2}=\frac{y}{mn-l^2}=\frac{z}{nl-m^2}$, then show that $lx+my+nz=0$.

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14. If $a:b=x:y$, then show that $\left(a^2+b^2\right):\frac{a^3}{a+b}::\left(x^2+y^2\right):\frac{x^3}{x+y}$

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15. If $\frac{\sqrt{x}}{\sqrt{y}}=\frac{a+\sqrt{2}}{a-\sqrt{2}}$, then find the value of $\frac{x-y}{x+y}$.

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16. If $\frac{a}{b}=\frac{b}{c}=\frac{c}{d}$, then show that $(a-b)^3:(b-c)^3=a:d$.

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17. If $\frac{b}{a+b} = \frac{3a-c-b}{2b+c-a} = \frac{-a+3c}{2a-b+3c}$ (where $a+b+c \neq 0$), then prove that a = b = c .

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18. If $a : b = c : d$, then prove that $\frac{a+b}{a-b} = \frac{\sqrt{ac+ad+bc+bd}}{\sqrt{ac-ad-bc+bd}}$.

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19. If $\frac{bz+cy}{a} = \frac{cx+az}{b} = \frac{ay+bx}{c}$, then prove that $\frac{x}{a(b^2+c^2-a^2)} = \frac{y}{b(c^2+a^2-b^2)} = \frac{z}{c(a^2+b^2-c^2)}$.

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