

EXERCISE 9.1

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1. If $x : y = 3 : 5$, find the ratio $3x + 4y : 8x + 5y$

Solution:

Given $x : y = 3 : 5$

We can write above equation as

$$x/y = 3/5$$

$$5x = 3y$$

$$x = 3y/5$$

By substituting the value of x in given equation $3x + 4y : 8x + 5y$ we get,

$$3x + 4y : 8x + 5y = 3(3y/5) + 4y : 8(3y/5) + 5y$$

$$= (9y + 20y)/5 : (24y + 25y)/5$$

$$= 29y/5 : 49y/5$$

$$= 29y : 49y$$

$$= 29 : 49$$

2. If $x : y = 8 : 9$, find the ratio $(7x - 4y) : 3x + 2y$.

Solution:

Given $x : y = 8 : 9$

We can write above equation as

$$x/y = 8/9$$

$$9x = 8y$$

$$x = 8y/9$$

By substituting the value of x in the given equation $(7x - 4y) : 3x + 2y$ we get,

$$(7x - 4y) : 3x + 2y = 7(8y/9) - 4y : 3(8y/9) + 2y$$

$$= (56y - 36y)/9 : 42y/9$$

$$= 20y/9 : 42y/9$$

$$= 20y : 42y$$

$$= 20 : 42$$

$$= 10 : 21$$

3. If two numbers are in the ratio $6 : 13$ and their L.C.M is 312 , find the numbers.

Solution:

Given two numbers are in the ratio $6 : 13$

Let the required number be $6x$ and $13x$

The LCM of $6x$ and $13x$ is $78x$

$$= 78x = 312$$

$$x = (312/78)$$

$$x = 4$$

Thus the numbers are $6x = 6(4) = 24$

$$13x = 13(4) = 52$$

4. Two numbers are in the ratio 3: 5. If 8 is added to each number, the ratio becomes 2:3. Find the numbers.

Solution:

Let the required numbers be $3x$ and $5x$

Given that if 8 is added to each other then ratio becomes 2: 3

That is $3x + 8: 5x + 8 = 2: 3$

$$(3x + 8)/(5x + 8) = 2/3$$

$$3(3x + 8) = 2(5x + 8)$$

$$9x + 24 = 10x + 16$$

By transposing

$$24 - 16 = 10x - 9x$$

$$x = 8$$

Thus the numbers are $3x = 3(8) = 24$

$$\text{And } 5x = 5(8) = 40$$

5. What should be added to each term of the ratio 7: 13 so that the ratio becomes 2: 3

Solution:

Let the number to be added is x

Then $(7 + x) + (13 + x) = (2/3)$

$$(7 + x) 3 = 2(13 + x)$$

$$21 + 3x = 26 + 2x$$

$$3x - 2x = 26 - 21$$

$$x = 5$$

Hence the required number is 5

6. Three numbers are in the ratio 2: 3: 5 and the sum of these numbers is 800. Find the numbers

Solution:

Given that three numbers are in the ratio 2: 3: 5 and sum of them is 800

Therefore sum of the terms of the ratio = $2 + 3 + 5 = 10$

$$\text{First number} = (2/10) \times 800$$

$$= 2 \times 80$$

$$= 160$$

$$\text{Second number} = (3/10) \times 800$$

$$= 3 \times 80$$

$$= 240$$

$$\text{Third number} = (5/10) \times 800$$

$$= 5 \times 80$$

$$= 400$$

The three numbers are 160, 240 and 400

7. The ages of two persons are in the ratio 5: 7. Eighteen years ago their ages were in the ratio 8: 13. Find their present ages.

Solution:

Let present ages of two persons be $5x$ and $7x$

Given ages of two persons are in the ratio 5: 7

And also given that 18 years ago their ages were in the ratio 8: 13

$$\text{Therefore } (5x - 18)/(7x - 18) = (8/13)$$

$$13(5x - 18) = 8(7x - 18)$$

$$65x - 234 = 56x - 144$$

$$65x - 56x = 234 - 144$$

$$9x = 90$$

$$x = 90/9$$

$$x = 10$$

Thus the ages are $5x = 5(10) = 50$ years

And $7x = 7(10) = 70$ years

8. Two numbers are in the ratio 7: 11. If 7 is added to each of the numbers, the ratio becomes 2: 3. Find the numbers.

Solution:

Let the required numbers be $7x$ and $11x$

If 7 is added to each of them then

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

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

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

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

$$x = 21 - 14 = 7$$

Thus the numbers are $7x = 7(7) = 49$

And $11x = 11(7) = 77$

9. Two numbers are in the ratio 2: 7. 11 the sum of the numbers is 810. Find the numbers.

Solution:

Given two numbers are in the ratio 2: 7

And their sum = 810

Sum of terms in the ratio = $2 + 7 = 9$

First number = $(2/9) \times 810$

$$= 2 \times 90$$

$$= 180$$

Second number = $(7/9) \times 810$

$$= 7 \times 90$$

$$= 630$$

10. Divide Rs 1350 between Ravish and Shikha in the ratio 2: 3.

Solution:

Given total amount to be divided = 1350

Sum of the terms of the ratio = $2 + 3 = 5$

Ravish share of money = $(2/5) \times 1350$

$$= 2 \times 270$$

$$= \text{Rs. } 540$$

And Shikha's share of money = $(3/5) \times 1350$

$$= 3 \times 270$$

$$= \text{Rs. } 810$$

11. Divide Rs 2000 among P, Q, R in the ratio 2: 3: 5.

Solution:

Given total amount to be divided = 2000

Sum of the terms of the ratio = $2 + 3 + 5 = 10$

P's share of money = $(2/10) \times 2000$

= 2×200

= Rs. 400

And Q's share of money = $(3/10) \times 2000$

= 3×200

= Rs. 600

And R's share of money = $(5/10) \times 2000$

= 5×200

= Rs. 1000

12. The boys and the girls in a school are in the ratio 7:4. If total strength of the school be 550, find the number of boys and girls.

Solution:

Given that boys and the girls in a school are in the ratio 7:4

Sum of the terms of the ratio = $7 + 4 = 11$

Total strength = 550

Boys strength = $(7/11) \times 550$

= 7×50

= 350

Girls strength = $(4/11) \times 550$

= 4×50

= 200

13. The ratio of monthly income to the savings of a family is 7: 2. If the savings be of Rs. 500, find the income and expenditure.

Solution:

Given that the ratio of income and savings is 7: 2

Let the savings be $2x$

$2x = 500$

So, $x = 250$

Therefore,

Income = $7x$

Income = $7 \times 250 = 1750$

$$\begin{aligned}\text{Expenditure} &= \text{Income} - \text{savings} \\ &= 1750 - 500 \\ &= \text{Rs.}1250\end{aligned}$$

14. The sides of a triangle are in the ratio 1: 2: 3. If the perimeter is 36 cm, find its sides.

Solution:

Given sides of a triangle are in the ratio 1: 2: 3

Perimeter = 36cm

Sum of the terms of the ratio = $1 + 2 + 3 = 6$

First side = $(1/6) \times 36$

= 6cm

Second side = $(2/6) \times 36$

= 2×6

= 12cm

Third side = $(3/6) \times 36$

= 6×3

= 18cm

15. A sum of Rs 5500 is to be divided between Raman and Amen in the rate 2: 3. How much will each get?

Solution:

Given total amount to be divided = 5500

Sum of the terms of the ratio = $2 + 3 = 5$

Raman's share of money = $(2/5) \times 5500$

= 2×1100

= Rs. 2200

And Aman's share of money = $(3/5) \times 5500$

= 3×1100

= Rs. 3300

16. The ratio of zinc and copper in an alloy is 7: 9. If the weight of the copper in the alloy is 11.7 kg, find the weight of the zinc in the alloy.

Solution:

Given that ratio of zinc and copper in an alloy is 7: 9

Let their ratio = $7x: 9x$

Weight of copper = 11.7kg

$$9x = 11.7$$

$$x = 11.7/9$$

$$x = 1.3$$

Weight of the zinc in the alloy = 1.3×7

$$= 9.10\text{kg}$$

17. In the ratio 7: 8. If the consequent is 40, what a the antecedent

Solution:

Given ratio = 7: 8

Let the ratio of consequent and antecedent $7x: 8x$

Consequent = 40

$$8x = 40$$

$$x = 40/8$$

$$x = 5$$

$$\text{Antecedent} = 7x = 7 \times 5 = 35$$

18. Divide Rs 351 into two parts such that one may be to the other as 2: 7.

Solution:

Given total amount is to be divided = 351

Ratio 2: 7

The sum of terms = $2 + 7$

$$= 9$$

First ratio of amount = $(2/9) \times 351$

$$= 2 \times 39$$

$$= \text{Rs. } 78$$

Second ratio of amount = $(7/9) \times 351$

$$= 7 \times 39$$

$$= \text{Rs. } 273$$

19. Find the ratio of the price of pencil to that of ball pen, if pencil cost Rs.16 per score and ball pen cost Rs.8.40 per dozen.

Solution:

One score contains 20 pencils

And cost per score = 16

Therefore pencil cost = $16/20$

= Rs. 0.80

Cost of one dozen ball pen = 8.40

1 dozen = 12

Therefore cost of pen = $8.40/12$

= Rs 0.70

Ratio of the price of pencil to that of ball pen = $0.80/0.70$

= $8/7$

= 8: 7

20. In a class, one out of every six students fails. If there are 42 students in the class, how many pass?

Solution:

Given, total number of students = 42

One out of 6 student fails

x out of 42 students

$16 = x/42$

$x = 42/6$

$x = 7$

Number of students who fail = 7 students

No of students who pass = Total students - Number of students who fail

= $42 - 7$

= 35 students.

EXERCISE 9.2

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1. Which ratio is larger in the following pairs?**(i) 3: 4 or 9: 16****(ii) 15: 16 or 24: 25****(iii) 4: 7 or 5: 8****(iv) 9: 20 or 8: 13****(v) 1: 2 or 13: 27****Solution:**

(i) Given 3: 4 or 9: 16

LCM for 4 and 16 is 16

3: 4 can be written as = $\frac{3}{4}$ $\frac{3}{4} \times \frac{4}{4} = \frac{12}{16}$

And we have 9/16

Clearly $12 > 9$

Therefore 3: 4 > 9: 16

(ii) Given 15: 16 or 24: 25

LCM for 16 and 25 is 400

15: 16 can be written as = $\frac{15}{16}$ $\frac{15}{16} \times \frac{25}{25} = \frac{375}{400}$

And we have 24/25

 $\frac{24}{25} \times \frac{16}{16} = \frac{384}{400}$ Clearly $384 > 375$

Therefore 15: 16 < 24: 25

(iii) Given 4: 7 or 5: 8

LCM for 7 and 8 is 56

4: 7 can be written as = $\frac{4}{7}$ $\frac{4}{7} \times \frac{8}{8} = \frac{32}{56}$

And we have 5/8

 $\frac{5}{8} \times \frac{7}{7} = \frac{35}{56}$ Clearly $35 > 32$

Therefore 4: 7 < 5: 8

(iv) Given 9: 20 or 8: 13

LCM for 20 and 13 is 260

9: 20 can be written as = $9/20$

$$9/20 \times (13/13) = 117/260$$

And we have 8/13

$$8/13 \times (20/20) = 160/260$$

Clearly $160 > 117$

Therefore 9: 20 < 8: 13

(v) Given 1: 2 or 13: 27

LCM for 2 and 27 is 54

1: 2 can be written as = $1/2$

$$1/2 \times (27/27) = 27/54$$

And we have 13/27

$$13/27 \times (2/2) = 26/54$$

Clearly $27 > 26$

Therefore 1: 2 > 13: 27

2. Give the equivalent ratios of 6: 8.

Solution:

Given 6: 8

By multiplying both numerator and denominator by 2 we equivalent ratios

$$6/8 \times (2/2) = 12/16$$

And also by dividing both numerator and denominator by 2 we equivalent ratios

$$(6/2)/(8/2) = 3/4$$

Two equivalent ratios are 3: 4 = 12: 16

3. Fill in the following blanks:

$$12/20 = \dots /5 = 9/\dots$$

Solution:

$$12/20 = 3/5 = 9/15$$

Explanation:

Consider $12/20 = \dots /5$

Let unknown value be x

Therefore $12/20 = x/5$

On cross multiplying

$$x = 60/20$$

$$x = 3$$

Consider $12/20 = 9/...$

Let the unknown value be y

Therefore $12/20 = 9/y$

On cross multiplying we get

$$y = 180/12$$

$$y = 15$$



EXERCISE 9.3

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1. Find which of the following are in proportion?**(i) 33, 44, 66, 88****(ii) 46, 69, 69, 46****(iii) 72, 84, 186, 217****Solution:**

(i) Given 33, 44, 66, 88

Product of extremes = $33 \times 88 = 2904$ Product of means = $44 \times 66 = 2904$

Therefore product of extremes = product of means

Hence given numbers are in proportion.

(ii) Given 46, 69, 69, 46

Product of extremes = $46 \times 46 = 2116$ Product of means = $69 \times 69 = 4761$

Therefore product of extremes is not equal to product of means

Hence given numbers are not in proportion.

(iii) Given 72, 84, 186, 217

Product of extremes = $72 \times 217 = 15624$ Product of means = $84 \times 186 = 15624$

Therefore product of extremes = product of means

Hence given numbers are in proportion.

2. Find x in the following proportions:**(i) 16: 18 = x: 96****(ii) x: 92 = 87: 116****Solution:**

(i) Given 16: 18 = x: 96

In proportion we know that product of extremes = product of means

$$16/18 = x/96$$

On cross multiplying

$$x = (18 \times 96) / 16$$

$$x = 256/3$$

(ii) Given $x: 92 = 87: 116$

In proportion we know that product of extremes = product of means

$$x/ 92 = 87/116$$

On cross multiplying

$$x = (87 \times 92)/ 116$$

$$x = 69$$

3. The ratio of income to the expenditure of a family is 7: 6. Find the savings if the income is Rs.1400.

Solution:

Given that income = 1400

Given the ratio of income and expenditure = 7: 6

$$7x = 1400$$

Therefore $x = 200$

$$\text{Expenditure} = 6x = 6 \times 200 = \text{Rs.}1200$$

Savings = Income - Expenditure

$$= 1400 - 1200$$

$$= \text{Rs.}200$$

4. The scale of a map is 1: 4000000. What is the actual distance between the two towns if they are 5cm apart on the map?

Solution:

Given that the scale of map = 1: 4000000

Let us assume the actual distance between towns is x cm

$$1: 4000000 = 5: x$$

$$x = 5 \times 4000000$$

$$x = 20000000 \text{ cm}$$

We know that $1\text{km} = 1000 \text{ m}$

$$1\text{m} = 100 \text{ cm}$$

Therefore

$$x = 200 \text{ km}$$

5. The ratio of income of a person to his savings is 10: 1. If his savings for one year is

Rs.6000, what is his income per month?

Solution:

Given that the ratio of income of a person to his savings is 10: 1

Savings per year = 6000

Savings per month = $6000/12$

= Rs.500

Then let income per month be x

$x: 500 = 10:1$

$x = 500 \times 10$

$x = 5000$

Income per month is Rs. 5000

6. An electric pole casts a shadow of length 20 meters at a time when a tree 6 meters high casts a shadow of length 8 meters. Find the height of the pole.

Solution:

Given that length electric pole shadow is 20m

Height of the tree: Length of the shadow of tree

Height of the pole: Length of the shadow of pole

$x: 20 = 6: 8$

$x = 120/8$

$x = 15$

Therefore height of the pole is 15 meters