1. Express the following as a ratio $a:b$ and as a fraction in its simplest form.

(i). $Rs\ 750, Rs\ 1250$

Solution:

$Ratio\ of\ Rs\ 750\ t0\ Rs\ 1250$

$750:1250 = \dfrac{750}{1250} = \dfrac{3}{5} = 3:5$ (Divided by 25)

(ii). $450cm, 3m$

Solution:

$Ratio\ of\ 450cm\ to\ 3m$

$since\ 1m = 100cm$

$therefore, \qquad 3m = (3)(100)cm = 300cm$

$450:300 = \dfrac{450}{300} = \dfrac{3}{2} = 3:2$

(iii). $4lg, 2kg\ 750gm$

Solution:

$since\ 1kg = 1000gm$

$then, 4kg = (4)(1000)gm = 4000gm$

$and, 2kg\ 750gm = (2)(1000)gm + 750gm = 2750gm$

$ratio\ of\ 4000gm\ to\ 2750gm$

$4000:2750 = \dfrac{4000}{2750} = \dfrac{16}{11} = 16:11$

(iv). 27min. 30sec, 1 hour

Solution:

$Since\ 1min. = 60sec$

$then, \qquad 27min.\ 30sec = (27)(60)sec + 30sec = 1620sec + 30sec = 1650sec$

$1\ hour = (60)(60)sec = 3600sec$

$ratio\ of\ 27min.\,30sec\ to\ 1\ hour$

$$1650:3600 = \frac{1650}{3600} = \frac{11}{24} = 11:24$$

(v). $75^0, 225^0$

Solution:

$Ratio\ of\ 75^0\ to\ 225^0$

$$75:225 = \frac{75}{225} = \frac{1}{3} = 1:3$$

1. In a class of 60 students, 25 students are girls and remaining students are boys. Compute the ratio of

(i). boys to total students

Solution:

$no.\ of\ boys = total\ students - no\ of\ girls$

$no.\ of\ boys = 60 - 25 = 35\ boys$

$Ratio\ of\ boys\ to\ total\ students$

$Boys: Total\ students$

$35:60$

$7:12$

(ii). Boys to girls

Solution:

$Boys : Girls$

$35:25$

$7:5$

2. If $3(4x - 5y) = 2x - 7y$, find the ratio $x:y$.

Solution:

$3(4x - 5y) = 2x - 7y$

$12x - 15y = 2x - 7y$

$12x - 2x = -7y + 15y$

$10x = 8y$

$\dfrac{x}{y} = \dfrac{8}{10}$

$\dfrac{x}{y} = \dfrac{4}{5}$

$x : y = 4 : 5$

3. **Find the value of p, if the ratio $2p + 5 : 3p + 4$ and $3 : 4$ are equal.**

Solution:

$2p + 5 : 3p + 4 = 3 : 4$

In fraction form,

$\dfrac{2p + 5}{3p + 4} = \dfrac{3}{4}$

$4(2p + 5) = 3(3p + 4)$

$8p + 20 = 9p + 12$

$8p - 9p = 12 - 20$

$-p = -8$

$p = 8$

4. **If the ratio $3x + 1 : 6 + 4x$ and $2 : 5$ are equal. Find the value of x.**

Solution:

$3x + 1 : 6 + 4x = 2 : 5$

In fraction form,

$\dfrac{(3x + 1)}{6 + 4x} = \dfrac{2}{5}$

$5(3x + 1) = 2(6 + 4x)$

$$15x + 5 = 12 + 8x$$

$$15x - 8x = 12 - 5$$

$$7x = 7$$

$$x = \frac{7}{7}$$

$$x = 1$$

5. **Two numbers are in the ratio** $5: 8$**. If 9 are added to each number, we get a new ratio** $8: 11$**. Find the number**.

Solution:

since numbers are in the ratio $5: 8,$ *let* $5x$ *and* $8x$ *be the two numbers.*

According to the given condition,

$$\frac{5x + 9}{8x + 9} = \frac{8}{11}$$

$$11(5x + 9) = 8(8x = 9)$$

$$55x + 99 = 64x + 72$$

$$55x - 64x = 72 - 99$$

$$-9x = -27$$

$$x = -\frac{27}{-9}$$

$$x = 3$$

Numbers are $5x = 5(3) = 15$

and, $8x = 8(3) = 24$

6. **If 10 are added in each number of the ratio** $4: 13$**, we get a new ratio** $1: 2$**. What are the numbers?**

Solution:

since the numbers are in the ratio $4: 13,$ *let the numbers are* $4x$ *and* $13x.$

According to given condition,

$$\frac{4x + 10}{13x + 10} = \frac{1}{2}$$

$$2(4x + 10) = 1(13x + 10)$$

$$8x + 20 = 13x + 10$$

$$8x - 13x = 10 - 20$$

$$-5x = -10$$

$$x = -\frac{10}{-5}$$

$$x = 2$$

$So, the\ numbers\ are\ 4x = 4(2) = 8$

$and, 13x = 13(2) = 26$

7. Find the cost of 8kg mangoes, if 5kg of mangoes cost Rs.250.

Solution:

$let\ the\ cost\ 8kg\ of\ mangos\ be\ x.$

Then in proportion form,

$8kg : 5kg :: Rs.x : Rs.250$

$as, Product\ of\ extremes = Products\ of\ means$

$(8)(250) = (5)(x)$

$2000 = 5x$

$$\frac{2000}{5} = x$$

$400 = x$

$x = 400$

$i.e.the\ cost\ of\ 8kg\ mangoes\ is\ Rs.400$

8. If $a : b = 7 : 6$, find the values of $3a + 5b : 7b - 5a$.

Solution:

Given, $\dfrac{a}{b} = \dfrac{7}{6}$

Now, $3a + 5b : 7b - 5a = \dfrac{3a+5b}{7b-5a}$

$$\frac{3a + 5b}{7b - 5a} = \frac{3\left(\dfrac{a}{b}\right) + 5\left(\dfrac{b}{b}\right)}{7\left(\dfrac{b}{b}\right) - 5\left(\dfrac{a}{b}\right)}$$

$$\frac{3a + 5b}{7b - 5a} = \frac{3\left(\dfrac{a}{b}\right) + 5}{7 - 5\left(\dfrac{a}{b}\right)}$$

$$\frac{3a + 5b}{7b - 5a} = \frac{3\left(\dfrac{7}{6}\right) + 5}{7 - 5\left(\dfrac{7}{6}\right)}$$

$$\frac{3a + 5b}{7b - 5a} = \frac{\left(\dfrac{21}{6}\right) + 5}{7 - \left(\dfrac{35}{6}\right)}$$

$$\frac{3a + 5b}{7b - 5a} = \frac{\left(\dfrac{21 + 30}{6}\right)}{\left(\dfrac{42 - 35}{6}\right)}$$

$$\frac{3a + 5b}{7b - 5a} = \frac{\left(\dfrac{51}{6}\right)}{\left(\dfrac{7}{6}\right)}$$

$$\frac{3a + 5b}{7b - 5a} = \left(\frac{51}{6}\right)\left(\frac{6}{7}\right)$$

$$\frac{3a + 5b}{7b - 5a} = \frac{51}{7}$$

$$3a + 5b : 7b - 5a = 51 : 7$$

9. Complete the following:

(i). If $\dfrac{24}{7} = \dfrac{6}{x}$, then $4x =$ _____

Solution:

$$\frac{24}{7} = \frac{6}{x}$$

$$\frac{(6)(4)}{7} = \frac{6}{x}$$

$$4x = \frac{(6)(7)}{6}$$

$$4x = 7$$

(ii). If $\frac{5a}{3x} = \frac{15b}{y}$**, then** $ay =$ _____

Solution:

$$\frac{5a}{3x} = \frac{15b}{y}$$

$$ay = \frac{(15b)(3x)}{5}$$

$$ay = (3b)(3x)$$

$$ay = 9bx$$

(iii). If $\frac{9pq}{2lm} = \frac{18p}{5m}$**, then** $5q =$ _____

Solution:

$$\frac{9pq}{2lm} = \frac{18p}{5m}$$

$$5q = \frac{(18p)(2lm)}{(9p)(m)}$$

$$5q = (2)(2l)$$

$$5q = 4l$$

10. Find x **in following proportions.**

(i). $3x - 2 : 4 :: 2x + 3 : 7$

Solution:

$$3x - 2 : 4 :: 2x + 3 : 7$$

Product of extremes = product of extremes

$(3x - 2)(7) = (4)(2x + 3)$

$21x - 14 = 8x + 12$

$21x - 8x = 12 + 14$

$13x = 26$

$x = \dfrac{26}{13}$

$x = 2$

(ii). $\dfrac{3x-1}{7} : \dfrac{3}{5} :: \dfrac{2x}{3} : \dfrac{7}{5}$

Solution:

$\dfrac{3x - 1}{7} : \dfrac{3}{5} :: \dfrac{2x}{3} : \dfrac{7}{5}$

Product of extremes = product of extremes

$\left(\dfrac{3x - 1}{7}\right)\left(\dfrac{7}{5}\right) = \left(\dfrac{3}{5}\right)\left(\dfrac{2x}{3}\right)$

$\dfrac{3x - 1}{5} = \dfrac{2x}{5}$

$3x - 1 = \left(\dfrac{2x}{5}\right)(5)$

$3x - 1 = 2x$

$3x - 2x = 1$

$x = 1$

(iii). $\dfrac{x-3}{2} : \dfrac{5}{x-1} :: \dfrac{(x-1)}{3} : \dfrac{4}{x+4}$

Solution:

$\dfrac{x - 3}{2} : \dfrac{5}{x - 1} :: \dfrac{(x - 1)}{3} : \dfrac{4}{x + 4}$

Product of extremes = product of extremes

$$\left(\frac{x-3}{2}\right)\left(\frac{4}{x+4}\right) = \left(\frac{5}{x-1}\right)\left(\frac{x-1}{3}\right)$$

$$\left(\frac{2(x-3)}{x+4}\right) = \frac{5}{3}$$

$$(2)(3)(x-3) = 5(x+4)$$

$$6(x-3) = 5x + 20$$

$$6x - 18 = 5x + 20$$

$$6x - 5x = 20 + 18$$

$$x = 38$$

(iv). $p^2 + pq + q^2 : x :: \dfrac{p^3 - q^3}{p+q} : (p-q)^2$

Solution:

$$p^2 + pq + q^2 : x :: \frac{p^3 - q^3}{p+q} : (p-q)^2$$

Product of extremes = product of extremes

$$(p^2 + pq + q^2)(p-q)^2 = (x)\left(\frac{p^3 - q^3}{p+q}\right)$$

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

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

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

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

(v). $8 - x : 11 - x :: 16 - x : 25 - x$

Solution:

$$8 - x : 11 - x :: 16 - x : 25 - x$$

Product of extremes = product of extremes

$(8 - x)(25 - x) = (11 - x)(16 - x)$

$200 - 8x - 25x + x^2 = 176 - 11x - 16x + x^2$

$200 - 33x + x^2 = x^2 + 176 - 27x$

$200 - 33x + x^2 - x^2 - 176 + 27x = 0$

$24 - 6x = 0$

$6x = 24$

$x = \dfrac{24}{6}$

$x = 4$