Dhanmesh

Vijay

60 kg

Soka

Ratio of weight of  $V \notin D = S:6$ 



Ratio of weight of D&V  $\frac{6849}{5849} = \frac{6}{5} = 6:5$ 



4

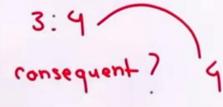
#### **Ratio**

A ratio is a <u>comparison</u> of the sizes of two or more quantities of the same kind by division.



- > If a and b are two quantities of the same kind (in same units), then the fraction a/b is called the ratio of a to b. It is written as a: b.
- The quantities a and b are called the terms of the ratio, a is called the first term or antecedent and b is called the second term or consequent.

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The ratio of two quantities is 3:4. If the antecedent is 15, the consequent is

(a) 16

(b) 60

(c) 22



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

$$\frac{15}{30} = \frac{3}{3}$$

$$x = \frac{3}{60} = 50$$

Both terms of a ratio can be multiplied or divided by the same (non-zero) number. Usually a ratio is expressed in lowest terms (or simplest form).



$$\frac{\frac{2}{60}}{\frac{9}{60}} = \frac{2}{3} = 2:3$$

$$\frac{\frac{1.6 \times 5}{2.4 \times 5}}{\frac{2}{12}} = \frac{2}{3}$$

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

$$\frac{2}{5} = \frac{2}{3} = 2:3$$

$$\frac{\frac{1.6 \times 5}{2.4 \times 5}}{\frac{2}{12}} = \frac{2}{3}$$

$$\frac{2}{5} = \frac{2}{3} = 2:3$$

$$\frac{2 \times 4}{5} = 0.4$$

# Stats by CAPRANAV

#### **Features of Ratio**

he order of the terms in a ratio is important.



$$\frac{2}{3} \neq \frac{3}{2}$$

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- > Ratio exists only between quantities of the same kind.
- > Example: There is no ratio between the weight of one child and age of another



Vijay = 
$$60 \text{ kg}$$
 V:D =  $60:168$ 

Dhamesh =  $168 \text{ cm}$  (h)

- > Quantities to be compared (by division) must be in the same units.
- > Example, Find ratio between





fractions having same denom.

- To compare two ratios, convert them into equivalent like fractions.
- > Example, compare which of the below ratio is greater



$$2\frac{1}{3}:3\frac{1}{3}$$

$$3.6:4.8$$

$$\frac{3}{7}:\frac{9}{7}$$

$$\frac{7}{3}:\frac{10}{3}$$

$$\frac{3.6}{4.8}=\frac{36}{10}:\frac{48}{10}=3:9=1:3$$

$$=36:48$$

$$=3:4$$

if worker produces 10 units in 8 hours
how many units will be produced in 40 hours

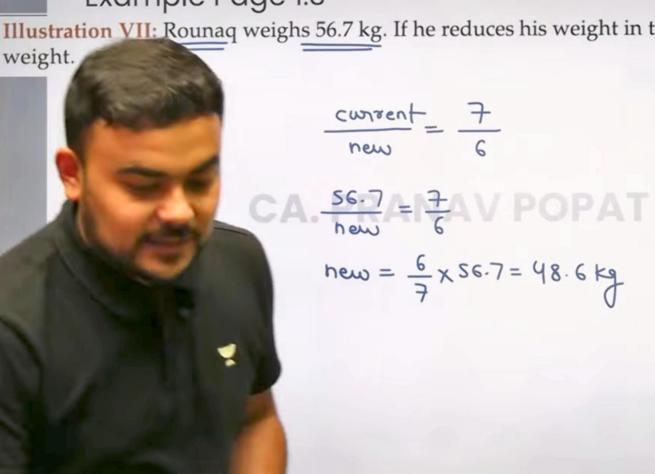
$$\frac{8 \text{ hours}}{40 \text{ hows}} = \frac{10 \text{ units}}{2}$$

$$x = \frac{10 \times 40}{8} = \text{so units}$$



#### Example Page 1.3

Illustration VII: Rounaq weighs 56.7 kg. If he reduces his weight in the ratio 7:6, find his new





if height of Sanskan increases in ratio 10:11 What is new height if original is 160 cm

$$\frac{|60 \text{ cm}}{|0|} \times |1| = |76|$$
 $= |76 \text{ cm}|$ 





> If a quantity increases or decreases in the ratio a:b

$$new \ quantity = \frac{b}{a} \times original \ quantity$$

The fraction by which the original quantity is multiplied (i.e. b/a) to get a new quantity is called the factor multiplying ratio.

#### Example Page 1.3

Example 1: Simplify the ratio 1/3: 1/8: 1/6

$$\frac{1}{3} : \frac{1}{8} : \frac{1}{6}$$

$$\frac{1}{3} \times \frac{8}{8} : \frac{1}{8} \times \frac{3}{3} : \frac{1}{6} \times \frac{4}{4}$$

$$\frac{1}{3} \times \frac{8}{8} : \frac{1}{8} \times \frac{3}{3} : \frac{1}{6} \times \frac{4}{4}$$

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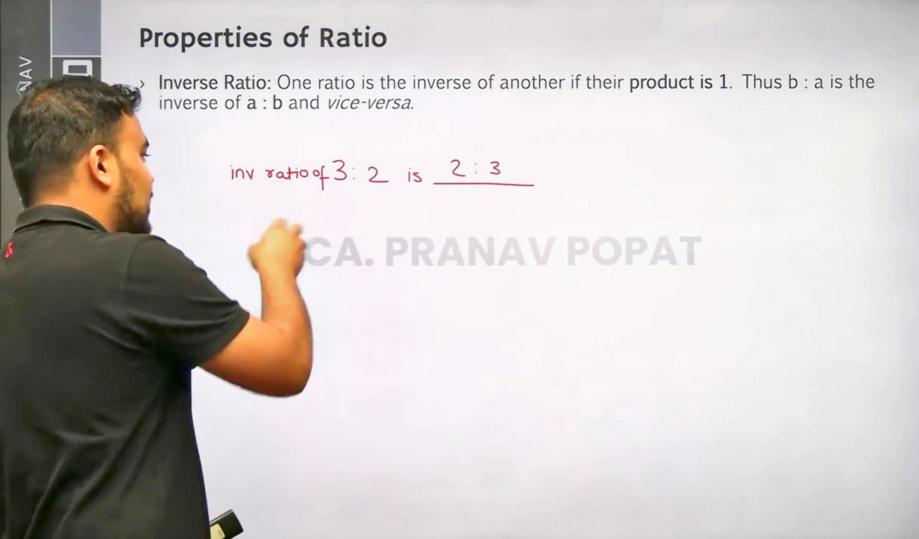
$$\frac{1}{8} \times \frac{1}{8} : \frac{1}{8} \times \frac{1}{8} \times \frac{1}{8}$$

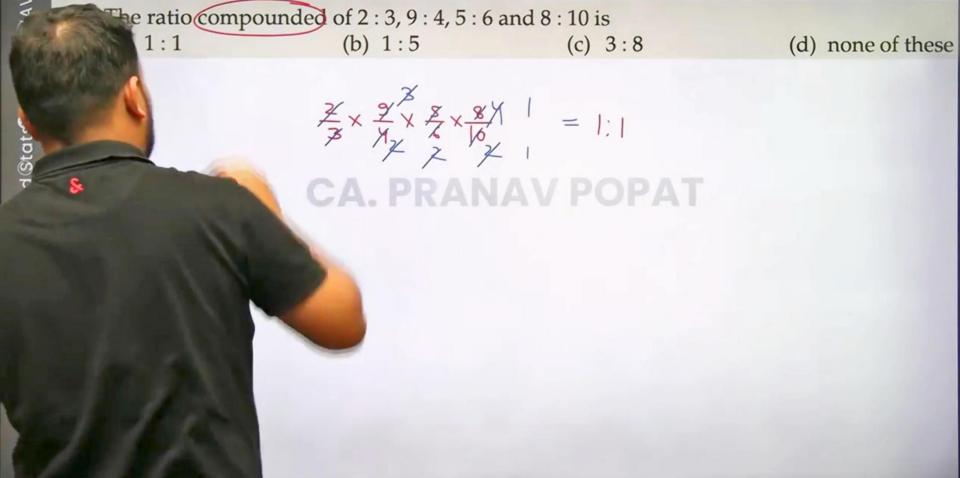
$$\frac{1}{8} \times \frac{1}{8} : \frac{1}{8} \times \frac{1}{8} \times \frac{1}{8}$$

$$\frac{1}{8} \times \frac{1}{8} : \frac{1}{8} \times \frac{1}{8} \times \frac{1}{8}$$

$$\frac{1}{8} \times \frac{1$$

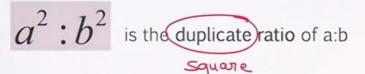






#### **Properties of Ratio**

> A ratio compounded of itself is called its duplicate ratio.



$$\frac{2}{3} \times \frac{2}{3} = \frac{52}{8} = 3.52$$

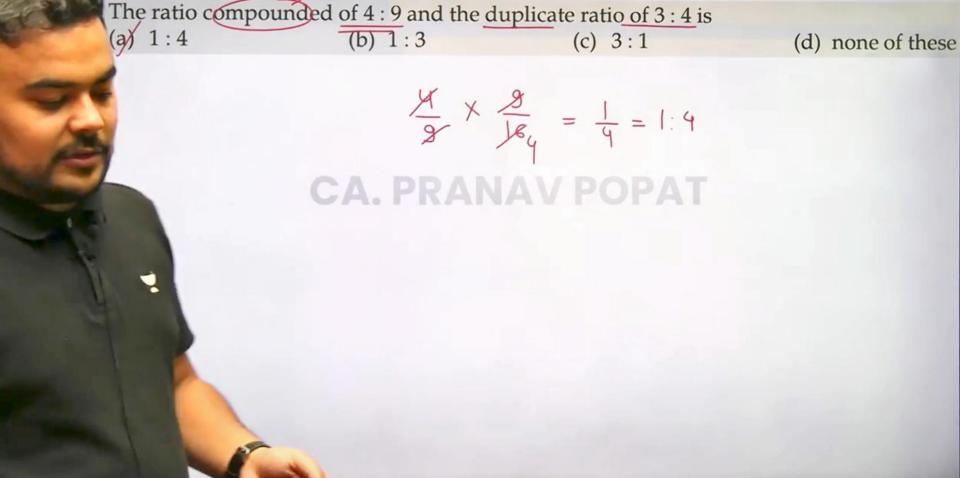
# $a^3:b^3$ is the triplicate ratio of a:b

#### **Properties of Ratio**

$$\sqrt{a}:\sqrt{b}$$
 is the sub-duplicate ratio of a:b satio of 16:25 = 4:5

$$\sqrt[3]{a}:\sqrt[3]{b}$$

# $\sqrt[3]{a}$ : $\sqrt[3]{b}$ is the sub-triplicate ratio of a:b

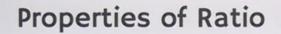


(d) none of these (c) 2:21 (b) 7:2 (a) 2:7

10. The ratio compounded of 4:9, the duplicate ratio of 3:4, the triplicate ratio of 2:3 and 9:7 is

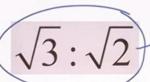
$$\frac{4}{9} \times \frac{3^{2}}{4^{2}} \times \frac{2^{3}}{3^{3}} \times \frac{9}{7} = \frac{1}{8} \times \frac{8}{12} \times \frac{8}{7} \times \frac{8}{7} = \frac{2}{21}$$
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# CA. PRANAV POPAT



- > If the ratio of two similar quantities can be expressed as a ratio of two integers, the quantities are said to be commensurable.
- > Otherwise, they are said to be incommensurable

Example of incommensurable quantities



irrational no.



21:35:50

Q:C = 21:50

"continued" a:b:c =











$$\frac{Q}{b} = \frac{3}{5} \qquad \frac{b}{c} = \frac{7}{10}$$

Common turn should be same

$$\frac{Q}{b} = \frac{3}{5} \times \frac{7}{7} = \frac{21}{35}$$

$$\frac{C}{P} = \frac{10}{5} \times \frac{2}{2} = \frac{20}{32}$$

if 
$$p:q=3:7$$
  $q:n=2:9$ 

$$p: y = 6:63$$
  
= 2:21

$$\frac{P}{9} = \frac{3}{7}$$

$$\frac{9}{7} = \frac{2}{9}$$

$$\frac{P}{9} = \frac{3}{7} \times \frac{2}{7} = \frac{6}{14}$$

$$\frac{9}{7} = \frac{2}{9} \times \frac{7}{7} = \frac{19}{63}$$

P, Q and R are three cities. The ratio of average temperature between P and Q is 11:12 and that between P and R is 9: §. The ratio between the average temperature of Q and R is (a) 22:27 (b) 27:22 (c) 32:33 (d) none of these

$$\frac{P}{Q} = \frac{11}{12} \frac{P}{R} = \frac{9}{8}$$

$$Q: R = \frac{108}{8} = \frac{27}{22} = 27:22$$

$$\frac{P}{Q} = \frac{11}{12} \frac{x^{9}}{9} \frac{P}{R} = \frac{9}{8} \times \frac{11}{11}$$

$$\frac{P}{Q} = \frac{99}{108}$$
  $\frac{P}{R} = \frac{99}{88}$ 

#### Example - Page 1.4

Example 1: The monthly incomes of two persons are in the ratio 4:5 and their monthly expenditures are in the ratio 7:9. If each saves ₹ 50 per month, find their monthly incomes.

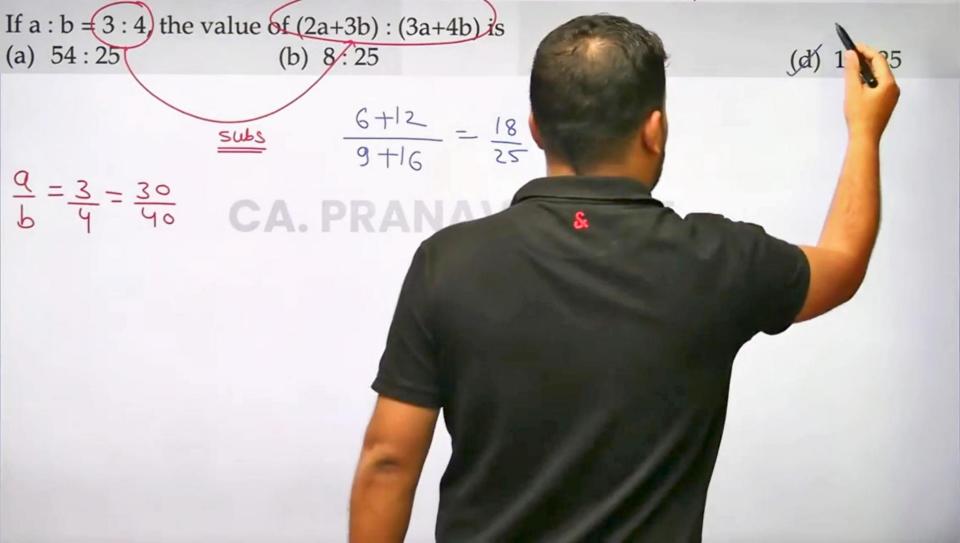
> hrome - expense = sowings Income - Sovings = Expense

$$4x - 50 = \frac{\text{Expense}}{\text{Expense}} = \frac{7}{9}$$

$$(4x - 50) \times 9 = (5x - 50) \times 7$$

$$36x - 450 = 35x - 350$$

$$\frac{7}{3/5} \% = \frac{7}{9}$$



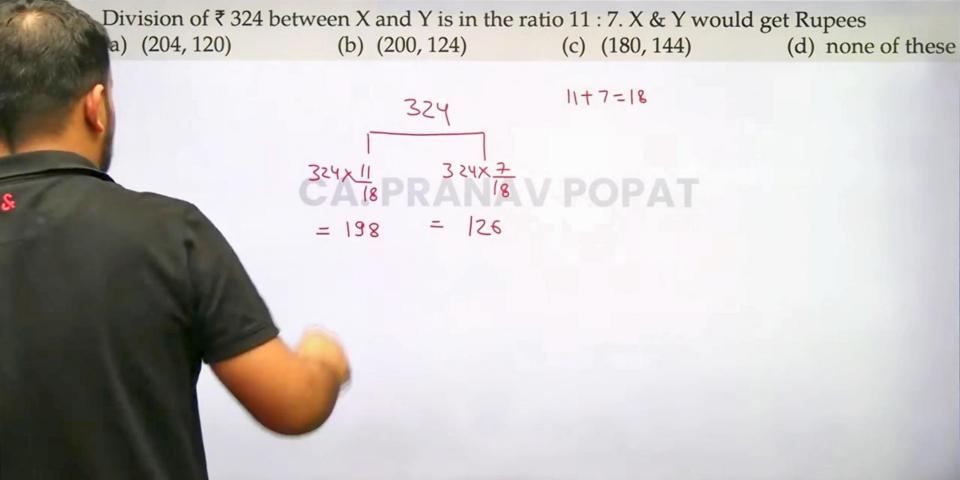
13. Two numbers are in the ratio 2:3) If 4 be subtracted from each, they are in the ratio 3:5. The numbers are

(a) (16, 24) (b) (4, 6) (c) (2, 3) (d) none of these

# CA. PRANAV POPAT

14. The angles of a triangle are in ratio 2:7:11. The angles are (a) (20°, 70°, 90°) (b) (30°, 70°, 80°) (c) (18°, 63°, 99°) sum of Total angles of Triangle = 180° 80° DRANAV POPAT  $= 18_{\circ} = 62_{\circ} = 33_{\circ}$   $= 18_{\circ} \times \frac{50}{5} = 180_{\circ} \times \frac{50}{11} = 180_{\circ} \times \frac{50}{11}$ 

(d) none of these



Anand earns ₹ 80 in 7 hours and Promode ₹ 90 in 12 hours. The ratio of their earnings is
(a) 32:21 (b) 23:12 (c) 8:9 (d) none of these

$$\frac{80}{90} = \frac{8}{9}$$

A nand  $\frac{80}{7}$ 

Promode  $\frac{90}{12}$ 
 $\frac{80}{7} = \frac{90}{12}$ 

CA. Promode  $\frac{90}{12}$ 
 $\frac{80}{7} = \frac{30}{12}$ 

$$\frac{3^2 \times 4 + 3 \times 4^2}{3^3 + 4^3} = \frac{36 + 48}{27 + 64} = \frac{84}{91} = \frac{12}{13}$$

## CA. PRANAV POPAT

If p : q is the sub-duplicate ratio of  $p-x^2$ :  $q-x^2$  then  $x^2$  is

(a) 
$$\frac{p}{p+q}$$

(b) 
$$\frac{q}{p+q}$$

(c) 
$$\frac{pq}{p+q}$$

(d) none of these

$$\frac{P}{9} = \sqrt{\frac{p-x^2}{9-x^2}}$$

$$\left(\frac{\frac{y-x}{q-x^2}}{q-x^2}\right)$$

$$\frac{p^{2}}{9^{2}} = \frac{p - x^{2}}{9 - x^{2}}$$

$$p^{2}q - p^{2}x^{2} = pq^{2} - x^{2}q^{2}$$

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

 $X_5d_5-b_5X_5=bd_5-b_5d$ 

$$\frac{2s}{3t} = \left(\frac{2s-p}{3t-p}\right)^{2}$$

$$2s = \left(\frac{2s-p}{3t-p}\right)^{2}$$

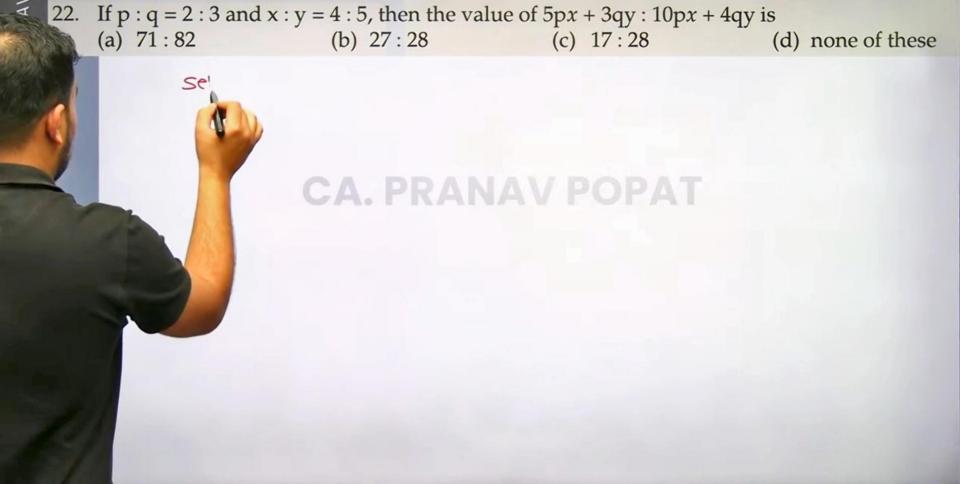
$$2s = \left(\frac{2s-p}{3t-p}\right)^{2}$$

$$2s = \left(\frac{2s-p}{3t-p}\right)^{2}$$

$$2s = \left(\frac{2s-p}{3t-p}\right)^{2}$$

$$\frac{3t}{2s} = \frac{(2s)^2 + p^2 - 2(2s)(p)}{(2s-3t)} = \frac{(2s)^2 + p^2 - 2(2s)(p)}{(2s-3t)} = \frac{(2s)^2 + p^2 - 2(3t)(p)}{(2s-3t)} = \frac{(2s)^2 + p^2 - 2$$

$$\frac{2S}{3t} = \frac{4s^2 + p^2 - 4sp}{9t^2 + p^2 - 6pt}$$



The ratio between the speeds of two trains is 7:8. If the second train runs 400 kms. in 5 rs, the speed of the first train is (c) 70 Km/hr (b) 50 Km/hr 10 Km/hr (d) none of these First bain speed =  $\frac{7}{8}$ Second bain speed =  $\frac{7}{8}$ A POPAT

#### Example - Page 1.3

**Example 2:** The ratio of the number of boys to the number of girls in a school of 720 students is 3:5 If 18 new girls are admitted in the school, find how many new boys may be admitted so that the ratio of the number of boys to the number of girls may change to 2:3.

consent: Boys = 
$$720 \times \frac{3}{8} = 270$$

Girls =  $720 \times \frac{5}{8} = \frac{450}{720}$ 

New boys

Rew: Girls =  $450 + 18 = 468$ 
 $\frac{B}{468} = \frac{2}{3} \Rightarrow B = \frac{2\times468}{3}$ 
 $B = 312$ 

department, the number of males and females are in the ratio 3:2. If 2 males and 5 females he department, then the ratio becomes 1:1. Initially, the number of females in the

Let no. of males and females be 
$$3 \times \text{ and } 2 \times \text{ les } p$$
.

$$\frac{(3 \times + 2)}{(2 \times + 5)} = \frac{1}{2}$$

$$\frac{(2 \times + 5)}{(3 \times + 2 + 2 \times + 5)} = \frac{1}{2}$$

$$\frac{(3 \times + 2)}{(3 \times + 2)} = \frac{1}{2}$$

$$\frac{(3 \times + 2)}{(2 \times + 5)} = \frac{1}{2}$$

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 $\chi = 3$ 

00:00:06

29

A bag contains 105 coins containing some 50 paise, and 25 paise coins in the ratio 4:3. The total value (in Rs.) in the bag is

(a) 41.25 (b) 43.25 (c) 105 (d) 52.5

$$|05 coins| + (45 \times 0.25)$$

$$|05 \times \frac{4}{7}| |05 \times \frac{3}{7}| + |1.25/-$$

$$= 60 coins = 45 coins$$

(a) 23:36

(b) 28:41

(c) 3:4

(d) 35:46

Let Income of R4S be 7x and 9x

Let expd. of RfS be 4y and 5y

$$(4y+5y)=7x$$
,  $9y=7x$ ,  $x=\frac{9}{7}y$ 

$$\frac{zawing of R}{zowing of S} = \frac{7x - 4y}{9x - 5y} = \frac{9y - 4y}{9(9y) - 5y} = \frac{y(9 - 4y)}{y(81 - 5)}$$

$$= \frac{5}{81 - 35} = \frac{5}{46} = \frac{5x7}{46} = \frac{35}{46}$$

$$= \frac{5}{\frac{81-35}{7}} = \frac{5}{\frac{46}{7}} = \frac{5\times7}{46} = \frac{35}{46}$$

