

Ratio & Proportion

↳ Just give a relation b/w two parameters

$$9:6 = 2:5$$



$$\begin{aligned} a &= 2x \\ b &= 5x \end{aligned}$$

$$\frac{a}{b} = \frac{2}{5} = \frac{4}{10} = \frac{6}{15} = \frac{8}{20}$$

$$b > a$$

↳ x → Integer or fraction



13:04 / 1:09:28

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Q. If $a:b = 7:3$, $a+b=300$ then find a & b ?

$$\frac{a}{b} = \frac{7}{3}$$

$$a = 7 \text{ unit}$$
$$b = 3 \text{ unit}$$

$$a+b=300$$

$$7+3 \rightarrow 300$$

$$10 \text{ Unit} \rightarrow 300$$

$$\underline{1 \text{ unit} \rightarrow 30}$$

$$a = 7 \text{ unit} \rightarrow 210$$

$$b = 3 \text{ unit} \rightarrow 90$$



Ques If $\frac{a}{b} = \frac{3}{2}$, then find $\frac{4a+3b}{4a-3b} = ?$

$$a = 3x$$

$$b = 2x$$

$$\frac{4a+3b}{4a-3b} = \frac{4 \times 3x + 3 \times 2x}{4 \times 3x - 3 \times 2x} = \frac{12+6}{12-6} = \frac{18}{6} = 3$$

$$a = 3$$

$$b = 2$$

$$\frac{4 \times 3 + 3 \times 2}{4 \times 3 - 3 \times 2} = \frac{12+6}{12-6} = 18$$

Ques If $\frac{a}{b} = \frac{3}{2}$, then find $\frac{3a^2 + 4b^2}{3a - 4b} = ?$ C.I.D.

$$\begin{aligned} \hookrightarrow a &= 3x \\ b &= 2x \end{aligned}$$

$$\frac{3a^2 + 4b^2}{3a - 4b} = \frac{3(3x)^2 + 4(2x)^2}{3(3x) - 4(2x)}$$

$$= \frac{27x^2 + 16x^2}{9x - 8x}$$

$$= \frac{43x^2}{x} = 43x$$



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Ques

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

(1)

~~$$\frac{4a^2 + b^2}{a^2 + b}$$~~

(2)

~~$$\frac{7a^3 + 3b^3}{a^3 - b^3}$$~~

(3)

~~$$\frac{a^3 - b^3}{a^2 + b^2}$$~~

(4)

$$\frac{a^2 + b^2}{7a^2}$$

(5)

$$\frac{a^7}{a^7 + b^7}$$



32:34 / 1:09:28



If $\frac{a}{b} = \frac{2}{3}$ & $b - a = 10$, then find a & b ?
 & $b > a$

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

$$a = 2 \text{ unit}$$

$$b = 3 \text{ unit}$$

$$b - a = 10$$

$$3 - 2 \rightarrow 10$$

$$1 \text{ unit} \rightarrow 10$$

$$a = 2 \text{ unit} = 2 \times 10 = 20$$

$$b = 3 \text{ unit} = 3 \times 10 = 30$$

Ques

$\frac{a}{b} = \frac{2}{3}$, $ab = 600$, then find a & b ?

$a \rightarrow 2 \text{ unit}$
 $b \rightarrow 3 \text{ unit}$

~~$2 \times 3 \rightarrow 600$~~

~~$6 \rightarrow 600$~~

~~$1 \rightarrow 100$~~

~~$a \rightarrow 2 \text{ unit} = 200$~~

~~$b \rightarrow 3 \text{ unit} = 3 \times 100 = 300$~~

~~$a \times b = 200 \times 300$~~

~~$600 \neq 60000$~~

$a = 2x$
 $b = 3x$

$a \times b = 600$

$2x \times 3x = 600$

$6x^2 = 600$

$x = 10$

$a = 20$

$b = 30$

$a \times b = 600$

$20 \times 30 = 600$





1) If $m : n = 3 : 2$, then $(4m + 5n) : (4m - 5n)$ is equal to

[VIZAG STEEL PLANT, 2015]

A) 4:9

B) 9:4

☒ C) 11:1

D) 9:1

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

$$\frac{4m + 5n}{4m - 5n} = ?$$

$$= \frac{4 \times 3 + 5 \times 2}{4 \times 3 - 5 \times 2} = \frac{12 + 10}{12 - 10} = \frac{22}{2} = \frac{11}{1}$$



44:06 / 1:09:28

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Joining the Ratio

Ex $\frac{a}{b} = \frac{2}{3} \quad \frac{b}{c} = \frac{4}{3}$

(I) $a : c$ (II) $a : b : c$

(I) $\frac{a}{b} = \frac{2}{3} \quad \frac{b}{c} = \frac{4}{3}$

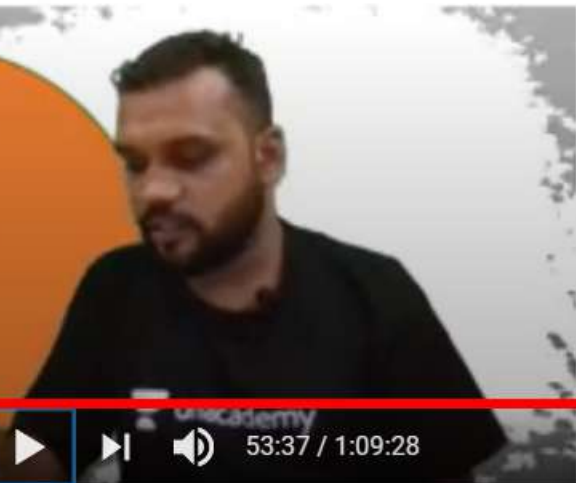
$\frac{a}{\cancel{b}} \times \frac{\cancel{b}}{c} = \frac{2}{3} \times \frac{4}{3} \Rightarrow \boxed{\frac{a}{c} = \frac{8}{9}}$

(II) $\frac{a}{\textcircled{b}} = \frac{\textcircled{2}}{\textcircled{3}} \quad \frac{\textcircled{b}}{c} = \frac{\textcircled{4}}{3}$

Join

$a : b : c = 8 : 12 : 9$

$\frac{a}{b} = \frac{2 \times 4}{3 \times 4} = \frac{8}{12} \quad \frac{b}{c} = \frac{4 \times 3}{3 \times 3} = \frac{12}{9}$



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$$\frac{a}{b} = \frac{2}{3}, \quad \frac{b}{c} = \frac{4}{3}$$

$$\begin{array}{ccc} a & : & b & : & c \\ 2 \times 4 & : & 3 \times 4 & : & 3 \times 3 \end{array}$$

$$\frac{a}{b} = \frac{3}{4} \quad \frac{b}{c} = \frac{1}{2}$$

$$\begin{array}{ccc} a & : & b & : & c \\ 3 \times 1 & : & 4 \times 1 & : & 4 \times 2 \end{array}$$



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$\frac{a}{b} = \frac{1}{2}$ $\frac{b}{c} = \frac{3}{2}$ $\frac{c}{d} = \frac{3}{4}$

$a : b : c : d$
 $1 : 2 : 3 : 4$
 $1 \times 3 \times 3 \quad 2 \times 3 \times 3 \quad 2 \times 2 \times 3 \quad 2 \times 2 \times 4$



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

$$\frac{b}{c} = \frac{5}{7}$$

$$\frac{c}{d} = \frac{1}{2}$$

a	o	b	o	c	o	d
2x5x1		3x5x1		3x7x1		3x7x2
NNN		DDN		DDN		DDD



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2) If $x : y = 3 : 4$ & $y : z = 3 : 4$, then $\frac{x+y+z}{3z}$ is equal to

[AAI, ATC]

A) 13 : 27

B) 1 : 2

C) 73 : 84

☒ D) 37 : 48

$$x : y = 3 : 4 \quad y : z = 3 : 4$$

$$\frac{x}{y} = \frac{3}{4} \quad \frac{y}{z} = \frac{3}{4}$$

$$\begin{matrix} x & : & y & : & z \\ 9 & : & 12 & : & 16 \end{matrix}$$

$$\begin{aligned} \frac{(x) + (y) + (z)}{3(z)} &= \frac{9 + 12 + 16}{3 \times 16} \\ &= \frac{28 + 9}{3 \times 16} \\ &= \frac{37}{48} \end{aligned}$$



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✓ 1) If $a : b = 2 : 5$ and $b : c = 6 : 7$ then find $a : b : c$?

A) 30 : 12 : 35

✓ B) 12 : 30 : 35

C) 30 : 35 : 12

D) NOTA

$$\begin{array}{ccc} \frac{a}{b} = \frac{2}{5} & & \frac{b}{c} = \frac{6}{7} \\ \text{NN} & & \text{ND} \quad \text{DD} \\ a & \div & b & \div & c \\ 12 & \div & 30 & \div & 35 \end{array}$$



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11:23 / 1:05:13

$$\frac{a}{b} = \frac{1}{2} \quad \frac{b}{c} = \frac{3}{4} \quad \frac{c}{d} = \frac{2}{1}$$

$$a : b : c : d$$

$\xrightarrow{NNN} 1 \times 3 \times 2 \Rightarrow 6$
 $\xrightarrow{DNN} 2 \times 3 \times 2 \Rightarrow 12$
 $\xrightarrow{DON} 2 \times 4 \times 2 \Rightarrow 16$
 $\xrightarrow{DDO} 2 \times 4 \times 1 \Rightarrow 8$

$$a : b = 1 : 2$$

$$b : c = 3 : 4$$

$$c : d = 2 : 1$$

$$a : b : c : d$$

$$6 : 2 \times 3 \times 2 : 2 \times 4 \times 2 : 8$$

$$6 : 12 : 16 : 8$$



2) If $a : b : c = 1 : 3 : 5$, and $6a - 2b + 3c = 90$ then the value of b is?

A) 18

B) 15

C) 21

D) 12

(m-I) $a : b : c = 1 : 3 : 5$

$$a = x \Rightarrow c$$

$$b = 3x \Rightarrow 18$$

$$c = 5x \Rightarrow 30$$

$$6a - 2b + 3c = 90$$

$$6 \times x - 2 \times 3x + 3 \times 5x = 90$$

$$15x = 90$$

$$x = 6$$

(m-II)

$$a : b : c = 1 : 3 : 5$$

$$a = 1 \text{ unit} \Rightarrow 6$$

$$b = 3 \text{ unit} \Rightarrow 18$$

$$c = 5 \text{ unit} \Rightarrow 30$$

$$6a - 2b + 3c = 90$$

$$6 \times 1 - 2 \times 3 + 3 \times 5 = 90$$

$$6 - 6 + 15 \rightarrow 90$$

$$15 \text{ unit} \rightarrow 90$$

$$1 \text{ unit} \rightarrow 6$$



23:38 / 1:05:13

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~~Ques~~ If $3A = 2B = 4C$, then find $A:B:C = ?$.

M-5 $3A = 2B = 4C = x$

$$A = \frac{x}{3}, B = \frac{x}{2}, C = \frac{x}{4}$$

$$A:B:C = \frac{x}{3} : \frac{x}{2} : \frac{x}{4} = \frac{1}{3} : \frac{1}{2} : \frac{1}{4} \\ = \underline{4:6:3}$$

M-12 $3A = 2B = 4C$

$$A:B:C = \frac{12}{3} : \frac{12}{2} : \frac{12}{4} = \underline{4:6:3}$$



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eg

$$(2)A - (5)B = (4)C$$

$$A : B : C = 10 : 4 : 5$$





3) If $6A = 4B = 9C$, What is $A : B : C$?

A) $6 : 4 : 9$

B) $9 : 4 : 6$

C) $4 : 9 : 6$

D) $6 : 9 : 4$



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Ques If $(a+b):(b+c):(c+a) = 5:7:6$, then find

✓ (a) $a:b:c$ ✓ (b) $\frac{1}{a}:\frac{1}{b}:\frac{1}{c}$

$$(a+b): (b+c): (c+a) = 5:7:6$$

$$(a+b) + (b+c) + (c+a) \rightarrow 18$$

$$2(a+b+c) \rightarrow 18$$

$$a+b+c \rightarrow 9 \text{ unit}$$

$$c \rightarrow 4 \text{ unit}$$

$$a \rightarrow 2 \text{ unit}$$

$$b \rightarrow 3 \text{ unit}$$

$$\textcircled{1} \quad a:b:c \\ 2:3:4$$

$$\textcircled{2} \quad \frac{1}{a}:\frac{1}{b}:\frac{1}{c} \\ = \frac{1}{2}:\frac{1}{3}:\frac{1}{4} \\ = 6:4:3$$



43:23 / 1:05:13

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4) If $(a + b) : c = (11 : 4)$, and $(b + c) : a = (26 : 9)$, then find $(c + a) : b = ?$

A) 13:4

B) 11:10

C) 19:16

D) 17:13

$$\frac{a+b}{c} = \frac{11 \times 7}{4 \times 7}$$

$$a+b+c \rightarrow 15$$

$$\frac{b+c}{a} = \frac{26 \times 3}{9 \times 3}$$

$$a+b+c \rightarrow 35$$

$$\begin{array}{c} \nearrow \times 7 \quad \nwarrow \times 3 \\ 105 \end{array}$$

$$\frac{a+b}{c} = \frac{77}{28}$$

$$a+b+c \rightarrow 105$$

$$\frac{b+c}{a} = \frac{78}{27}$$

$$a+b+c \rightarrow 105$$

$$\frac{c+a}{b} = 2 = \frac{28+27}{5} = \frac{55}{5} = \frac{11}{1}$$

$$\begin{array}{l} c = 28, a = 27 \\ a+b+c = 105 \\ b = 5 \end{array}$$



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5) If $(a + b) : (b + c) : (c + a) = 5 : 7 : 6$ & $2a - 3b + 4c = 66$, then find a, b, c ?

$$2(a + b + c) \rightarrow 18$$

$$a + b + c \rightarrow 9$$

$$\begin{aligned} c &\rightarrow 4 \text{ unit} \Rightarrow 24 \\ a &\rightarrow 2 \text{ unit} \Rightarrow 12 \\ b &\rightarrow 3 \text{ unit} \Rightarrow 18 \end{aligned}$$

$$2a - 3b + 4c = 66$$

$$2 \times 12 - 3 \times 18 + 4 \times 24 \rightarrow 66$$

$$4 - 9 + 16 \rightarrow 66$$

$$11 \text{ unit} \rightarrow 66$$

$$1 \text{ unit} \rightarrow 6$$



58:10 / 1:05:13

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6) If a, b, c all are natural numbers and $(x + y) : (y + z) : (z + x) = 4 : 8 : 6$, then value

of $\frac{x+y+z}{y}$ is

A) 3

B) 5/4

C) 11/3

D) 7

[J E]

$$2(x+y+z) \rightarrow 18$$

$$\frac{x+y+z}{y} \rightarrow 9$$

$$\frac{x+y+z}{y} \rightarrow 3$$

$$\frac{x+y+z}{y} = \frac{9}{3}$$

$$= 3$$



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Aptitude for GATE/ESE/PSUs/AE/JE/College Placement, Topic- Ratio & Proportion

- ✓ 1) ₹38000 are divided among A, B and C in such a manner that the ratio of the amount of A to that of B is 3 : 7 and the ratio of the amount of B to that of C is 6 : 5. the amount of money received by B is

A) ₹7200

✓ B) ₹16800

C) ₹1440

D) ₹2400

₹38000 → A, B, C

$$\begin{array}{cc} A : B & B : C \\ 3 : 7 & 6 : 5 \end{array}$$

Join

$$\begin{aligned} 95 \text{ unit} &\rightarrow 38000 \\ 1 \text{ unit} &\rightarrow 400 \\ B &\rightarrow 42 \text{ unit} = 42 \times 400 \\ &= 16800 \end{aligned}$$

$$\begin{aligned} A : B : C &= 3 \times 6 : 7 \times 6 : 7 \times 5 \\ &= 18 : 42 : 35 \end{aligned}$$

$$\begin{aligned} A + B + C &\rightarrow 18 + 42 + 35 \\ &= 95 \text{ unit} \end{aligned}$$

$$\begin{aligned} A &\rightarrow 18 \times 400 \\ C &\rightarrow 35 \times 400 \\ &+ \end{aligned}$$



Aptitude for GATE/ESE/PSUs/AE/JE/College Placement, **Topic- Ratio & Proportion**

✓ 2) A sum of money is divided among A, B and C in the ratio 2 : 5 : 3. B gets ₹ 125. Find the total amount of money?

NAT

$$\begin{array}{ccc} A & : & B & : & C \\ (2) & : & (5) & : & (3) \end{array}$$

$$\begin{aligned} B &\rightarrow ₹125 \\ 5 \text{ unit} &\rightarrow ₹125 \\ 1 \text{ unit} &\rightarrow ₹25 \\ \text{Total Money} &= (2+5+3) \text{ unit} \\ &= 10 \text{ unit} \\ &= \underline{\underline{250}} \end{aligned}$$

$$\begin{array}{l} A \rightarrow 2 \times 25 \\ C \rightarrow \end{array}$$



Aptitude for GATE/ESE/PSUs/AE/JE/College Placement, **Topic- Ratio & Proportion**

3) A man divide has property so that his son's share to his wife's and wife's share to his daughter's are both as in the ratio 5 : 2. If the daughter gets ₹29,400 less than son, the value(in rupees) of the whole property is

- A) ₹54,600 B) ₹56,000 C) ₹52,650 D) ₹58,500

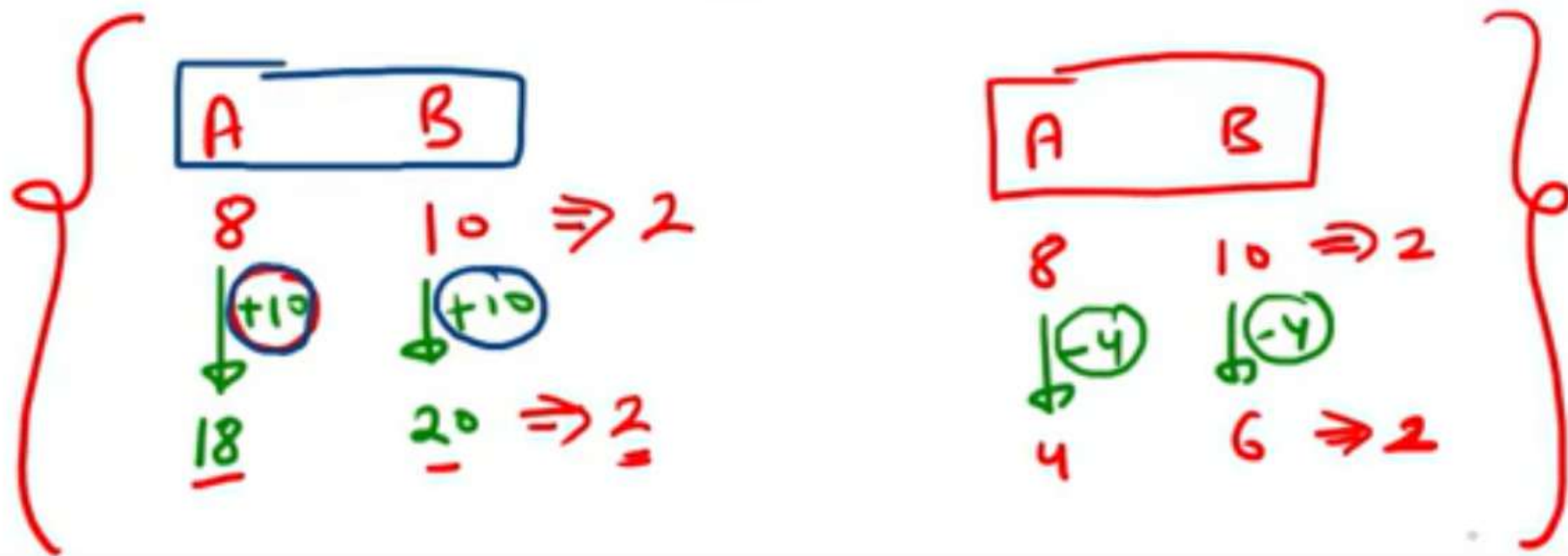
$S : W = 5 : 2$
 $W : D = 5 : 2$

$S : W : D = 25 : 10 : 4$

$(25 - 4) \text{ unit} \rightarrow 29400$
 $21 \text{ unit} \rightarrow 29400$
 $1 \text{ unit} \rightarrow 1400$

Whole Property = $(25 + 10 + 4) \text{ unit}$
 $= 39 \text{ unit}$
 $= 39 \times 1400$

Questions based on increasing or decreasing a Ratio by given constant





Aptitude for GATE/ESE/PSUs/AE/JE/College Placement, **Topic- Ratio & Proportion**

✓ 4) Two number are in the ratio 4:9. If both numbers increase by 12, the ratio become 11:21. The sum of the original number is:

A) 52

B) 64

C) 128

✓ D) 104

M-T

A B

4:9

+12 (11:21) +12

$$A = 4x \quad B = 9x$$
$$\hookrightarrow 4x+12 \quad \hookrightarrow 9x+12$$

$$\frac{4x+12}{9x+12} = \frac{11}{21} \Rightarrow 84x + 252 = 99x + 132$$
$$15x = 120$$

$$A = 4x = 4 \times 8 = 32 \quad \boxed{x = 8}$$

$$B = 9x = 9 \times 8 = 72$$

$$A + B = 32 + 72 = \boxed{104}$$

$$\begin{array}{l}
 A : B \\
 4 : 9 \Rightarrow 5 \\
 \begin{array}{c} +12 \\ \hline 11 : 21 \Rightarrow 10 \end{array}
 \end{array}$$

$$\begin{array}{l}
 A : B \\
 (4 : 9) \times 2 \\
 (11 : 21)
 \end{array}
 \left\{
 \begin{array}{l}
 A : B \\
 8 : 18 \Rightarrow 10 \\
 \begin{array}{c} +3 \\ \hline 11 : 21 \Rightarrow 10 \end{array}
 \end{array}
 \right.$$

$$\begin{array}{r}
 3 \text{ Unit} \rightarrow 12 \\
 1 \text{ Unit} \rightarrow 4
 \end{array}$$

$$\begin{aligned}
 A &= 8 \text{ Unit} = 8 \times 4 = 32 \\
 B &= 18 \text{ Unit} = 18 \times 4 = 72
 \end{aligned}$$

$$\boxed{A + B = 104}$$



Aptitude for GATE/ESE/PSUs/AE/JE/College Placement, Topic- Ratio & Proportion

5) Two numbers are such that the ratio between them is 4:7. If each is increased by 4, the ratio becomes 3:5. The larger number is **[VIZAG STEEL PLANT, 2015]**

A) 36

B) 48

☒ C) 56

D) 64

$$\begin{array}{ccc} A & B & \\ 4 & 7 & \Rightarrow 3 \\ \downarrow +1 & \downarrow +2 & \\ 3 & 5 & \Rightarrow 2 \end{array}$$

+4

$$\begin{array}{ccc} A & B & \\ 8 & 14 & \Rightarrow 6 \\ \downarrow +1 & \downarrow +1 & \\ 9 & 15 & \Rightarrow 6 \end{array}$$

1 unit $\rightarrow 4$

$$B = 14 \text{ unit} \\ = 14 \times 4$$

$$= 56$$



Aptitude for GATE/ESE/PSUs/AE/JE/College Placement, Topic- Ratio & Proportion

6) Two numbers are in the ratio 3:5, If 13 is subtracted from each, the new number are in the ratio of 10:21. If 15 is added to each of the original numbers then the ratio become

[AAI, 2017]

A) 24 : 35

B) 4 : 5

C) 23 : 35

D) 5 : 7

Handwritten solution for the first part of the problem:

A B
3 : 5 \Rightarrow (2)
-13 -13
10 : 21 \Rightarrow (11)

Handwritten solution for the first part of the problem:

A B
33 : 55 \Rightarrow (22)
 $\downarrow -13$ $\downarrow -13$
20 42 \Rightarrow (22)

13 unit = 13
1 unit = 1

Handwritten solution for the first part of the problem:

A = 33 unit = 33

Handwritten solution for the first part of the problem:

B = 55 unit = 55

Handwritten solution for the second part of the problem:

$\frac{29}{35} = \frac{48}{70} = \frac{33+15}{55+15}$