Lesson 1: Problems on ages

eg

Past	Present	Future

i) 17 $\xleftarrow{-10}$ 27 $\xrightarrow{+10}$

ago / back — hence / after

(Past)

10 years ago / back $x-10$

(future)

hence / after 10 years is $x+10$

x is current age.

ii)

$$a:b = \frac{a}{b}$$

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

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i) The present ages of A & B are in the ratio 4:5 & after 5yr they will be in the ratio 5:6. The present age of A is

Present → future

like in ratio 4 : 5

$$\frac{4x+5}{5x+5} \longrightarrow \frac{5}{6}$$

$$\frac{4x+5}{5x+5} = \frac{5}{6}$$

$$6(4x+5) = 5(5x+5)$$

$$24x+30 = 25x+25$$

$$x = 5$$

$$\frac{4(5)}{5(5)}$$

$$20:25$$

$$A = 20$$

2) The respective ratio of the present ages of Swati & Trupu is 4:5. Six years hence, the respective ratio of their ages will be 6:7. What is difference b/w their ages?.

present → (+6 hence) → future

$\frac{4x}{5x} \xrightarrow{+6} \frac{6}{7}$

$$\frac{4x+6}{5x+6} = \frac{6}{7}$$

$$7(4x+6) = 6(5x+6)$$

$$28x + 42 = 30x + 36$$

$$-2x = -42 + 36$$

$$+2x = +6$$

$$\boxed{x = 3}$$

$$4(3) - 5(3) =$$

$$12 \sim 15 = 3 \text{ years}$$

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3) The ratio of present ages of two brothers is 1:2 & 5yr back, the ratio was 1:3. What will be the ratio of their ages after 5 yrs.

Past → (−5 back) → Pres

$\frac{1}{3} \xleftarrow{-5} \frac{1x}{2x}$

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

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

$3x - 15 : 2x - 5$

$\boxed{x = 10}$

$10 : 20$

After 5 year

$10+5 : 20+5$

$15 : 25$

$\boxed{3 : 5}$

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4) The ratio of the present age of Anju & sandhya is 13:17, respectively. four years ago, the respective ratio of their ages was 11:15. What will be the respectively ratio of their ages six years hence?

Ratio		Present
$\frac{11}{15}$	$\xleftarrow[\text{ago}]{-4}$	$\frac{13}{17}$

$$\frac{13x-4}{17x-4} = \frac{11}{15}$$

$$15(13x-4) = 11(17x-4)$$

$$195x - 60 = 187x - 44$$

$$(195-187)x = 60-44$$

$$8x = 16$$

$$\boxed{x = 2}$$

$13(2) = 26$

$17(2) = 34$

After 6 years

$26+6 : 34+6$

$4 \cancel{32} : \cancel{40}\ 5$

$\boxed{4 : 5}$

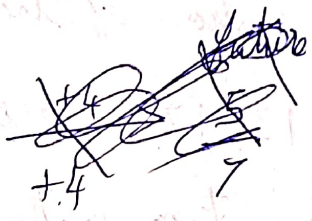
5) 4 yr ago, the ratio of the ages of A & B was 2:3 and after 4 yr, it will become 5:7 Find their present ages.

Past		Present		future
$\frac{2}{3}$	$\xleftarrow{-4}$		$\xrightarrow[\text{after}]{+4}$	$\frac{5}{7}$

i) different between age from past to future

Past $\rightarrow$ Present

$2x:3x \xrightarrow{+4} \frac{2x+4}{3x+4}$



Present $\xrightarrow{+4}$ future

$\frac{2x+4}{3x+4} \xrightarrow{+4} \frac{2x+8}{3x+8}$

$$\frac{2x+8}{3x+8} = \frac{5}{7}$$

$$7(2x+8) = 5(3x+8)$$

$$14x + 56 = 15x + 40$$

$$56 - 40 = 15x - 14x$$

$$\boxed{16 = x}$$

ii) where we substitute this x

$$2x + 4 = 2(16) + 4 = 36$$

$$3x + 4 = 3(16) + 4 = 52$$

$A = 36$

$B = 52$

6) Harsha is 40 yr old & Bill is 60 yr old. How many years ago was the ratio of their ages 3:5

Past ← x → Present (future)

$\frac{3}{5}$ ← x → $\frac{40}{60}$

Given age ask the where the ratio will come

$$\frac{40-x}{60-x} = \frac{3}{5}$$

$$5(40-x) = 3(60-x)$$

$$200 - 5x = 180 - 3x$$

$$200 - 180 = 5x - 3x$$

$$20 = 2x$$

$$\boxed{x = 10}$$

10 years ago the ratio

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7) The ratio of the ages of two persons is 4:7 & age of one of them is greater than that of the other by 30 yr. The sum of their ages (in years) is

4 : 7

30 years greater

$$7x - 4x = 30$$

$$3x = 30$$

$$\boxed{x = 10}$$

$40 + 70 = 110$ years

8) The respective ratio b/w the present age of Parag & Sapna is 21:19. Six years ago, the respective ratio b/w their ages was 9:8. How old is Lina, if her present age is 12 yrs less than Sapna's present age?

	last	Present
9	-6	21x
8	ago	19x.

$$\frac{21x-6}{19x-6} = \frac{9}{8}$$

$$9(21x-6) = 9(19x-6)$$

$$168x - 46 = 171x - 54 \qquad 189x - 54 = 152x - 48$$

$$171x - 168x = 54 - 46 \qquad 189x - 152x = 54 - 48$$

$$3x = 6 \qquad 37x = 6$$

$$x = 2$$

$$21(2) = 42$$

$$19(2) = 38$$

Parag = 42 Sapna = 38

Lina = Sapna age − 12

= 38 − 12

Lina = 26 years old

Lesson 2:

Twice / Thrice

Note

① Father age is three times the age of his son

Son	father
x	$3x$

② Father age is three times more than his son

son	father
x	$x + 3x$
↓	↓
x	$4x$

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1) I am 3 times as old as my son. 15 yr later, I will be twice as old as my son. The sum of our ages is

	Present	→ 15 yr	Future
	x		$x + 15$
	$3x$		$2(x+15)$

$$\frac{x+15}{3x+15} = \frac{1}{2(x+15)}$$

$x + 15$

Father → son age

$$3x + 15 = 2(x + 15)$$

$$3x + 15 = 2x + 30$$

$$3x - 2x = 30 - 15$$

$$\boxed{x = 15}$$

$15 + 3(15) =$

$15 + 45 = 60$

the sum of our age is 60

2) The sum of present ages of A & B is 11 times the different of their ages. 5 years hence, their total ages will be 13 times the difference of their. What is the present age of elder one?

$$A + B = 11(A \sim B)$$

After 5 years

$$A + B = 13(A \sim B)$$

i) Find $\frac{A}{B}$ by ratio

A : B

$A + B = 11A - 11B$

$12B = 10A$

$\frac{A}{B} = \frac{12}{10} \frac{6}{5} = \frac{6}{5}$

$A : B = 6 : 5$

$6x + 5 =$

ii) After 5 years

$(A+5) + (B+5) = 11(A+B)$

A $(6x+5)$

B $(5x+5)$

$(6x+5) + (5x+5) = 13(6x - 5x)$

$11x + 10 = 13x$

$10 = 2x$

$5 = x$

$= 6(5)$

$= 30$ elder one $=$

3) The present age of a father is 3 yr more than three times the age of his son. 3 yr hence father's age will be 10 yr more than twice the age of the son. The father's present age is

$3 + 3x$

3 yrs more than three times the age

Son	Father
x	$3+3x$

Future $x+3$ $\quad 3+3x+3$ $\quad 6+3x$ making eq is careful

$11(6+3x) = 2(x+3)$

father's age = years + twice → son age

$3x+6 = 10 + 2(x+3)$

$3x+6 = 10 + 2x+6$

$3x+6 = 16+2x \quad 3x-2x = 16-6$

$x = 10$

$3+3(10)$

33

father age is 33

Son age is 10

4) 10 years ago daughter's age was two fifth of her mother's age that time. While 10 years hence her age will be three fifth of her mothers age. Find the different in the ages of the two.

$\frac{2}{5}x \xleftarrow{-10}$ $\xrightarrow{+10} \frac{3}{5}$

x

i) Condition Messy Solve...

	Daughter	mom
	x	y
Past	$x-10$	$y-10$

$(x-10) = \frac{2}{5}(y-10) \rightarrow (1)$

$(x+10) = \frac{3}{5}(y+10) \rightarrow (2)$

(1) $5x - 50 = 2y - 20$

$5x - 2y = 50 - 20$

$5x - 2y = 30$

(2) $5x + 50 = 3y + 30$

$5x - 3y = -50 + 30$

$5x - 3y = -20$

(2) $5x - 2y = 30$

(1) $5x - 3y = -20$

$y = +50$ → mom

$y = 50$

$5(x) - 2(50) = 30$

$5x = 100 + 30$

$x = 130$

$x = 26$ → daughter

different in the ages $50 - 26 = 24$ years

5) Father is aged three times more than his son Arun. After 8 years, he would be two & a half times of Arun's age. After further 8 years, how many times would he be of Arun's age?

$$2\overline{)2.5}\ \begin{matrix}1\\4\end{matrix}\quad \frac{14}{5}$$

	Arun's son	father
	x	$x+x(4x)$
After	$x+8$	$4x+8$

father age $\rightarrow$ $4x+8 = 2\frac{1}{2}(x+8)$ $\leftarrow$ son age

$$4x+8 = \frac{5}{2}(x+8)$$

$$2(4x+8) = 5x+40$$

$$8x+16 = 5x+40$$

$$8x-5x = 40-16$$

$$3x = 24$$

$$\boxed{x = 8}$$

$8 \qquad 4(8)$

$8+8+8 \qquad 32+8+8$

$6 \quad \begin{matrix}+2\\24\end{matrix} : 48 \quad 26\ 13$

$1 : 2$

6) If the ages of A & C are adding to twice the age of B, the total becomes 59. If the ages of A & C are added to thrice the age of A, the total becomes 68 & if the age of A is added to thrice the age of B and thrice the age of C the total becomes 108. What is the age of A?

① → $A + C + 2B = 59$

② $B + C + 3A = 68$

③ → $A + 3B + 3C = 108$

$A + 2B + C = 59$

$3A + B + C = 68$

(−) (−) (−) (−)

$= -9$

② × 3 ⇒ $9A + 3B + 3C = 204$

$A + 3B + 3C = 108$

(−) (−) (−) (−)

$8A = 96$

$A = 12$

$A + C + 2B = 59 \Rightarrow 12 + C + 2B = 59$

$C + 2B = 47$

$3(2) + B + C = 68 \quad B + C = 62$

$-2 + 3B + 3C = 108$

$3B + 3C = 106$

B + C →

2B + C = 57

B + C = 62 (-)

B = ...

Lesson 3 Average Age

(1) Average Age of father & Mother is 34

$$\frac{F+M}{2} = 34$$

$$F + M = 34 \times 2$$

$$\boxed{F+M = 68}$$

(2) Average Age of father & mother & son is 52

$$\frac{F+M+S}{3} = 52$$

$$= 52 \times 3$$

$$\boxed{F+M+S = 156}$$

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1) In a family, the average age of father & mother is 35, the average age of the father, mother & their only son is 27 yrs. What is the age of the son

$$F + M = 70$$

$$F+M+S = 27 \times 3 = 81$$

$$\therefore 70 + S = 81$$

$$S = 81 - 70$$

$$\boxed{S = 11}$$

2) 5yr age, the average age of A, B, C & D was 45yrs. With E joining them now, the avg age of all the five is 49 yrs. How old is E?

$$\frac{A+B+C+D}{4} = 45$$

$A+B+C+D = 180$ → Total age

5yrs ago

Past +5 to present

$A+5 + B+5 + C+5 + D+5 = 180$

$A+B+C+D = 180+20$

$A+B+C+D = 200$ Present age

E add

$$\frac{A+B+C+D+E}{5} = 49$$

$= 49 \times 5$

$A+B+C+D+E = 245$

$200 + E = 245$

$E = 245 - 200$

$E = 45$

3) The average age of a husband & wife, who were married 4 yr ago, was 25 yr at the time of their marriage. The average age of the family consisting of husband, wife & child, born during the interval is 20 yr today. The age of the child

Ans

$$h + W = 25 \times 2$$

4 yr ago

$$h + W = 50 + 8$$

$$h + W = 58 \rightarrow$$ total age of present

$$h + W + C = 20 \times 3$$

$$58 + C = 60$$

$$\boxed{C = 2}$$

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4) Average age of 6 sons of a family is 8 yr. Avg age of son together with their parents is 22 yr. If the father is older than the mother by 8 yr, then the age of mother

$$\frac{S+S}{6} = 8$$

$$S = 8 \times 6 = 48$$

$$\frac{F+M+S}{8} = 22 \times 8$$

$$F + M + S = 176$$

$$48 = 176$$

$$= 176 - 48$$

$$\boxed{F + M = 128}$$

$$M + 8 + M = 128$$

$$2M = 120$$

$$\boxed{M = 60}$$

$$F = M + 8$$

45

6 | 176 | 1 22
48 | 6 | 132
128 | 48
144
45
53
48
6

5) When the avg age of husband & wife & their son was 42yr, the son got married and a child was born just one year after the marriage. When child turned to be 5yrs, then the average age of family became 42. What was the age of daughter-in-law at time of marriage.

$$\frac{M+F+C}{3} = 42$$

$$M+F+C = 126$$

$$M+F+C = 126$$

$$\frac{M+F+C+D_{in\,law}+C}{5} = 36$$

$$M+f+C+D+C = 36\times 5$$

$$= 180$$