Problems on Ages

Some useful short-cut methods

1. **If the age of A, t years ago, was n times the age of B and at present A's age is n_2 times that of B, then**

   A's present age $= \left(\dfrac{n_1 - 1}{n_1 - n_2}\right) n_2 \text{ t years}$

   and B's present age $= \left(\dfrac{n_1 - 1}{n_1 - n_2}\right) \text{ t years}$

Expanation

Let the present age of B be x years.

Then, the present age of A = n_2 x years

Given, t years ago,

$n_1 (x - t) = n_2 x - t$ or $(n_1 - n_2) x = (n_1 - 1) t$

or, $x = \left(\dfrac{n_1 - 1}{n_1 - n_2}\right) t.$

Therefore, B's present age $= \left(\dfrac{n_1 - 1}{n_1 - n_2}\right) t \text{ years}$

and A's present age $= \left(\dfrac{n_1 - 1}{n_1 - n_2}\right) n_2 t \text{ years.}$

NUMERICAL CHALLENGE 8.1

The age of father is 4 times the age of his son. If 5 years ago father's age was 7 times the age of his son at that time, what is father's present age ?

Solution

The father's present age

$= \left(\dfrac{n_1 - 1}{n_1 - n_2}\right) n_2 t$ $\qquad$ (Here $n_1 = 7$, $n_2 = 4$ and $t = 5$)

$= \left(\dfrac{7 - 1}{7 - 4}\right) 4 \times 5 = \dfrac{6 \times 4 \times 5}{3} = 40 \text{ years.}$

2. **The present age of A is n_1 times the present age of B. If t years hence, the age of A would be n_2 times that of B, then**

$$\text{A's present age} = \left(\frac{n_2 - 1}{n_1 - n_2}\right) n_2 \, t \text{ years}$$

$$\text{and B's present age} = \left(\frac{n_2 - 1}{n_1 - n_2}\right) t \text{ years}$$

Explanation

Let the present age of B be x years.

Then, the present age of A = $n_1 x$

Given, t years hence,

$$(n_1 x + t) = n_2 (x + t)$$

or, $(n_1 - n_2)x = (n_2 - 1)t$

or, $x = \left(\dfrac{n_2 - 1}{n_1 - n_2}\right) t$

Therefore, B's present age = $\left(\dfrac{n_2 - 1}{n_1 - n_2}\right) n_1 t$ years

and A's present age = $\left(\dfrac{n_2 - 1}{n_1 - n_2}\right) n_1 t$ years.

NUMERICAL CHALLENGE 8.2

The age of Mr Gupta is four times the age of his son. After 10 years, the age of Mr Gupta will be only twice the age of his son. Find the present age of Mr Gupta's son.

Solution

The present age of Mr Gupta's son

$$= \left(\frac{n_2 - 1}{n_1 - n_2}\right) t$$

$$= \left(\frac{2 - 1}{4 - 2}\right) 10$$

(Here n_1 = 4, n_2 = 2 and t = 10)

= 5 years.

3. **The age of A, t_1 years ago, was n_1 times the age of B, If t_2 years hence A's age would be n_2 times that of B, then,**

   A's age would be n_2 times that of B, then,

   A's present age $= \dfrac{n_1(t_1 + t_2)(n_2 - 1)}{n_1 - n_2} + t_1$ years

   and B's present age $= \dfrac{t_2(n_2 - 1) + t_1(n_1 - 1)}{n_1 - n_2}$ years.

   Explanation

   Let A's present age = x years and B's present age = y years.

   Given $x - t_1 = n_1(y - t_1)$ and $x + t_2 = n_2(y + t_2)$

   i.e., $x - n_1 y = (1 - n_1)t_1$ .... (1)

   and $x - n_2 y = (-1 + n_2)t_2$ .... (2)

   Solving Eqs. (1) and (2), we get

   $$x = \dfrac{n_1(t_1 + t_2)(n_2 - 1)}{n_1 - n_2} + t_1$$

   and, $y = \dfrac{t_2(n_2 - 1) + t_1(n_1 1)}{n_1 - n_2}$

NUMERICAL CHALLENGE 8.3

10 years ago Amu's mother was 4 times older than her daughter. After 10 years, the mother will be twice older than the daughter. Find the present age of Anu.

Solution

Present age of Anu

$= \dfrac{t_2(n_2 - 1) + t_1(n_1 - 1)}{n_1 - n_2}$

(Here $n_1 = 4$, $n_2 = 2$, $t_1 = 10$ and $t_2 = 10$)

$= \dfrac{10(2 - 1) + 10(4 - 1)}{4 - 2} = \dfrac{10 + 30}{2} = 20$ years.

4. **The sum of present ages of A and B is S years. If, t years ago, the age of A was n times the age of B, then**

   Present age of A $= \dfrac{Sn - t(n - 1)}{n + 1}$ years

   and Present age of B $= \dfrac{S + t(n - 1)}{n + 1}$ years.

Explanation

Let the present age of A and B be x and y years, respectively.

Given $x + y = S$ ...... (1)

and $x - t = n(y - t)$

or $x - ny = (1 - n)t$ .... (2)

Solving Eqs. (1) and (2), we get

$$x = \frac{Sn - t(n-1)}{n+1}$$

and $$y = \frac{S + t(n-1)}{n+1}$$

NUMERICAL CHALLENGE 8.4

The sum of the ages of A and B is 42 years. 3 years back, the age of A was 5 times the age of B. Find the difference between the present ages A and B.

Solution

Here S = 42, n = 5 and t = 3

∴ Present age of A

$$= \frac{Sn - t(n-1)}{n+1} = \frac{42 \times 5 - 3 - 3(5-1)}{5+1}$$

$$= \frac{198}{6} = 33 \text{ years}$$

and present age of B

$$= \frac{5 + t(n+1)}{n+1} = \frac{42 + 3(5-1)}{5+1}$$

$$= \frac{54}{6} = 9 \text{ years.}$$

∴   Difference between the present ages of A and B = 33 − 9 = 24 years.

Note : If, instead of sum (S), difference (D) of their ages is given, replace S by D and in the denominator (n + 1) by (n − 1) in the above formula.

5.   **The sum of present ages of A and B is S years. If, t years hence, the age of A would be n times the age of B, then**

present age of A = $\dfrac{Sn + t(n-1)}{n+1}$ years

and present age of B = $\dfrac{S - t(n-1)}{n+1}$ years.

Explanation

Let the present ages of A and B be x and y years, respecively

Given $x + y = S$ .... (1)

and $x + t = n(y + t)$

or $x - ny = t(n - 1)$ .... (2)

Solving Eqs. (1) and (2), we get

$$x = \frac{Sn + t(n-1)}{n+1}$$

and $$y = \frac{S - t(n-1)}{n+1}$$

NUMERICAL CHALLENGE 8.5

The sum of the ages of of a son and father is 56 years. After four years, the age of the father will be three times that of the son. Find their respecive ages.

Solution

The age of father

$$= \frac{Sn + t(n-1)}{n+1} = \frac{56 \times 3 + 4(3-1)}{3+1}$$

(Here S = 56, t = 4 and n = 3)

$$= \frac{176}{4} = 44 \text{ years.}$$

The age of son $$= \frac{S - t(n-1)}{n+1}$$

$$= \frac{56 - 4(3-1)}{3+1}$$

$$= \frac{48}{4} = 12 \text{ years.}$$

6. **If the ratio of the present ages of A and B is a : b and t years hecne, it will be c : d, then**

A's present age $= \dfrac{at(c-d)}{ad-bc}$

and, B' present age $= \dfrac{bt(c-d)}{ad-bc}$

NUMERICAL CHALLENGE 8.6

The ratio of the age of father and son at present is 6 : 1. After 5 years, the ratio will become 7 : 2. Find the present age of the son.

Solution

The present age of the son = $\dfrac{bt(c-d)}{ad-bc}$

(Here a = 6, b =1, c = 7, d = 2 and t = 5)

$= \dfrac{1 \times 5(7-2)}{6 \times 2 - 1 \times 7} = 5$ years.

Note : If, with the ratio of present ages, the ratio of ages t years ago is given, then replace t by (–t) in the above formula.

NUMERICAL CHALLENGE 8.7

Six years ago Mahesh was twice as old as Suresh. If the ratio of their present ages is 9 : 5 respecively, what is the difference between their present ages ?

Solution

Present age of Mahesh

$= \dfrac{-at(c-d)}{ad-bc}$

$= \dfrac{-9 \times 6(2-1)}{1 \times 9 - 5 \times 2}$

(Here a = 9, b = 5, c = 2, d = 1 and t = 6)

= 56 years

Present age of Suresh

$= \dfrac{-bt(c-d)}{ad-bc}$

$= \dfrac{-5 \times 6(2-1)}{1 \times 9 - 5 \times 2} = 30$ years.

∴ Difference of their ages = 54 – 30 = 24 years.

PROBLEMS ON AGES

SOLVED EXAMPLES

1. A's age is one-sixths of B's age. B's age will be twice of C's age after 10 years. If C's eighth birthday was celebrated two years ago, then the present age of A must be

(1) 5 years   (2) 10 years

(3) 15 years   (4) 20 years

Sol. $A = \dfrac{1}{6} B$, $B + 10 = 2(C + 10)$, $C = 10$

∴ B = 30, A = 5 years

2. Sachin was twice as old as Ajay 10 years back. How old is Ajay today if Sachin will be 40 years old 10 years hence ?

(1) 20 years   (2) 10 years

(3) 30 years   (4) None of these

Sol. Sachin's age today = 30 years

Sachin's age 10 years back = 20 years

Ajay's age 10 years back = 10 years

Ajay's age today = 20 years.

3. Two groups of student, whose average ages are 20 years and 30 years, combine to form a third group whose average age is 23 years. What is the ratio of the number of students in the first group to the number of students in the second group ?

(1) 5 : 2   (2) 2 : 5

(3) 7 : 3   (4) None of these

Sol. Let the number of students in the two groups be x and y respectively.

∴ $20x + 30y = 23(x + y) \Rightarrow 3x = 7x \Rightarrow \dfrac{x}{y} = \dfrac{7}{3}$.

4. A years ago, a father was four times his son's age. In six years, his age will be 9 more than twice his son's age. What is the present age of the son ?

(1) 10 years   (2) 9 years

(3) 20 years   (4) None of these

Sol. $(F - 1) = 4(S - 1)$ ..... (1)

where F and S are the Father's and the Son's ages respecively at present.

∴ $(F + 6) = 2(S + 6) + 9$ ...... (2)

From Eqs. (1) and (2). S = 9.

5. 5 years ago his mother's age was thrice that of Amit. Amit's present age is 20. What will be the ratio of their ages 10 years from now ?

(1) 30 : 70   (2) 1 : 3

(3) 5 : 2   (4) 1 : 2

Sol. Amit's present age is 20. 5 years ago he was 15; therefore his mother was 45. 10 years from now his mother will be 60; Amit will be 30. Hence the ratio of Amit's age to mother's is 1 : 2.

6. The average age of a class is 15.8 years. The average age of the boys in the class is 16.5 years and that of the girls is 15.4 years. What is the ratio of boys to girls in the class ?

(1) 1 : 2   (2) 3 : 4

(3) 2 : 3   (4) None of these

Sol. Let number of boys = x

Let number of girls = y

∴ Total number of students = x + y

$\Rightarrow (x + y) \times 15.8 = 16.4x + 15.4y \Rightarrow 0.6x = 0.4y$

$\Rightarrow \dfrac{x}{y} = \dfrac{0.4}{0.6} = \dfrac{2}{3}$

7. The ratio of the ages of the father and the son at present is 7 : 1. After 4 years, the ratio will become 4 : 1. What is the sum of the present ages of the father and the son ?

(1) 29 years   (2) 35 years

(3) 32 years   (4) None of these

Sol. Let the present age of father and son be 7x and x years, respectively.

After 4 years,

age of father = (7x + 4) years

age of son = (x + 4) years

Given, $\dfrac{7x + 4}{x + 4} = \dfrac{4}{1}$

$\Rightarrow$ 7x + 4 = 4x + 16

$\Rightarrow$ 3x = 12

∴   x = 4

∴   7x + x = 28 + 4 = 32 years

8. The product of the present ages of Sarita and Gauri is 320. Eight years from now, Sarita's age will be three times the age of Gauri. What was the age of Sarita when Gauri was born ?

(1) 40 years   (2) 32 years

(3) 48 years   (4) 36 years

Sol. Let the present ages of Sarita and Gauri are x and y.

Then $xy = 320$

and $(x + 8) = 3 (y + 8)$

$\Rightarrow$ $x - 3y = 16$

$\Rightarrow$ $x - 3 \left(\dfrac{320}{x} \right) = 16$

$\Rightarrow$ $x^2 - 16x - 960 = 0$

$\Rightarrow$ $(x - 40) (x + 24) = 0$

$\Rightarrow$ $x = 40$ and $y = 8$

At the time of Gauri born, the age of Sarita is 32 years.

9. In a class, there are 20 boys whose average age is decreased by 2 months, when one boy age 18 years is replaced by a new boy. The age of the new boy is

(1) 14 years 8 months

(2) 16 years 4 months

(3) 15 years

(4) 17 years 10 months

Sol. Total age decreases $= 20 \times 2 = 40$ months

$= 3$ years 4 months

$\therefore$ The age of new boy $= 18$ years $- 3$ years 4 months

$= 14$ years 8 months

10. Ashu's mother was three times as old as Ashu 5 years ago. After 5 years, she will be twice as old as Ashu. How old is Ashu today ?

(1) 35 years   (2) 10 years

(3) 20 years   (4) 15 years

Sol. Let the age of Ashu at present be x years and her mother be y years.

Now, according to the question,

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

or, $3x - 15 = y - 5$

or, $3x - y = 10$ ..... (1)

Again, according to the question,

$$2(x + 5) = (y + 5)$$

or, $2x + 10 = y + 5$

or, $2x - y = -5$

Subtracting Eq. (2) from (1), we get   ...... (2)

$$x = 15$$

Hence, Ashu's today's age is 15 years.

PROBLEMS ON AGES   EXERCISE

1. Seven years ago the ratio of the ages of P and Q (in years) was 7 : 6. Which of the following cannot be the ratio of their ages 6 years from now?
    (1) 13 : 11   (2) 15 : 14
    (3) 13 : 12   (4) 16 : 15

2. The ratio of the present ages of Anand and Bala is 8 : 3. When Anand was 30 years old, Bala was 5 years old. Find the present age of Bala. (In years)
    (1) 10   (2) 12
    (3) 15   (4) 20

3. Nine years ago A's age and B's age were in the ratio 5 : 7. Which of the following cannot be the ratio of their ages 5 years from now?
    (1) 11 : 13   (2) 13 : 19
    (3) 21 : 25   (4) 15 : 16

4. The ratio of the present ages of Ram and Shyam is 3 : 2. Which of the following cannot be the ratio of their ages 20 years ago?
    (1) 8 : 5   (2) 17 : 10
    (3) 9 : 5   (4) 7 : 5

5. Amit is as much younger to Barkha as he is older to Chaman. If the sum of the ages of Barkha and Chaman is 48 years, what is the present age of Amit?
    (1) 18 years   (2) 36 years
    (3) 24 years   (4) 28 years

6. Bipin is 6 times old as Alok. Bipin's age will be twice of Chandan's age after 10 years. If Chandan's 7th birthday was celebrated 3 years ago, what is Alok's present age?
    (1) 15 years   (2) 12 years
    (3) 5 years   (4) none of these

7. Renuka got married 8 years ago. Today her age is $1\frac{1}{3}$ times her age at the time of marriage. Her daughter's age is $\frac{1}{8}$ times her age. Her daughter's age is :
    (1) 3 years   (2) 4 years
    (3) 6 years   (4) 8 years

8. Ten years ago B was twice of A in age. If the ratio of their present ages is 4 : 3, what is the sum of their present ages?
    (1) 25 years   (2) 30 years
    (3) 40 years   (4) 35 years

9. The sum of the ages of Aryabhatta and Shridhar is 45 years. Five years ago the product of their ages was 4 times the Aryabhatta's age at that time. The present ages of Aryabhatta and Shridhar respectively are :
    (1) 25 and 20   (2) 35 and 10
    (3) 36 and 9   (4) 40 and 5

10. The ages of A, B and C together total 185 years. B is twice as old as A and C is 17 years older than A. Then, the respective ages of A, B and C are
    (1) 40, 86 and 59 years
    (2) 42, 84 and 59 years
    (3) 40, 80 and 65 years
    (4) None of these

11. The sum of ages of a father and son is 45 years. Five years ago, the product of their ages was four times the father's age at that time. The present age of the father is
    (1) 39 years   (2) 36 years
    (3) 25 years   (4) None of these

12. If 1 is added to the age of the elder sister, then the ratio of the ages of two sisters becomes 0.5 : 1, but if 2 is subtracted from the age of the younger one, the ratio becomes 1 : 3. Find the age of the two sisters.
    (1) 8 and 5 years   (2) 11 and 6 years
    (3) 9 and 5 years   (4) 8 and 6 years

13. The age of the father 5 years ago was 5 times the age of his son. At present the father's age is 3 times that of his son. What is the present age of the father ?
    (1) 33 years   (2) 30 years
    (3) 45 years   (4) None of these

14. Sonu is 4 years younger than Manu while dolly is 4 years younger than Sumit but one-fifth times as old as Sonu. If Sumit is eight years old, how many times as old is Manu as Dolly ?
    (1) 6   (2) 1/2
    (3) 3   (4) None of these

15. The age of a man is 3 times that of his son. 15 years ago, the man was 9 times as old as his son. What will be the age of the man after 15 years ?

(1) 45 years   (2) 60 years

(3) 75 years   (4) 65 years

16. Father is 5 years older than the mother and the mother's age now is thrice the age of the daughter. The daughter is now 10 years old. What was the father's age when the daughter was born ?

(1) 20 years   (2) 15 years

(3) 25 years   (4) 30 years

17. A father told his son, "I was as old as you are at present at the time of your birth". If the father is 38 years old now, then what was the son's age five years back ?

(1) 14 years   (2) 19 years

(3) 38 years   (4) 33 years

18. In a cricket 11, the average age of 11 players is 28 years. Out of these, the average ages of three groups of three players each are 25 years, 28 years and 30 years, respecively. If in these groups, the captain and the youngest player are not included and the captain is eleven years older than the youngest player, what is the age of the captain ?

(1) 33 years   (2) 34 years

(3) 35 years   (4) 36 years

19. The average age of an adult class is 40 years. Twelve new students with an average age of 32 years join the class, thereby decreasing the average age of the class by 4 years. The original strength of the class was.

(1) 10   (2) 11   (3) 12   (4) 15

20. The present ages of Amit and his father are in the ratio of 2 : 5, respectively. Four years hence the ratio of the their ages will become 5 : 11, respectively. What was the father's age five years ago ?

(1) 40 years   (2) 45 years

(3) 30 years   (4) 35 years

21. The respective ratio between the present age of Manisha and Deepali is 5 : x. Manisha is 9 years younger than Parineeta. Parineeta's age after 9 years will be 33 years. The difference between Deepali's and Manisha's age is same as the present age of Parineeta. What will come in place of x ?

(1) 23   (2) 39

(3) 15   (4) None of these

22. The ages of Nishi and Vinnee are in the ratio of 6:5 respectively. After 9 years the ratio of their ages will be 9:8. What is the difference in their ages ?

(1) 9 years   (2) 7 years

(3) 5 years   (4) 3 years

23. The total of the ages of a class of 75 girls is 1050, the average age of 25 of them is 12 years and that of another 25 is 16 years. Find the average age of the remaining girls.

(1) 12 years   (2) 13 years

(3) 14 years   (4) 15 years

24. Michelle got married 9 years ago. Today her age is $1\frac{1}{3}$ times her age at the time of marriage. At present her daughter's age is one-sixth of her age. What was her daughter's age two years ago ?

(1) 6 years

(2) 7 years

(3) 3 years

(4) None of the above

25. Sneh's age is one-sixth of her father's age. Sneh's father's age will be twice of Vimal's age after 10 years. If Vimal's eighth birthday was celebrated 2 years before, then what is Sneh's present age ?

(1) 30 years   (2) 24 years

(3) 6 years   (4) None of these

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	1	3	2	4	3	3	1	4	3	2	4	3	2	1	3	3	1	3	3	4
Que.	21	22	23	24	25															
Ans.	4	1	3	4	4															