

Numerical Ability

TCS Digital Test Preparation Series

About me

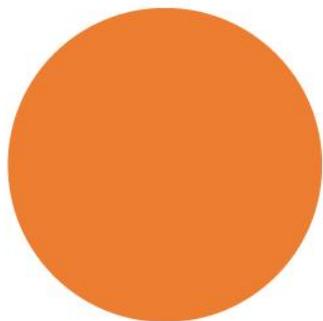
- Name- Sagar Sarkar
- Years of experience- 2.7 Years
- Areas of expertise-Python, Machine Learning and AI.
- TCS Digital Cleared.
- Gold Medalist in Academics in the branch of Mechanical and Automation Engineering in 2019 at Amity University.
- Pursuing B.Sc. in Data Science and Programming from IIT Madras.

Pattern

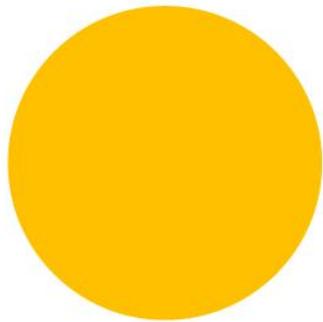
Topic Name	Marks per Item	No of Items	Time
Numerical Ability	1	15	40 mins

- **Negative marking-You must read all instructions carefully. If there is any negative marking, it will be clearly mentioned in the instructions.**
- **For more details, please visit this link - <https://www.tcs.com/careers/tcs-off-campus-hiring> .**

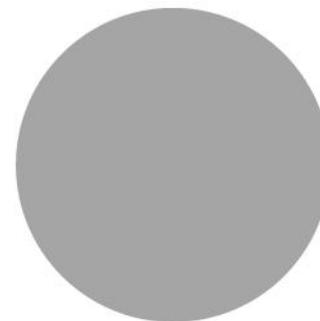
Approach



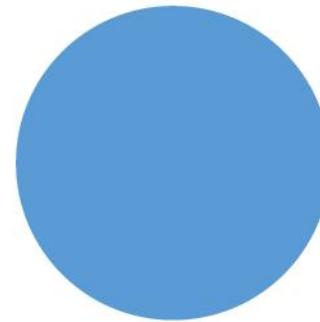
Complete understanding of questions covered during the Session.



Go through the link provided in the resource slide and try to solve them.



Try to attempt practice assignment questions.



Try to attempt questions from the book details of which have been provided in the resources slide.

Problems on Age



Formulas

- If you are assuming the current age to be x , then the age after n years will be $(x+n)$ years.
- If you are assuming the current age to be x , then the age before n years will be $(x-n)$ years.
- If the age is given in the form of a ratio, for example, $p:q$, then the age shall be considered as qx and px
- If you are assuming the current age to be x , then n times the current age will be (xxn) years
- If you are assuming the current age to be x , then $1/n$ of the age shall be equal to (x/n) years

Sample Question 1

Q 1. The present age of Aradhana and Aadrika is in the ratio 3:4. 5 years back, the ratio of their ages was 2:3. What is the present age of Aradhana?

1. 12 years
2. 15 years
3. 20 years
4. 22 years
5. 10 years

Sample Question Solution 1

Solution:

Let the present age of Aradhana be $3x$

Let the present age of Aadrika be $4x$

5 years back, Aradhana's age = $(3x-5)$ years

5 years back, Aadrika's age = $(4x-5)$

According to the question, $(3x-5) : (4x-5) = 2:3$

$$\Rightarrow (3x-5) \div (4x-5) = 2/3$$

$$\Rightarrow 3(3x-5) = 2(4x-5)$$

$$\Rightarrow 9x-15 = 8x-10$$

$$\Rightarrow x = 5$$

Therefore, Aradhana's current age = $3 \times 5 = 15$ years

Sample Question 2

3 years ago, the age of A's was 4 times the square of his son's age. 3 years hence, the ratio of the age of A and his son will be 14 : 3. The present age of the son is?

1. 2
2. 3
3. 5
4. 6
5. None

Sample Question Solution 2

The age of the son before 3 years be x years.

	Son	A's age
3 years ago age	x	$4x^2$
Present age	$x + 3$	$4x^2 + 3$
3 years hence the age	$x + 6$	$4x^2 + 6$

3 years hence, the ratio of the age of A and his son will be 14 : 3.

$$(x + 6)/(4x^2 + 6) = 3/14$$

$$\Rightarrow 14x + 84 = 12x^2 + 18$$

$$\Rightarrow 12x^2 - 14x - 66 = 0$$

$$\Rightarrow 6x^2 - 7x - 33 = 0$$

$$\Rightarrow (x - 3)(6x + 11) = 0$$

$$\Rightarrow x = 3$$

∴ The present age of the son is 6 years.

Sample Question 3

After 8 years, a man will be 3 times as much old as he is now. After how much time he will be 5 times as much old as now?

1. 16 years
2. 10 years
3. 12 years
4. 8 years

Sample Question Solution 3

Let the present age of man be x years

Let n years after the age will be 5 times of present age.

According to the question,

Age after 8 years = $3 \times$ Present age

$$\Rightarrow x + 8 = 3x$$

$$\Rightarrow 2x = 8$$

$$\Rightarrow x = 4$$

After n years = $5 \times$ Present age

$$\Rightarrow x + n = 5x$$

$$\Rightarrow 4 + n = 20$$

$$\Rightarrow n = 16 \text{ years}$$

∴ After 16 years the age will be 5 times of present age.

Sample Question 4

Ravi asks Amit, what's your age and Amit replied 20 years hence my age will be 10 times of my age 10 years back. What is Amit's present age?

1. 13 years

2. 13.3 years

3. 10 years

4. 11.3 years

Sample Question Solution 4

Let Amit's present age be x years

Amit's age before 10 years = $(x - 10)$

Amit's age after 20 years = $(x + 20)$

According to question

$$(x + 20) = 10(x - 10)$$

$$\Rightarrow x + 20 = 10x - 100$$

$$\Rightarrow 9x = 120$$

$$\Rightarrow x = 13.3 \text{ years}$$

∴ Present age of Amit is 13.3 years.

Problems on Average and Percentage



Formulas

- % increase /decrease = $100 \times \text{Quantity increase or decrease} / \text{original quantity}$
- *To Increase a Number by y %:* If a number is increased by 10 %, then it becomes 1.1 times of itself.
- *To Decrease a Number by y %:* If a number is decreased by 10 %, then it becomes 0.90 times of itself.
- *The price of a commodity is increased by R %, by what percent should its consumption be decreased, so that the total expenditure remains the same. I.e., if the price is increased then consumption should be decreased by $100 \times R / (100 + R)$. If the price is decreased, then consumption should be increased by $100 \times R / (100 + R)$.*
- *Increase and Decrease by different% age.* If there is X percent increase and then Y percent decrease in a value, then net percentage change = $X - Y - (XY/100)$

Formulas

- Average= $(\text{Sum of observations}) / (\text{Number of observations})$
- If a person travels some distance at a speed of $x \text{ km/hr}$ and the same distance at a speed of $y \text{ km/hr}$, then the average speed during the whole journey will be calculated by using the formula $2xy/(x+y)$.
- If a person covers $P \text{ km}$ at $x \text{ km/hr}$ and $Q \text{ km}$ at $y \text{ km/hr}$ and $R \text{ km}$ at $z \text{ km/hr}$, then the average speed in covering the whole distance is $(P+Q+R)/(P/x+Q/y+R/z)$
- When a person replaces another person then:
 - If the average is increased, then
 $\text{Age of new person} = \text{Age of person who left} + (\text{Increase in average} * \text{total number of persons})$
 - If the average is decreased, then
 $\text{Age of new person} = \text{Age of person who left} - (\text{Decrease in average} * \text{total number of persons})$
- When a person joins the group:
 - In case of an increase in average,
 $\text{Age of new member} = \text{Previous average} + (\text{Increase in average} * \text{Number of members including new member})$
 - In case of decrease in average,
 $\text{Age of new member} = \text{Previous average} - (\text{Decrease in average} * \text{Number of members including new member})$
- In the Arithmetic Progression there are two cases:
 - When the number of terms is odd - the average will be the middle term.
 - When number of terms is even - the average will be the average of two middle terms.

Formulas

Some important properties of average are:

- When the difference between all the items is same (and the number of terms is odd), then the average is equal to the middle term.
- If x is added to all the items, then the average increases by x .
- If x is subtracted from all the items, then the average decreases by x .
- If every item is multiplied by x , then the average also gets multiplied by x .
- If every item is divided by x , then the average also gets divided by x .
- **Average formula for An AP Series= $(1\text{st term} + \text{last term})/2$**

Sample Question 5

A number is increased by 20%, and then it is decreased by 30%, what is the net change in the number?

- A. 16 % increase
- B. 16 % decrease
- C. 10 % decrease
- D. 5 % increase

Sample Question Solution 5

Sol: Option B

Solution: Using the formula: $X + Y + XY/100$

$$\Rightarrow 20 + (-30) + 20 * -30 / 100 = -16$$

This means there is a decrease of 16 %

Sample Question 6

Soni is 20 % heavier than Rekha in weight. By how much percent is Rekha lighter than Soni?

- A. 20%
- B. 25%
- C. 16.67%
- D. None of these

Sample Question Solution 6

Sol : Option C

Explanation Required % = $100 * 20 / 120 = 16.67 \%$. (Applying: $100 * R / (100 + R)$)

Sample Question 7

The population of a town increases at the rate of 3.7 % each year. It is 31,110 now. What was it last year?

- A. 30,000
- B. 29,959
- C. 30,270
- D. None of these

Sample Question Solution 7

Sol : Option A

Explanation: Last year it was x

$$31110 = x \left(1 + \frac{3.7}{100}\right) \Rightarrow x = 30000.$$

Sample Question 7

If the population of a town is 926100 and it has been growing annually at 5 %, what was the population 3 years ago?

- A. 800,000
- B. 600,000
- C. 400,000
- D. 450,000

Sample Question Solution 7

Sol: Option A

Let the population be X

$$X * (100 + 5)^3 / (100)^3 = 926100; X * (105/100) * (105/100) * (105/100) = 926100$$

$$\Rightarrow X * (21/20) * (21/20) * (21/20) = 926100$$

$$\Rightarrow X = 926100 * (20/21) * (20/21) * (20/21) = 800,000$$

Sample Question 8

When the cost of cigarettes increases by 25 %, a man reduces his annual consumption by 10 %. Find the % change in his annual expenditure on cigarettes?

- A. 12.5 %
- B. 11.11 %
- C. 15 %
- D. 6.25 %

Sample Question Solution 8

Sol : Option A

Explanation: % change in the annual expenditure = $1.25 * 0.9 = 1.125$

⇒ Net increase of 12.5 %

Sample Question 9

Mukul has earned as an average of 4,200 dollars for the first eleven months of the year. If he justifies his staying in the US on the basis of his ability to earn at least 5000 dollars per month for the entire year, then how much should he earn (in dollars) in the last month to achieve his required average for the whole year?

- A. 14600
- B. 13800
- C. 12,800
- D. 11800

Sample Question Solution 9

Sol : Option B

The salary expectation for the whole year is 5000. So, the total earning will be 60000.

Earning for 11 months is 4200 so the total earnings are 46200.

Now for the last month he has to earn $60000 - 46200 = 13800$.

Sample Question 10

In 40 overs game, in first 20 overs of a game of cricket, the run rate was only 5. What should be the run rate for the remaining overs so that the total score reaches 300?

- A. 15
- B. 10
- C. 28
- D. 20

Sample Question Solution 10

Sol : Option B

Runs scored for 1st 20 overs = 100

Total required = 300

So, in the next 20 overs the team has to score 200 runs.

So, run rate required = $200/20 = 10$

Sample Question 11

For 9 innings, Aman has a certain run rate. In the tenth inning, he scores 100 runs, thereby increasing his run rate by 8 runs. What is his new run rate?

- A. Rs. 22
- B. Rs. 26
- C. Rs. 28
- D. Rs. 32

Sample Question Solution 11

Sol : Option C

Let initial run rate be x so, the final run rate would have be $X+8$

$$\text{ATQ, } 9 \times X + 100 = 10 \times (X+8)$$

Solving, we get $X = 20$

So, the new average will be 28.

Sample Question 12

In a hotel, the tariff for every odd dates is Rs.1000 and for even dates is Rs. 2000. If the man paid total of 30000 in all. For how many days did he stay in the hotel given that the first day is 5th date of the month?

- A. 50
- B. 20
- C. 40
- D. 60

Sample Question Solution 12

Sol : Option B

Total tariff = 30000

So, for odd dates (5th , 7th , and so on) = 1000

And for even dates (6th , 8th and so on) = 2000

So, the average amount of money for 2 days is Rs. 1500.

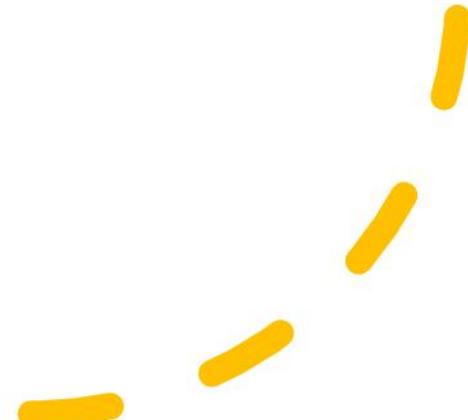
So, total amount paid = 30000

So , number of days he stayed in the hotel = $30000/1500 = 20$.

Boats & Streams

Formulas

- Suppose the speed of boat in still water is u km/hr and the speed of the stream is v km/hr.
- Then:
- Upstream Speed: It is the speed of the boat against the stream
 $= (u - v)$ km/hr
- Downstream Speed: It is the speed of the boat with the stream
 $= (u + v)$ km/hr
- If upstream is denoted as U_s and downstream as D_s , then:
Speed of boat or swimmer in still water = $1/2 (D_s + U_s)$
Speed of stream = $1/2 (D_s - U_s)$



Sample Question 13

A man rows 24 km upstream in 6 hours and a distance of 35 km downstream in 7 hours. Then the speed of the man in still water is

- A. 4.5 km/hr
- B. 4 km/hr
- C. 5 km/hr
- D. 5.5 km/hr

Sample Question Solution 13

Sol : Option A

Speed of upstream = $24 / 6 = 4$ km / hr. Speed of downstream = $35 / 7 = 5$ km / hr.

\therefore Speed of man in still water = $(4 + 5) / 2 = 4.5$ km / hr.

Sample Question 14

A boatman can row 2 km against the stream in 20 minutes and return in 10 minutes. Find the rate of flow of the current.

- A. 2 km/h
- B. 1 km/h
- C. 3 km/h
- D. 5 km/h

Sample Question Solution 14

Sol : Option C

Let x be the speed of man in still water and y be the speed of current.

Speed of $d / s = (2 / 10) \times 60 = 12 \text{ km / hr.}$ Speed of $u / s = (2 / 20) \times 60 = 6 \text{ km / hr.}$

\therefore rate of current $= (12 - 6) / 2 = 3 \text{ km/hr.}$

Sample Question 15

A boat makes a return journey from point A to point B and back in 5 hours 36 minutes. One way it travels with the stream and on the return it travels against the stream. If the speed of the stream increases by 2 km/hr, the return journey takes 9 hours 20 minutes. What is the speed of the boat in still water? (The distance between A and B is 16 km.)

- A. 5 km/hr
- B. 3 km/hr
- C. 7 km/hr
- D. 9 km/hr

Sample Question Solution 15

Sol : Option C

Let x be speed of u / s and y be the speed of d / s .

$$\therefore \frac{16}{x} + \frac{16}{y} = \frac{28}{5} \text{ and } \frac{16}{y+2} + \frac{16}{x-2} = \frac{28}{3}$$

Solving these 2 equations, we get $x = 4\text{km/hr}$ and $y = 10\text{km/hr}$

$$\therefore \text{speed of boat in still water} = \frac{(4+10)}{2} = 7\text{km/hr.}$$

Sample Question 16

A boat travels from point A to B, a distance of 12 km. From A it travels 4 km downstream in 15 minutes and the remaining 8 km upstream to reach B. If the downstream speed is twice as high as the upstream speed, what is the average speed of the boat for the journey from A to B?

- A. $10\frac{2}{3}$ km/hr
- B. 9.6 km/hr
- C. 11.16 km/hr
- D. 10.44 km/hr

Sample Question Solution 16

Sol : Option B

4 km downstream is covered in 15 min. ∴ speed of downstream = 16 km/hr. So speed of upstream = 8km/hr. Total time taken for downstream journey = 15 min (given). Now total time taken for upstream journey = $8/8 = 1$ hr = 60 min. Hence total time taken from A to B = $15 + 60 = 75$ min. As average speed = Total distance /total time, so average speed from A to B = $(12/75)*60 = 48/5 = 9.6$ kmph.

Time, Speed & Distance

Formulas

- Average speed = **Total Distance covered/ Total Time Taken**
- When the distance is constant: **Average speed = $2xy/x+y$** ; Where, x and y are the two speeds at which the same distance has been covered.
- When time taken is constant: **Average speed = $(x + y)/2$** ; Where, x and y are the two speeds at which we traveled for the same time.
- **Distance = Speed × Time.** Using this formula, all basic problems can be handled. However, you need to make sure about the correct usage of units while using the above formulas.
- Speed is inversely proportional to the time taken when distance travelled is constant. So **when speed increases, time decreases** and vice versa.
- Relative speed is defined as the speed of a moving object with respect to another.
- When two objects are moving in the same direction, relative speed is calculated as their difference. When the two objects are moving in opposite directions, relative speed is computed by adding the two speeds.

Formulas

- When two trains are going in the same direction, then their relative speed is the difference between the two speeds.
- When two trains are moving in the opposite direction, then their relative speed is the sum of the two speeds.
- When a train crosses a stationary man/ pole/ lamp post/ sign post- in all these cases, the object which the train crosses is stationary and the distance travelled is the length of the train.
- When it crosses a platform/ bridge- in these cases, the object which the train crosses is stationary and the distance travelled is the length of the train and the length of the object.
- When two trains are moving in same direction, then their speed will be subtracted.
- When two trains are moving in opposite directions, then their speed will be added.
- In both the above cases, the total distance is the sum of the length of both the trains.
- When a train crosses a car/ bicycle/ a mobile man- in these cases, the relative speed between the train and the object is taken depending upon the direction of the movement of the other object relative to the train- and the distance travelled is the length of the train.

Sample Question 17

Two trains of lengths 120 m and 50 m are running on parallel tracks at 66 km/hr and 60 km/hr respectively. In what time will they pass each other?

- a) 10seconds
- b) 25.5 seconds
- c) 51 seconds
- d) 102 seconds

Sample Question Solution 17

Sol : Option D

Explanation: Dist to be covered is $120 + 50 = 170$ m.

Relative speed is $66 - 60 = 5$ km/hr = $6 \times 5 / 18$

= $30 / 18$ m/s. So time required = $200 / (30 / 18) = 102$ sec.

Correction in $170 * 18 / 30$

Sample Question 18

Find the average speed of train if it covers first half of the distance at 3 kmph and second half of the distance at 6 kmph.

1. 4.5 kmph
2. 5 kmph
3. 4 kmph
4. 6 kmph

Sample Question Solution 18

Formula used:

When distance is equal, Average speed = $[2 \times S_1 \times S_2] / [S_1 + S_2]$

Calculation:

$$\text{Average speed} = (2 \times 3 \times 6) / (3 + 6)$$

$$\Rightarrow 36 / 9$$

$$\Rightarrow 4 \text{ kmph}$$

\therefore The average speed is 4 kmph



Alternate Method

Let total distance be 36 km.

$$\text{Time taken to cover 1st half distance} = 18/3 = 6 \text{ hr}$$

$$\text{Time taken to cover 2nd half distance} = 18/6 = 3 \text{ hr}$$

$$\therefore \text{Average speed} = \text{Total distance}/\text{Total time} = 36/(6 + 3) = 36/9 = 4 \text{ km/h}$$

Sample Question 19

Moving at 50 kmph, a person reaches his office 10 min late. Next day, he increases his speed and moves at 60 kmph and reaches his office 5 min early. What is the distance from his home to his office?

Sample Question Solution 19

Solution: We can observe that difference in timings on both days is 15 min (and not 5 min, as one day he is late and on the other day he is early)

Let the required distance = D km. As time taken at the speed of 50 kmph is more than time taken at 60 kmph, so equation can be formed as $D/50 - D/60 = 15/60$. Solving this equation, we get the answer as 75 km.

Sample Question 20

A train moving with a speed of 40 km/hr takes 2 hours 6 minutes more to cover a certain distance than a train moving at 96 km/hr. What is the distance?

- a) 144 km
- b) 72 km
- c) 36 km
- d) 18 km

Sample Question Solution 20

Sol : Option A

Explanation: Let the distance be x $\therefore \frac{x}{40} - \frac{x}{96} = 2\frac{6}{60} \rightarrow \frac{x}{40} - \frac{x}{96} = \frac{21}{10} \therefore x = 144$ km.

Equations



Formulas

- The standard form of a quadratic equation is: $ax^2+bx+c = 0$ where a, b and c are known values and $a \neq 0$. Also, x is a real variable.
- If the value of a is 0, then the equation will become a linear equation.
- A root of the equation $f(x) = 0$ is when the value of x makes $f(x) = 0$. We can say that $x = a$ is the root of $f(x) = 0$. Here, $f(a)$ is the value of the polynomial $f(x)$ at $x = 0$ and is obtained by replacing x by a in $f(x)$.
- If there is a quadratic equation $ax^2 + bx + c = 0$, then the roots of this equation will be:

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

- In the above mentioned formula, $b^2 - 4ac$ is the discriminant as it can discriminate between the possible types of solutions:
- When we have a positive value of $b^2 - 4ac$, then we will get two Real solutions
- When the value of $b^2 - 4ac$ is zero, then we will get only one Real solution
- When we have a negative value of $b^2 - 4ac$, then we will get two Complex solutions (i.e. the answer will include imaginary numbers)
- Let the roots of the equation $ax^2 + bx + c$ be α and β .
- Then, the sum of the roots: $\alpha + \beta = -b/a$
- The product of the roots = $\alpha \beta = c/a$
- If $p + \sqrt{q}$ is a root of a quadratic equation, then its other root is $p - \sqrt{q}$
- When $D \geq 0$, then $ax^2 + bx + c$ can be expressed as a product of two linear factors.
- If α and β are the roots of $ax^2 + bx + c$, then we can write it as: $x^2 - (\alpha + \beta)x + \alpha\beta = 0$

Formulas

- A Linear Equation in one variable is defined as $ax + b = 0$ or $ax = c$, where a , b and c are real numbers. Also, $a \neq 0$ and x is an unknown variable.
- The solution of the equation $ax + b = 0$ is $x = -b/a$. We can also say that $-b/a$ is the root of the linear equation $ax + b = 0$.
- A Linear Equation in two variables is of the $ax + by + c = 0$ or $ax + by = d$ type where a , b , c and d are constants and also, both a and b are not equal to 0.
- **Substitution Method**-Find the value of one variable say y in terms of the other i.e. x . from either equation. Then substitute the value of y so obtained in the other equation. Therefore, we have a single equation in one variable x . Now solve this equation for x . In the end, substitute the value of x , thus obtained, in first step and find the value of y .
- **Method of Elimination**-Multiply both the equations with such numbers so as to make the coefficients of one of the two unknowns numerically same. To get an equation containing only one known, subtract or add the two equations. Solve this equation to get the value of the unknown. In either of the two original equations, substitute the value of the unknown. Thus, by solving that, the value of the other unknown is obtained.
- **Short – Cut Method**-Let us consider two equations as: $a_1x + b_1y = c_1$ and $a_2x + b_2y = c_2$. Then, the solution will be written as $x/(b_1 c_2 - b_2 c_1) = y/(c_1 a_2 - c_2 a_1) = (-1)/(a_1 a_2 - b_1 b_2)$ i.e. $x = -(b_1 c_2 - b_2 c_1)/(b_1 c_2 - b_2 c_1)$ and $y = (c_1 a_2 - c_2 a_1)/(a_1 b_2 - a_2 b_1)$. Suppose, we have two linear equations: $a_1x + b_1y = c_1$ and $a_2x + b_2y = c_2$
- If $a_1/a_2 = b_1/b_2$, the system will have only one solution that will be consistent. The graphs of this type of equation will have intersecting lines.
- If $a_1/a_2 = b_1/b_2 = c_1/c_2$, the system will be consistent with numerous solutions. The graphs of this type of equation will have coincident lines.
- If $a_1/a_2 = b_1/b_2 \neq c_1/c_2$, the system will have no solution and will be inconsistent. The graphs of this type of equation will have parallel lines.

Sample Question 21

In the question, two equations I and II are given. You have to solve both the equations and establish the correct relation between x and y and choose the correct option.

I. $(x - 1)^2 = 0$

II. $y^2 = 1$

1. $x > y$
2. $x < y$
3. $x \geq y$
4. $x \leq y$
5. either $x = y$ or relation cannot be established

Sample Question Solution 21

Answer (Detailed Solution Below)

Option 3 :

$$x \geq y$$

Sample Question 22

A rectangular garden has an area of 735m^2 . If length is decreased by 7m and breadth is increased by 7m, then it became a square. Find the area of the square (in m^2).

- A. 625
- B. 784
- C. 484
- D. 676

Sample Question Solution 22

Sol : Option B

Let length = l, breadth = b, Area = lb = 735.

Given $l - 7 = b + 7$ = side of square.

So $l = b + 14 \Rightarrow$ So $b(b + 14) = 735 \Rightarrow b^2 + 14b - 735 = 0 \Rightarrow (b + 35)(b - 21) = 0$
 $\Rightarrow b = 21$. So side of square = $21 + 7 = 28 \Rightarrow$ Area = $(28)^2 = 784$. Hence 2nd option.

Sample Question 23

For what value of h, the system of equations, $hx-y-2=0$ and $6x-2y-3=0$ has a unique solution?

A - 2

B - 3

C - 4

D - 5

Sample Question Solution 23

Answer - B

Explanation

For, a unique solution, we must have $a_1/a \neq b_1/b_2$
 $h/6 \neq -1/-2 \Rightarrow h/6 \neq 1/2 \Rightarrow h = 3$

Correction-It should be $a_1/a_2=b_1/b_2$

Sample Question 24

The sum of the squares of two consecutive odd natural numbers is 130. Find those numbers.

- A. 3, 5
- B. 7, 9
- C. 5, 7
- D. 7, -9

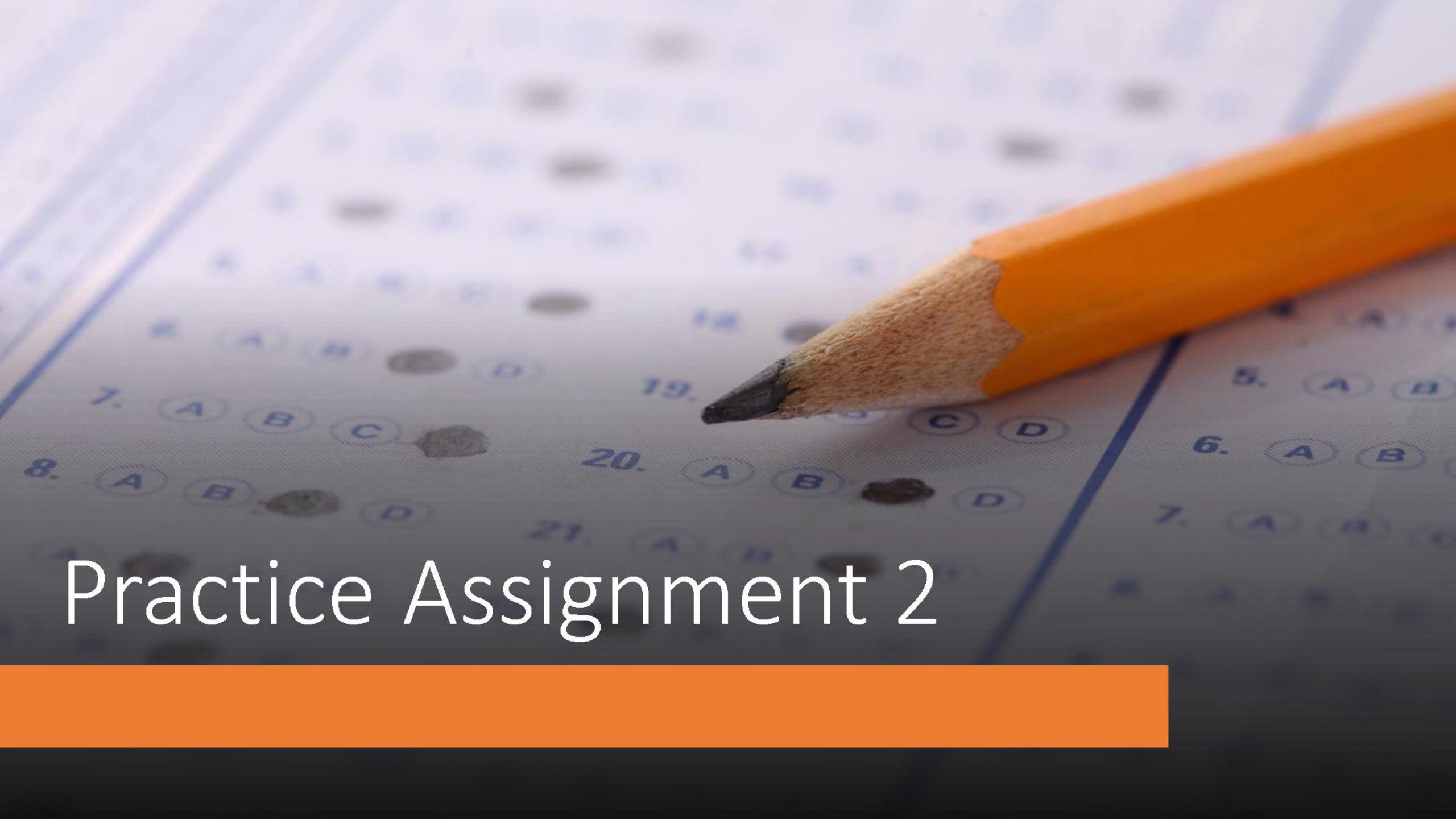
Sample Question Solution 24

Sol : Option B

Two consecutive odd natural nos. are x and $x + 2$

$$\Rightarrow x^2 + (x + 2)^2 = 130 \Rightarrow x = 7 \therefore \text{nos. are } 7 \text{ & } 9.$$

Practice Assignment 2



Practice Question 1.1

Saransh is 50 years old and Nazma is 40 years old. How long ago was the ratio of their ages 3:2?

- A. 20 years
- B. 30 years
- C. 40 years
- D. 25 years

Practice Question Solution 1.1

Sol : Option A

Here, we have to calculate: How many years ago the ratio of their ages was 3:2. Let us assume x years ago

At present: Saransh is 50 years and Nazma is 40 years

x years ago: Saransh's age = $(50 - x)$ and Nazma's age = $(40 - x)$

Given, the ratio of their ages was 3:2

$$(50-x) / (40-x) = 3/2$$

Solving, we get: $x = 20$

Therefore, the answer is 20 years.

Practice Question 1.2

Dinesh is younger to Roshan by 9 years. If their ages are in the respective ratio of 4:5, how old is Dinesh?

- A. 36 years
- B. 23 years
- C. 29 years
- D. Cannot be determined

Sample Question Solution 1.2

Sol : Option A

Let Roshan's age be x years.

Then, Dinesh 's age = $(x - 9)$ years.

$$(x - 9)/x = 4/5$$

$x = 45$ Hence, Dinesh's age = $(x - 9) = 36$ years.

Practice Question 1.3

A man said to his son, "I was one-third of your present age when you were born". If the present age of the man is 48 years, find the present age of the son.

- A. 25.7 years
- B. 28 years
- C. 29.3 years
- D. 36 years

Practice Question Solution 1.3

Sol : Option D

Present age of the son be P, he was born P years ago.

The age of the man was: $(48 - P)$.

His age when the son was born should be equal to $\frac{1}{3}$ of P.

$$(48 - P) = \frac{1}{3} P \Rightarrow P = 36$$

Practice Question 1.4

The ratio of the present ages of Pranav and Qureshi is 4:5. Five years ago, the ratio of their ages was 7:9. Find their present ages? (In years)

- A. 40, 50
- B. 18, 25
- C. 40, 60
- D. 20, 25

Practice Question Solution 1.4

Sol : Option A

Their present ages be $4X$ and $5X$.

5 years ago, the ratio of their ages was $7:9$, then $(4X - 5) : (5X - 5) = 7:9$

$$X = 45 - 35 \Rightarrow X = 10.$$

Their present ages are: $40, 50$.

Practice Question 1.5

Ten years ago, the age of mother was three times the age of her son. After ten years, mother's age will be twice that of his son. Find the ratio of their present ages.

- A. 11 : 7
- B. 9 : 5
- C. 7 : 4
- D. 7 : 3

Practice Question Solution 1.5

Sol : Option D

10 years ago, age of mother was three times the age of her son. Say, the age of son was x and mother's age was $3x$.

At present: Mother's age is $(3x + 10)$ and son's age is $(x + 10)$

After ten years: Mother's age will be $(3x + 10) + 10$ and son's age will be $(x + 10) + 10$. Given that, mother's age is twice that of son after ten years.

$$(3x + 10) + 10 = 2[(x + 10) + 10]$$

$$(3x + 20) = 2[x + 20]$$

Solving the equation, we get $x = 20$

$$(3x + 10):(x + 10) = 70:30 = 7:3.$$

Practice Question 1.6

One year ago, the ratio of Honey and Piyush ages was 2: 3 respectively. After five years from now, this ratio becomes 4: 5. How old is Piyush now?

- A. 5 years
- B. 25 years
- C. 10 years
- D. 15 years

Practice Question Solution 1.6

Sol : Option C

We are given that age ratio of Honey: Piyush = 2: 3

Honey's age = $2x$ and Piyush's age = $3x$

One year ago, their age was $2x$ and $3x$.

Hence at present, Honey's age = $2x + 1$ and Piyush's age = $3x + 1$

After 5 years, Honey's age = $(2x + 1) + 5 = (2x + 6)$

Piyush's age = $(3x + 1) + 5 = (3x + 6)$

After 5 years, this ratio becomes 4: 5. Therefore,

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

$$10x + 30 = 12x + 24 \Rightarrow x = 3$$

Piyush's present age = $(3x + 1) = (3 \times 3 + 1) = 10$ years

Honey's present age = $(2x + 1) = (2 \times 3 + 1) = 7$ years

Practice Question 1.7

Nisha is 15 years elder to Romi. If 5 years ago, Nisha was 3 times as old as Romi, then find Nisha's present age.

- A. 32.5 years
- B. 27.5 years
- C. 25 years
- D. 24.9 years

Practice Question Solution 1.7

Sol : Option B

Let age of Romi be y

Nisha is 15 years elder than Romi = $(y + 15)$. So Nisha's age 5 years ago = $(y + 15 - 5)$.

Romi's age before 5 years = $(y - 5)$

5 years ago, Nisha is 3 times as old as Romi

$$(y + 15 - 5) = 3(y - 5)$$

$$(y + 10) = (3y - 15)$$

$$2y = 25 \Rightarrow y = 12.5$$

Romi's age = 12.5 years

Nisha's age = $(y + 15) = (12.5 + 15) = 27.5$ years.

Practice Question 1.8

What is Aman's present age, if after 20 years his age will be 10 times his age 10 years back?

- A. 6.2 years
- B. 7.7 years
- C. 13.3 years
- D. 10 years

Practice Question Solution 1.8

Sol : Option C

Let Aman's present age be x

Aman's age before 10 years = $x - 10$)

Aman's age after 20 years = $(x + 20)$

We are given that, Aman's age after 20 years ($x + 20$) is 10 times his age 10 years back ($x - 10$)

Therefore, $(x + 20) = 10(x - 10)$

Solving the equation, we get $x + 20 = 10x - 100$

$9x = 120$, $x = 13.3$ years

Practice Question 1.9

Father is four times the age of his daughter. If after 5 years, he would be threee times of daughter's age, then further after 5 years, how many times he would be of his daughter's age?

- A. 1.5 times
- B. 2 times
- C. 2.5 times
- D. 3 times

Practice Question Solution 1.9

Sol : Option C

Let the daughter's age be x and father's age be $4x$.

So as per question, $4x + 5 = 3(x + 5)$. So $x = 10$.

Hence present age of daughter is 10 years and present age of father is 40 years.

So after $5 + 5 = 10$ years, daughter age would be 20 years and father's age would be 50 years.

Hence father would be $50/20 = 2.5$ times of daughter's age.

Practice Question 1.10

The sum of the ages of a daughter and mother is 56 years; after four years the age of the mother will be three times that of the daughter. What is the age of the daughter and the mother, respectively?

12 years, 41 years

12 years, 30 years

11 years, 34 years

12 years, 44 years

21 years, 42 years

Practice Question Solution 1.10

Solution:

Let the present age of the mother be x years and the present age of the daughter be y years

According to the question, $x+y = 56$ — (1)

After 4 years, age of the Mother = $x+4$

Age of the daughter after 4 years = $y+4$

So,

$$x+4 = 3(y+4) \text{ -- (2)}$$

$$x+4 = 3y + 12$$

From the equation (1) we get, $x = 56-y$

Thus, keep the value of x in equation 2, we get

$$(56-y) + 4 = 3y + 12$$

$$\Rightarrow 60 - y = 3y + 12$$

$$\Rightarrow y = 12$$

So, the daughter's present age is 12 years

Mother's present age = $56-12 = 44$ years

Practice Question 1.11

The tax on an article is increased by 20 %. As a result of which the consumption decreases by 25 %. What is the % change in the tax revenue received by the government from this article?

- A. 10 % decrease
- B. 15 % increase
- C. 10 % increase
- D. None of these

Practice Question Solution 1.11

Sol : Option A

Explanation: % Change in Tax revenue = $1.2 * 0.75 = 0.9$

⇒ Net decrease of 10 %.

Practice Question 1.12

Ali the barber shaved 40 % of his customers and gave a haircut to 80 % of his customers. He charged Rs. 7 for a shave and Rs. 5 for a haircut. If 20 % of customers who opted for a shave also had a hair-cut, what were Khan's earnings if he had 75 customers (in Rs.)?

- A. 410
- B. 1,020
- C. 510
- D. None of these

Practice Question Solution 1.12

Sol : Option C

Explanation: Total customers = 75

Numbers of customers shaved = $75 * 40/100 = 30$

Number of customers who got hair cut = $75 * 80/100 = 60$

∴ His total income= $(30 * 7) + (60 * 5) = 210 + 300 = 510.$

Practice Question 1.13

The average salary of 30 officers in a firm is Rs.120 and the average salary of laborers is Rs. 40. Find the total number of laborers if the average salary of the firm is Rs. 50.

- A. Rs. 180
- B. Rs. 420
- C. Rs. 240
- D. Rs. 210

Practice Question Solution 1.13

Sol : Option D

The sum of salary of officers will be = $30 \times 120 = 3600$

Let the number of labourers = X.

$$\text{ATQ, } 3600 + 40X = 50(30+X)$$

$$2100 = 10X$$

$$X = 210$$

Practice Question 1.14

The average weight of 39 men travelling to Ladakh is 30. If an obese man with weight 130 kg join them. What will be the average weight of the people travelling to Ladakh?

- A. 52
- B. 30
- C. 32.5
- D. 130

Practice Question Solution 1.14

Sol : Option C

If the weight of the man would have been 30, then the average weight would have been the same.

So, the extra 100 kg that the obese man brings with him would be distributed equally amongst all of them, i.e. $100/40 = 2.5$

So, the average becomes $30 + 2.5 = 32.5$

Practice Question 1.15

In an election there were two candidates P and S. The poll turnout was only 90 %. 500 of the given votes were declared invalid. P won 440 of X = 400 % of the total votes. Find the total number of eligible voters and the number of votes received by each of the candidates.

- A. 5000,2200, 1800
- B. 6000,1200,3800
- C. 4000,1100,3500
- D. 4500,2200,1000

Practice Question Solution 1.15

Sol: Option A

Solution: Let the registered voters = X

P got $440/9\%$ of X = $4.4X/9$

Since P got 400 votes more than S, S got $4.4X/9 - 400$

Total votes registered = X = P + S + Invalid votes

$$X = 4.4 X/9 + (4.4 X/9 - 400) + 500 \Rightarrow X = 8.8X/9 + 100$$

$\Rightarrow X = 4500$. Since the poll turnout was only 90%, the total number of eligible voters = $100/90 * 4500 = 5000$

Number of votes P got = $4.4/9 * 4500 = 2200$

Number of votes S got = $2200 - 400 = 1800$.

Practice Question 1.16

In a class, the average marks of 40 students was calculated to be 52.15. It was later discovered that the marks of a student were taken to be 49, instead of 85. Find the real average of the class.

- A. 53.05
- B. 53.15
- C. 52.85
- D. 52.95

Practice Question Solution 1.16

Sol : Option A

Average marks for 40 students is equal to 52.15 , the marks were taken as 49 instead of 85 so there will be an increase of 36 which is now to be distributed equally amongst 40 students , so $36/40 = 0.9$ which is to be distributed amongst all.

So, new average stands out to be $52.15 + 0.9 = 53.05$

Practice Question 1.17

The average of 7 consecutive numbers is n . If the next two numbers are included, the average will

- A. increased by 2
- B. remains the same
- C. increased by 1
- D. increased by 2

Practice Question Solution 1.17

Sol : Option C

The average of 7 consecutive numbers is n implies that the 4th term is equal to n .

Now if we include next two terms then the average of 9 terms will be the 5th term. Now as the terms are consecutive, so the 5th term will be $n + 1$.

Practice Question 1.18

The population of a town increases at the rate of 3.7 % each year. It is 31,110 now. What was it last year?

- A. 30,000
- B. 29,959
- C. 30,270
- D. None of these

Practice Question Solution 1.18

Sol : Option A

Explanation: Last year it was x

$$31110 = x (1 + 3.7/100) \Rightarrow x = 30000.$$

Practice Question 1.19

Out of two numbers, 40% of the greater number is equal to 60% of the smaller. If the sum of the numbers is 150, then the greater number is?

Practice Question Solution 1.19

Solution: Let us assume, greater number be X.

$$\therefore \text{Smaller number} = 150 - X$$

According to the question,

$$(40 \times X)/100 = 60(150 - X)/100$$

$$\Rightarrow 2p = 3 \times 150 - 3X$$

$$\Rightarrow 5X = 3 \times 150$$

$$\Rightarrow X = 90$$

Practice Question 1.20

A square is converted into a rectangle by increasing one of its sides by 5 % and reducing the other by 5 %. What will be the % change in the area of the two figures?

- A. 0.5 % decrease
- B. 0.5 % increase
- C. 0.25 % increase
- D. 0.25 % decrease

Practice Question Solution 1.20

Sol: Option D

Solution: Let the side of the square = a

∴ Its area = a^2 ; When the square is being converted to a rectangle, the length becomes $1.05a$ and the width becomes $0.95a$. ∴ New area = $1.05a \times 0.95a = 0.9975a^2$

Change in area = a decrease of $0.0025a^2$

∴ % decrease in area = $0.0025a^2 * 100/a^2 = 0.25\%$

Practice Question 1.21

A man rows 'k' km upstream and back again downstream to the same point in H hours. The speed of rowing in still water is s km/hr and the rate of stream is r km/hr. Then

- A. $(s^2 - r^2) = 2sk / H$
- B. $(r + s) = kH / (r - s)$
- C. $rs = kH$
- D. None of the above

Practice Question Solution 1.21

Sol : Option A

Time taken to cover total distance = H hrs.

Speed of upstream = $s - r$. Speed of downstream = $s + r$.

$$\therefore k / (s + r) + k / (s - r) = H \Rightarrow (s^2 - r^2) = 2sk / H$$

Practice Question 1.22

A boat goes 12 km upstream in 48 minutes. The speed of stream is 2 km/hr. The speed of boat in still water is

- A. 15 km/hr
- B. 16 km/hr
- C. 17 km/hr
- D. 18 km/hr

Practice Question Solution 1.22

Sol : Option C

12 km upstream in 48 min. \Rightarrow it will cover 15 km in 1 hr. Speed of stream = 2 km / hr.

\therefore Speed of boat in still water = $15 + 2 = 17$ km / hr.

Practice Question 1.23

A motorboat can travel at 5 km/hr in still water. It travelled 90 km downstream in a river and then returned, taking altogether 100 hours. Find the rate of flow of the river.

- A. 3 km/hr
- B. 3.5 km/hr
- C. 2 km/hr
- D. 4 km/hr

Practice Question Solution 1.23

Sol : Option D

Speed of boat in still water = $x = 5$ km/hr.

Let rate of flow of river = y km/hr. \therefore Speed of u/s = $5 - y$ and speed of d / s = $5 + y$

$$\therefore \frac{90}{5+y} + \frac{90}{5-y} = 100 \Rightarrow y = 4 \text{ km/hr.}$$

Practice Question 1.24

A man can row 30 km upstream in 6 hours. If the speed of the man in still water is 6 km/hr, find how much he can row downstream in 10 hours.

- A. 70 km
- B. 140 km
- C. 200 km
- D. 250 km

Practice Question Solution 1.24

Sol : Option A

Speed of upstream = $30 / 6 = 5$ km / hr. Speed of man in still water = 6 km / hr.

∴ Speed of current = $6 - 5 = 1$ km / hr. So speed of downstream = $6 + 1 = 7$ km / hr.

∴ Distance traveled in 7 hrs = $10 * 7 = 70$ km.

Practice Question 1.25

How long will it take to row 20 km upstream if one can row 10 km in 10 minutes in still water and the same distance in 8 minutes with the stream?

- A. 12 min
- B. 13.33 min
- C. 24 min
- D. 26.67 min

Practice Question Solution 1.25

Sol : Option D

Let x be the speed of man in still water and y be the speed of stream.

\therefore Speed of man (x) = 60 km/hr and speed of downstream = 75 km/hr. \therefore Speed of stream = 15 km/hr.

Hence upstream speed = $60 - 15 = 45$ km/hr.

So time taken to cover 20 km = $20/45 \times 60 = 26.67$ min.

Practice Question 1.26

A man takes 20 minutes to row 12 km upstream which is a third more than the time he takes on his way downstream. What is his speed in still water?

- A. 41 km/hr
- B. 36 km/hr
- C. 42 km/hr
- D. 45 km/hr

Practice Question Solution 1.26

Sol : Option C

Let the speed in still water = x km/hr. Takes 20 min. to row 12 km upstream \Rightarrow speed of u/s = 36 km/hr. Also, time taken for u/s is $1/3$ more than for d/s.

\therefore distance covered in d / s will be $1/3$ more.

Hence distance covered by man for d / s in 20 min. = $12 \times (12/3) = 16$ km.

So speed of d / s = 48 km/hr.

$\therefore x + y = 48$ and $x - y = 36 \Rightarrow x = 42$ km/hr.

Practice Question 1.27

A boat running downstream covers a distance of 24 km in 3 hours while for covering the same distance upstream, it takes 6 hours. What is the speed of the current?

Practice Question Solution 1.27

Sol: The downstream speed = $24/3 = 8 \text{ km/hr}$

The upstream speed = $24/6 = 4 \text{ km/hr}$

The speed of the current = $(8-4)/2 = 4/2 = 2 \text{ km/hr}$

Practice Question 1.28

Speed of the boat in still water is 15 km/hr and the speed of the current is 7 km/hr. Find the total time taken by a man rowing to a place at a distance of 88 km and back.

Practice Question Solution 1.28

Sol: The downstream speed is $15 + 7 = 22$ km/hr and the upstream speed = $15 - 7 = 8$ km/hr.

The total time taken = $(88/22) + (88/8) = 4+11 = 15$ hours.

Practice Question 1.29

The speed of the boat in still water is 30 km/hr. It goes 75 km downstream and comes back in 9 hours. Find the speed of the current.

Practice Question Solution 1.29

Sol: Let the speed of the current = 'x' km/hr

$$\text{We have } \frac{75}{(30+x)} + \frac{75}{(30-x)} = 9$$

$$\Rightarrow 75\left(\frac{60}{900-x^2}\right) = 9$$

$$\Rightarrow 900-x^2 = 500$$

$$\Rightarrow x^2 = 400$$

$$\Rightarrow x = 20 \text{ km/hr}$$

Practice Question 1.30

A boat running upstream takes 4 hours 24 minutes to cover a certain distance, while it takes 2 hours to cover the same distance running downstream. What is the ratio between the speed of the boat and speed of the water respectively?

Practice Question Solution 1.30

Sol: Let x be the speed of boat and y be the speed of water \therefore

$$\Rightarrow \frac{22}{5}(x-y) = 2(x+y)$$

$$\Rightarrow 11x - 11y = 5x + 5y \Rightarrow 6x = 16y \Rightarrow x/y = 8/3$$

Hence the ratio of the speed of the boat and speed of the water is 8: 3

Practice Question 1.31

After traveling 50km, a train meets with an accident and travels at $(3/4)$ th of the usual Speed and reaches 45 min late. Had the accident happened 10km further on it would have reached 35 min late. Find the usual Speed?

Practice Question Solution 1.31

Solutions:

Using Inverse Proportionality Method

Here there are 2 cases

Case 1: accident happens at 50 km

Case 2: accident happens at 60 km

Difference between two cases is only for the 10 kms between 50 and 60. The time difference of 10 minutes is only due to these 10 kms.

In case 1, 10 kms between 50 and 60 is covered at $(3/4)^{\text{th}}$ Speed.

In case 2 , 10 kms between 50 and 60 is covered at usual Speed.

So the usual Time "t" taken to cover 10 kms , can be found out as below. $4/3 t - t = 10 \text{ mins} \Rightarrow t = 30 \text{ mins}$, $d = 10 \text{ kms}$

so usual Speed = $10/30 \text{ min} = 10/0.5 = 20 \text{ km/hr}$

Practice Question 1.32

A train running at 54 km/hr crosses a telegraph pole in 18 seconds less time than it takes to cross a platform. Find the length of the platform.

- a) 30 m
- b) 90 m
- c) 270 m
- d) 810 m

Practice Question Solution 1.32

Sol : Option C

Explanation: Speed is $54 \times 5 / 18 = 15$ m/s. Let the time required for crossing the pole be t . Length of the train is $15 \times t$. Length of the train + length of the platform
 $= 15 \times (t + 18)$. So length of the platform $= 15 \times (t + 18) - 15 \times t = 15 \times 18 = 270$ m.

Practice Question 1.33

A train crosses a platform at 54 km/hr in 20 seconds. Another train is 150 m shorter than the former and is running at 36 km/hr. Find the time the second train will take to cross the same platform.

- a) 5 sec
- b) 10 sec
- c) 15 sec
- d) 20 sec

Practice Question Solution 1.33

Sol : Option C

Explanation: Speed of the first train is $54 \times 5/18 = 15$ m/s.

(Length of the platform + length of the train) is $= 20 \times 15$

$= 300$ m. If the second train is 150 m shorter, then the length of the platform + length of the second train is $300 - 150 = 150$ m.

That train is running at $36 \text{ km/hr} = 36 \times 5/18 = 10$ m/s.

So it will take $150 / 10 = 15$ seconds to cross the platform.

Practice Question 1.34

The distance between two countries P and Q which are joined by land route is 5000 km. A train starts from country P at 6:00 am and travels towards country Q at the speed of 250 km/hr. Another train starts from country Q at 10:00 am and travels towards country P at the speed of 150 km/hr. At what time they will meet each other?

1. 8:00 pm
2. 9:00 pm
3. 10:00 pm
4. 11:00 pm

Practice Question Solution 1.34

Given:

Distance between two countries P and Q = 5000 km

A train starts from country P at 6:00 am at the speed = 250 km/hr

Second train B starts from country Q at 10:00 am at the speed = 150 km

Formula:

If the speed of the two trains be x km/hr and y km/hr respectively if $x > y$.

Relative speed, if opposite directions = $(x + y)$ km/hr

Speed = Distance/Time

Calculation:

Distance cover by train A in 4 hrs ($10 - 6 = 4$ hours) = $250 \times 4 = 1000$ km

Remaining distance between two countries P and Q which is to be covered by both trains = $5000 - 1000 = 4000$ km

Relative speed of both train if they running opposite direction = $250 + 150 = 400$ km / hr

Time taken after 10 am to meet = $4000/400 = 10$ hrs

\therefore Required time = 10:00 am + 10 hrs = 8:00 pm

Practice Question 1.35

A car travels some distance at a speed of 8 km/hr and returns at a speed of 12 km/hr. If the total time taken by the car is 15 hours, then what is the distance (in km)?

1. 48
2. 60
3. 56
4. 72

Practice Question Solution 1.35

Let the distance be d km.

We know that,

Distance = Speed \times Time

$$\Rightarrow \frac{d}{8} + \frac{d}{12} = 15$$

$$\Rightarrow \frac{3d+2d}{24} = 15$$

$$\Rightarrow d = 72 \text{ km}$$

Practice Question 1.36

A car completes a journey in seven hours. It covered half of the distance at 40 kmph and the remaining half at 60 kmph speed. Then, the distance (in km) covered is:

1. 280
2. 300
3. 336
4. 420

Practice Question Solution 1.36

Calculation:

Let total distance be $2x$.

$$\text{Time}_1 = \text{Distance}/\text{Speed}$$

$$\Rightarrow x/40 \text{ hours}$$

$$\text{Time}_2 = \text{Distance}/\text{Speed}$$

$$\Rightarrow x/60 \text{ hours}$$

$$\text{Total time} = \text{Time}_1 + \text{Time}_2$$

$$\Rightarrow 7 = x/40 + x/60$$

$$\Rightarrow 7 = (3x + 2x)/120$$

$$\Rightarrow 7 = 5x/120$$

$$\Rightarrow x = 7 \times 24$$

$$\Rightarrow x = 168 \text{ km}$$

$$\Rightarrow \text{Total distance} = 2x$$

$$\Rightarrow 2 \times 168$$

$$\Rightarrow 336 \text{ km}$$

∴ Total distance covered by the car is 336 km.

Practice Question 1.37

A flight covering a distance of 1200 km could reduce the travel time by 30 minutes, due to an additive tailwind that increases the average speed by 120 km/hr. What was the duration of the flight in hours?

1. 2.2 hours
2. 1.9 hours
3. 1.8 hours
4. 2 hours 30 min

Practice Question Solution 1.37

As we know,

$$30 \text{ min} = 1/2 \text{ hr}$$

Let the speed of the flight be x km/hr

According to the question

$$\Rightarrow 1200/x - 12000/(x + 120) = 1/2$$

$$\Rightarrow 1200 [(x + 120 - x)/x (x + 120)] = 1/2$$

$$\Rightarrow 1200 [120/(x^2 + 120x)] = 1/2$$

$$\Rightarrow 1200 \times 120 \times 2 = x^2 + 120x$$

$$\Rightarrow 288000 = x^2 + 120x$$

$$\Rightarrow x^2 + 120x - 288000 = 0$$

$$\Rightarrow x^2 + 600x - 480x - 288000 = 0$$

$$\Rightarrow x(x + 600) - 480(x + 600) = 0$$

$$\Rightarrow (x + 600)(x - 480) = 0$$

Taking

$$\Rightarrow (x - 480) = 0$$

$$\Rightarrow x = 480 \text{ km/hr}$$

Total distance = 1200 km

Speed = 480 km/hr

As we know,

Time = Distance/Speed

$$\text{Time} = 1200/480 = 2.5 \text{ hr or } 2 \text{ hr } 30 \text{ min}$$

Practice Question 1.38

A person covers a certain distance with 8 km/hr, he gets late by 12 minutes. If he covers the same distance with 12 km/hr, then he gets 2 minutes late only. Find the time in which he must reach the destination so that he is not late.

1. 18 minutes
2. 20 minutes
3. 30 minutes
4. 28 minutes

Practice Question Solution 1.38

Suppose the distance to be covered = x km

$$\therefore x/8 - 12/60 = x/12 - 2/60$$

$$\Rightarrow x/8 - x/12 = 10/60$$

$$\Rightarrow x = 4$$

$$\therefore \text{Scheduled time} = 4/8 - 12/60 = 0.3 \text{ hours} = 18 \text{ minutes}$$

Practice Question 1.39

The distance between two stations, Delhi and Amritsar, is 530 km. A train starts at 4 p.m. from Delhi and moves to Amritsar at an average speed of 80 km/hr. Another train starts from Amritsar at 3.20 p.m. and moves towards Delhi at an average speed of 60 km/hr. How far from Delhi will the two meet?

- a) 140km
- b) 280 km
- c) 200 km
- d) 180 km

Practice Question Solution 1.39

Sol : Option B

Explanation: Suppose the trains meet at a distance of x km from Delhi.

At 4 pm the distance that has to be covered is

$$530 - 60 \times 2 / 3 = 490 \text{ km.}$$

The relative speed of the trains is $80 + 60 = 140 \text{ km/h}$. Time required for covering the distance is $490 / 140$ hours.

The train from Delhi will be $80 \times 49 / 14 \text{ km}$ away from Delhi at the point of meeting. $= 40 \times 49 / 7 = 280 \text{ km.}$

Practice Question 1.40

A train passes a station platform in 36 sec and a man standing on the platform in 20 sec. If the speed of the train is 54 km/hr, find the length of the platform.

- a) 240 m
- b) 680 m
- c) 360 m
- d) 720 m

Practice Question Solution 1.40

Sol : Option A

Explanation: Speed of the train is $54 \times 5 / 18 = 15$ m/s.

Length of the train is $20 \times 15 = 300$ m.

Length of platform + train = $36 \times 15 = 540$ m.

So the length of the platform is $540 - 300 = 240$ m.

(No wonder it did not stop at this station!)

Practice Question 1.41

For what value of h, the system of equations, $x+2y+7 = 0$ and $2x+hy+14= 0$ have an infinite number of solutions?

A - 3

B - 4

C - 5

D - 6

Practice Question Solution 1.41

Answer - B

Explanation

For infinite solutions, we have $a_1/a_2 = b_1/b_2 = c_1/c_2$;
 $h1/2 = 2/h = 7/14 \Rightarrow h=4$.

Practice Question 1.42

For what value of h, the system of equations, $hx-10y-3=0$ and $3x-5y-7=0$ has no solutions?

A - 6

B - 5

C - 4

D - 3

Practice Question Solution 1.42

Answer - A

Explanation

For no solution, we have $a_1/a_2 = b_1/b_2 \neq c_1/c_1$
 $\therefore h/3 = -10/-5 \neq -3/-7 \Rightarrow h = 6$

Practice Question 1.43

Given $217x + 131y = 913$ and $131x + 217y = 827$. Then x,y are

A - 1,6

B - 3,2

C - 12,13

D - 16,18

Practice Question Solution 1.43

Answer - B

Explanation

$$217x + 131y = 913 \dots (a)$$

$$131x + 217y = 827 \dots (b)$$

It is a special case in which coefficients of x and y in (a) are interchanged in (b)

Adding (a) and (b), we get : $348(x+y) = 1740 \Rightarrow x+y = 5$
 $\dots (a)$

Subtracting (b) from (a), we get: $86(x-y) = 86 \Rightarrow x-y = 1$
 $\dots (b)$

Adding (a) and (b), we get: $x= 3, y= 2$

Practice Question 1.44

Given $(x+y-8)/2 = (x+2y-14)/3 = (3x+y-12)/11$. Then x,y are

A - 1,7

B - 2,7

C - 2,6

D - 1,5

Practice Question Solution 1.44

Answer - D

Explanation

Taking first two parts, we get:

$$(x+y-8)/2 = (x+2y-14)/3$$

$$\Rightarrow 3(x+y-8) = 2(x+2y-14)$$

$$\Rightarrow 3x+3y-24 = 2x+4y -28$$

$$\Rightarrow x - y = -4 \dots (1)$$

Taking last two parts, we get:

$$(x+2y-14)/3 = (3x+y-12)/11$$

$$\Rightarrow 11(x+2y-14) = 3(3x+y-12)$$

$$\Rightarrow 11x + 22y - 154 = 9x + 3y - 36$$

$$\Rightarrow 2x + 19y - 118 \dots (2)$$

Multiplying (1) by 2 and subtracting from (2) we get,

$$21y = 126$$

$$\Rightarrow y = 6$$

Putting $y = 6$ in (1), we get: $x = 2$

$$\Rightarrow x = 2, y = 6$$

Practice Question 1.45

The sum of a natural number and its reciprocal is $50/7$. What is the number?

- A. 7
- B. 10
- C. $1/5$
- D. 5

Practice Question Solution 1.45

Sol : Option A

$$x + \frac{1}{x} = 50/7 \Rightarrow x = 7$$

Practice Question 1.46

If the roots x_1 and x_2 of the quadratic equation satisfy the condition $7x_2 - 4x_1 = 47$. The quadratic expression is $x^2 - 2x + c = 0$, find the value of c .

- A. - 15
- B. 15
- C. - 6
- D. None of these

Practice Question Solution 1.46

Sol : Option A

$$x_1 + x_2 = +2 \quad \dots \dots \dots (1),$$

$$\text{Also } -4x_1 + 7x_2 = 47 \quad \dots \dots \dots (2)$$

Solving (1) & (2) we get $x_1 = -3$ and $x_2 = 5$

$$\therefore x_1 x_2 = -15 = c$$

Practice Question 1.47

If $(x^2 - y^2) = 16$ and $xy = -15$. Which of the following is a possible value of $(x + y)$, if $(x + y)$ is a positive number.

- A. 3
- B. 2
- C. 5
- D. None of these

Practice Question Solution 1.47

Sol : Option B

$$x^2 - y^2 = 16 \text{ and } xy = -15, (x + y) > 0 = ?$$

$$x = -15/y, (-15/y)^2 - y^2 = 16, 225/y^2 - y^2 = 16$$

$$y^4 + 16y^2 - 225 = 0$$

$$y^2 = -25, 9 \text{ or } y = \pm 3 \text{ (avoiding complex roots)}$$

Putting values $x = \pm 5$ for $y = 3$ and $x = \pm 5$ for $y = -3$

$$\text{Therefore } (x+y) = 5+3 = 8, -5+3 = -2$$

$$\text{Or } (x+y) = 5-3 = 2, -5-3 = -8$$

Therefore, $x+y = 2$ or 8 (because $x+y > 0$).

Practice Question 1.48

The difference between the roots of a quadratic equation $6x^2 + wx + 1 = 0$ is $1/6$. If $w > 0$, then the value of w is

- A. 6
- B. -5
- C. 5
- D. 10

Practice Question Solution 1.48

Sol : Option C

Let α, β are the roots of the equation, then

$$\alpha + \beta = -w/6, \alpha\beta = 1/6, \alpha - \beta = 1/6 \text{ and } w > 0$$

$$\text{Solving } \alpha = (-w+1)/12, \beta = (-w-1)/12,$$

$$\text{Therefore, } (1-w)/12 \times (-1-w)/12 = 1/6$$

$$\text{Solving } w = \pm 5 \text{ as } w > 0, w = 5$$

Thus, option C is the answer

Practice Question 1.49

The base of a triangle is greater than twice its height by 1 cm. The area of the triangle is 18 sq. cm. Find the base and height of the triangle.

- A. 18 cm, 2 cm
- B. 9 cm, 4 cm
- C. 6 cm, 9 cm
- D. 6 cm, 7 cm

Practice Question Solution 1.49

Sol : Option B

$$B = 2H + 1$$

$$\text{Area} = B * H/2 \Rightarrow 18 = (2H + 1)/2$$

$$H = 4, B = 9$$

Practice Question 1.50

The sum of the squares of two consecutive natural numbers is 85. Find those numbers.

- A. 6, 7
- B. 5, 8
- C. 6, 8
- D. -8, 6

Practice Question Solution 1.50

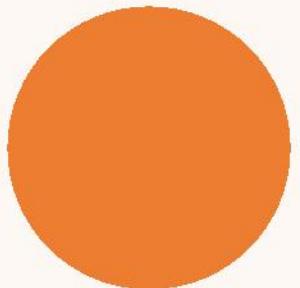
Sol : Option A

Two consecutive natural nos. are x and $x + 1$.

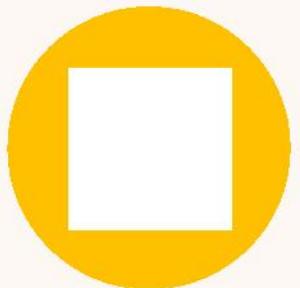
$$\Rightarrow x^2 + (x + 1)^2 = 85 \Rightarrow x = 6. \therefore \text{nos. are } 6 \text{ and } 7.$$



Resources and Books



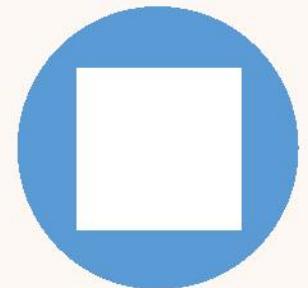
Fast Track Objective Arithmetic by Rajesh Verma –
Arihant Publication.



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Thank you

