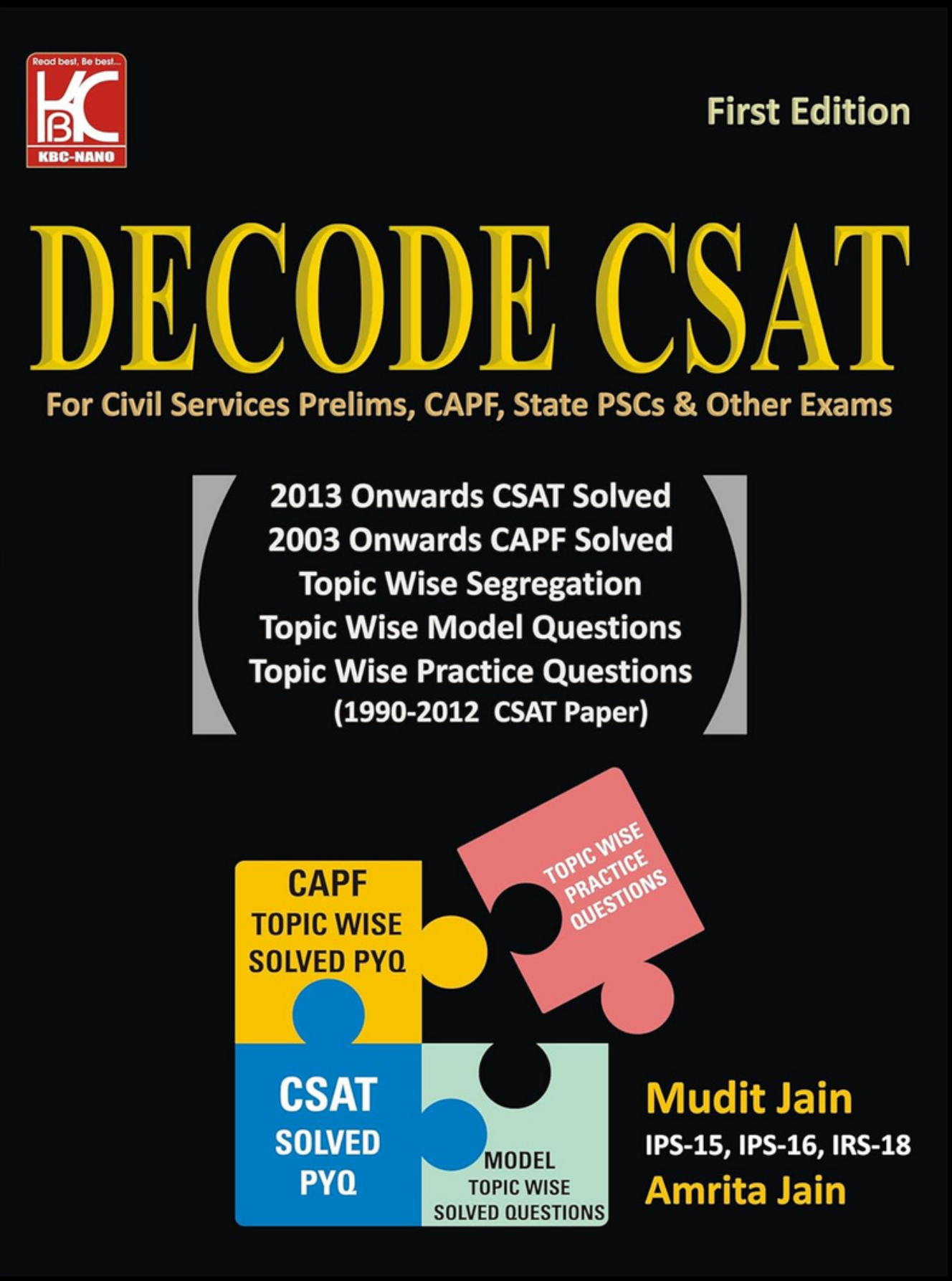

CAPF PYQPs SOLVED & SEGREGATED INTO 32 TOPICS

MODEL SOLVED QUESTIONS SIMILAR TO CSAT PYQs FOR 32 TOPICS

CSAT 1990-2012 QUESTIONS INCLUDED AS TOPICWISE PRACTICE SETS

2013 ONWARDS CSAT SOLVED

ALL IN 280 PAGES!

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Decode CSAT, our 5th title, took us over 2.5 years from start to finish. Highlights of the book:

1) We identified 32 topics from which questions have been asked in UPSC CSE Prelims CSAT from 2013-2023

2) After identification of topics and after going through CAPF papers from 2003 onwards, we observed that many questions in CSAT were literally copied from CAPF

3) Then we segregated 2003-2023 CAPF questions into the 32 identified topics, solved them and placed them in book topic-wise

4) Next step was to frame topic-wise model questions similar to questions asked in 2013-2023 CSAT paper for all 32 topics. This is to provide best exam simulation possible by having questions of UPSC standard and mindset

5) Then we solved 2013-2023 CSAT papers

6) Plus, we went through 1990-2012 UPSC CSE Question papers and segregated questions topic wise and included the same as chapter wise practice sets in book because even PYQs get repeated verbatim

7) We have also included topic-wise compilations of formulas

8) Also, like other "Decode Series Books", conscious effort has been made to have this bundle of information in a concise manner i.e. in only 280 pages so that getting to 33% qualification marks does not feel like a laborious task!

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32 topics from which questions have been asked in CSAT

CONTENT

UPSC CSAT : YEAR WISE SOLVED PAPER (2023-2013)

UPSC CSAT : CSP/CAPF TOPIC WISE QUESTIONS ANALYSIS

Q 9. Consider the following in respect of prime number p and composite number c.

1. $(p + c)/(p - c)$ can be even.
2. $2p + c$ can be odd.
3. pc can be odd.

Which of the statements given above are correct?

(a) 1 and 2 only (b) 2 and 3 only
(c) 1 and 3 only (d) 1, 2 and 3

Ans. Let the numbers be 11 and 9

$(p+c)/(p-c) = (11+9)/(11-9)$ = even number

$2p + c = 2 \times 11 + 9$ = odd number

$Pc = 11 \times 9$ = odd number

Therefore, (d) is correct option.

Q 10. A 3-digit number ABC, on multiplication with D gives 37DD where A, B, C and D are different non-zero digits. What is the value of A + B + C?

(a) 18 (b) 16
(c) 15
(d) Cannot be determined due to insufficient data

Ans. 37DD can be written as 3700 + 10D + D = 3700 + 11D

ABC x D = 3700 + 11D or ABC = 3700/D + 11

3700/D should be a whole number. So, possible values of D are 1, 2, 4, and 5. Put these 4 values and check value of ABC

If D = 1, ABC = 3711 (Rejected as ABC should be 3-digit number)

If D = 2, ABC again is a 4 and not 3-digit number and hence rejected

If D = 5, ABC = 3700/5 + 11 = 751. But, as question directs that digits shall not repeat, this value is also rejected as B and D both are 5

If D = 4, ABC = 925 + 11 = 936.

So, A + B + C = 9 + 3 + 6 = 18

Therefore, (a) is correct option.

Q 11. For any choices of values of X, Y and Z, the 6-digit number of the form XYZXYZ is divisible by

(a) 7 and 11 only (b) 11 and 13 only
(c) 7 and 13 only (d) 7, 11 and 13

Ans. XYZXYZ = XYZ × 1000 + XYZ or XYZ (1000 + 1) or XYZ × 1001

As, 1001 = 7 × 11 × 13, this must be divisible by 7, 11 and 13

Therefore, (d) is correct option.

Q 12. 125 identical cubes are arranged in the form of cubical block. How many cubes are surrounded by other cubes from each side?

(a) 27 (b) 25
(c) 21 (d) 18

Ans. 125 = 5 × 5 × 5. Hence, length, breadth and height all have 5 cubes and n = 5

Number of cubes that are surrounded by other cubes from each side or internal cubes

$= (n-2)^3 = 27$

Therefore, (a) is correct option.

Q 13. How many distinct 8-digit numbers can be formed by rearranging the digits of the number 11223344 such that odd digits occupy odd positions and even digits occupy even positions?

(a) 12 (b) 18
(c) 36 (d) 72

Ans. There are 4 odd and 4 even positions in a 8-digit number and there are 4 odd numbers (1, 1, 3, 3) and 4 even numbers (2, 2, 4, 4)

Number of ways in which these 4 odd numbers can be arranged in 4 positions = 4!/(2 × 2) = 6

Number of ways 4 even numbers (2, 2, 4, 4) can be arranged is also 6

So, total ways = 6 × 6 = 36

Therefore, (c) is correct option.

Q 14. A, B, C working independently can do a piece of work in 8, 16 and 12 days respectively. A alone works on Monday, B alone works on Tuesday, C alone works on Wednesday; A alone, again works on Thursday and so on. Consider the following statements:

1. The work will be finished on Thursday.
2. The work will be finished in 10 days.

Which of the above statements is/are correct?

(a) 1 Only (b) 2 Only
(c) Both 1 and 2 (d) Neither 1 nor 2

Ans. A, B and C working independently can do a piece of work in 8, 16 and 12 days respectively i.e. in 1 day, 1/8, 1/16 and 1/12 of total work.

So total 3 days' work is 1/8 + 1/16 + 1/12 = 13/48

9 days' work = 3 × 13/48 = 39/48

1 POWER – UNIT PLACE – REMAINDER

INTRODUCTION

- Rem[$(x^y)/d$] = Rem[r^y/d] where r is remainder when x divided by d
- $(A + X)^n / A = X^n/A$
- Rem[(a × b × c)/d] = Rem[a/d] × Rem[b/d] × Rem[c/d]
- Rem[(a + b + c)/d] = Rem[a/d] + Rem[b/d] + Rem[c/d]
- Repetition cycle = After how many iterations is the unit digit repeated for a number n^y where y = 1, 2, 3 and so on
- n ^ a × n ^ b = n ^ (a + b)
- n ^ a / n ^ b = n ^ (a – b)
- n ^ (a ^ b) = n ^ (a × b)
- n ^ (–a) = 1/n ^ a
- n ^ 0 = 1
- The unit digit of number depends on the last digit of that number

CAPF 2003–2023 SOLVED QUESTIONS ON POWER-UNIT PLACE-REMAINDER

Q 1. **n = $[(6374)^{1793} \times (625)^{317} \times (313)^{49}]$ Which one of the following is the digit at the unit place of n?** ***(CAPF 2017)***

(a) 0 (b) 1
(c) 2 (d) 5

Ans. To solve such questions, firstly find the unit digit patterns and repetition cycles of all the unit digits mentioned in the given numbers.
Here, unit digits are 4, 5 and 3
Unit digit pattern of 4^n is $4^1 = 4$, $4^2 = 16$, $4^3 = 64$, $4^4 = 256$
Repetition cycle of the 4 i.e. after how many iterations is the unit digit repeated is found as:
$4^1 = 4$ (1st iteration) → $4^2 = 16$ (2nd iteration) → $4^3 = 64$ (3rd iteration) and unit digit gets repeated after 3 – 1 i.e. 2 iterations
After finding the repetition cycle, divide the number given in power (exponent) with the repetition cycle of unit digit and find the remainder. Here, number given as exponent for unit digit 4 is 1793. Hence, 1793/2 remainder = 1
Now, the unit digit will be (unit digit)^{remainder}.
Hence, unit digit of $4^{1793} = 4^1 = 4$
Similarly, Unit digit pattern of 5 is $5^1 = 5$, $5^2 = 25$, $5^3 = 125$ and as can be seen, unit digit for 5^n or $(625)^{317} = 5$
Similarly, Unit digit pattern of 3 is $3^1 = 3$, $3^2 = 9$, $3^3 = 27$, $3^4 = 81$, $3^5 = 243$
Hence, repetition cycle i.e. after how many iterations is the unit digit repeated is 4. Now, divide exponent with repetition cycle i.e. 49/4 to find remainder i.e. 1
Now, the unit digit will be (unit digit)^{remainder}.
Hence, unit digit of $(313)^{49} = 3^1 = 3$
Unit digit of given multiplication product = unit digit of 4 × 5 × 3 or 60 = 0
Therefore, (a) is correct option.

Q 2. **Which one of the following is the remainder when 10^{20} is divided by 7?** ***(CAPF 2018)***

(a) 1 (b) 2
(a) 4 (d) 6

Chapter for each topic also includes useful theory + formulas

2 Division & Multiplication

INTRODUCTION

- A number will be absolutely divided by 2 if its unit is either even number or zero
- A number will be absolutely divided by 3 if the sum of digits of the number is divisible by 3
- A number will be absolutely divided by 4 if the last two digits of the number is absolutely divisible by 4
- A number will be absolutely divided by 5 if its unit is either five or zero
- A number will be absolutely divided by 6 if it is absolutely divisible by both 2 and 3
- A number will be absolutely divided by 8 if its last three digits are absolutely divisible by 8
- A number will be absolutely divided by 9 if sum of its digits is divisible by 9
- A number will be absolutely divided by 10 if its unit is 0
- A number will be absolutely divided by 11 if the difference between sum of its even digits and odd digits is either 0 or divisible of 11

CAPF 2003 – 2023 SOLVED QUESTIONS ON DIVISION & MULTIPLICATION

Q 1. If ABC × DEED = ABCABC where A, B, C, D and E are different digits, what are the values of D and E? ***(CAPF 2004, CSP 2015)***

(a) D = 2, E = 0 (b) D = 0, E = 1
(c) D = 1, E = 0 (d) D = 1, E = 2

Ans. When we write any Number in form of ABCABC then that number must be divisible by 13, 11 and 7

Hence, ABCABC is multiple of (13 × 11 × 7 = 1001)

Hence, for any value of ABC; ABC × 1001 = ABCABC; i.e. DEED = 1001

Hence, D = 1 and E = 0

Therefore, (c) is correct option.

Q 2. The number of terms between 11 and 200 which are divisible by 7 but not by 3 are? ***(CAPF 2008)***

(a) 18 (b) 19
(c) 27 (d) 28

Ans. Multiples of 7 between 11 and 200 are 14, 21, 28, 35, 42, ... , 189, 196

To solve such questions, use arithmetic progression to find number of number of terms divisible by 7 between 14 and 196. Formula for nth term of an arithmetic progression: $a_n = a_1 + (n-1) \times d$ where a_1 is the first term, $a_1 + d$ is the second term, and d is the common difference. Hence,

$196 = 14 + (n-1) \times 7$;

$(n-1) \times 7 = 182$ or $n = 27$

Multiples of 7 and 3 both, i.e., 21 between 11 and 200 are 21, 42, 63, ..., 189

Use arithmetic progression to find number of number of terms divisible by 21 between 21 and 189.

$189 = 21 + (n-1) \times 21$

$(n-1) \times 21 = 168$ or $n = 9$

Hence, required number of terms = 27 – 9 = 18

Therefore, (a) is correct option.

Q 3. Let a number of three digits have for its middle digit the sum of the other two digits. Then it is a multiple of? ***(CAPF 2008)***

(a) 11 (b) 10
(c) 18 (d) 50

3 Digits

INTRODUCTION

- **Natural Numbers:** The number that we use to count objects are called Natural Numbers or Cardinal Numbers. For example: 1, 2, 3, 4, 5, 6... etc. Note. Zero (0) is not a natural number because we start counting from 1. The smallest or first natural number is 1.
- **Whole Numbers:** The natural numbers including zero (0) is called whole numbers. For example: 0, 1, 2, 3, 4... etc.
- **Integers:** Integers include natural numbers, zero and negative numbers. For example: –5, –4, –3, –2, –1, 0, 1, 2, 3, 4... etc. Note: Zero is neither negative nor positive number.
- **Prime Numbers:** Natural numbers more than 1 which are divisible by either 1 or itself only are called prime numbers. For example: 2, 3, 5, 7, 11. Or numbers that have only two divisors. For example: 2 = 1 × 2, 2 × 1.
- **Factor Numbers:** Natural numbers which are divisible by at least 3 natural numbers are called factor numbers. For example: 4, 6, 8, 9, 10, 12, 14, 16... etc.
- Number of factors means the total number of those number which can absolutely divide the given number. For example: If we talk about the number of divisors of 6, it is 1, 2, 3 and 6. Hence total number of divisors = 4.
- **Rational Numbers:** Numbers in the form of p/q where p and q are whole numbers and q ≠ 0 are called national numbers.
- **Irrational Numbers:** Numbers which can't be written in the form of p/q are called irrational numbers.
- **Co-prime number:** Pair of numbers a and b for which H.C.F is 1 are called co-prime numbers.

CAPF 2003 – 2023 SOLVED QUESTIONS ON DIGITS

Q 1. How many numbers are there between 99 and 1000 such that the digit 8 occupies the units' place? ***(CAPF 2003, CSP 2017)***

(a) 64 (b) 80
(c) 90 (d) 104

Ans. For 100 to 200: 8 will come at the unit's place 10 times, i.e. 108, 118, 128.... 198.
Similarly, for 200 to 300 and so on.
Hence, the number of times that 8 will come at unit's place between 99 and 1000 = 10 × 9 = 90
Therefore, (c) is correct option.

Q 2. A boy wrote successive whole numbers starting from 1 up to 900. In doing so, how many times did he write the digit 7? ***(CAPF 2004)***

(a) 271 (b) 280
(c) 281 (d) None of these

Ans. In the range 0-100: 7 as unit digit comes 10 times (7, 17, 27, ..., 97); 7 as tens digit comes 10 times (70, 71, 72, 73, ..., 79)
So in 0-100, 7 is written 10 + 10 = 20 times
So, in 9 hundreds i.e. 0-100, 101-200..801-900, 7 as units or tens digit will be written 9 × 20 = 180 times
Plus 100 times when 7 is written as hundreds digit (700, 701, 702, ..., 799)
Total 180 + 100 = 280
Therefore, (b) is correct option.

MODEL QUESTIONS ON BASIS OF 2013–2023 CIVIL SERVICES PRELIMS (CSP) QUESTIONS

Q 1. A gardener has 1100 plants. He wants to plant these in such a way that the number of rows and number of columns remains same. Find the minimum number of plants he needs more for this. ***(Reference: CSP 2013)***

(a) 56 (b) 46
(c) 11 (d) None of these

Ans. Let number of rows and column be x.
Then, X^2 = total number of plants i.e. 1100 + extra plants
To find extra plants needed, find perfect square nearest to 1100
We know that $32 \times 32 = 1024$, $33 \times 33 = 1089$ and $34 \times 34 = 1156$
Hence, there must be 34 rows and columns and 1156 plants, giving 56 as answer
Therefore, (a) is correct option.

Q 2. A cricket team scored 700 runs with 7 players such that every player scored 30 runs more than the previous player. What is the score of 4th player? ***(Reference: CSP 2013)***

(a) 70 (b) 120
(c) 80 (d) 100

Ans. Let score of 1st player be x. Then, scores of other players are: x + 30, x + 60, x + 90, x + 120, x + 150 and x + 180
Total is 700.
So, x + x + 30, x + 60, x + 90, x + 120, x + 150 + x + 180 = 700
$7x + 630 = 700$ or $x = 10$
Score of 4th player is x + 90 = 100
Therefore, (d) is correct option.

Q 3. In a parking lot of 2 and 4 wheelers, number of wheels is 20 less than square of number of bikes and 8 times the number of bikes. The number of vehicles is? ***(Reference: CSP 2015)***

(a) 25 (b) 30
(c) 15 (d) None of these

Ans. Let number of bikes be x and cars be y.
Then, wheels = 2x + 4y and,
$2x + 4y = x^2 - 20$ (Equation 1) and $2x + 4y = 8x$ (Equation 2)
$8x = x^2 - 20$ or $x^2 - 8x - 20 = 0$
$(x - 10)(x + 2) = 0$
$x = 10$ or -2. As -2 is not possible, $x = 10$.
Substituting in equation 2: $20 + 4y = 80$ or $y = 15$
Hence, total vehicles = 10 + 15 = 25
Therefore, (a) is correct option.

Q 4. A person ordered 4 shirts of brand A and some shirts of brand B. The price of one shirt of brand A was twice that of brand B. When the order was executed, it was found that the numbers of the two brands has been interchanged. This increased the bill by 40%. The ratio of the number of brand A shirts to that of brand B shirts in the original order was? ***(Reference: CSP 2015)***

(a) 1 : 2 (b) 1 : 3
(c) 1 : 4 (d) 1 : 5

Ans. Let the number of shirts of brand B be x and cost of a shirt of brand B be Re. 1. Then, cost of shirt of brand A is Rs. 2
Original cost = $4 \times 2 + x = 8 + x$
In case II, $4 + 2x = (8 + x) \times 140/100 = (8 + x) \times 7/5$
On solving, x = 12
Hence, ratio = 4 : 12 = 1 : 3
Therefore, (b) is correct option.

Q 5. In a team, there are 3 less all-rounders than batters and 4 less all-rounders than bowlers. If total all-rounders is 2 than number of players in the team is? ***(Reference: CSP 2015)***

(a) 15 (b) 11
(c) 13 (d) None of these

Ans. Let batters be x and bowlers be y. Then,
X = 2 + 3 and y = 2 + 4
X = 5 and y = 6
Total players in team = 5 + 2 + 6 = 13
Therefore, (c) is correct option.

Q 6. There are some chairs and persons. If one person occupies one chair then, 6 people are left without chair. If only every 2nd person occupies a chair then, 3 chairs are left empty. What is the number of chair? ***(Reference: CSP 2016)***

(a) 18 (b) 10
(c) 14 (d) 12

Ans. Relative speed of friends = 10 + 14 = 24km/hr as they are moving towards each other

24km is covered in 1 hr or 60 mins, then 10km will be covered in 10 × 60 mins/24

= 600/24 = 25mins

Therefore, (b) is correct option.

Q 21. Car A takes 1 hour more than car B, which travels at a speed of 60 km per hour, to cover some fixed distance. If car A had doubled its speed, it could cover the distance in1hour less time than car B travelling at 60 km per hour. What is the original speed of car A in km per hour? ***(CAPF 2023)***

(a) 30 (b) 40

(c) 45 (d) 50

Ans. Time = Distance / Speed

As per question, Distance / Speed A – Distance / Speed B = 1

Also, Distance / Speed B - Distance / 2 × Speed A = 1

Add two equations.

Distance / Speed A - Distance / 2 × Speed A = 2

Distance / Speed A = 4

Put value in equation 1; Distance / Speed B = 3; Distance = 180

Thus, Speed of A = 180 / 4 = 45

Therefore, (c) is correct option.

MODEL QUESTIONS ON BASIS OF 2013–2023 CIVIL SERVICES PRELIMS (CSP) QUESTIONS

Q 1. A car travels at a certain average speed for a distance of 60 km and then travels a distance of 80 km at an average speed of 10 km/hr more than its original speed. If it takes 4 hours to complete the total journey, what is the original speed of the car in km/hr? ***(Reference: CSP 2013)***

(a) 25 km/hr (b) 35 km/hr

(c) 30 km/hr (d) 40 km/hr

Ans. Time taken = Distance / Speed

Let S be the original speed.

4 hrs = 60/S + 80/(S + 10)

$4 = (60S + 600 + 80S) / (S^2 + 10S)$

$S^2 + 10S = 15S + 150 + 20S$

$S^2 – 25S – 150 = 0$

(S – 30) (S + 5) = 0

S = 30 km/hr

Another method to solve the equation is by smart guess and substituting values given in options to find correct option

Therefore, (c) is correct option.

Q 2. Abhishek running at 9 km/hr is chased by Sanket whose speed is 12 km/hr. If Abhishek is 300 m ahead of the Sanket, then the time required for Sanket to catch Abhishek will be? ***(Reference: CSP 1995, CSP 2013)***

(a) 6 minutes (b) 5 minutes

(c) 6.5 minutes (d) 5.5 minutes

Ans. Relative speed is 12 – 9 = 3 km/hr

= 3 × (5/18) m/s

Time taken by Sanket = Distance / Relative speed

Time taken by Sanket = 300 / 3 × (5/18)

= 360 sec = 6 minutes

Therefore, (a) is correct option.

Q 3. The distance between two cities A and B is 80 km. Sanket starts a bike ride from A towards B at 7 am at a speed of 10 km/hr. Abhishek starts bike ride from B towards A at 8 am at a speed of 25 km/hr. At what time will they cross each other? ***(Reference: CSP 2014)***

(a) 9 am (b) 10 am

(c) 9.30 am (d) 10.30 am

Ans. Abhishek starts one hour late. In one hour, Sanket covers a distance of 10 km

New distance between the two

= 80 – 10 = 70 km

Relative speed is 10 + 25 = 35 km/hr

The time taken by two to meet each other

= 70 / 35 = 2 hrs

Hence, they meet each other at (8 + 2) = 10 am

Therefore, (b) is correct option.

Q 4. Two cities X and Y are 400 km apart. A car goes from X to Y with a speed of 50 km/hr and returns to X with a speed of 80 km/hr. What is the average speed of the car? ***(Reference: CSP 2015)***

(a) 66.5 km/hr (b) 65 km/hr

(c) 61.5 km/hr (d) 70 km/hr

PRATICE QUESTIONS

Q 1. 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) 28 years (b) 32 years
(c) 36 years (d) 40 years

Q 2. One year ago, the ratio of Abhishek and Sanket ages was 2 : 3 respectively. After five years from now, this ratio becomes 4 : 5. How old is Sanket now?
(a) 8 years (b) 7 years
(c) 11 years (d) 10 years

Q 3. The sum of the present ages of a father and his son is 60 years. Six years ago, father's age was five times the age of the son. After 6 years, son's age will be?
(a) 18 years (b) 20 years
(c) 22 years (d) 24 years

Q 4. Ayesha's father was 38 years of age when she was born while her mother was 36 years old when her brother four years younger to her was born. What is the difference between the ages of her parents?
(a) 2 years (b) 4 years
(c) 6 years (d) 8 years

Q 5. Q is as much younger than R as he is older than T. If the sum of the ages of R and T is 50 years, what Q's age?
(a) 25 years (b) 20 years
(c) None of these (d) Data insufficient

Q 6. Suresh is now half of his father's age. After 20 years, his father will be one and half times older than Suresh. The present age of Suresh is? *(CSP 1990)*
(a) 15 (b) 20
(c) 25 (d) 40

Q 7. The age of a father is twice that of the elder son. Ten years hence the age of the father will be three times that of the younger son. If the difference of ages of the two sons is 15 years, the age of the father is? *(CSP 1992)*
(a) 100 years (b) 70 years
(c) 60 years (d) 50 years

Q 8. A father is now three times as old as his son. Five years back, he was four times as old as his son. The age of the son is? *(CSP 1993)*
(a) 12 years (b) 15 years
(c) 18 years (d) 20 years

Q 9. In a family, a couple has a son and a daughter. The age of the father is three times that of his daughter and the age of the son is half of his mother. The wife is nine years younger to her husband and the brother is seven years older than his sister. What is the age of the mother? *(CSP 1998)*
(a) 40 years (b) 45 years
(c) 50 years (d) 60 years

Q 10. In 1930, a person's age was 8 times that of his son. In 1938, the father's age became ten times that of his son's age in 1930. The ages of the son and father in 1940 were, respectively? *(CSP 2001)*
(a) 16 & 58 (b) 15 & 50
(c) 14 & 42 (d) 13 &34

Q 11. The age of a man is three times the sum of the ages of his two sons. Five years hence, his age will be doubled of the sum of the ages of his sons. The father's present age is? *(CSP 2002)*
(a) 40 years (b) 45 years
(c) 50 years (d) 55 years

ANSWER KEY

1.	(c)	**2.**	(d)	**3.**	(b)	**4.**	(c)	**5.**	(a)
6.	(d)	**7.**	(d)	**8.**	(b)	**9.**	(d)	**10.**	(c)
11.	(b)								