# ARITHMETICAL REASONING

Arithmetical Reasoning tests the ability to solve basic arithmetic problems encountered in everyday life. These problems require basic mathematical skills like addition, subtraction, multiplication, division etc. The tests include operations with whole numbers, rational numbers, ratio and proportion, interest and percentage, and measurement. Arithmetical reasoning is one factor that helps characterize mathematics comprehension, and it also assesses logical thinking.

**EXAMPLE 1.**

The total of the ages of Amar, Akbar and Anthony is 80 years. What was the total of their ages three years ago ?

(a) 71 years (b) 72 years

(c) 74 years (d) 77 years

**Sol.** (a) Required sum = (80 – 3 x 3) years = (80 – 9) years

= 71 years.

**EXAMPLE 2.**

Two bus tickets from city A to B and three tickets from city A to C cost Rs. 77 but three tickets from city A to B and two tickets from city A to C cost Rs. 73. What are the fares for cities B and C from A ?

(a) ₹4, ₹23 (b) ₹13, ₹17

(c) ₹15, ₹14 (d) ₹17, ₹13

**Sol.** (b) Let Rs. x be the fare of city B from city A and Rs. y be the fare of city C from city A.

Then, $2x + 3y = 77$ ...(i)

and $3x + 2y = 73$ ...(ii)

Multiplying (i) by 3 and (ii) by 2 and subtracting, we get: $5y = 85$ or $y = 17$.

Putting $y = 17$ in (i), we get: $x = 13$.

**EXAMPLE 3.**

A student got twice as many sums wrong as he got right. If he attempted 48 sums in all, how many did he solve correctly?

(a) 12 (b) 16

(c) 18 (d) 24

**Sol.** (b) Suppose the boy got x sums right and 2x sums wrong.

Then, $x + 2x = 48$, $3x = 48$, $x = 16$.

**EXAMPLE 4.**

In a group of cows and hens, the number of legs are 14 more than twice the number of heads. The number of cows is

(a) 5 (b) 7

(c) 10 (d) 12

**Sol.** (b) Let the number of cows be x and the number of hens be y.

Then, $4x + 2y = 2(x + y) + 14$, $4x + 2y = 2x + 2y + 14$, $2x = 14$, $x = 7$.

**EXAMPLE 5.**

Rani, Reeta , Sukhada, Jane and Radhika are friends. Reeta is 18 years of her age, Radhika is younger to Reeta, Rani is in between Radhika and Sukhada while Reeta is in Between Jane and Radhika. If there be a difference of two years between the ages of girls from eldest to the youngest, how old is Sukhada?

(a) 10 years (b) 12 years

(c) 14 years (d) 16 years

**Sol.** (b) Arranging them on the basis of their ages,

Jane>Reeta>Radhika>Rani>Sukhada

If Reeta is 18 years old then Sukhada is 12 years

# EXERCISE

1. The 30 members of a club decided to play a badminton singles tournament. Every time a member loses a game he is out of the tournament. There are no ties. What is the minimum number of matches that must be played to determine the winner?

(a) 15 (b) 29

(c) 61 (d) None of these

2. A tailor had a number of shirt pieces to cut from a roll of fabric. He cut each roll of equal length into 10 pieces. He cut at the rate of 45 cuts a minute. How many rolls would be cut in 24 minutes?

(a) 32 rolls (b) 54 rolls

(c) 108 rolls (d) 120 rolls

3. In a class of 60 students, the number of boys and girls participating in the annual sports is in the ratio 3 : 2 respectively. The number of girls not participating in the sports is 5 more than the number of boys not participating in the sports. If the number of boys participating in the sports is 15, then how many girls are there in the class?
(a) 20 (b) 25
(c) 30 (d) Data inadequate

4. At a dinner party every two guests used a bowl of rice between them, every three guests used a bowl of daal between them and every four used a bowl of meat between them. There were altogether 65 dishes. How many guests were present at the party ?
(a) 60 (b) 65
(c) 90 (d) None of these

5. In a family, each daughter has the same number of brothers as she has sisters and each son has twice as many sisters as he has brothers. How many sons are there in the family?
(a) 2 (b) 3 (c) 4 (d) 5

6. In a garden, there are 10 rows and 12 columns of mango trees. The distance between the two trees is 2 metres and a distance of one metre is left from all sides of the boundary of the garden. The length of the garden is
(a) 20m (b) 22m (c) 24m (d) 26m

7. In a family, the father took 1/4 of the cake and he had 3 times as much as each of the other members had. The total number of family members is
(a) 3 (b) 7 (c) 10 (d) 12

8. In three coloured boxes - Red, Green and Blue, 108 balls are placed. There are twice as many balls in the green and red boxes combined as there are in the blue box and twice as many in the blue box as there are in the red box. How many balls are there in the green box ?
(a) 18 (b) 36
(c) 45 (d) None of these

9. A, B, C, D and E play a game of cards. A says to B, "If you give me 3 cards, you will have as many as I have at this moment while if D takes 5 cards from you, he will have as many as E has." A and C together have twice as many cards as E has. B and D together also have the same number of cards as A and C taken together. If together they have 150 cards, how many cards has C got ?
(a) 28 (b) 29 (c) 31 (d) 35

10. A man wears socks of two colours - Black and brown. He has altogether 20 black socks and 20 brown socks in a drawer. Supposing he has to take out the socks in the dark, how many must he take out to be sure that he has a matching pair ?
(a) 3 (b) 20
(c) 39 (d) None of these

11. Nithya is Sam's Sister. Mogan is Sam's Father. Selvan is Rajan's Son. Rajan is Mogan's Brother. How is Nithya related to Selvan?
(a) Daughter (b) Sister
(c) Cousin (d) Wife

12. I have a few sweets to be distributed. If I keep 2, 3 or 4 in a pack, I am left with one sweet. If I keep 5 in a pack, I am left with none. What is the minimum number of sweets I have to pack and distribute ?
(a) 25 (b) 37 (c) 54 (d) 65

13. Mr. X, a mathematician, defines a number as 'connected with 6 if it is divisible by 6 or if the sum of its digits is 6, or if 6 is one of the digits of the number. Other numbers are all 'not connected with 6'. As per this definition, the number of integers from 1 to 60 (both inclusive) which are not connected with 6 is
(a) 18 (b) 22 (c) 42 (d) 43

14. A player holds 13 cards of four suits, of which seven are black and six are red. There are twice as many diamonds as spades and twice as many hearts as diamonds. How many clubs does he hold ?
(a) 4 (b) 5 (c) 6 (d) 7

15. Nitin's age was equal to square of some number last year and the following year it would be cube of a number. If again Nitin's age has to be equal to the cube of some number, then for how long he will have to wait?
(a) 10 years (b) 38 years
(c) 39 years (d) 64 years

16. At the end of a business conference the ten people present all shake hands with each other once. How many handshakes will there be altogether ?
(a) 20 (b) 45 (c) 55 (d) 90

17. Anand, David , Karim and Mano are fans of games. Each has a different favourite game among hockey, chess, cricket and football. David doesn't watch cricket and hockey matches. Anand doesn't like hockey, chess and cricket. Mano doesn't watch cricket. Which is favourite game of Karim?
(a) chess (b) cricket (c) football (d) hockey

18. David gets onthe elevator at the 11th floor of a building and rides up at the rate of 57 floors per minute. At the same time. Albert gets on an elevator at the 51st floor of the same building and rides down at the rate of 63 floors per minute. If they continue travelling at these rates, then at which floor will their paths cross?
(a) 19 (b) 28 (c) 30 (d) 37

19. A fibres 5 shots to B's 3 but A kills only once in 3 shots while B kills once in 2 shots. When B has missed 27 times, A has killed
(a) 30 birds (b) 60 birds
(c) 72 birds (d) 90 birds

20. First bunch of bananas has (1/4) again as many bananas as a second bunch. If the second bunch has 3 bananas less than the first bunch, then the number of bananas in the first bunch is
(a) 9 (b) 10 (c) 12 (d) 15

21. A boy's age is one fourth of his father's age. The sum of the boy's age and his father's age is 35. What will be father's age after 8 years?
(a) 15 (b) 28 (c) 35 (d) 36

22. If 1 candle in box number 1 is placed in box number 2, then box-2 has twice the number of candles that box 1 has.
If 1 candle from box-2 is placed in box-1, the box-2 and box-1 have the same number of candles.
How many candles were there in box-1 and box-2 ?

| | Box--1 Box-2 | | Box-1 Box-2 |
|---|---|---|---|
| (a) | $\boxed{5}:\boxed{3}$ | (b) | $\boxed{7}:\boxed{5}$ |
| (c) | $\boxed{6}:\boxed{4}$ | (d) | $\boxed{5}:\boxed{7}$ |

23. A boat moves from a jetty towards East. After sailing for 9 nautical miles, she turns towards right and covers another 12 nautical miles. If she wants to go back to the jetty, what is the shortest distance now from her present position ?

(a) 21 nautical miles (b) 20 nautical miles
(c) 18 nautical miles (d) 15 nautical miles

## ANSWER KEY

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | (b) | **4** | (a) | **7** | (c) | **10** | (a) | **13** | (d) | **16** | (b) | **19** | (a) | **22** | (d |
| **2** | (d) | **5** | (b) | **8** | (d) | **11** | (c) | **14** | (c) | **17** | (b) | **20** | (d) | **23** | (d) |
| **3** | (c) | **6** | (c) | **9** | (a) | **12** | (a) | **15** | (b) | **18** | (c) | **21** | (d) | | |

# HINTS & SOLUTIONS

1. (b) Clearly, every member except one (i.e. the winner) must lose one game to decide the winner. Thus, minimum number of matches to be played = 30 – 1 = 29.
2. (d) Number of cuts made to cut a roll into 10 pieces = 9.
Therefore required number of rolls = (45 × 24)/9 = 120.
3. (c) Let the number of boys and girls participating in sports be 3x and 2x respectively.
Then, 3x = 15 or x = 5.
So, number of girls participating in sports = 2x = 10.
Number of students not participating in sports
= 60 – (15 + 10) = 35.
Let number of boys not participating in sports be y.
Then, number of girls not participating in sports = (35 – y).
Therefore (35 – y) = y + 5
y = 15.
So, number of girls not participating in sports
= (35 – 15) = 20.
Hence, total number of girls in the class
= (10 + 20) = 30.
4. (a) Let the number of guests be x. Then number of bowls of rice = $\frac{x}{2}$; number of bowls of dal = $\frac{x}{3}$; number of bowls of meat = $\frac{x}{4}$.

$$\therefore \frac{x}{2}+\frac{x}{3}+\frac{x}{4}=65$$

$$\Leftrightarrow \frac{6x+4x+3x}{12}=65 \Leftrightarrow 13x=65\times 12$$

$$\Leftrightarrow x=\left(\frac{65\times 12}{13}\right)=60$$

5. (b) Let d and s represent the number of daughters and sons respectively.
Then, we have :
d – 1 = s and 2 (s – 1) = d.
Solving these two equations, we get: d = 4, s = 3.
6. (c) Each row contains 12 plants.
There are 11 gapes between the two corner trees (11 × 2) metres and 1 metre on each side is left.
Therefore Length = (22 + 2) m = 24 m.
7. (c) Let there be (x + 1) members. Then,
Father's share = $\frac{1}{4}$, share of each other member = $\frac{3}{4x}$.

$$\therefore 3\left(\frac{3}{4x}\right)=\frac{1}{4} \Leftrightarrow 4x=36 \Leftrightarrow x=9$$

Hence, total number of family member = 10.
8. (d) Let R, G and B represent the number of balls in red, green and blue boxes respectively.
Then, R + G + B = 108 ...(i)
G + R = 2B ...(ii)
B = 2R ...(iii)
From (ii) and (iii), we have G + R = 2 × 2R = 4R or G = 3R.
Putting G = 3R and B = 2R in (i), we get:
R + 3R + 2R = 108 6R = 108 R = 18.
Therefore Number of balls in green box = G = 3R
= (3 × 18) = 54.
9. (a) Clearly, we have :
A = B – 3 ...(i)
D + 5 = E ...(ii)
A + C = 2E ...(iii)
B + D = A + C = 2E ...(iv)
A+B+ C + D + E=150 ...(v)
From (iii), (iv) and (v), we get: 5E = 150 or E = 30.
Putting E = 30 in (ii), we get: D = 25.
Putting E = 30 and D = 25 in (iv), we get: B = 35.
Putting B = 35 in (i), we get: A = 32.
Putting A = 32 and E = 30 in (iii), we get: C = 28.

10. (a) Since there are socks of only two colours, so two out of any three socks must always be of the same colour.

11. (c) Nithya is Sam's Sister and Mogan is Sam's Father ⇒ Nithya is Mogan's Daughter.
Selvan is Rajan's Son and Rajan is Mogan's Brother ⇒
Selvan is Mogan's Nephew.
So, Nithya is Selvan's Cousin.

12. (a) Clearly, the required number would be such that it leaves a remainder of 1 when divided by 2, 3 or 4 and no remainder when divided by 5. Such a number is 25.

13. (d) Numbers from 1 to 60, which are divisible by 6 are : 6,12,18, 24, 30, 36,42, 48, 54, 60.There are 10 such numbers.
Numbers from 1 to 60, the sum of whose digits is 6 are : 6, 15, 24, 33, 42, 51, 60.
There are 7 such numbers of which 4 are common to the above ones. So, there are 3such uncommon numbers.
Numbers from 1 to 60, which have 6 as one of the digits are 6, 16, 26, 36, 46, 56, 60.
Clearly, there are 4 such uncommon numbers.
So, numbers 'not connected with 6'
$= 60 - (10 + 3 + 4) = 43.$

14. (c) Clearly, the black cards are either clubs or spades while the red cards are either diamonds or hearts.
Let the number of spades be x. Then, number of clubs $= (7 - x)$.
Number of diamonds = 2 x number of spades = 2x;
Number of hearts = 2 x number of diamonds = 4x.
Total number of cards $= x + 2x + 4x + 7 - x - 6x + 7$.
Therefore $6x + 7 = 13 \Leftrightarrow 6x = 6 \Leftrightarrow x - 1$.
Hence, number of clubs $= (7 - x) = 6$.

15. (b) Clearly, we have to first find two numbers whose difference is 2 and of which the smaller one is a perfect square and the bigger one a perfect cube.
Such numbers are 25 and 27.
Thus, Nitin is now 26 years old. Since the next perfect cube after 27 is 64,
so required time period = (64 – 26) years = 38 years.

16. (b) Clearly, total number of handshakes $= (9+ 8 + 7 + 6 + 5 + 4 + 3 + 2+1) = 45$.

17. (b)

| Games→ Person ↓ | Hockey | Chess | Cricket | Football |
|---|---|---|---|---|
| Anand | × | × | × | √ |
| David | × | √ | × | × |
| Karim | × | × | √ | × |
| Mano | √ | × | × | × |

18. (c) Suppose their paths cross after x minutes.

Then, $11 + 57x = 51 - 63x \Leftrightarrow 120x = 10 \Leftrightarrow x = \frac{1}{3}$

Number of floors covered by David in $\frac{1}{3}$ min

$= \left(\frac{1}{3} \times 57\right) = 19$.

So, their paths cross at (11 + 19)th i.e., 30th floor.

19. (a) Let the total number of shots be x. then,

Shots fired by A $= \frac{5}{8}x$ ; Shots fired by B $= \frac{3}{8}x$

Killing shots by A $= \frac{1}{3}$ of $\frac{5}{8}x = \frac{5x}{24}$;

Shots missed by B $= \frac{1}{2}$ of $\frac{3}{8}x = \frac{3x}{16}$.

$\therefore \frac{3x}{16} = 27$ or $x = \left(\frac{27 \times 16}{3}\right) = 144$

Birds killed by A $= \frac{5x}{24} = \left(\frac{5}{24} \times 144\right) = 30$

20. (d) Let the number of bananas in the second bunch be x
Then, number of bananas in the first bunch

$= x + \frac{1}{4}x = \frac{5}{4}x$

So, $\frac{5}{4}x - x = 3 \Leftrightarrow 5x - 4x = 12 \Leftrightarrow x = 12$

$\therefore$ Number of bananas in the first bunch

$= \left(\frac{5}{4} \times 12\right) = 15$

21. (d) Let father's age is x yr.

Son's age is $\frac{x}{4}$ yr.

$x + \frac{x}{4} = 35 \Rightarrow x = 28$ yr.

Father's age after 8 year is 36 years.

22. (d) Going by options; Box 1 : Box 2
5 : 7
If 1 cande in box number is placed in box number 2 then
Box 1 : Box 2
4 : 8
Therefore, Box 2 has twice the number of candles than box 1.
If 1 candle from box 2 is palced in box-1
Then- Box 1 : Box 2
6 : 6 Hence, Both boxer have the same numbers of candles.

23. (d) The shortest distance

$= \sqrt{AB^2 + BC^2}$

$= \sqrt{9^2 + 12^2}$

$= \sqrt{225}$

= 15 neutical miles