ARITHMETICAL REASONING

Learning Objectives

- Introduction
- Types of Arithmetical Reasoning

Introduction

This chapter includes three types of problems based on word problems Ages and Venn-diagrams.

- In other words this part of reasoning deals with arithmetical problems common nature the common sense with slight amount of logical reasoning is required for solving these general arithmetical problems.
- The Arithmetical reasoning subtest asks you to read a word problems.

Types of Arithmetical Reasoning

There are three types of arithmetical reasoning.
(i) Calculation on Word Problems
(ii) Problems on Ages
(iii) Venn-diagrams Problems

Calculation on Word Problems

In word problems, apply mathematical principles to the real life phenomena.

Example

- The number of boys in a class is three times the number of girls. Which one of the following numbers represents the total number of students in the class?
  (a) 35   (b) 50
  (c) 64   (d) 78
  (e) None of these
  Answer: (c)

  Explanation: Option (c) is correct. Suppose the number of girls in the class = X. i.e; the number of boys in the class $= 3 \times X = 3X$

  Thus, the total number of student $= 3 \times X$. Number of boys + No. of girls $= X + 3X = 4X$. Thus, the number of students in the class must be multiple of 4. Out of the given options only 64 is the multiple of 4. So answer is (C).

  The first bunch of bananas has $\dfrac{1}{4}$ excess to as many as bananas in the second bunch.

- If the second bunch has 3 bananas less than the first bunch then what is the number of bananas in the first bunch?
  (a) 9   (b) 10
  (c) 12   (d) 15
  (e) None of these
  Answer: (d)

  Explanation: Option (d) is correct. Suppose the number of bananas in second bunch = 'a'

  Therefore, the number of bananas in first bunch $= a + \dfrac{a}{4} = \dfrac{4a+a}{4} = \dfrac{5a}{4}$

  Thus, $\dfrac{5a}{4} - a = 3 \Rightarrow 5a - 4a = 12 \Rightarrow a = 12$

  Then, number of bananas in the first bunch $= \dfrac{5 \times 12}{4} = 15$.

Commonly Asked Questions

- There are some benches in a classroom. If 4 students sit on each bench, then 3 benches are left unoccupied. However, if 3 students sit on each bench, 3 students are left standing. How many students are there in the class?
  (a) 36   (b) 48
  (c) 56   (d) 64
  (e) None of these
  Answer: (b)

  Explanation: Option (b) is correct. Let there be x students in the class.

  When 4 students sit on each bench, number of benches $= \left(\dfrac{x}{4} + 3 \right)$

  When 3 students sit on each bench, number of benches $= \left(\dfrac{x-3}{3} \right)$

  $\therefore \dfrac{x}{4} + 3 = \dfrac{(x-3)}{3} \Leftrightarrow 3x + 36 = 4x - 12 \Leftrightarrow x = 48$.
  Hence, number of students in the class = 48. So, the answer is (B)

- In an examination, a student scores 4 marks for every correct answer and loses 1 mark for every wrong answer. If he attempts in all 60 questions and secures 130 marks, the number of questions he attempts correctly, is
  (a) 35   (b) 38
  (c) 40   (d) 42
  (e) None of these

  Answer: (b)
  Explanation: Option (b) is correct. Let the number of questions attempted correctly be x. Then, number of incorrect ones $= (60 - x)$.

  $\therefore 4x - 1(60 - x) = 130 \Leftrightarrow 5x = 190 \Leftrightarrow x = 38$.
  Hence, the answer is (B).

- A man has certain number of small boxes to pack into parcels. If he packs 3, 4, 5 or 6 in a parcel, he is left with one over if he packs 7 in a parcel, none is left over. What is the number of boxes, he may have to pack?
  (a) 106   (b) 301
  (c) 309   (d) 400
  (e) None of these

  Answer (b)
  Explanation: Option (b) is correct. Clearly, the required number would be such that it leaves a remainder of 1 when divided by 3, 4, 5 or 6 and no remainder when divided by 7. Thus, the number must be of the form $(\text{L.C.M. of } 3, 4, 5, 6) \times +1$ i.e. $(60x + 1)$ and a multiple of 7. Clearly, for x = 5, the number is a multiple of 7. So, the number is 301.
  Hence, the answer is (B).

- There are 36 students in a class. The number of boys is twice of the number of girls.
  There are 13 boys ahead of Sarita who ranked 19th the class. How many girls are in the behind Sarita?
  (a) 5   (b) 6
  (c) 11   (d) 12
  (e) None of these

  Answer (b)
  Explanation: Option (b) is correct. Suppose the number of girls = a
  $\therefore$ the number of boys = 2a
  Thus, a + 2a = 36 or 3a = 36
  a = 36/3 = 12

Thus, there are 12 girls and 24 boys.
Number of students before Sarita = 18 and out of 18, the boys are 13 and girls are 5
So, Number of girls behind Sarita $= 12 - (5+1) = 12 - 6 = 6$

- Monika cut a cake in two equal parts and one of these two pieces is again cut into equal parts, each small part is of 20 grams. If there are seven parts of the whole cake, what will be the weight of the original cake?
  (a) 140 grams   (b) 280 grams
  (c) 240 grams   (d) 120 grams
  (e) None of these

  Answer: (c)
  Explanation: Option (c) is correct. At first time the cake was cut into two equal parts. After it one of these two parts is further cut into 6 equal parts. One small part weights 20 grams, so half cake weight $20 \times 6 = 120$ grams and thus the whole cake weigh $120 \times 2 = 240$ grams.

Problems on Ages

- This topic includes whole chapter of problems on ages.

Example:

- A father is now there times as old as his son. Five years back, he was four times as old as his son. The age of the son is:
  (a) 12   (b) 15
  (c) 18   (d) 20
  (e) None of these
  Answer: (b)

  Explanation: Option (b) is correct. Let son's age be x then father's age is $3x$
  Five years ago, father's age = 3x – 5 and son's age = x – 5
  So, $3x - 5 = 4 \ (x - 5)$
  $\Rightarrow 3x - 5 = 4x - 20$
  $\Rightarrow x = 15$

- Reena is twice as old as Sunita. Three years ago, she was three times as old as Sunita.
  How old is Reena now?
  (a) 6 years   (b) 12 years
  (c) 10 years   (d) 16 years
  (e) None of these
  Answer: (b)

  Explanation: Option (b) is correct. Let Sunita's present age = x years
  Then Reena present age = 2x years
  Three years ago
  $(2x - 3) = 3(x - 3)$
  $2x - 3 = 3x - 9$
  or $x = 6$
  Reena age $= 2x = 2 \times 6 = 12 \ year$.

Commonly Asked Questions

- Five years ago Vinay's age was one-third of the age of Vikas and now Vinay's age is 17 years. What is the present age of Vikas?
  (a) 9 years   (b) 36 years
  (c) 41 years   (d) 51 years
  (e) None of these

Answer: (c)
Explanation: Option (c) is correct. Vinay's present age is 17 years
Five years ago, Vinay age was 12 years and that of Vikas was 36 years
Present age of Vikas = 36 + 5 = 41 years

- Pushpa is twice as old as Rita was two years ago. If difference between their ages be 2 years, how old is Pushpa today?
  (a) 6 years   (b) 8 years
  (c) 10 years   (d) 12 years
  (e) None of these

Answer: (b)
Explanation: Option (b) is correct Let the present age of Pushpa be x years.
Then, the present age of Rita would be (x – 2) years. Now, as given is the question.
$$X = 2(x-2-2)$$
or $x = 2x - 8$
or $x = 8$ years
Therefore, present age of Pushpa is 8 years.

- 10 years ago, Chandravati's mother was 4 times older than her daughter After 10 years, the mother will be twice older than the daughter. The present age of Chandravati is:
  (a) 5 years   (b) 10 years
  (c) 20 years   (d) 30 years
  (e) None of these

Answer: (c)
Explanation: Option (c) is correct. Let Chandravati's age, 10 years ago, be x years.
Then, mother's age, 10 years ago, was 4x years. After 10 years, or after 20 years when Chandravati's age would be 10 years, we have
$$(4x+20) = 2(x+20)$$
$$4x - 20 = 2x - 40$$
$$2x = 20 \ or \ x = 10 \ \text{years.}$$
Present age of Chandravati = 20 years.

- The sum of ages of a father and son is 45 years. Five years ago the product of their ages was 4 times the father's age at that time. The present age of the father and son, respectively are:
  (a) 25 years, 10 years   (b) 36 years, 9 years
  (c) 39 years, 6 years   (d) All of these
  (e) None of these

Answer: (b)
Explanation: Option (b) is correct. Let the present age of father be x years and that of the son be $(45-x)$ years.
Five years ago the age of son was $(45-x-5) = (40-x)$ and that of father was $(x-5)$ years.
Now, $(x-5)(40-x) = 4(x-5)$ $x^2 - (36+5)x + 180 = 0$
or $x^2 - 36x - 5x + 180 = 0$ or $x(x-36) - 5(x-36) = 0$
or $(x-36)(x-5) = 0$
or $x - 36 - 0 \ or \ x - 36|x - 5 = 0 \ or \ x = 5$ unacceptable
Therefore, the present age of father and son are 36 years and 9 years respectively.

- Jayesh is as much younger to Anil as he is older to Prashant. If the sum of the ages of Anil and Prashant be 48 years, what is the age of Jayesh?
  (a) 20 years   (b) 24 years
  (c) 30 years   (d) cannot be determined
  (e) None of these

Answer (b)

Explanation: Option (b) is correct. Let the age of Anil and Prashant be x and (48 – x) years, respectively. Let the age of Jayesh be y years, then

$$(x - y) = y - (48 - x)$$

or $\quad x - y = y - (48 - x)$

or $\quad 2y = 48, \, or \, y = 24 \,$ years

∴ Age of Jayesh is 24 years.

- Rajan's age is 3 times than that of Ashok. 12 years ago, father's age was 7 times of the age of his son, what is the age of Arvind's father at present?
  (a) 27 Years   (b) 32 years
  (c) 36 Years   (d) 40 years
  (e) None of these

Answer (c)

Explanation: Option (c) is correct.
Let the present age of Ashok be x years the age of Rajan = 3x years.
In 12 years hence, the age of Ashok would be (x + 12) years and that of Rajan be (3x + 12) years.
As given in the question

$$(3x + 12) = 2(x + 12)$$
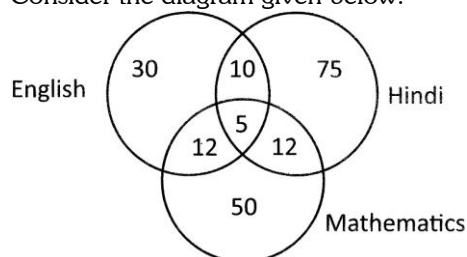
or $3x + 12 = 2x + 24$

or $x = 12$ years

Therefore, the age of Rajan $= 3 \times 12 = 36 \,$ years.

Venn-Diagram Based Problem

A Venn diagram allows us to have a pictorial representation of sets. In a Venn diagram we have a universal set U, which is represented by the region that contains everything else.

Example:

- Consider the diagram given below:

Five hundred candidates appeared in the examination conducted for the test in English, Hindi and Mathematics. The diagram gives the number of candidates who failed in different tests. What is the percentage of candidates who failed in at least two subjects?
(a) 0.078%   (b) 1.0%
(c) 6.8%   (d) 7.8%
(e) None of these

Answer: (d)

Explanation: Option (d) is correct. From the diagram, it is clear that number of candidates who failed in at least two subjects = number of candidates who failed in two or more subjects.
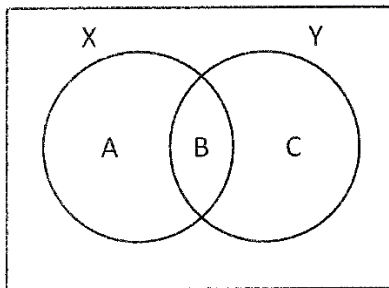
$= (10 + 12 + 12 + 5) = 39$.

Therefore, the required percentage $= \left(\dfrac{39}{500} \times 100 \right)\% = 7.8\%$

Therefore, the option (D) is the correct answer.

- In an examination, 42% students failed in Hindi and 52% failed in English. If 17% failed in both the subjects, the percentage of those who passed in both the subjects, is:

(a) 23%   (b) 27%

(c) 34%   (d) 40%

(e) None of these

Answer: (c)

Explanation: Option (c) is correct.

A = 42%   B = 17%

C = 52%

Let the total number of students who appeared for the examination be 100 Circles a and Y represent the students who failed in Hindi and English, respectively Now number of students who failed in Hindi only.

$= (42 - 17)$

$= 25\%$

Number of students who failed in English only (52 – 17) = 35%

Total number of students failed

= students failed in Hindi only + students failed in English only
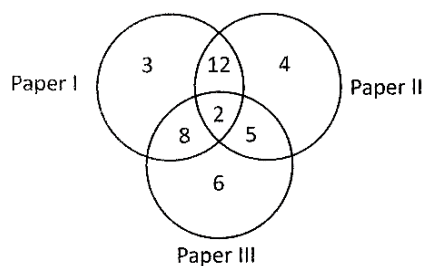
= 25 + 35 = 60%.

Number of student passed = 100 – 60 = 40%

Hence, option (D) is the correct answer.

Commonly Asked Questions

- Consider the Venn diagram given below:

- The number in Venn diagram indicates the number of persons reading the newspapers. The diagram is drawn after surveying 50 persons. In a population of 10,000 ho can be expected to read at least two newspapers?

(a) 5, 000   (b) 5, 400

(c) 6, 000   (d) 6, 250

(e) None of these

Answer (b)

Explanation: Option (b) is correct. No. of persons who read at least two newspapers

= No. of persons who read two newspapers and more

$= 12 + 2 + 8 + 5 = 27$

6

It means out of 50 persons 27 read at least two newspapers.

No. of such persons per $10000 = \left(\dfrac{27}{50} \times 10000\right) = 5400$.

- If the number from 1 to 45 which are exactly divisible by 3 were arranged in ascending order, minimum number being on the top, which would come at the ninth the top?
  (a) 18   (b) 24
  (c) 21   (d) 27
  (e) None of these
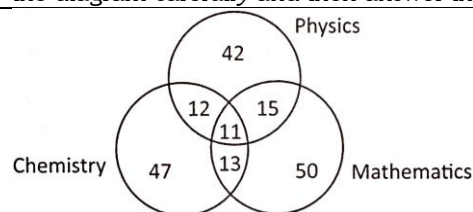
  Answer (d)
  Explanation: Option (d) is correct.
  3, 6, 9, ...,45
  $a = 3,\ d = 6 - 3 = 3,\ n = 9$
  $T_n = ?$
  $= 3 + (9 - 1) \times 3 = 3 + 24 = 27$

The following diagram shows the number of students who got distinction in there subject in a total of 500 students. Study the diagram carefully and then answer the questions that follow:

- What is the percentage of students who got distinction in two subjects?
  (a) 8%   (b) 9%
  (c) 10%   (d) 12%
  (e) None of these

  Answer: (a)
  Explanation: Option (a) is correct. No. of students who got distinction in two subjects
  $= (15 + 13 + 12) = 40$
  $\therefore$ Required percentage $= \left(\dfrac{40}{500} \times 100\right) = 8\%$

- What is the percentage of students who got distinction?
  (a) 28%   (b) 18.6%
  (c) 38%   (d) 15%
  (e) None of these

  Answer (c)
  Explanation: Option (c) is correct. No. of students who got distinction
  $= (50 + 47 + 42 + 12 + 11 + 13 + 15) = 190$
  $\therefore$ Required percentage $= \left(\dfrac{190}{500} \times 100\right) = 38\%$

- The percentage of students with distinction marks in mathematics is:
  (a) 17.8%   (b) 18.6%
  (c) 19.2%   (d) 20.6%
  (e) None of these

  Answer: (a)

Explanation: Option (a) is correct. No. of students with distinction marks in mathematics

$= (50 + 13 + 11 + 15) = 89$

$\therefore$ Required percentage $= \left(\dfrac{59}{500} \times 100 \right) = 17.8\%$