

SECTION - II

QUESTION NO # 5

- a) The sum of three consecutive number is 187,
then what are the numbers?

SOLUTION:

The sum of three consecutive numbers = 187

Three consecutive numbers = x_1, x_2, x_3

Total prime numbers = 3

$$\text{Average} = \frac{187}{3}$$

$$= 62.3 = 62$$

Prime numbers around 62 = 59, 61, 67

The sum of prime numbers around 62;

$$59 + 61 + 67 = 187$$

Hence,

Three consecutive prime numbers which
add up to make 187 are:

$$x_1 = 59$$

$$x_2 = 61$$

$$x_3 = 67$$

$$x_1 + x_2 + x_3 = 187$$

$$\boxed{59 + 61 + 67 = 187}$$

b)

A positive number which when increased by 17 is equal to 60 times the reciprocal of the number:

EQUATION:

$$x + 17 = 60 \left(\frac{1}{x} \right)$$

$$x + 17 = \frac{60}{x}$$

$$x^2 + 17x = 60$$

Standard equation:

$$x^2 + 17x - 60 = 0$$

Applying Quadratic Formula

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

where,

$$a = 1$$

$$b = 17$$

$$c = -60$$

Now, putting the values in quadratic formula

$$x = \frac{-17 \pm \sqrt{(17)^2 - 4(1)(-60)}}{2(1)}$$

$$= \frac{-17 \pm \sqrt{289 + 240}}{2}$$

$$x = \frac{-17 \pm \sqrt{529}}{2}$$

$$x = \frac{-17 \pm 23}{2}$$

$$x = \frac{-17 + 23}{2}$$

$$x = \frac{-17 - 23}{2}$$

$$x = \frac{6}{2}$$

$$x = \frac{-40}{2}$$

$$x = 3$$

positive number

$$x = -20$$

not positive

Hence,

A positive number which when increased by 17 is equal to 60 times the reciprocal of the number is 3

C)

Increase in population:

$$2,62,500 - 1,75,000 = 87,500$$

Increase in population of a town in 10 years

$$= 87,500$$

$$\text{So Average increase in one year} = \frac{87,500}{10}$$

$$= 8750$$

Percentage of population increase per year

$$= \frac{8750}{175000} \times 100$$

$$= 5\%$$

D)

$$20 \text{ dozen eggs} = 240 \text{ eggs}$$

$$\text{Cost per dozen} = 375$$

$$\begin{aligned} \text{Total Cost of 20 dozen eggs} &= 20 \times 375 \\ &= 7500 \end{aligned}$$

Selling price of 20 dozen eggs:

$$240 \times 33 = 7920$$

Profit :

$$\text{Selling price} - \text{Cost price}$$

$$7920 - 7500$$

$$420$$

$$\text{Profit percentage} = \frac{\text{Profit}}{\text{cost price}} \times 100$$

$$= \frac{420}{7500} \times 100$$

$$\boxed{\text{Profit percentage} = 5.6\%}$$

QUESTION NO # 7

a) A two-digit number whose unit's digit exceeds its ten's digit by 2 and the product of the given number and the sum of its digits is equal to 144, then the number could be 13 or 24

Let's check whether the number is 13 or 24

If the number is 13, then the product of 13 and sum of its digit, means 1 and 3, ~~that would~~ ^{that} be is 4, would be:

$$13 \times 4 = 52$$

So, It is not 13

If the number is 24, then product of 24 and the sum of its digits, 2 and 4 that is 6, would be:

$$24 \times 6 = 144$$

Hence,

24 is the two-digit number, which can be the number having its unit's digit greater than tens' digit by 2 and its product with the sum of the digits is 144.

b) Find the missing number

i) 53, 53, 40, 40, 27, 27,

27, 14, 14, 1, 1

In the given series, each number is repeating one time and then subtracting the number with 13 and again the resulting number one time and subtracting 13, Hence the series would be 53, 53, 40, 40, 27, 27, 14, 14, 1, 1

ii)

14, 28, 20, 40, 32, 64, ...

14, 28, 20, 40, 32, 64, 56, 112, 104

+14 -8 +20 -8 +32 -8 +56 -8

In the given series, each number is first added to itself which gives the second number, then subtracting that number with 8 gives third number and this goes on. Hence, the series would be

14, 28, 20, 40, 32, 64, 56, 112, 104

iii) 8, 6, 9, 23, 87, ...

In the given Series:

$$8 \times 1 - 2 = 6$$

$$6 \times 2 - 3 = 9$$

$$9 \times 3 - 4 = 23$$

$$23 \times 4 - 5 = 87$$

$$87 \times 5 - 6 = 429$$

$$429 \times 6 - 7 = 2,567$$

In the given series, numbers are multiplying by the natural numbers consecutively and also subtracting each with consecutive numbers starting with 2.

Hence, the series would be:

8, 6, 9, 23, 87, 429, (2,567)

iv) B, F, R...

B, F, R, V, H

According to the given series, alphabets are 3 step forward and 11 step forward which gives the next alphabets V and H. Hence, the series would be B, F, R, V, H

v) V, U, W, V, X, W...

V, U, W, V, X, W, Y, X, Z, Y

In the given series, each alphabet is one step backward then, the next alphabet, again one step backward, the same series goes on. Hence, the series would be:

V, W, W, V, X, W, Y, X, Z, Y

D) present age

$$\text{Son} = x$$

$$\text{Father} = y$$

Past age 10 years ago

$$\text{Son} = x - 10$$

$$\text{Father} = y - 10$$

Future age after 10 years

$$\text{Son} = x + 10$$

$$\text{Father} = y + 10$$

past age:

$$y - 10 = 3(x - 10)$$

$$y - 10 = 3x - 30$$

$$y - 3x = -20 \rightarrow (i)$$

Future age:

$$y+10 = 2(x+10)$$

$$y+10 = 2x+20$$

$$y-2x = 10 \rightarrow (ii)$$

By subtracting eq, (i) and (ii)

$$+y - 3x = -20$$

$$\oplus y \ominus 2x = \oplus 10$$

$$+x = +30$$

$$x = 30$$

Son age is 30

$$y-10 = 3(x-10)$$

$$y-10 = 3(30-10)$$

$$y-10 = 3(20)$$

$$y = 60+10$$

$$y = 70$$

Father age is 70

Ratio of present ages

Father : Son

70 : 30

35 : 15

7 : 3

C):

20% of $a \pm b$

$$\frac{20}{100} \times a \pm b$$

$$\frac{1}{5} a \pm b$$

$$a \pm 5b$$

b% of 20

$$\frac{b}{100} \times 20 \Rightarrow \frac{20b}{100}$$

$$= \frac{b}{5}$$

SECTION - I

QUESTION NO# 3

a) BIG BANG THEORY

Big Bang Theory explains the origin of universe. This theory was proposed by George Lemaitre. According to this theory;

Universe began as a singularity, a single point, around 13.8 billion years ago. This singularity expanded rapidly, and as it did cooled and formed subatomic particles.

Origin and explanation of evolution of Universe

This theory is based on the evidence that

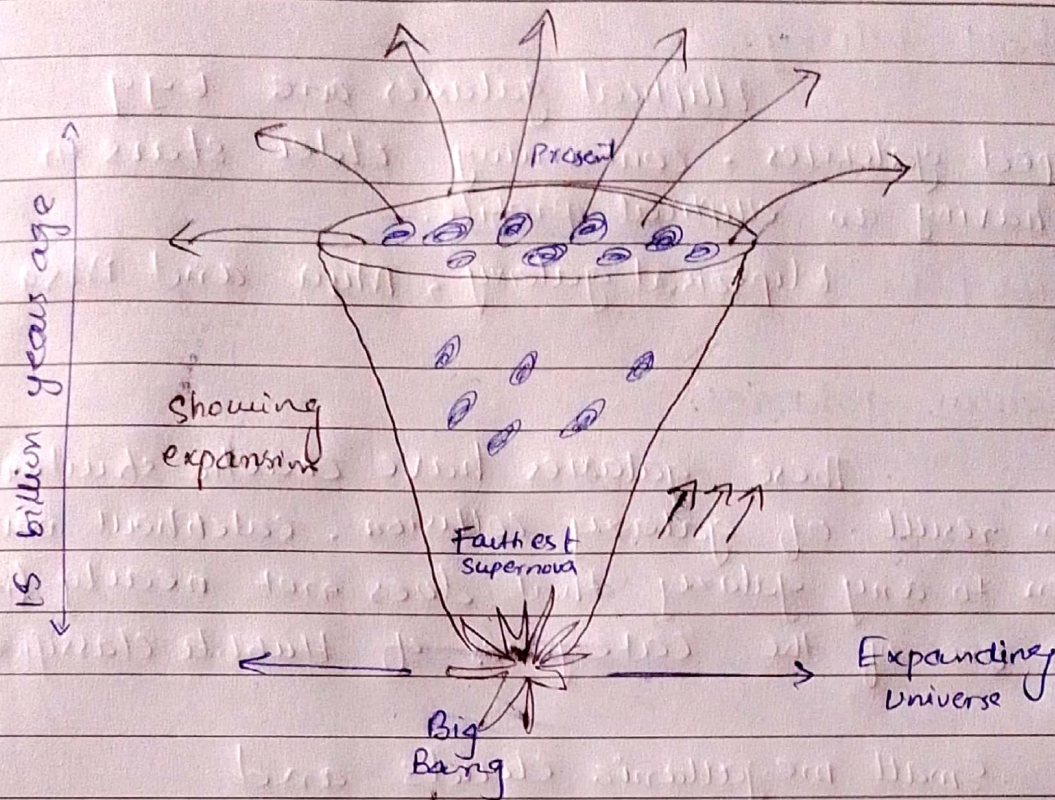
the universe is expanding. The evidence for the big bang theory includes the cosmic microwave background radiation, the abundance of light elements, and large scale structure of the universe.

Role of Dark energy in the universe Expansion

In physical cosmology and astronomy, dark energy is ~~an~~ hypothesized to permeate all of space tending to accelerate the expansion of the universe. Edwin Hubble, in 1929, founded that fainter, more distant galaxies showed a large degree of red shift : closer galaxies, not so much. Hubble determined that this was because the universe itself is expanding.

Evidence Supporting Big Bang theory

- Cosmic microwave background radiation
- the abundance of light elements, and
- Large structure of the universe
- Lord Kelvin was studying galaxy, he observe the mass of galaxy much more greater than the actual total mass of matter in galaxy, he realised there is something which is not visible to eye which is dark energy and matter, work against the attractive forces which cause universe to expand.



B) GALAXY

A galaxy is a massive gravitationally bound system consisting of stars, blackhole, nebulae, stellar remnants, interstellar gas, planets, dwarf planets, dust and dark matter typically dominated by a central supermassive blackhole.

Classification of Galaxy

Spiral Galaxies:

Spiral galaxies are disk shaped galaxies with spiral arms. These are flat rotating galaxies

Example: Milky way Galaxy.

Elliptical galaxy:

Elliptical galaxies are Egg Shaped galaxies, containing older stars in it. having an elliptical profile.

Example: Elipsoisal galaxy, M49 and M59

Irregular galaxies:

These galaxies have chaotic structure often result of galaxy collision. Catchall name given to any galaxy that does not nearly fit into one of the categories of Hubble Classification.

Example:

Small magellanic clouds and
Large magellanic clouds

Milky way Galaxy

We live in Milky way Galaxy. It is spiral shaped. Contain several hundred billion stars including our Sun. It is about 100,000 light years across and thick. The Galactic centre, contains atleast One supermassive black hole called Sagittarius.

Arms of milky way,

- Perseus arm
- Sagittarius arm
- Centaurus arm
- Cygnus arm

by long heavy shadows
the sun of summer the heavy rays
in George Washington Washington
Kearney
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