Aakash

Medical | IIT-JEE | Foundations

KNOWLEDGE BYTES

MARCH 2025

CLASS 10

Aakash

Medical | IIT-JEE | Foundations

Edition: 2024-25

PREFACE

What is Knowledge Bytes ?

Knowledge Bytes is a collection of riddles, interesting facts, mnemonics and puzzles that will make your learning fun and engaging.

We want you to be delighted about studying. Knowledge Bytes helps you to know more about the subject in a fun, motivating and educational way and helps to implement what you learn in a creative way.

Benefits

Saves Time

Develops Learning Skills

Stimulates Interest

Leads to Increased Comprehension

EXPLORE

Puzzle

After knee transplantation, Arun's doctor told him to return to his jogging program gradually. He suggested jogging for 10 minutes on first day. Thereafter, he suggested to increase jogging time by 5 minutes per day.

In how many days jogging time will become 90 minutes?

Cheat code:

Day No.	1	2	3	–	–	n
Minutes of jogging each day	10	15	20	–	–	90

Adding 5 minutes to the daily jogging time creates the sequence 10, 15, 20 minutes .....

Solution

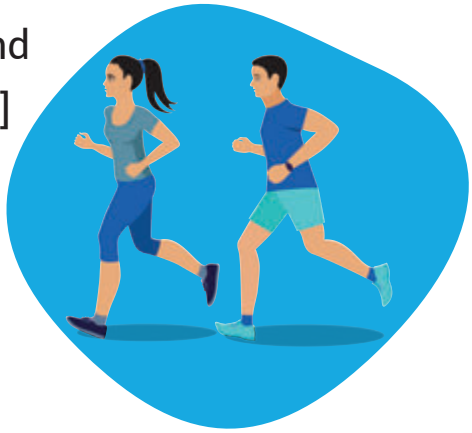
10, 15, 20 .....

This sequence is arithmetic progression.

$a_n = a_1 + (n - 1)d$ [Where a_1 is the first term and d is the common difference]

$\Rightarrow$ $90 = 10 + (n - 1)5$

$\therefore$ $n = 17$ days



MEANS → AM, GM & HM

Arithmetic Mean (AM)

The arithmetic mean is the sum of all the values of a set divided by the quantity of numbers in a set. It is commonly referred as average.

Let $a_1, a_2, a_3 \ldots\ldots, a_n$ be a group of values, then arithmetic mean is given by the formula

$$A.M. = \frac{a_1 + a_2 + \ldots + a_n}{n}$$

$$A.M.(\bar{x}) = \frac{1}{n}\sum_{i=1}^{n} a_i$$ where n is the total no. of ovservations

Geometric Mean (GM)

Geometric mean is defined as the n^{th} root of product of 'n' values of a set.

Let $a_1, a_2, a_3 \ldots\ldots, a_n$ be values of a set, then geometric mean is given by the formula

$$GM = \sqrt[n]{a_1 \times a_2 \times a_3 \ldots . a_n}$$

$$= (a_1 \times a_2 \times a_3 \ldots . a_n)^{\frac{1}{n}}$$ Where n is the total no. of ovservations

$$GM = \left(\prod_{i=1}^{n} a_i\right)^{\frac{1}{n}}$$

Harmonic Mean (HM)

It is defined as the number of values of a set divided by the sum of the reciprocals of the values of a set.

Let $a_1, a_2, a_3 \ldots\ldots, a_n$ be values of a set. The Harmonic Mean is given by the formula

$$HM = \frac{n}{\frac{1}{a_1} + \frac{1}{a_2} + \frac{1}{a_3} + \ldots + \frac{1}{a_n}}$$

$$HM = \frac{n}{\sum_{i=1}^{n} \frac{1}{a_i}}$$

What is the relationship between AM, GM & HM?

Let us consider two positive values 'a' and 'b'

$A.M = \frac{a+b}{2}$ ...(1) (Arithmetic Mean)

$G.M = \sqrt{ab}$ ...(2) (Geometric Mean)

$H.M = \frac{2}{\frac{1}{a}+\frac{1}{b}}$ ...(3) (Harmonic Mean)

$A.M = \frac{a+b}{2} \Rightarrow 2(A.M) = a + b$ ...(4) From equation (1)

$G.M = \sqrt{ab} \Rightarrow (G.M)^2 = ab$ ...(5) Squaring both sides

$H.M = \frac{2}{\frac{1}{a}+\frac{1}{b}} \Rightarrow \frac{1}{a}+\frac{1}{b} = \frac{2}{H.M}$

$\Rightarrow \frac{b+a}{ab} = \frac{2}{H.M}$

$\Rightarrow \frac{2}{H.M} = \frac{(a+b)}{ab}$ ...(6)

$\Rightarrow \frac{2}{H.M} = \frac{2(A.M)}{(G.M)^2}$ using equations (4) and (5)

$\Rightarrow (G.M)^2 = A.M \times H.M$

$\therefore G^2 = AH$

Facts Electricity

1. A spark of static electricity can measure upto **3000 volts.**

2. **Thomas Edison** built the first power plant, and in 1882 his pearl street power station in New York sent electricity to 85 buildings.

3. The sun radiates more energy in 15 minutes than 1 year of global human energy consumption.

4. A single bolt of lightning can contain upto 30,00,000 volts that is enough electricity to serve over 2,00,000 homes.

5. Electricity causes muscle cells in your heart to contract. Electrocardiogram (ECG) machines measure the electricity going through heart.

Effect of Current on Human Body (For 50/60 Hz AC)

CURRENT	EFFECT
1 mA	Barely noticeable
16 mA	Maximum amps before you can't let go
20 mA	Paralysis of respiratory muscles
100 mA	Ventricular fibrillation starts
2 A	Cardiac standstill and organ damage

Myths About Electricity

1. **Power lines are insulated**

90 percent of power lines are not insulated that means they are never safe to touch.

2. **The wire is safe because it is not at high voltage**

Actually voltage is not what will kill you, current will. It takes 1 amp to cause total heart irregularities.

3. **A fallen wire will shut off**

It could still be live, even if it does not produce spark so stay away.

4. **Wood is not a conductor**

Wood is not just a poor conductor, but wet wood is much better conductor of electric current.

5. **Rubber gloves and rubber shoes insulate**

Only if 100% pure rubber. If not, do not expect them to protect you from a potential electrocution.

Metals and Non-metals

Composition of Various Alloys

Element	Alloy	Composition
Copper (Cu)	Brass	Cu and Zn
	Bronze	Cu and Sn
	Gun metal	Cu, Sn and Zn
	Bell metal	Cu and Sn
	German silver	Cu, Zn and Ni
	Monel metal	Cu and Ni

Element	Alloy	Composition
Iron (Fe)	Steel	Fe and C
	Stainless steel	Fe, Cr, Ni and C
	Alnico	Fe, Co, Ni and Al
Aluminium (Al)	Duralumin/ Duralium	Al, Mg, Mn and Cu
	Magnalium	Al and Mg

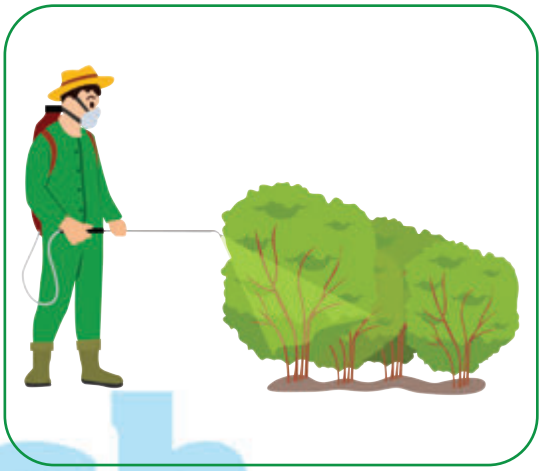
Element	Alloy	Composition
Lead (Pb)	Type metal	Pb, Sn and Sb
	Solder	Pb and Sn
Chromium (Cr)	Ferrochrome	Cr and Fe
Nickel (Ni)	Nichrome	Ni and Cr

Different types of alloys are prepared by changing the constituent elements and also by varying the proportion of the constituent elements.

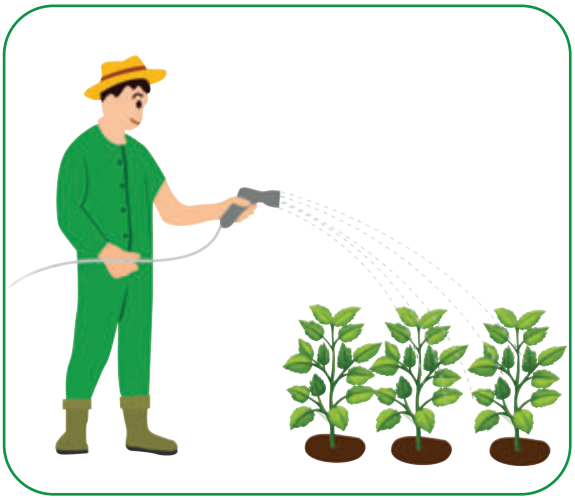
Control and Coordination (Plants)

Auxins as weedicides

Some synthetic auxins are used as weedicides (chemicals used to kill unwanted plants growing along with the crops). Example: 2, 4-dichlorophenoxyacetic acid (2, 4-D) is used to remove broad leaved weeds or dicotyledonous weeds in cereal crops or monocotyledonous plants.



Scientific Contribution



Skoog and Miller *et al*. discovered the first cytokinin from degraded product of autoclaved herring sperm DNA which had a powerful cytokinesis (division of cytoplasm) promoting effect. It is called kinetin. It is a synthetic product and does not occur naturally in plants.

Abscisic Acid as Antitranspirant

Application of minute quantity of abscisic acid to leaves reduces transpiration to a great extent through partial closure of stomata. Thus, it conserves water and reduces the requirement of irrigation.

Scientific Contribution

Herbert Henry Cousins discovered and confirmed that ripe oranges emitted a volatile substance that brought about early ripening of unripe bananas kept nearby. Later on, this volatile substance was identified as ethylene.

MNEMONIC — **5 Phytohormones**

AC Gives A cooling Effect

1. **A**uxin
2. **C**ytokinin
3. **G**ibberellin
4. **A**bscisic acid
5. **E**thylene

Tabular Summary of Phytohormones

	Germination	Growth to Maturity	Seed Dormancy	Flowering	Fruit Development	Abscission
Auxin	✗	✓	✗	✓	✓	✗
Gibberellin	✓	✓	✗	✓	✓	✗
Cytokinin	✗	✓	✗	✓	✓	✗
Abscisic acid (ABA)	✗	✗	✓	✗	✗	✓
Ethylene	✗	✗	✗	✓	✓	✓

Can you say which is the only plant hormone that is transported in one direction in a plant – downward, that is from the top to the bottom, like a one-way road from the stem tip to the roots?

HINT: Its concentration is highest at the top of the plant and decreases as you get closer to the roots, this controls the overall shape of the plant and helps to keep the primary stem of a plant the leader.

Ans. Auxin

Fact

You know how a farmer and a businessman makes profit out of stem of a plant?

Longer stems would mean more profit, but how?

Gibberellins sprayed on sugarcane elongate the stem between the nodes. Longer stems mean more stored sugar. More sugar to sell means more coin.

Remember how some hormones work together to affect plants?

Auxin = Cytokinin	Normal cell division occurs
Auxin > Cytokinin	Root formation
Auxin < Cytokinin	Shoot formation

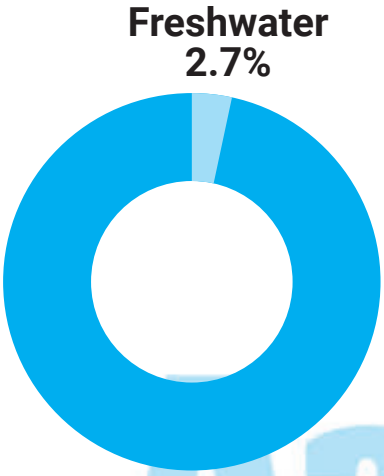
Fact

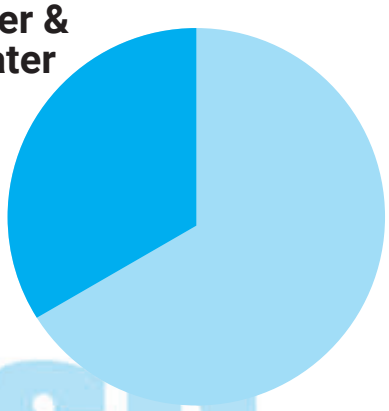
Tomato farmers noticed something weird happening with their crops. Earlier many farmers used kerosene heaters in their greenhouses to warm the air so that they could grow tomatoes during the winter. With the advent of electricity, some farmers switched to new, fancy electric heaters but they soon found that their tomatoes were not ready to be picked at the same time as it used to be earlier; when the greenhouses were warmed with kerosene heaters.

The burning of the kerosene in the heaters produce a molecule similar to ethylene that synchronized the ripening of the tomatoes.

Water Resources

Water

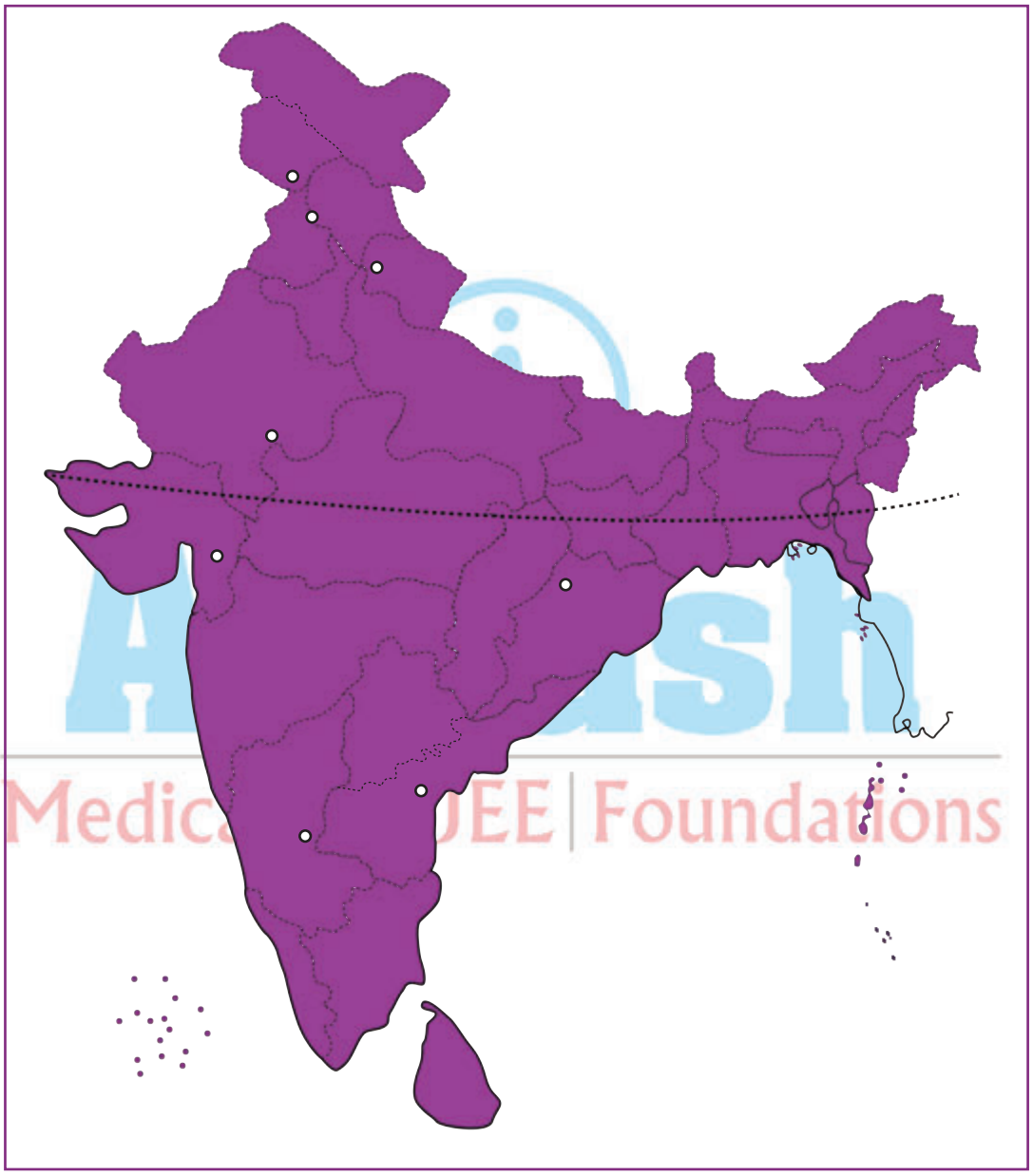




Out of total water on the Earth, **97.3%** is saline water and **2.7%** is freshwater

Out of total freshwater on Earth, **70%** is frozen as ice and less than **30%** is available as Ground water & Surface water

Map Work



1. Salal	**5.** Sardar Sarovar
2. Bhakra Nangal	**6.** Hirakud
3. Tehri	**7.** Nagarjuna Sagar
4. Rana Pratap Sagar	**8.** Tungabhadra

Quiz

1. Rooftop rain water harvesting is compulsory structure in which state ?

(A) Bihar (B) Meghalaya

(C) Tamil Nadu (D) Karnataka

2. Which of the following factor is responsible for gully erosion of soil ?

(A) Wind (B) Snowfall

(C) Rainfall (D) Drought

3. "Renigaon" is famous for

(A) Water Conservation (B) Organic Agriculture

(C) Environment Conservation (D) Chipko Movement

4. Hirakud Dam is situated on the river

(A) Godavari (B) Tapi

(C) Mahanadi (D) Yamuna

5. In which state did Narmada Bachao Andolan, an NGO, launch movement against river valley project?

(A) Madhya Pradesh (B) Maharashtra

(C) Karnataka (D) Gujarat

6. The state prone to flood is

(A) Rajasthan (B) Madhya Pradesh

(C) Assam (D) Delhi

Answer (Quiz)

1. (C) **2.** (C) **3.** (A) **4.** (C) **5.** (D)

6. (C)

Reported Speech

What is Direct & Indirect Speech?

Direct Speech

The message of the speaker is conveyed or reported in his own actual words without any change.

Indirect Speech

The message of the speaker is conveyed or reported in our own words.

Example:

Direct	Indirect
Radha said, "I am very busy now."	Radha said that she was very busy then.

Process of conversion followed in the example:

- All inverted commas or quotation marks are omitted and the sentence ends with a full stop.
- Conjunction 'that' is added in place of comma (,)
- The pronoun 'I' is changed to 'she'. (The Pronoun is changed according to person & gender of the speaker)
- The verb 'am' is changed to 'was'. (Present Tense is changed to Past)
- The adverb 'now' is changed to 'then'.

Rules For Changing Direct Speech into Indirect Speech

1. When the reporting or principal verb is in Past Tense, the tense of the reported clause is changed into the corresponding Past Tenses.
   - Tense of the reported clause doesn't change when the reporting verb is in present/ future tense.
   - Tense also doesn't change when the reported clause is a quote, universal truth or scientific fact.

2. **Commands and Requests**

   Indirect Speech is introduced by some verbs like **ordered**, **requested**, **advised** and **suggested**. **Forbid(s)/forbade** is used for the negative sentences. The imperative mood is changed into the Infinitive verb form.

   Exclamations and Wishes

   Indirect Speech is introduced by some words like grief, sorrow, happiness, applaud. Exclamatory sentence changes into assertive sentence and Interjections are removed.

3. **Change of Pronouns**

S	O	N
1st	2nd	3rd

   - First person pronoun changes according to subject.
   - Second person changes according to object.
   - Third person will have no change.

4. Words expressing nearness in time or place also change to distant.

Now	—	Then
Here	—	There
Ago	—	Before
Thus	—	So
Today	—	That day
Tomorrow	—	The next day/the following day

5. In interrogative sentences, Reporting Verb like 'said/ said to' changes to asked, enquired or demanded.
   - Comma is removed to add 'if or whether' in questions demanding 'yes or no' answer.
   - In W/H family questions, same W/H word is used instead of any other connector.
   - Question is converted into a statement.

6. In positive sentences, reporting verbs change in presence of Object.
   - Said to — told
   - Says to — tells
   - In absence of the Object — no change in reporting verb

Spot the error and rewrite the sentences given as indirect speech.

1. **Direct:** The boy said, "I'm happy with my results."
   Indirect: The boy said that he is happy with his results. **(Incorrect)**

2. **Direct:** She said, "I have baked a cake."
   Indirect: She said (that) she baked a cake. **(Incorrect)**

3. **Direct:** He said, "All people have equal rights."
   Indirect: He said that all people had equal rights. **(Incorrect)**

4. **Direct:** Roshni said, "I may meet him here".
   Indirect: Roshni said that she may meet him here. **(Incorrect)**

5. **Direct:** She says, "I will go to school tomorrow."
   Indirect: She says that she would go to school the day after. **(Incorrect)**

6. **Direct:** He said, “She is coming this week to discuss it."

Indirect: He said that she was coming this week to discuss it. **(Incorrect)**

7. **Direct:** He said to them, “Will you come for dinner?"

Indirect: He said to them will they come for dinner? **(Incorrect)**

8. **Direct:** The teacher said, “Be quiet and listen to my words."

Indirect: The teacher said them to be quiet and listen to my words. **(Incorrect)**

Answers

1. The boy said that he was happy with his results.
2. She said (that) she had baked a cake.
3. He said that all people have equal rights.
4. Roshni said that she might meet him there.
5. She says that she will go to school tomorrow.
6. He said that she was coming that week to discuss it.
7. He asked them whether they would come for dinner.
8. The teacher urged /ordered them to be quiet and listen to her/his words.

Number Riddles

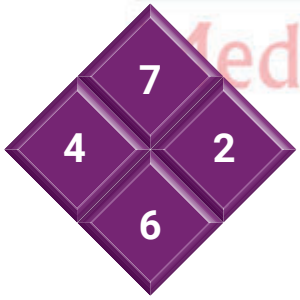
BETTER THAN PEMDAS ?

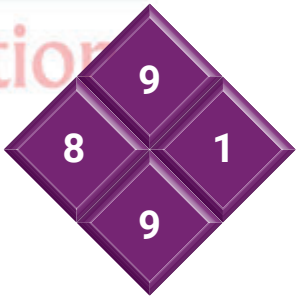
New Order of Operations Mnemonic

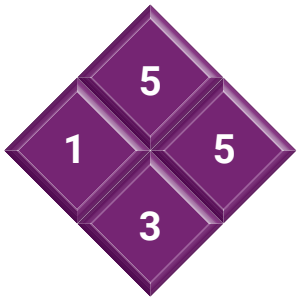
G E M S

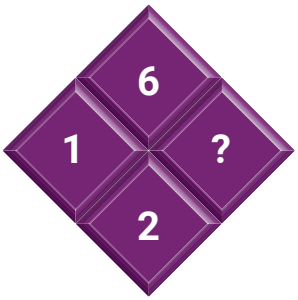
- **G** — Groupings: ( ) { } [ ]
- **E** — Exponents: n^2
- **M** — Multiply/Divide: Left to Right → ÷ / × ·
- **S** — Subtract/Add: Left to Right → + −

FIND THE MISSING NUMBER









RIDDLE

How can you add eight 8's to get the number 1000 ?

CAN YOU SOLVE THIS ?

(i)

1 = 2

2 = 10

3 = 30

4 = 68

6 = ?

(ii) 2, 5, 10, 17, ?, ?

Answer (Missing Number)

7 × 6 = 4 2

9 × 9 = 8 1

5 × 3 = 1 5

6 × 2 = **1 2**

Answer (Riddle)

888 + 88 + 8 + 8 + 8 = **1000**

Answer (Can You Solve This?)

(i)

$1 \times 2 = 2$

$2 \times 5 = 10$

$3 \times 10 = 30$

$4 \times 17 = 68$

$5 \times 26 = 130$

$6 \times 37 = \boxed{222}$

(ii)

$2 + 3 = 5$

$5 + 5 = 10$

$10 + 7 = 17$

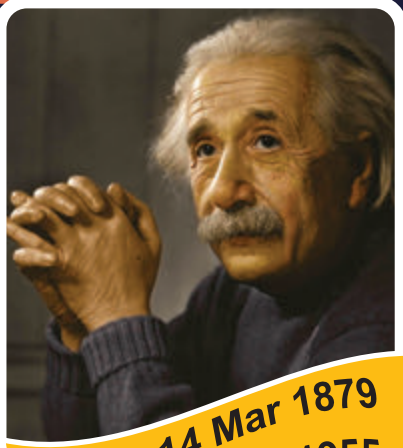
$17 + 9 = \boxed{26}$

$26 + 11 = \boxed{37}$

NOBEL PRIZE WINNER GERMAN PHYSICIST

Happy Birthday

Albert Einstein



Born - 14 Mar 1879
Died - 18 Apr 1955

Law of Photoelectric Effect

Developed the world's most famous equation $E = mc^2$ and the General Theory of Relativity - one of the two pillars of modern physics.

In 1921, he was awarded the Nobel Prize in Physics "for his services to theoretical physics and especially for his discovery of the law of Photoelectric Effect". The latter was pivotal in establishing quantum theory.

OUR RESULTS 2024

NEET (UG) 2024

AIR 1

JEE (Advanced) 2024

1430 Students Scored Above MAS

344 Classroom Students Qualified in NSEs* 2023-24

- (Group A & B) 34+30 NSEA*
- 156 NSEB*
- 72 NSEC*
- 23 NSEP*
- 29 NSEJS*

Aakashians Qualified for INO-2024

Diptanshu Sharma	Priyanshu Sarkar	Mridul Garg	Zaman Hussain	Shubhradeep Paul	Samvit Shandilya
NSEB | NSEC | NSEP	NSEB | NSEC | NSEP	NSEB | NSEC | NSEP	NSEA | NSEC | NSEP	NSEA | NSEC | NSEP	NSEA | NSEC | NSEP

and many more...

*NSEA-National Standard Examination in Astronomy | NSEB-National Standard Examination in Biology | NSEC-National Standard Examination in Chemistry
NSEP-National Standard Examination in Physics | NSEJS-National Standard Examination in Junior Science | INO-Indian National Olympiad

Aakashians Qualified for OCSC/IMOTC-2024

32 Classroom Students Qualified in INOs 2024

Aneesh Shastri	Sanvi Jain	Mridul M Anand	Zaman Hussain	Sushant Agarwal	Archit Kumar
Qualified INAO	Qualified INChO	Qualified INBO	Qualified INMO	Qualified INJSO	Qualified INAO Jr

OCSCs - Orientation cum Selection Camps | **IMOTC** - International Mathematical Olympiad Training Camp

and many more...

Aakashians Qualified for RMO from Classroom Programs

869 Classroom Students Qualified in IOQM 2024

Class VIII Joish Achyuta	Class VIII Pranava NS	Class VIII Bruteshwar Rajguru	Class VIII Hardik Mishra	Class VIII Hardik Dhariwal	Class IX Dhanush Damu
2 Year Classroom	3 Year Classroom	3 Year Classroom	2 Year Classroom	2 Year Classroom	4 Year Classroom

IOQM - Indian Olympiad Qualifier in Mathematics

and many more...

Board Exam Results 2024

Top Performers from Class X

Devidyuti K Pisharody	P Harini	Jiya Dugar V
Marks 500/500	Marks 499/500	Marks 498/500
CBSE	CBSE	CBSE

and many more...

Top Performers from Class XII

Ananthan R	Ansh Agrawal	Himanshu Agarwal
Marks 496/500	Marks 495/500	Marks 495/500
CBSE	CBSE	CBSE

and many more...

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