



# Aakash

Medical | IIT-JEE | Foundations

# KNOWLEDGE BYTES

FEBRUARY 2025

CLASS 10





# Aakash

Medical | IIT-JEE | Foundations

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# 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

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# Pair of Linear Equations in Two Variables, Quadratic Equations

## Slope

**Definition :-** Slope of a line describes the direction and steepness of a line. It is also called gradient.

General form of linear equation in two variables :

$$ax + by + c = 0$$

⇒

$$by = -ax - c$$

$$m = \frac{-a}{b}$$

⇒

$$y = \frac{-a}{b}x - \frac{c}{b}$$

Slope of a line =  $\frac{-a}{b}$  ; y-intercept =  $-\frac{c}{b}$

as in equation  $y = mx + c$   
m represents slope and 'c'  
represents y-intercept.



What is y-intercept? (y-coordinate of intersection with y-axis)

y-intercept (also called vertical intercept) is a point where the graph of a linear equation or any other function or equation intersects y-axis.

Slope is usually denoted by 'm'. It is calculated by finding ratio of 'vertical change' to 'horizontal change' between any two distinct points on a line or a curve.

Mathematically,

It is also represented by  $\Delta \rightarrow$  delta which represents change in a certain quantity.

$$m = \frac{\Delta y}{\Delta x}$$

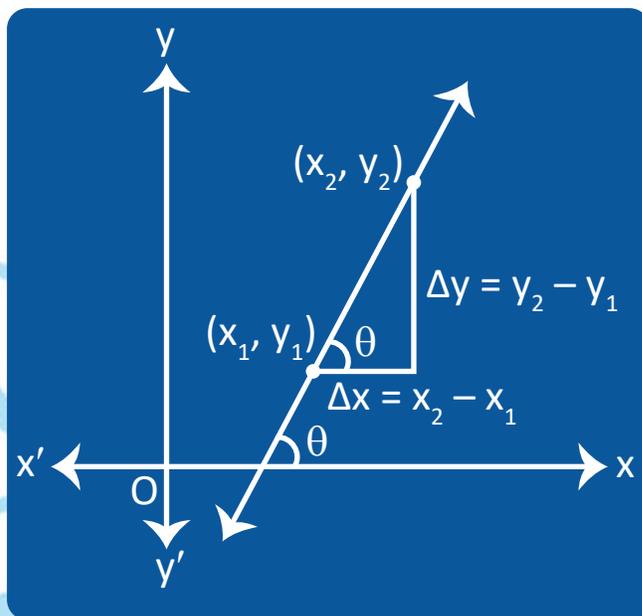
OR

$$m = \frac{y_2 - y_1}{x_2 - x_1}; \text{ where } (x_1, y_1) \text{ and}$$

$(x_2, y_2)$  are any two points on the line whose slope is to be calculated.

Also, the slope of a line, can be calculated by 'tan  $\theta$ ', where ' $\theta$ ' is the angle of inclination which the line makes with x-axis.

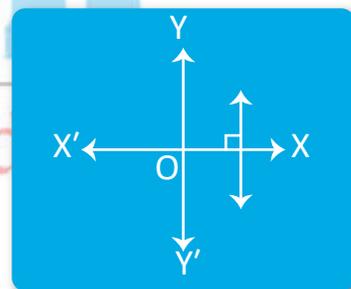
The angle  $\theta$  is the angle made by the line with positive direction of x-axis and measured anti clockwise.



1. Vertical line (line parallel to y-axis)

Angle made by vertical line with x-axis is  $90^\circ$ .

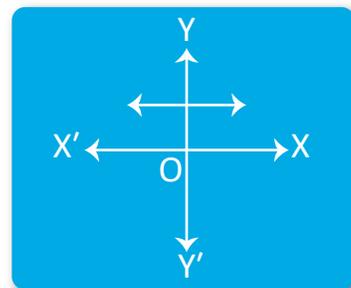
Slope =  $\tan \theta = \tan 90^\circ =$  (Not defined)



2. Horizontal line (line parallel to x-axis)

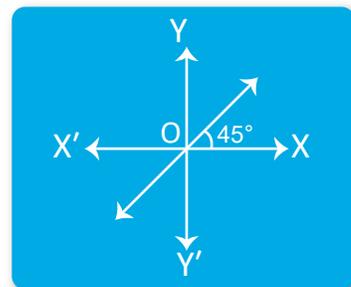
Angle made by horizontal line with x-axis is  $0^\circ$ .

Slope =  $\tan \theta = \tan 0^\circ = 0$



3. A line has slope = 1; when it makes angle with x-axis as  $45^\circ$

Slope =  $\tan \theta = \tan 45^\circ = 1$



## Solutions of Some Important Inequalities

If we are given an equation like

$$(x - a)(x - b) = 0$$

Finding the solution is quite easy, equate each factor to zero.

i.e.  $(x - a) = 0$  or  $(x - b) = 0$

$\Rightarrow x = a$  or  $x = b$  is the solution.

Now,  
if we change our equation to  
inequation, then how to find  
solution?



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(i)  $(x - a)(x - b) > 0$ ;  $a < b$  (say)

To solve this inequality, we will learn **wavy curve method**.

Inequalities can be of the form  $< 0$ ,  $> 0$ ,  $\leq 0$ ,  $\geq 0$

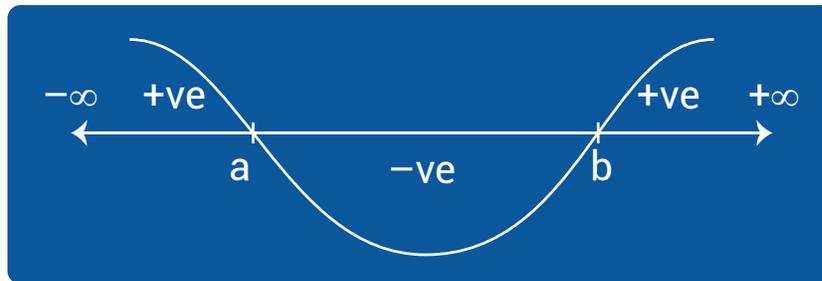
- First step is to find critical points i.e. points at which value of given inequality will become zero.

So, in the above equation critical points are 'a' and 'b'.

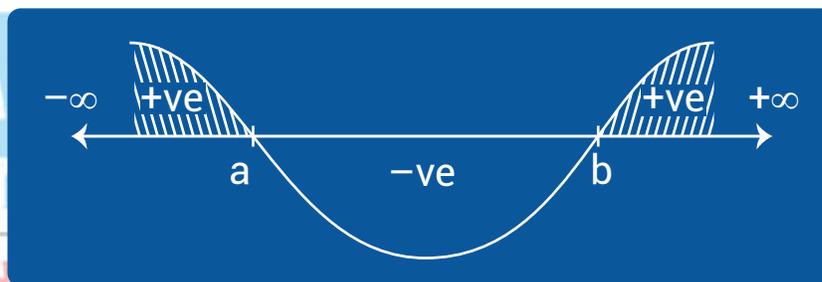
- Plot these points on the number line.



- Mark intervals and put +ve and -ve marks on alternate interval starting from right of b.



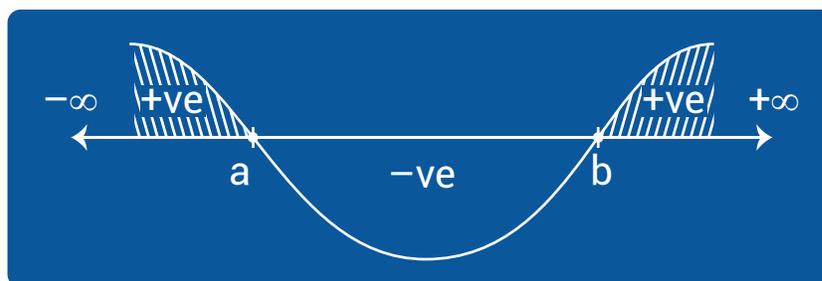
- Let us look at the given inequality  $(x - a)(x - b) > 0$ . It is greater than zero. So, we have to find the solution at which the value is greater than zero. Clearly, the intervals with the +ve sign gives positive value. Mark those intervals.



- Solution of  $(x - a)(x - b) > 0, a < b$  is  $x < a$  or  $x > b$

(ii)  $(x - a)(x - b) \geq 0, a < b$

To find the solution where the value is greater than equal to zero.

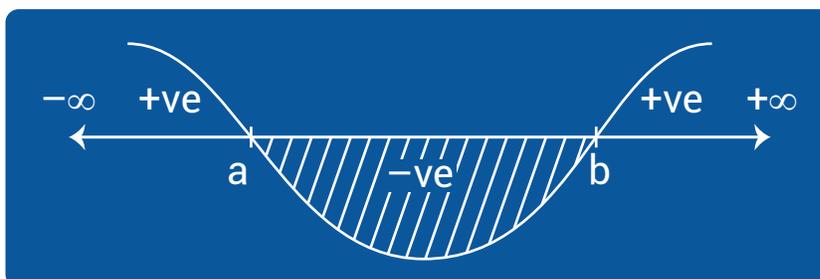


Solution will be  $x \leq a$  or  $x \geq b$ , as the inequality is  $\geq 0$ , so critical points will also be included.

(iii)  $(x - a)(x - b) < 0, a < b$

To find the solution where the value is less than zero.

Same steps have to be followed, mark the critical points and intervals with the +ve & -ve sign alternatively starting from right of b.



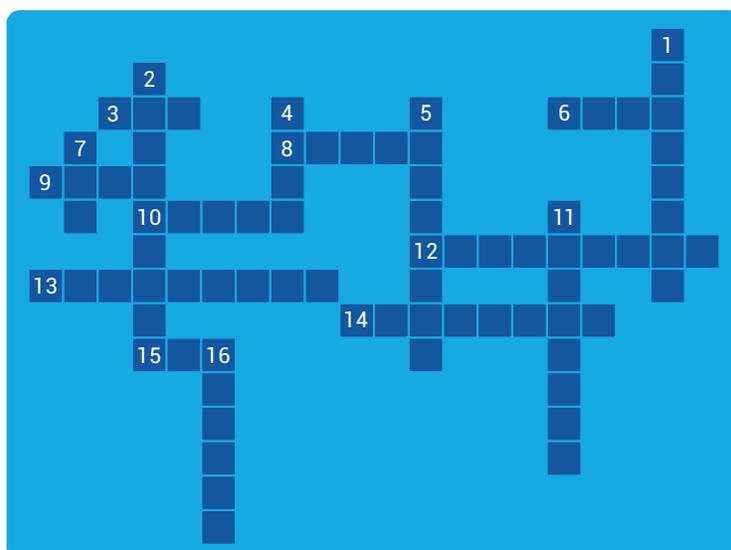
Shaded part is the solution, which gives -ve value.

So, solution of  $(x - a)(x - b) < 0, a < b$  is  $a < x < b$



$(x - a)(x - b) \leq 0, a < b$

## Crossword



### Across

- The product of the slopes of a pair of perpendicular lines is minus \_\_\_\_\_. [3]
- The slope of the line with equation  $y = 4x + 1$  is \_\_\_\_\_. [4]
- The y-intercept of the line with equation  $y = 3x + 8$  is \_\_\_\_\_. [5]
- The slope of the line with equation  $-10x + 2y = 14$  is \_\_\_\_\_. [4]
- The slope of a line is the \_\_\_\_\_ of its rise and run. [5]
- In the equation  $y = -4x + 1$ , as  $x$  increases,  $y$  \_\_\_\_\_ because slope is negative. [9]
- The slope of a vertical line is \_\_\_\_\_. [9]
- The line with equation  $x = 3$  is parallel to y-axis. Therefore, it is a \_\_\_\_\_ line. [8]
- The slope of line that passes through the points  $(2, 4)$  &  $(-1, -2)$  is \_\_\_\_\_. [3]

### Down

- \_\_\_\_\_ lines have the same slope. [8]
- The equation  $y = 3x - 2$  is in slope \_\_\_\_\_ form. [9]
- A horizontal line has a slope of \_\_\_\_\_. [4]
- The equation  $4x + 2y + 9 = 0$  is in \_\_\_\_\_ form. [8]
- The y-intercept of the line in the equation  $5x + 2y = 12$  is \_\_\_\_\_. [3]
- A \_\_\_\_\_ slope indicates that the line falls from left to right. [8]
- The line with equation  $y = -2x$  passes through the \_\_\_\_\_. [6]



# Human Eye and Colourful World

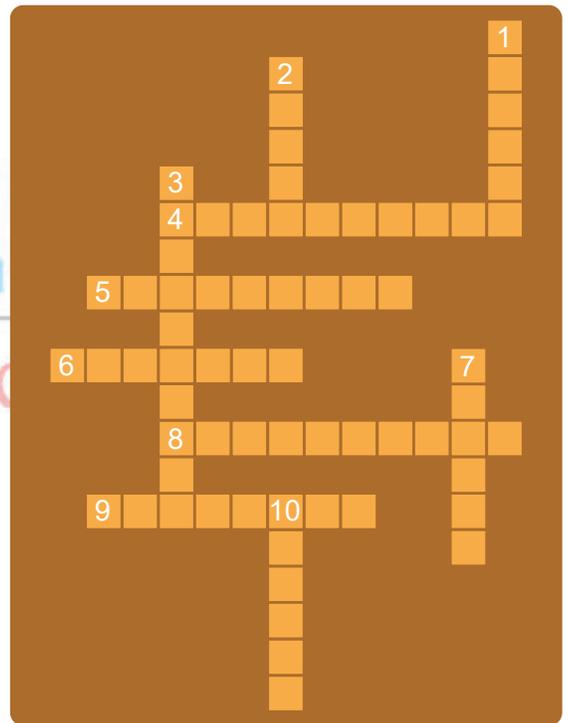
## Crossword

### Across

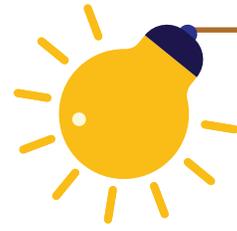
4. Arises due to gradual weakening of ciliary muscles. [10]
5. The area of the eye where there is no vision. [9]
6. A natural spectrum appearing in the sky after a rain shower. [7]
8. The twinkling of stars is due to atmospheric \_\_\_\_\_ of starlight. [10]
9. The band of coloured components of a light beam. [8]

### Down

1. Most of the refraction of light rays entering the eyes occurs at [6]
2. The sensory cells that detect colour. [5]
3. The nerve that takes electrical impulses to the brain from the eye [10]
7. Near - sightedness is also known as [6]
10. The light sensitive membrane in the eye [6]



# Interesting Facts



## Human Eye

1. Your peripheral vision is of low resolution.
2. On an average you blink 15 to 20 times per minute.
3. Resolution of Iphone 13 camera is about 12 megapixels and that of human eye is about 576 megapixels.
4. It is impossible to sneeze with your eyes open.
5. Eyes are the second most complex organ after brain.
6. The cornea is the only tissue in the human body which doesn't contain blood vessels.
7. Fingerprint has 40 unique characteristics and iris has 256. That's why retina scan are increasingly being used for security purposes.
8. Newborns don't produce any tears and they are colour blind at birth.
9. The optic nerve that connects the eye to the brain is too sensitive to reconstruct successfully.
10. With over 55% of the world's population having brown eyes, it remains the most common colour.



# Quiz

1

The term “power of accommodation” as applied to the eye, refers to its ability to:

- (A) Control the light intensity falling on the retina
- (B) Erect the inverted image formed on the retina
- (C) Vary the focal length of the lens
- (D) Vary the distance between the lens and retina

2

How do you think that the eye change in order to focus on near or distant objects?

- (A) The lens moves in or out
- (B) The retina moves in or out
- (C) The lens becomes thicker or thinner
- (D) The pupil gets larger or smaller

3

A person cannot see the distant objects clearly (though he can see the nearby objects clearly). He is suffering from the defect of vision called:

- (A) Cataract
- (B) Hypermetropia
- (C) Myopia
- (D) Presbyopia

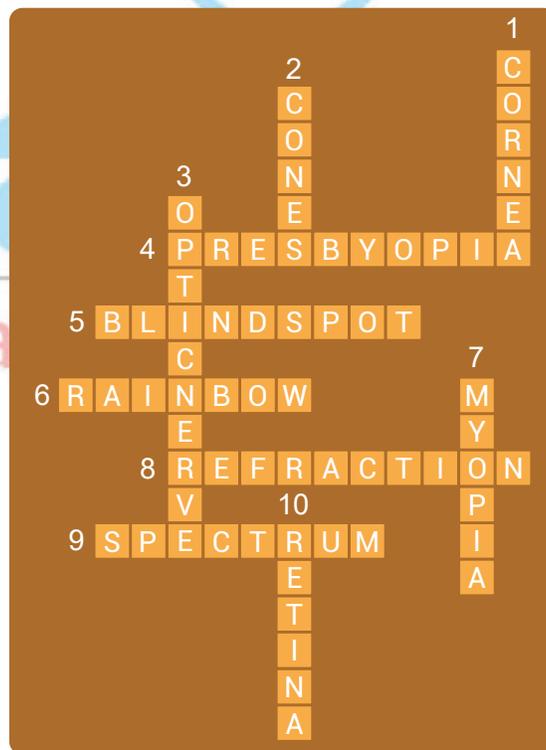


4

A man finds it difficult to read the odometer on the dashboard of the car but is able to clearly read a distant road sign. Which of the following statement is correct about this man?

- (A) The near point of his eyes has receded away.
- (B) The near point of his eyes has come closer to him.
- (C) The far point of his eyes has receded away.
- (D) The far point of his eyes has come closer to him.

Answer (Crossword)



Answer (Quiz)

Q.1 (C)

Q.2 (C)

Q.3 (C)

Q.4 (A)



# Salts and Indicators

## Common Salt and Us

*Why is common salt important for our body?*



- ✓ Keeps the body hydrated
- ✓ Essential for nerve and muscle function
- ✓ It regulates blood fluids and prevents low blood pressure.



## Maintaining Salt Balance in Our Body

**Excess salt consumption causes** health problems like kidney disease, high blood pressure, cardiovascular disease and stroke.

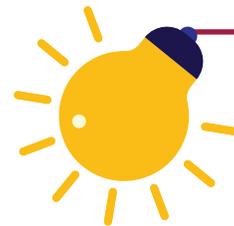
**Low salt consumption causes** vomiting, headache, confusion, loss of energy, brain malfunctioning and muscle weakness.



## DID YOU KNOW?

Salt is present in each and every cell of our body. It is required to flush out toxins from the body.

# Interesting Facts



1. In chemistry, soap is a type of salt. This is because it is formed from the mixing of an acid and a base.
2. Salt was so valuable in ancient Rome that soldiers were sometimes paid with it. In fact, the word 'salary' comes from the Latin word sal, for salt. If a soldier did a lousy job, his pay cheque might be cut, which is how we got the expression "not worth his salt".
3. Salt also took on a great deal of symbolic value. There is a reason it is mentioned so many times in the Bible ('salt of the earth', 'a pillar of salt', 'a covenant of salt'). Its preservative properties made it an appropriate metaphor for permanence and conviction.
4. Most people consume too much of salt. The World Health Organization (WHO) recommends less than 5 grams of salt per day, which is equal to one teaspoon. Do not keep salt shakers on the table in order to reduce the salt intake.



Extra salt may be lurking in your meals, even if you are very careful.

## ***Cultivate Healthier Eating Habits***

Avoid sprinkling salt on salads, fruits or yogurt. Condiments like salad dressings, pickles, papads and ketchup are high in sodium content.



Soap with high pH (too basic) will irritate or burn the skin and should not be used !!!



*Don't have pH strips to test the soap before using it on the skin?*

- **Don't Worry!** Luckily, there are plenty of ways to test the soap before using it on the skin.
- **Red cabbage (aka: purple cabbage)** is an effective pH indicator.



- Place a small amount of the juice directly onto your soap.
- Within seconds, the purple juice will begin to change color.
- Red cabbage contains a pigment molecule called flavin that changes color depending on the pH level of various substances.
- If the pH level which is safe level for soap is 8-10, then the purple liquid will quickly change from purple to blue.
- If soap is too basic, the purple cabbage juice will turn from purple to green or yellow.



**?** Have you ever ended up with a too basic batch of soap?

Now you can check and use what is best for you.



# Control and Coordination

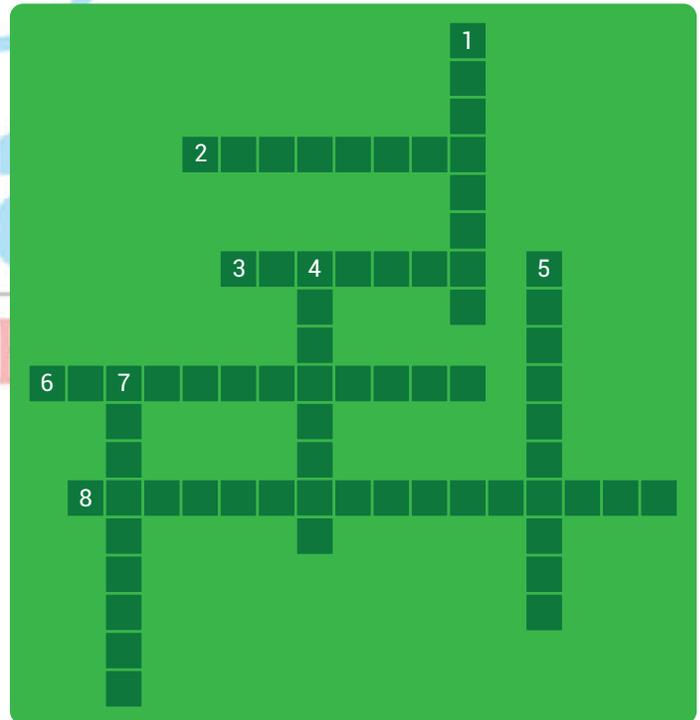
## Crossword

### Across

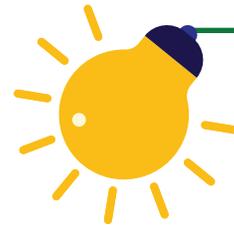
2. Largest part of the brain.
3. Self propagated current that runs along the surface of the nerve fibre for passage of information.
6. Automatic response to a stimulus which is not under the voluntary control of the brain.
8. Cardiac, respiratory and salivary centre.

### Down

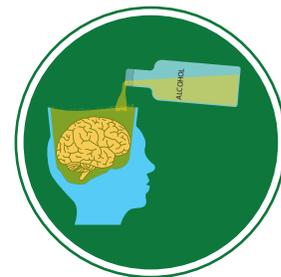
1. Non-nutrient chemical substances secreted by endocrine gland.
4. Works as both exocrine and endocrine gland.
5. Caused by over secretion of growth hormone after adult size is reached.
7. Part of the brain specialised for hearing, smell, sight and so on.



# Interesting Facts



1. People who consume too much alcohol cannot coordinate movement with their senses (Example: cannot touch tip of nose with their fingers, have abnormal walking movements & staggers). This is because alcohol inhibits the activity of **cerebellum** which results in a loss of ability to coordinate muscular movements.



2. Injury to the vestibular branch of the **VIII Cranial Nerve** may cause **vertigo** (a subjective feeling that one's own body or the environment is rotating).



3. We cry when we are very happy because our hypothalamus in our brain can't distinguish the difference between strong happiness and strong sadness.



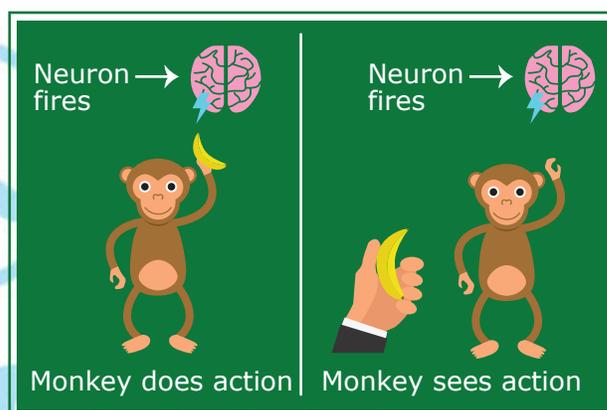
4. **Diabetes mellitus (Type-I)**: It is insulin dependent diabetes mellitus (IDDM) and also known as juvenile onset diabetes because it most commonly develops in people younger than 20. It is an autoimmune disorder in which immune system destroys  $\beta$  cells.

**Diabetes mellitus (Type-II)**: It is non-insulin dependent diabetes mellitus (NIDDM). It is also known as maturity onset diabetes because it occurs later in life. It arises not from shortage of insulin but because of target cells became less sensitive to insulin. Obesity may be a cause & insulin resistance occurs.

5. Babies are capable of reproducing facial expressions, and as adults, we imitate basic behaviour. Laughter can be spread, we can cry while watching a sad movie. It seems like we have the capacity to feel what others feel, empathize with them and understand their feelings. What happens in the brain for this to happen?

The answer is **mirror neurons**.

Mirror neurons can be defined as a group of neurons that activate when we perform an action or when we see an action being performed. For example, when a chimpanzee sees its mother opening a nut with a rock and then tries to imitate her with another nut. Mirror neurons are related with empathic, social and imitations behaviour. They are a fundamental tool for learning.



## Mnemonics

### 1. Brain : 4 Lobes

**O**live **P**asta **T**astes **F**abulous: Occipital, Parietal, Temporal, Frontal

### 2. Mnemonic on the neurotransmitters released:

**SAD**: **S**erotonin, **A**cetylcholine, **D**opamine

## Choose the Correct Word From the Word Box



### Word Box

- Somatic neural system
- Cerebellum
- Cerebrospinal fluid
- 12 pairs
- Cranium
- Hypothalamus
- Autonomic neural system

1

\_\_\_\_\_ present in the brain and spinal cord serves as a pad to cushion the central nervous system from shock.

2

\_\_\_\_\_ is called the thermoregulatory centre of the body.

3

\_\_\_\_\_ is the second largest part of the brain.

4

Brain is protected by the \_\_\_\_\_ in the skull.

5

\_\_\_\_\_ cranial nerves arise from the brain.

6

PNS is divided into two divisions called \_\_\_\_\_ & \_\_\_\_\_.



**Q1**

**Q2**

Which part of diencephalon is referred to as “relay centre” of the cerebral cortex ?

(A) Hypothalamus  
 (B) Epithalamus  
 (C) Thalamus  
 (D) Cerebellum

Which of the following parts of brain is concerned with regulating body posture, equilibrium and coordinated rapid muscular activity?

(A) Diencephalon (B) Pons  
 (C) Medulla (D) Cerebellum

**Answer (Crossword)**

**Answer (Choose the correct word)**

1. Cerebrospinal fluid
2. Hypothalamus
3. Cerebellum
4. Cranium
5. 12 pairs
6. Somatic Neural System and Autonomic Neural System

**Answer (Scratch Your Brain)**

**Q.1 (C)**

**Q.2 (D)**



# The Age of Industrialization

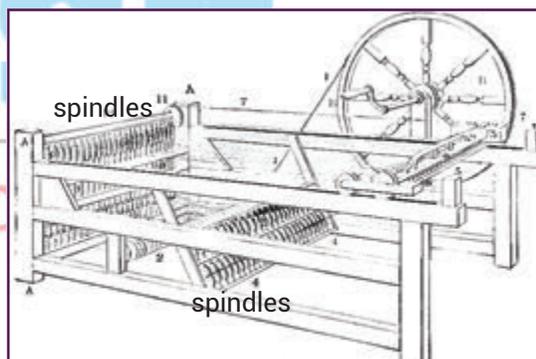
*Industrialisation was the period of social and economic change that transformed human society from an agrarian society into an industrial society. It involved an extensive re-organisation of the economy for the purpose of manufacturing.*

*The period of Industrialisation began in the mid 18<sup>th</sup> century (i.e. 1750's) in England.*

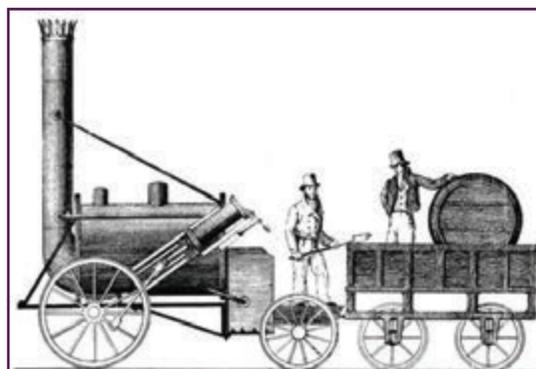
## Causes of Industrial Revolution

1. Increase in the population led to the increase in the demand among the people in the market.
2. Expansion of foreign trade created an international demand for goods and services.
3. Development of effective means of transportation created efficiency in terms of the loading and unloading of the goods and services from one region to another.
4. Technological inventions like Spinning Jenny, Steam Engine helped in mass production.

These factors collectively led to the beginning of Industrial Revolution.



Spinning Jenny



Locomotive Engine, "The Rocket", 1830

## Reasons for the beginning of Industrial Revolution in England

England acquired colonies and established an international market through the regular supply of raw material.

It also earned a vast amount of profit through this overseas trade and the trade in slaves which made Britain a supreme and unrivalled power in the world.

Serfdom was abolished which created a large labour force. Demand of labour for industries was fulfilled from here.



### DID YOU KNOW?

**Serfdom:** It was a system in medieval Europe in which a tenant farmer was bound to a hereditary plot of land and the will of his landlord. Serfdom was not same as slavery.



The commercial class acquired more political power which meant no restrictions at the end of the government.

England had a lot of natural resources like coal, iron ore etc... which were essential for the industries.

England had a large shipping industry, hence no problem of transportation.

Hence, this provided all the necessary conditions for the beginning of Industrial Revolution in England.

### Impact of the Industrial Revolution

1. Emergence of middle class
2. Emergence of many type of factories
3. Improvement in the education sector
4. Increased environmental pollution



### Quiz

1. The Industrial Revolution began in which country?

- (A) England (B) France  
(C) Germany (D) USA

2. Who invented Spinning Jenny ?

- (A) James Hargreaves (B) James Watt  
(C) Newcomen (D) Nicola Tesla



**3.** Which of the following is/are the reason/reasons behind the beginning of Industrial Revolution ?

- (A) Increase in the demand in the market
- (B) Technological innovation
- (C) Expansion of foreign trade
- (D) All of these

**4.** The Industrial Revolution began in \_\_\_\_\_.

- (A) 1700
- (B) 1750's
- (C) 1800
- (D) 1850's

**5.** Which of the following was/were the social impact of Industrial Revolution?

- (A) Creation of middle class
- (B) Rapid urbanisation
- (C) Emergence of nuclear family
- (D) All of these

## Answers

1. (A)      2. (A)      3. (D)      4. (B)      5. (D)



# Finities & Non-Finities

## Difference between finities and non-finites

Finite and non-finite verbs are two different types of verbs in English. Finite verbs are the ones that are conjugated with the subject in a sentence. They indicate the person, number, and tense of the subject. Non-finite verbs are not conjugated with the subject in a sentence. They are not in a specific tense and do not indicate the person, number, or tense of the subject. Finite verbs are the main verbs of a clause while non-finite verbs are usually auxiliary or modal verbs.

### Finite Verbs

I am **running**.

She was **walking**.

They **will go**.

### Non-finite verbs

He wanted to **run**.

**Having walked** five kilometers, he was tired.

He bought **running** shoes for himself.

She can **talk** endlessly.

She hurt her **broken** arm again.

I love **reading** books

## Non-finite verb forms

Non-finite verbs can have several forms. These forms are:

**Infinitive:** to run, can talk

**Gerund:** reading

**Participle:** running shoes, broken arm, having talked





# Exercise

Fill in the blanks with suitable forms of the verbs given in the brackets.

- 1 Rohan has always liked .....(play) basketball.
- 2 The movie made everyone .....(cry).
- 3 Mummy makes me .....(clean) my room every day.
- 4 .....(give) is better than to receive.
- 5 The teachers advised Rahul .....(improve) his English.
- 6 I ..... (have) a yellow cable but I ..... (to be – negative ) sure if that is the one you need.
- 7 Danny ..... (have) a client panel interview today.
- 8 Jannet ..... (to be) the first one to arrive.
- 9 Your hair ..... (look) great today.
- 10 Gayathri and Kiran ..... (go) to Singapore for the holidays.

## Answers

- |              |                |              |           |
|--------------|----------------|--------------|-----------|
| 1 playing    | 2 cry          | 3 clean      | 4 To give |
| 5 to improve | 6 have, am not | 7 has        |           |
| 8 was        | 9 looks        | 10 are going |           |



# Alphabetic, Alphanumeric and Pattern Series

Choose the missing term out of the given options.

1

25Z, 24Y, 22W, 19T, ?

(A) 15P

(B) 16Q

(C) 16P

(D) 17Q

2

Z2J, X4L, V7N, T11P, R16R, ?

(A) T11Q

(B) P20R

(C) P22T

(D) P21M

3

0B4, 0D8, ?, 2N8, 4V4

(A) 4W6

(B) 1H6

(C) 6H1

(D) 1H5

4

1 \_ m 2 n \_ \_ 3 o o \_ \_

(A) nmoon

(B) mnooo

(C) mnonn

(D) mnnoo



5

AB, BA, ABC, CBA, ?, DCBA

(A) ABCE

(B) ABCD

(C) BCDA

(D) ABDC

## Answers

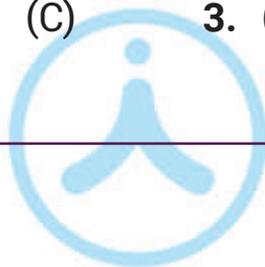
1. (A)

2. (C)

3. (B)

4. (D)

5. (B)



# Aakash

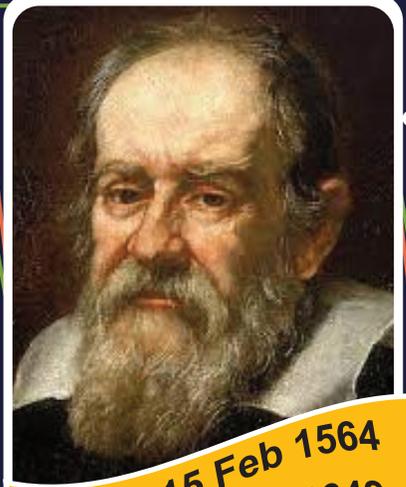
Medicines & Health Solutions



FATHER OF OBSERVATIONAL ASTRONOMY

*Happy Birthday*

**Galileo Galilei**



Born - 15 Feb 1564  
Died - 08 Jan 1642

Galileo Galilei is a famous Italian Astronomer, Mathematics Professor, and Physicist who first used the telescope to study space. His contributions in Science and Mathematics still resonate today, and became the basis for different ideas that sprung up during the scientific revolution during and after his time.

## OUR RESULTS 2024

**AIR 1**

**NEET (UG) 2024**

<b>State Topper</b> Delhi	<b>State Topper</b> Uttar Pradesh	<b>State Topper</b> West Bengal	<b>State Topper</b> Uttar Pradesh	<b>State Topper</b> Maharashtra	<b>State Topper</b> Rajasthan
Mridul M Anand 3 Year Classroom	Ayush Naugraiya 4 Year Classroom	Arghyadeep Dutta 2 Year Classroom	Aryan Yadav 1 Year Classroom	Palansha Agarwal 2 Year Classroom	Iram Quazi 1 Year Classroom

**JEE (Advanced) 2024**

<b>AIR 25</b>	<b>AIR 67</b>	<b>AIR 78</b>	<b>AIR 93</b>	<b>AIR 95</b>
Rishi Shekher Shukla 2 Year Classroom	Krishna Sai Shishir 4 Year Classroom	Abhishek Jain 4 Year Classroom	Hardik Aggarwal 2 Year Classroom	Ujjwal Singh 4 Year Classroom

## 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**  
NSEB | NSEC | NSEP



**Priyanshu Sarkar**  
NSEB | NSEC | NSEP



**Mridul Garg**  
NSEB | NSEC | NSEP



**Zaman Hussain**  
NSEA | NSEC | NSEP



**Shubhradeep Paul**  
NSEA | NSEC | NSEP



**Samvit Shandilya**  
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**  
Qualified INAO



**Sanvi Jain**  
Qualified INChO



**Mridul M Anand**  
Qualified INBO



**Zaman Hussain**  
Qualified INMO



**Sushant Agarwal**  
Qualified INJSO



**Archit Kumar**  
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**  
2 Year Classroom



**Class VIII Pranava NS**  
3 Year Classroom



**Class VIII Bruteshwar Rajguru**  
3 Year Classroom



**Class VIII Hardik Mishra**  
2 Year Classroom



**Class VIII Hardik Dhariwal**  
2 Year Classroom



**Class IX Dhanush Damu**  
4 Year Classroom

IOQM - Indian Olympiad Qualifier in Mathematics

and many more...

## Board Exam Results 2024

### Top Performers from Class X



Marks  
**500**  
**500**

**Devidyuti K Pisharody**  
CBSE



Marks  
**499**  
**500**

**P Harini**  
CBSE



Marks  
**498**  
**500**

**Jiya Dugar V**  
CBSE

and many more...

### Top Performers from Class XII



Marks  
**496**  
**500**

**Ananthan R**  
CBSE



Marks  
**495**  
**500**

**Ansh Agrawal**  
CBSE



Marks  
**495**  
**500**

**Himanshu Agarwal**  
CBSE

and many more...



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