Agniveer Army GD 8th June 2026 (Shift 2) Memory-Based Paper (Previous Year Paper)

Army GD Agniveer • 2026 • 50 questions • 60 minutes • Answer key and solutions

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GENERAL KNOWLEDGE

Q1. Who led the revolt of 1857 at Kanpur?

(a) Bahadur Shah
(b) Nana Sahib
(c) Shah Mai
(d) Maulavi Ahmadulla Shah

Q2. Which day is celebrated as Indian Air Force Day?

(a) 8 February
(b) 8 September
(c) 8 October
(d) 8 November

Q3. INS Trikand, a frontline guided-missile frigate of the Indian Navy, arrived at Dar-es-Salaam in April 2026 for a port call in which country?

(a) Kenya
(b) Tanzania
(c) Mozambique
(d) Seychelles

Q4. The oldest mountain range of India is

(a) Vindhya
(b) Aravalli
(c) Nilgiri
(d) Himalaya

Q5. 'Guru Shikhar' is the highest peak of which mountain range?

(a) Vindhya Range
(b) Satpura Range
(c) Aravali Range
(d) Western Ghats

Q6. Most southern state of India?

(a) Karnataka
(b) Kerla
(c) Tamil Nadu
(d) Andhra Pradesh

Q7. The Brahmo Samaj was founded by:

(a) Keshab Chandra Sen
(b) Raja Rammohan Roy
(c) Devendranath Tagore
(d) Dayananda Saraswathi

Q8. Which Article provides for the formation of Ward Committees in Municipal areas?

(a) Article 243R
(b) Article 243Z
(c) Article 243T
(d) Article 243S

Q9. Which tribal leader was considered by his followers to be an incarnation of God, Dharti Aba or Vishwapita and the new prophet?

(a) Birsa Munda.
(b) Sidhu-Kanhu
(c) Chand-Bhairava
(d) More than one of the above

Q10. Fundamental duties are mentioned in which part of the Indian Constitution?

(a) Part III-B
(b) Part III-A
(c) Part IV-A
(d) Part II-A

Q11. Which Article of the Indian Constitution prohibits the employment of children below the age of 14 years in any factory, mine, or hazardous occupation?

(a) Article 23
(b) Article 24
(c) Article 25
(d) Article 26

Q12. Delhi is located on the banks of river _____.

(a) Gomati
(b) Sarayu
(c) Yamuna
(d) Gandak

Q13. Which organization organized Yoga Mahotsav-2026 to mark the 100-day countdown to the International Day of Yoga?

(a) Patanjali Yogpeeth
(b) Morarji Desai National Institute of Yoga (MDNIY)
(c) Isha Foundation
(d) National Institute of Naturopathy

Q14. What is the approximate total length of the Golden Quadrilateral (GQ) highway network?

(a) 7,300 km
(b) 1,235 km
(c) 1,700 km
(d) 5,846 km

Q15. Lavani is a folk dance of which of the following states of India?

(a) Maharashtra
(b) Jharkhand
(c) Gujarat

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(d) Rajasthan

GENERAL SCIENCE

Q16. Which of the following is a thermosetting plastic?

(a) Polythene
(b) Bakelite
(c) PVC
(d) Polyester

Q17. Nitrogen in water is commonly found in the form of

(a) Nitric oxide
(b) Nitrate
(c) Nitrite
(d) Nitrous oxide

Q18. A Galvanometer can be converted into voltmeter by connecting_____.

(a) Low Resistance in series
(b) High Resistance in series
(c) High Resistance in parallel
(d) Low Resistance in parallel

Q19. What is the correct SI unit of water equivalent?

(a) Litre
(b) Pound
(c) Metre
(d) Kilogram

Q20. A stone tied to a string is rotated in a circle. The force that acts towards the centre is—

(a) Centripetal force
(b) Centrifugal force
(c) Frictional force
(d) Gravitational force

Q21. Select the group of organisms in which asexual reproduction occurs by fission.

(a) All seed plants
(b) Blue-green algae
(c) Flowering plants
(d) All plants

Q22. One diopter is the power of a lens:

(a) Whose focal length is 10 metres
(b) Whose focal length is 100 metres
(c) Whose focal length is 1 metre
(d) Whose focal length is 0.01 metre

Q23. What change occurs when sound passes from air into water?

(a) Frequency remains unchanged, but wavelength varies
(b) Frequency increases while wavelength stays constant
(c) Both frequency and wavelength decrease
(d) Speed decreases while frequency increases

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Q24. Acceleration is equal to the rate of change of _____.

(a) Momentum
(b) Displacement
(c) Velocity
(d) Position

Q25. Which of the following parts of the human body contains gustatory receptors?

(a) Eyes
(b) Nose
(c) Tongue
(d) Skin

Q26. Which of the following compounds is used as an antacid?

(a) Sodium chloride
(b) Magnesium hydroxide
(c) Calcium oxide
(d) Calcium hydroxide

Q27. A magnet exerting a force on another magnet is an example of _____.

(a) Contact Force
(b) Non-Contact Force
(c) Electrostatic Force
(d) Gravitational Force

Q28. Ribosomes are formed of:

(a) DNA and RNA
(b) RNA and Protein
(c) DNA and Protein
(d) RNA and Amino acids

Q29. The third member of homologous series of alkane is _____.

(a) propane
(b) pentane
(c) ethane
(d) butane

Q30. Which of the following does not involve Total Internal Reflection?

(a) Mirages in Deserts
(b) Kaleidoscope
(c) Diamond Sparkle
(d) Transmission of light rays in Optical Fibres

MATHEMATICS

Q31. 840 is what percentage of 1500?

(a) 64 percent
(b) 56 percent
(c) 62 percent
(d) 57 percent

Q32. If A can complete work in 6 days, B can complete the work in 8 days and C can complete the same work in 12 days. In how much time A, B, and C can complete the work.

(a) 3/4 days
(b) 8/3 days
(c) 5/2 days

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(d) 3/8 days

Q33. A scooter's value was reduced by 20 percent and is now worth Rs. 72000. What was its original price?

(a) Rs. 88000
(b) Rs. 94000
(c) Rs. 90000
(d) Rs. 100000

Q34. The average of three numbers A, B, and C is 48. The average of A and B is 45. The average of B and C is 49. What is the value of B?

(a) 42
(b) 44
(c) 46
(d) 48

Q35. Value of tan 45 is

(a) 0
(b) infinity
(c) 1
(d) √3 / 2

Q36. What is the LCM of 13, 65, and 91?

(a) 650
(b) 455
(c) 1825
(d) 5005

Q37. What will come in place of question mark (?) in the following question?

572 + 38 × 0.5 = ? + 10

(a) 471
(b) 581
(c) 521
(d) 671

Q38. Two angles of a triangle are 37° and 81° ; If so, what is its third angle?

(a) 90°
(b) 60°
(c) 38°
(d) 62°

Q39. Evaluate 34^2

(a) 1166
(b) 1186
(c) 1156
(d) 1176

Q40. Convert 9 km/hr into m/s.

(a) 0.5 m/s
(b) 2.5 m/s
(c) 3.5 m/s
(d) 1.5 m/s

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Q41. On a certain sum, the simple interest for 5 years at 4% per annum is Rs. 1,047. Find the sum (in Rs.).

(a) 5,232
(b) 5,238
(c) 5,234
(d) 5,235

Q42. A person bought an item for Rs. 1975 and sold it at a profit of 12%. What was the selling price of the item?

(a) Rs. 2192
(b) Rs. 2202
(c) Rs. 2212
(d) Rs. 2222

Q43. What will come on the place on question mark?

16 ÷ 4 - 21 + 12 × 9 = ?

(a) 91
(b) 87
(c) 86
(d) 90

Q44. What is the square root of 4096?

(a) 62
(b) 66
(c) 64
(d) 68

Q45. What is the result of 21/4 ÷ 0.5 ?

(a) 4.25
(b) 4.5
(c) 4.75
(d) 5.25

LOGICAL REASONING

Q46. A watch shows 6 p.m. when the hour hand points east. In which direction is the minute hand facing when the time is 9:15 p.m.?

(a) East
(b) South
(c) West
(d) North

Q47. if 7 : 51 then 8 : ?

(a) 56
(b) 66
(c) 86
(d) 64

Q48. In the following question, select the missing number of the given series.

84, 95, 107, 120, 134, ?

(a) 149
(b) 150
(c) 154
(d) 151

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Q49. In a row of 50 students, A is 15th from top. Then find the rank of A from bottom?

(a) 37
(b) 30
(c) 36
(d) 35

Q50. Select the option that is related to the third term in the same way as the second term is related to the first term.

DANIEL : NLIEDA :: BROTHER : ?

(a) TORRHEB
(b) TQOOHEB
(c) TRROHEB
(d) TRROEHB

ANSWER KEY

1	b	2	c	3	b	4	b	5	c	6	c	7	b	8	d	9	a	10	c
11	b	12	c	13	b	14	d	15	a	16	b	17	b	18	b	19	d	20	a
21	b	22	c	23	a	24	c	25	c	26	b	27	b	28	b	29	a	30	b
31	b	32	b	33	c	34	b	35	c	36	b	37	b	38	d	39	c	40	b
41	d	42	c	43	a	44	c	45	b	46	d	47	b	48	a	49	c	50	c

SOLUTIONS

Q1. Answer: (b) Nana Sahib

The correct answer is Nana Sahib.

Key Points

• Nana Saheb led the revolt of 1857 from Kanpur.

• The rebellion of 1857 was spread across the areas of Meerut, Agra, Mathura, and Lucknow near Kanpur.

• Nana Saheb, the adopted heir of Baji Rao II joined the struggle as he was denied the pension and honours on the ground that he was not the natural born heir.

• Tantia Tope assisted Nana Saheb in Kanpur as the Commander in Chief.

The Sepoy Mutiny

• The First War of Independence, known as Sepoy Mutiny, was the first rebellion against the British troops in India in 1857.

• The revolt began in Meerut and was led by Bahadur Shah II from Delhi, Begum Hazrat Mahal from Lucknow, Nana Sahib, and Tantya Tope from Kanpur, and Rani Laxmibai from Jhansi.

The reasons behind the revolt were:

• Destruction of Indian Economy and Land Reforms

• Policies of Subsidiary Alliance and Doctrine of Lapse

• Introduction of Enfield Rifles with fat coatings

Q2. Answer: (c) 8 October

The correct answer is '8 October'.

Key PointsIndian Air Force Day

• The Air Force was established on October 8, 1932, in undivided India under colonial rule.

• Therefore, Indian Air Force Day is celebrated every year on 8 October.

• On this day a program is organized at Hindon Air Force Station in Ghaziabad.

• In this program, many veterans including army officers are involved and powerful aircraft are displayed in the sky.

• A parade of male and female pilots is held in Hindon on this day.

• In this ceremony, the Chief of the Air Staff felicitates the military personnel with medals.

Hence, the correct answer is 8 October.

Additional Information Indian Air Force

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• The Indian Air Force is the fourth largest air force in the world.

• The Hindon Air Force Station located in Ghaziabad, Uttar Pradesh is the largest in Asia.

• Since the inception of the Indian Air Force, it has been following the path of its motto 'Nabh: Sprisham Deeptam'. It means 'To touch the sky with pride.' This motto of the Air Force has been taken from the 11th chapter of the Bhagavad Gita.

• The colors of the Indian Air Force are blue, sky blue, and white.

Important Points Let's have a look at other options:

Date	Day
8 February	Safer Internet Day
8 September	International Literacy Day
8 November	World Radiography Day

Q3. Answer: (b) Tanzania

The correct answer is Tanzania.

In News

• INS Trikand, a frontline guided-missile frigate of the Indian Navy, arrived at Dar-es-Salaam, Tanzania, on April 3, 2026.

Key Points

• The visit is part of the ship's ongoing deployment in the South West Indian Ocean Region to strengthen maritime cooperation.

• The port call aligns with India’s vision of MAHASAGAR (Mutual and Holistic Advancement for Security and Growth Across Regions).

• Activities include joint training with the Tanzania Navy and the handing over of critical logistical stores ferried from India.

• INS Trikand

• Type - Talwar-class guided-missile frigate

• Commanding Officer - Captain Sachin Kulkarni

• Mission - Enhancing bilateral ties and interoperability in the Indian Ocean.

Additional Information

• Tanzania

• Capital - Dodoma

• Largest City - Dar-es-Salaam

• Currency - Tanzanian Shilling

• MAHASAGAR

• An Indian Navy initiative for high-level virtual interaction between Maritime Heads for security and growth in the region.

Q4. Answer: (b) Aravalli

The correct answer is Aravalli.

• Aravalli is the oldest mountain range of India.

Key Points

• Aravali Range

• Aravalis is one of the world’s oldest fold mountains running in the north-east to southeast direction from Delhi to Palampur in Gujarat.

• It expands in 3 states (Rajasthan, Haryana, Gujarat) and 1 union territory (New-Delhi).

• It is an example of a fold mountain.

• Guru Shikhar is the highest peak of Aravali.

Additional Information

• Vindhyan Range acts as a water-divide between the Ganga system and the river system of south India.

• The Eastern and the Western Ghats meet each other at the Nilgiri hills.

• It is located in Tamil Nadu.

• The Himalayas are young fold mountains of the tertiary period.

Q5. Answer: (c) Aravali Range

The correct answer is Aravali Range.

Key Points

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• Guru Shikhar is the highest peak of the Aravali Range, standing at an elevation of 1,722 meters (5,650 feet) above sea level.

• The peak is located in Mount Abu, which is situated in the Sirohi district of Rajasthan.

• It is named after Guru Dattatreya, an incarnation of the Hindu deities Brahma, Vishnu, and Shiva; a temple dedicated to him is located at the summit.

• The Aravali Range is one of the oldest fold mountain systems in the world, extending approximately 692 km across Gujarat, Rajasthan, Haryana, and Delhi.

• Geologically, these mountains were formed during the Proterozoic era and have been significantly eroded over millions of years, categorizing them as residual mountains today.

Additional Information

• Vindhya Range

• A complex, discontinuous chain of mountain ridges and plateau escarpments in west-central India.

• The highest point is Sadbhawna Shikhar (Goodwill Peak), also known as Kalumar Peak.

• Satpura Range

• A range of hills in central India that runs parallel to the Vindhya Range between the Narmada and Tapti rivers.

• The highest peak of this range is Dhupgarh, located near Pachmarhi in Madhya Pradesh.

• Western Ghats

• Also known as Sahyadri, it is a mountain range that runs parallel to the western coast of the Indian peninsula.

• The highest peak is Anamudi, located in Kerala, which is also the highest point in South India.

Q6. Answer: (c) Tamil Nadu

Concept:

• Cape Comorin is the southernmost point in South India.

• It is located in Tamil Nadu.

Explanation:

• The southernmost part refers to the place farthest towards the south.

• Kanyakumari is the coastal town on the southernmost tip.

• Cape Comorin is a town in Kanyakumari.

• It is referred to as 'The Land's End'.

• It is a popular tourist place with unique ocean sunrise and sunset.

Q7. Answer: (b) Raja Rammohan Roy

The Brahmo Samaj was founded by Raja Rammohan Roy.

Key Points

• It was founded in Calcutta in 1828 by Ram Mohan Roy as Brahmo Sabha.

• The Brahmo Samaj was a monotheistic sect of Hinduism

• The samaj was dedicated to the "worship and adoration of the Eternal, the Unsearchable, the Immutable Being, who is the Author and Preserver of the Universe".

• The Samaj was open to all without distinction of color, creed, caste, nation, or religion.

• It denounced polytheism, image worship, and the caste system.

• It also discarded meaningless Hindu rituals.

• Raja Rammohun Roy is also called the father of the Indian renaissance.

Q8. Answer: (d) Article 243S

The correct answer is Article 243S.

Key Points

• Article 243S of the Constitution of India provides for the formation of Ward Committees in Municipal areas.

• According to Article 243S, Ward Committees are mandatory for municipalities with a population of 3 lakh or more.

• These committees are formed to ensure local representation and to facilitate decentralized decision-making at the ward level. Hence, the statement is correct.

• Ward Committees consist of members elected from the wards within the jurisdiction of the municipality and aim to represent the interests of the residents of those wards.

• The Chairperson of the municipality is also a member of the Ward Committee, providing a link between municipal governance and local governance.

• Article 243S emphasizes the importance of inclusive governance and ensures that the needs and concerns of smaller

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communities within municipal boundaries are addressed effectively.

• It is part of the 74th Constitutional Amendment Act, 1992, which aimed to strengthen urban local bodies in India. Hence, the correct answer is Article 243S.

Additional Information

• 74th Constitutional Amendment Act:

• The 74th Amendment introduced provisions for urban local governance, including the formation of municipalities and Ward Committees.

• It aims to provide a framework for decentralized governance and ensure grassroots democracy in urban areas.

• Ward Committees:

• These are formed at the ward level to address local issues such as sanitation, water supply, waste management, and public infrastructure.

• They act as an interface between citizens and the municipal administration, ensuring better service delivery and representation.

• Example: Ward Committees in cities like Bangalore and Mumbai play a critical role in urban governance.

• Population Criteria:

• Ward Committees are mandatory for municipalities with a population of 3 lakh or more, ensuring their relevance in densely populated urban areas.

• In smaller municipalities, similar mechanisms may exist but are not mandated by Article 243S.

Important Points

• Decentralized Governance:

• Ward Committees are an essential part of decentralized governance, enabling citizen participation in decision-making processes.

• They improve the efficiency of municipal governance by addressing local needs more effectively.

• Challenges in Implementation:

• In many cities, Ward Committees face challenges such as lack of funding, inadequate powers, and bureaucratic hurdles.

• Strengthening the role and functions of Ward Committees can significantly improve urban governance and service delivery.

Q9. Answer: (a) Birsa Munda.

The correct answer is Birsa Munda.

Key Points

• Birsa Munda was a prominent tribal freedom fighter and religious leader of the Munda tribe in the late 19th century.

• He was considered by his followers as an incarnation of God and referred to as Dharti Aba (Father of the Earth).

• Birsa Munda led the Munda Rebellion (Ulgulan) against British colonial rule and exploitative practices by landlords.

• He advocated for tribal rights, cultural revival, and socio-economic reforms among the indigenous communities.

• His movement aimed to establish tribal sovereignty over their ancestral land and resist exploitation.

Additional Information

• Munda Rebellion: Also known as the Ulgulan, it was a significant tribal revolt against British imperialism and feudal exploitation in the Chotanagpur region.

• Dharti Aba Title: This title reflects the reverence of Birsa Munda as a protector of the tribal land and culture.

• Religious Reform: Birsa Munda founded a new faith called Birsait, which rejected superstitions and aimed to purify tribal practices.

• Legacy: Birsa Munda is remembered as a national hero, and his birth anniversary (15th November) is celebrated as Jharkhand Foundation Day.

• Contribution: His efforts significantly contributed to the tribal movements against colonial exploitation, inspiring future struggles for indigenous rights.

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Q10. Answer: (c) Part IV-A

The correct answer is Part IV-A.

Key Points

• Fundamental duties are listed in Part IV-A of the Indian Constitution.

• These duties were added by the 42nd Amendment Act in 1976.

• Article 51A of the Constitution specifies the list of Fundamental Duties.

• Originally, ten Fundamental Duties were included, and an eleventh duty was added by the 86th Amendment in 2002.

• These duties are moral obligations for all citizens to help promote a spirit of patriotism and to uphold the unity of India.

Additional Information

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• 42nd Amendment Act, 1976

• Known as the "Mini-Constitution" due to its extensive changes to the Constitution.

• Added the Fundamental Duties in Part IV-A.

• Strengthened the power of the central government.

• Article 51A

• Lists the Fundamental Duties of citizens.

• Includes duties like respecting the National Flag and the Constitution, cherishing noble ideals of the freedom struggle, and promoting harmony.

• 86th Amendment Act, 2002

• Added the 11th Fundamental Duty.

• The 11th duty emphasizes providing opportunities for education to children aged 6 to 14 years.

• Directive Principles of State Policy

• Listed in Part IV of the Constitution.

• These principles aim to create social and economic conditions under which citizens can lead a good life.

Q11. Answer: (b) Article 24

The correct answer is Article 24.

Key Points

• Article 24 of the Constitution of India prohibits the employment of children below the age of 14 years in any factory, mine, or engagement in any other hazardous occupation. This article is a critical component of the Right against Exploitation, ensuring that children are protected from labor that could harm their physical or mental health. Hence, the correct answer is Article 24.

• Article 23 prohibits human trafficking, begar (forced labor), and other similar forms of forced labor. While it is also a part of the Right against Exploitation, it primarily addresses the exploitation of adults and the general practice of slavery or forced servitude. Hence, statement 1 is incorrect.

• Article 25 provides for the freedom of conscience and the right to freely profess, practice, and propagate religion. It is categorized under the Right to Freedom of Religion and does not pertain to labor or employment regulations. Hence, statement 3 is incorrect.

• Article 26 deals with the freedom to manage religious affairs, allowing religious denominations to establish institutions and manage their own matters in religion. It has no direct relation to the prohibition of child labor in industrial settings. Hence, statement 4 is incorrect.

• The Fundamental Rights in the Indian Constitution are enshrined in Part III, spanning from Article 12 to 35. The specific protection against exploitation through child labor is an absolute right in hazardous industries to safeguard the future of the nation.

Additional Information

• Child Labour (Prohibition and Regulation) Act, 1986: This was the primary legislation enacted to give effect to Article 24. It listed specific occupations and processes where child labor was strictly prohibited.

• 2016 Amendment Act: The Child Labour (Prohibition and Regulation) Amendment Act, 2016, brought significant changes. it completely prohibited the employment of children below 14 years in all occupations and processes. It also introduced the term adolescent for those aged 14 to 18 years and prohibited their employment in hazardous occupations.

• Article 21A: This article, added by the 86th Constitutional Amendment Act, 2002, provides for free and compulsory education to all children of the age of 6 to 14 years. This provision works in tandem with Article 24 to ensure that children are in schools rather than workplaces.

• Directive Principles of State Policy (DPSP): Article 39(e) and Article 39(f) of the Constitution direct the State to ensure that children are not abused and are given opportunities to develop in a healthy manner and in conditions of freedom and dignity.

• International Commitment: India ratified the International Labour Organization (ILO) Convention No. 138 (Minimum Age) and Convention No. 182 (Worst Forms of Child Labour) in June 2017, aligning its domestic laws with global standards.

Important Points

• M.C. Mehta vs. State of Tamil Nadu (1996): This landmark Supreme Court judgment led to the creation of the Child Labour Rehabilitation Welfare Fund. The court ordered that the offending employer must pay a fine of Rs. 20,000 for every child employed in contravention of the law.

• PENCIL Portal: Launched in September 2017, the Platform for Effective Enforcement for No Child Labour (PENCIL) is an electronic portal that connects the Central Government, State Government, District, and Project Societies to ensure the effective implementation of the National Child Labour Project (NCLP).

• Kailash Satyarthi: A prominent Indian social reformer and Nobel Peace Prize winner (2014) who founded the Bachpan Bachao Andolan in 1980. His work has been instrumental in the rescue of thousands of children from bonded labor and trafficking.

• Gurupadaswamy Committee (1979): This was the first committee to study the issue of child labor in India in detail. Its recommendations led to the enactment of the Child Labour (Prohibition and Regulation) Act in 1986.

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Q12. Answer: (c) Yamuna

The correct answer is the Yamuna.

• Delhi is situated at the bank of Yamuna river.

• Yamuna is the second-largest tributary river of the Ganga and the longest tributary in India.

• Originating from the Yamunotri Glacier.

• It flows in Yamuna Nagar, Delhi, Agra, Prayagraj, Mathura, Noida, Etawah, Firozabad, Kalpi, Baghpat, Hamirpur.

Key Points

List of important cities of India located on river banks:

Name of the city	Name of the river
Amravati	Krishna
Patna	Ganga
Ahemdabad	Sabarmati
Surat	Tapi
Srinagar	Jhelum
Ujjain	Shipra
Nashik	Godavari
Kota	Chambal
Agra	Yamuna
Ayodhya	Sarayu
Varanasi	Ganga
Kolkata	Hooghly

Q13. Answer: (b) Morarji Desai National Institute of Yoga (MDNIY)

The correct answer is Morarji Desai National Institute of Yoga (MDNIY).

In News

• The Morarji Desai National Institute of Yoga (MDNIY), under the Ministry of Ayush, is organizing Yoga Mahotsav-2026 at Vigyan Bhawan, New Delhi.

Key Points

• 100-Day Countdown: The event marks the start of the countdown to the 12th International Day of Yoga (IDY), which will be celebrated on June 21, 2026.

• Mass Outreach: A campaign has been launched where 100 organizations will promote Yoga across 100 cities/places in India.

• Iconic Locations: The Ministry of Ayush plans to observe IDY 2026 at 100 iconic locations across the country to boost tourism and heritage awareness.

• Objective: The Mahotsav serves as a strategic phase to encourage global public participation and highlight Yoga's role in holistic well-being.

Additional Information

• International Day of Yoga (IDY)

• The idea was first proposed by Prime Minister Narendra Modi at the UN General Assembly in 2014. The first IDY was observed on June 21, 2015.

• MDNIY

• Located in New Delhi, it is an autonomous organization under the Ministry of Ayush and acts as a focal point for Yoga education, training, and research.

• Summer Solstice

• June 21 is the longest day of the year in the Northern Hemisphere and holds special significance in many parts of the world, which is why it was chosen for IDY.

Q14. Answer: (d) 5,846 km

The correct answer is 5,846 km.

Key Points

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• The Golden Quadrilateral (GQ) is a highway network connecting major industrial, agricultural, and cultural centers of India.
• The total length of the Golden Quadrilateral is approximately 5,846 kilometers.
• It links four major cities: Delhi, Mumbai, Chennai, and Kolkata.
• This project was launched by the Government of India in 2001 and completed in 2012.
• The GQ is a part of the National Highways Development Project (NHDP) and has significantly improved the transportation infrastructure in India.

Additional Information

• National Highways Development Project (NHDP)
• The NHDP is a project to upgrade, rehabilitate, and widen major highways in India to international standards.
• It includes seven phases aimed at improving connectivity and infrastructure across the country.
• The Golden Quadrilateral was part of Phase I of NHDP.
• Other key projects under NHDP include the North-South and East-West Corridors.
• Benefits of the Golden Quadrilateral
• Enhanced connectivity between major cities, boosting trade and commerce.
• Reduction in travel time and fuel consumption.
• Improved safety and reduction in accident rates due to better road conditions.
• Promotion of tourism and economic development in regions along the route.
• Key Features of the GQ
• Four-lane and six-lane highways designed for high-speed traffic.
• Constructed using modern engineering techniques and materials.
• Equipped with facilities like rest areas, service stations, and toll plazas.
• Regular maintenance and monitoring to ensure road quality and safety.
• Future Developments
• Plans to further expand and upgrade the GQ to accommodate increasing traffic.
• Integration with other highway networks to form a comprehensive transportation grid.
• Introduction of smart technologies for traffic management and monitoring.
• Continued focus on improving road safety and reducing environmental impact.

Q15. Answer: (a) Maharashtra

The correct answer is option 1.

• Lavani is a folk dance of Maharashtra.
• Women wearing ankle bells (Ghungroo) and 9 yards saree perform this dance on dholak beats.

State	Folk Dances
Maharashtra	Lavani, Koli, Dindi, Dhangari Gaja and Tamasha.
Jharkhand	Jhumair, Domkach, Paika, Chhau.
Gujarat	Dandiya, Garba, Bhavai.
Rajasthan	Ghoomar, Kachchighori, Tejaji.

Q16. Answer: (b) Bakelite

The correct answer is Bakelite.

• Bakelite is a thermosetting plastic.

Key Points

• Thermosetting plastics:
• These are the polymers which when condensed have a permanent change on heating.
• On heating they undergo extensive cross-linking in molds and become hard and infusible; therefore, they cannot be reused.
• Its examples are Bakelite, glyptal.
• Bakelite (Phenol-formaldehyde resin):
• It is a condensation polymer.
• It is obtained from phenol and formaldehyde in presence of either an acid or a base catalyst.
• It is used in making combs, fountain pens, photographs, records, electrical goods, etc.

• It was invented by Leo H Baekeland.

Additional Information

• Poly Vinyl Chloride(PVC) is a synthetic plastic polymer.

• • Polyester is a polymer of the ester functional group.

• There are two kinds of polyesters that each lead to thermoplastic or thermosetting products. The difference between the two kinds of polyester is their chemical structures.

Q17. Answer: (b) Nitrate

The correct answer is option 2 i.e. Nitrate

• Nitrogen in water is commonly found in the form of Nitrate.

• The main source of nitrogen compounds in water is fertilizer.

• Fertilizers mainly contain nitrate, it also contains ammonia, ammonium, urea, and amines

• Some fertilizers also contain certain "micronutrients".

• Micronutrients are necessary for plant growth, such as zinc and other metals.

• Nitric oxide is a colorless gas.

• Nitric oxide has an unpaired electron(so it is called free radical).

Q18. Answer: (b) High Resistance in series

The correct answer is High Resistance in series.

• A Galvanometer is an electromechanical measuring instrument for electric current.

Key Points

• On the other hand, the voltmeter is an instrument used for measuring the electric potential difference between two points in an electric circuit.

• A galvanometer can be converted into a voltmeter by connecting high resistance (R) in series with the coil of the galvanometer.

• The scale is calculated in volt and the value of the resistance connected in series decides the range of the voltmeter.

Q19. Answer: (d) Kilogram

The correct answer is Kilogram.

Key Points

• Water Equivalent:

• It is defined as the mass of water which would absorb or evolve the same amount of heat as is done by the body in rising or falling through the same range of temperature.

• It is the quantity of water whose thermal capacity is the same as the heat capacity of the body.

• Its SI unit is Kilogram (Kg) and the dimensional formula is [$M^1L^0T^0$].

• It is represented by W.

• The product of the mass (m) of a substance by its specific heat equals numerically to the mass of water (W) that is equivalent in thermal capacity to the substance

• W = mass x specific heat

Additional Information

• A liquid in equilibrium with vapour has the same pressure and temperature throughout the system.

• Heat transfer always involves temperature difference between two systems or two parts of the same system.

• Any energy transfer that does not involve temperature difference in some way is not heat.

Q20. Answer: (a) Centripetal force

The correct answer is Centripetal force.

Key Points

• Centripetal force is the force that acts towards the center of a circular path and is necessary for an object to move in a circular motion.

• When a stone is tied to a string and rotated in a circle, the tension in the string provides the centripetal force.

• The centripetal force is responsible for continuously changing the direction of the stone’s velocity, ensuring circular motion. Hence, statement is correct.

• Without centripetal force, the stone would move tangentially in a straight line due to inertia, as per Newton's First Law of Motion.

• The centripetal force does not cause the object to accelerate towards the center; it merely changes the direction of the velocity vector, maintaining circular motion.

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• The magnitude of centripetal force can be calculated using the formula: $F = (mv^2)/r$, where m is the mass of the object, v is the velocity, and r is the radius of the circle.

• Hence, the correct answer is Centripetal force.

Additional Information

• Centripetal Force:

• Centripetal force is directed towards the center of the circular path and is essential for circular motion.

• Examples include: gravitational force keeping planets in orbit, tension in a string when rotating a stone, and frictional force enabling a car to turn on a curved road.

• Centrifugal Force:

• It is a fictitious force that appears to act outwardly on an object moving in a circle, experienced in a rotating reference frame.

• Example: When a car takes a sharp turn, passengers feel they are pushed outward, which is the effect of centrifugal force.

• Other Forces (Incorrect Options):

• Frictional force: Acts parallel to the surface and opposes motion. It is not responsible for circular motion in this case.

• Gravitational force: Acts between masses and is responsible for phenomena like planetary motion but not the circular motion of a stone tied to a string.

Important Points

• Newton's Laws of Motion:

• Circular motion requires a net inward force to continuously change the direction of motion. This is explained by Newton's First Law.

• The absence of centripetal force will result in the object moving tangentially due to inertia.

• Applications of Centripetal Force:

• Used in designing roller coasters, ensuring cars stay on curved paths in racing tracks, and satellites maintain their orbits.

• Important for understanding physical systems like planetary orbits, electron motion in circular accelerators, and spinning objects like centrifuges.

Q21. Answer: (b) Blue-green algae

The correct answer is Blue-green algae.

Key Points

• Blue-green algae, also known as cyanobacteria, reproduce asexually through a process called binary fission. This is a simple and efficient method of reproduction where a single cell divides into two identical daughter cells.

• In fission, the genetic material (DNA) of the parent cell is copied, and the cell divides into two, ensuring that both daughter cells are genetically identical to the parent cell.

• Cyanobacteria are prokaryotic organisms, meaning they lack a defined nucleus and other membrane-bound organelles, which facilitates their simpler mode of reproduction.

• These organisms are found in diverse environments, including freshwater, marine, and terrestrial ecosystems. They play a crucial role in ecosystems by contributing to nitrogen fixation and oxygen production.

• Unlike seed plants and flowering plants, which reproduce sexually, blue-green algae rely on asexual reproduction for their propagation. Hence, the correct answer is Blue-green algae.

Additional Information

• Asexual Reproduction:

• Asexual reproduction is a mode of reproduction where offspring are produced from a single organism, and there is no involvement of gametes or sexual processes.

• It is commonly observed in prokaryotes like bacteria and archaea, as well as in some eukaryotic organisms like fungi, algae, and certain plants and animals.

• Common methods of asexual reproduction include binary fission, budding, fragmentation, and spore formation.

• Characteristics of Blue-Green Algae (Cyanobacteria):

• Cyanobacteria are a group of photosynthetic prokaryotes capable of oxygenic photosynthesis, meaning they release oxygen as a byproduct.

• They are considered one of the earliest life forms on Earth and have played a significant role in shaping the planet's atmosphere.

• Examples include Oscillatoria, Anabaena, and Nostoc.

• Some cyanobacteria can fix atmospheric nitrogen into a usable form, which is essential for nutrient cycling in ecosystems.

• Why Other Options Are Incorrect:

• All seed plants: Seed plants reproduce sexually through the formation of seeds, which involve the fusion of gametes. Asexual reproduction is not a characteristic of all seed plants.

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• Flowering plants: These plants primarily reproduce sexually through flowers, which are specialized structures for sexual reproduction.

• All plants: While some plants (like algae or mosses) reproduce asexually, not all plants rely on this mode of reproduction. Most higher plants reproduce sexually.

• Importance of Cyanobacteria:

• They are crucial in aquatic and terrestrial ecosystems as primary producers.

• Cyanobacteria contribute significantly to the global nitrogen cycle and are used in biofertilizers to enhance soil fertility.

• They are also studied for their potential in biofuel production and other biotechnological applications.

Important Points

• Binary Fission:

• This is the most common form of asexual reproduction in unicellular organisms.

• It involves the replication of the genetic material, followed by the division of the parent cell into two identical cells.

• Binary fission is rapid and allows for exponential population growth under favorable conditions.

• Differences Between Asexual and Sexual Reproduction:

• Asexual reproduction: Involves a single parent, produces genetically identical offspring, and is faster but lacks genetic diversity.

• Sexual reproduction: Involves two parents, produces genetically diverse offspring, and is slower but enhances adaptability and evolution.

• Ecological Significance of Cyanobacteria:

• Cyanobacteria are crucial in maintaining the balance of oxygen and nutrients in aquatic ecosystems.

• They form symbiotic relationships with plants and fungi, aiding in nutrient exchange and ecosystem stability.

Q22. Answer: (c) Whose focal length is 1 metre

1 dioptre is SI unit of the power of a lens whose focal length is 1 metre. It is denoted by the letter D. Thus 1 D = 1 m^(-1).

Q23. Answer: (a) Frequency remains unchanged, but wavelength varies

The correct answer is Frequency remains unchanged, but wavelength varies.

Key Points

• When sound passes from air to water, its frequency remains unchanged because the frequency of a wave is determined by its source and does not depend on the medium.

• The speed of sound increases significantly in water compared to air due to the higher density and elasticity of water.

• The wavelength of the sound wave changes because wavelength is directly proportional to the speed of sound in the medium (wavelength = speed/frequency).

• In water, due to the increased speed of sound, the wavelength becomes longer compared to its value in air.

• This phenomenon adheres to the principle of wave mechanics, where the product of frequency and wavelength equals the speed of the wave.

Additional Information

• Behavior of Sound Waves in Different Media

• Sound is a mechanical wave that requires a medium to propagate and travels as a longitudinal wave.

• The speed of sound depends on the medium's density and elasticity. It travels faster in solids, slower in liquids, and slowest in gases.

• The relationship between speed, frequency, and wavelength is given by the equation: speed = frequency × wavelength.

• The change in speed and wavelength occurs to maintain the same frequency as the wave moves from one medium to another.

Q24. Answer: (c) Velocity

The correct answer is Velocity.

Key Points

• Acceleration is defined as the rate of change of velocity with respect to time. It is a vector quantity, meaning it has both magnitude and direction.

• The formula for acceleration is: a = (v - u)/t, where:

• v = Final velocity.

• u = Initial velocity.

• t = Time taken for the velocity change.

• Acceleration can be positive, negative, or zero:

• Positive acceleration: When velocity increases over time.

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• Negative acceleration: When velocity decreases over time, also called deceleration.
• Zero acceleration: When velocity remains constant.
• Units of acceleration are m/s² in the SI system.
• Acceleration is observed in scenarios such as a car speeding up, a ball slowing down after being thrown, or gravitational acceleration due to Earth's pull.

Additional Information

• Momentum:
• Momentum is the product of mass and velocity (p = m × v).
• It is a vector quantity with units of kg·m/s.
• Momentum remains conserved in an isolated system (Law of Conservation of Momentum).
• Displacement:
• Displacement is the shortest straight-line distance between the initial and final positions of an object.
• It is a vector quantity with units of meters (m).
• Displacement differs from distance as it considers direction.
• Position:
• Position refers to the location of an object in a given reference frame.
• It is typically described using a coordinate system (e.g., x, y, z axes in space).
• Gravitational Acceleration:
• The Earth's gravitational acceleration is approximately 9.8 m/s².
• It affects all objects near the Earth's surface, pulling them downward.

Important Points

• Newton's Second Law of Motion:
• States that the force acting on an object is equal to the mass of the object multiplied by its acceleration (F = m × a).
• This law directly relates acceleration to the net force applied to an object.
• Applications of Acceleration:
• Acceleration is critical in understanding vehicle dynamics, projectile motion, and satellite movements.
• It is widely used in engineering, physics, and space exploration.

Q25. Answer: (c) Tongue

The correct answer is Tongue.

Key Points

• The gustatory receptors which detect taste are present in the tongue.
• Gustatory receptors
• It is present on the tongue and is spread evenly across the taste buds.
• Their main function is to provide a sense of taste.
• Gustatory receptors are found in the tongue.
• The gustatory system is much easier than the olfactory system.
• Four primary taste varieties are generally recognized as sweet, sour, salty, and bitter.
• In different regions on the tongue are present different sensitivities to the four taste varieties.
• The tip of the tongue is the most sensitive to sweetness and saltiness.

Additional Information

• Receptors are the organs or cells which respond to light, heat, or external stimulus and transmit the signal to the sensory nerve.
• Olfactory receptors
• It is present on the surface of the olfactory neurons.
• Their main function is to sense smell.
• These receptors equip sperm cells for finding the egg through a sense of smell.
• Sensory receptors occur in specialized organs such as the eyes, ears, nose, and mouth, as well as internal organs.

Q26. Answer: (b) Magnesium hydroxide

The correct answer is Magnesium hydroxide.

Key Points

• Magnesium hydroxide is commonly used as an antacid to neutralize stomach acid and relieve indigestion and heartburn.

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• It is often referred to as "milk of magnesia" due to its milky appearance.

• Magnesium hydroxide works by neutralizing hydrochloric acid in the stomach, thereby increasing the pH level and reducing acidity.

• It is also used as a laxative to relieve constipation by drawing water into the intestines and promoting bowel movements.

Additional Information

• Antacids:

• Antacids are substances that neutralize stomach acidity and are used to relieve heartburn, indigestion, or an upset stomach.

• Common active ingredients include magnesium hydroxide, aluminum hydroxide, calcium carbonate, and sodium bicarbonate.

• Antacids provide quick relief from symptoms but do not heal the underlying cause of acid-related conditions.

• Mechanism of Action:

• Antacids work by neutralizing the excess hydrochloric acid in the stomach, which increases the pH level and reduces acidity.

• This action provides relief from pain and discomfort caused by acid reflux and indigestion.

• Other Uses of Magnesium Hydroxide:

• Besides being an antacid, magnesium hydroxide is also used as a laxative to treat constipation.

• It works by drawing water into the intestines, which helps to soften stools and stimulate bowel movements.

• Safety and Side Effects:

• Common side effects of magnesium hydroxide include diarrhea, cramping, and an imbalance in electrolytes if used excessively.

• Patients with kidney disease should use magnesium hydroxide with caution due to the risk of magnesium accumulation.

Q27. Answer: (b) Non-Contact Force

The correct answer is Non-Contact Force.

Key Points

• Magnetic force is a type of non-contact force. This means that it does not require any physical contact between the magnets to exert a force.

• Forces like gravitational, electrostatic, and magnetic forces can act at a distance, meaning objects do not need to touch for the force to be exerted. This is the fundamental characteristic of a non-contact force.

• When a magnet exerts force on another magnet, it is not dependent on direct physical contact but rather on the magnetic field created by the magnets. Hence, the correct answer is Non-Contact Force.

• Contact forces, such as friction or tension, require physical contact between objects. Since magnets can attract or repel without touching each other, magnetic force is not a contact force.

• Unlike gravitational or electrostatic forces, which act between objects due to their mass or electric charge, magnetic force specifically arises due to the motion of electric charges within the material creating a magnetic field.

Additional Information

• Contact Force:

• Contact forces arise when two objects come into physical contact. Examples include frictional force, tension force, and normal force. These forces act only when objects are in direct physical connection.

• For example, when you push a table, you are applying a contact force.

• Non-Contact Force:

• A non-contact force acts on an object without any physical contact. Examples include gravitational, electrostatic, and magnetic forces.

• For instance, the Earth's gravitational force pulls objects toward its center without needing direct contact.

• Magnetic Force:

• The force between magnets or between a magnet and a magnetic material is known as magnetic force. It is a type of non-contact force.

• This force is due to the interaction of magnetic fields produced by moving charges or the alignment of magnetic domains in materials like iron, nickel, and cobalt.

• Examples include the force between the poles of two magnets or the attraction of a magnet to a metallic object like a nail.

• Electrostatic Force:

• Electrostatic force is another type of non-contact force. It acts between charged particles or objects and is governed by Coulomb's law.

• For example, when you rub a balloon on your hair, the balloon becomes charged and can attract small pieces of paper without touching them.

• Gravitational Force:

• Gravitational force is the force of attraction between two masses. It is the weakest of the fundamental forces but operates over

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long distances.

• For example, the force that keeps planets in orbit around the Sun or objects falling toward the Earth is due to gravity.

Important Points

• Difference Between Contact and Non-Contact Forces:

• Contact forces require physical interaction, such as friction, while non-contact forces act through fields (e.g., gravitational, magnetic).

• Non-contact forces can act over a distance, whereas contact forces act only when objects are in direct contact.

• Examples of Non-Contact Forces:

• The Earth's gravity pulling objects downward.

• Magnets attracting or repelling each other without touching.

• Electrostatic forces causing charged objects to attract or repel each other.

Q28. Answer: (b) RNA and Protein

Key Points

Explanation:

• Ribosomes are known as protein factories because they are the main site of protein synthesis. The molecule of RNA which is a component of the ribosome organelle is called ribosomal RNA.

• Ribosomes are composed of ribonucleic acids and proteins.

• It is made up of two subunits-

• Large subunits- join amino acids to form a polypeptide chain.

• Small subunits- reads RNA.

So, each subunit is made up of one or more of ribosomal RNA and ribosomal proteins.

Q29. Answer: (a) propane

CONCEPT:

Homologous Series of Alkanes

• A homologous series is a group of organic compounds that have the same general formula, similar chemical properties, and successive members differing by a CH2 group.

• Alkanes are saturated hydrocarbons with the general formula C_nH_(2n+2).

• The members of the homologous series of alkanes include methane (CH4), ethane (C2H6), propane (C3H8), butane (C4H10), pentane (C5H12), and so on.

EXPLANATION:

• The first member of the homologous series of alkane is methane (CH4).

• The second member is ethane (C2H6).

• The third member of this series is propane (C3H8).

• Each successive member of the series is formed by adding a CH2 group to the previous member.

Therefore, the third member of the homologous series of alkane is propane.

Q30. Answer: (b) Kaleidoscope

The correct answer is

Key Points

• Total Internal Reflection:

• It is the phenomenon that occurs when the light rays travel from a more optically denser medium to a less optically denser medium.

• Following are the two conditions of total internal reflection:

• The light ray moves from a more dense medium to a less dense medium.

• The angle of incidence must be greater than the critical angle.

• Examples of Total Internal Reflection:

• Diamond Sparkle

• Transmission of light rays in Optical Fibres

• Mirages in Deserts

• Kaleidoscope:

• The phenomenon is popularly known as the 22-degree circular halo of the sun or occasionally the Moon (also called a moon ring or winter halo), occurs when the sun’s or moon’s rays get deflected/refracted through the hexagonal ice crystals present in cirrus

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clouds. Hence, Kaleidoscope does not involve total internal reflection.

Q31. Answer: (b) 56 percent

Given

Numerator: 840

Denominator: 1500

Concept:

Percentage calculation: (numerator/denominator) × 100

Calculation:

Percentage => (840/1500) × 100 = 56%

Therefore, 840 is 56 percent of 1500

Q32. Answer: (b) 8/3 days

Given:

A can do a work in 6 days, B can do the same work in 8 days

And C can do the same work in 12 days

Formula Used:

Efficiency prop. to 1/Time taken

Calculation:

The efficiency of A = 1/6 per day

The efficiency of B = 1/8 per day

The efficiency of C = 1/12 per day

A, B, C can do the same work in = (1/6 + 1/8 + 1/12)

=> (4 + 3 + 2)/24 = 9/24

Therefore Time taken to complete work is 8/3 days.

Q33. Answer: (c) Rs. 90000

Given:

Current Value = Rs. 72000,

Depreciation = 20%

Concept:

Original Price = Current Value/(1 - Depreciation)

Solution:

=> Original Price = 72000/(1 - 0.20)

=> Original Price = Rs. 90000

Therefore, the original price was Rs. 90000.

Q34. Answer: (b) 44

The correct answer is 44

Shortcut Trick

Value of middle term B = (Sum of A & B) + (Sum of B & C) − (Sum of A, B & C)

Sum of A & B = 45 × 2 = 90

Sum of B & C = 49 × 2 = 98

Sum of A, B & C = 48 × 3 = 144

Therefore B = 90 + 98 − 144 = 188 − 144 = 44

Therefore The correct answer is 44.

Alternate Method

Given:

=> Average of A, B, and C = 48

=> Average of A and B = 45

=> Average of B and C = 49

Formula Used:

Sum of observations = Average × Number of observations

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Calculations:

=> A + B + C = 48 × 3 = 144 --- (i)

=> A + B = 45 × 2 = 90 --- (ii)

=> B + C = 49 × 2 = 98 --- (iii)

=> Subtracting (ii) from (i): C = 144 − 90 = 54

=> Substituting C in (iii): B + 54 = 98

=> B = 98 − 54 = 44

Therefore The correct answer is 44.

Additional Information

Average Concept

Average is the central value of a set of data, calculated as Sum ÷ Count.

Net Deviation Method

The sum of deviations of all observations from their mean is always zero.

Weighted Average

Combined average of two groups = (n1x1 + n2x2) ÷ (n1 + n2).

Q35. Answer: (c) 1

Given:

tan 45°

Formula Used:

tan θ = sin θ / cos θ

Calculation:

=> tan 45° = sin 45° / cos 45°

=> sin 45° = cos 45° = √2 / 2

=> tan 45° = (√2 / 2) / (√2 / 2)

=> tan 45° = 1

Therefore The correct answer is 1.

Q36. Answer: (b) 455

Shortcut Trick

Identify the numbers as multiples of 13: 13×1, 13×5, and 13×7.

The LCM must contain the common factor 13 and all unique prime factors 5 and 7.

LCM = 13 × 5 × 7 = 65 × 7 = 455.

Therefore The correct answer is 455.

Alternate Method

Given: Numbers are 13, 65, and 91.

Formula Used: Prime Factorization Method.

=> Prime factorization of 13 = 13^1

=> Prime factorization of 65 = $5^1 \times 13^1$

=> Prime factorization of 91 = $7^1 \times 13^1$

=> LCM = Product of highest powers of all prime factors = $13^1 \times 5^1 \times 7^1$

=> LCM = 13 × 35 = 455

Therefore The correct answer is 455.

Additional Information

LCM and HCF Relationship

For two numbers a and b, the product of the numbers is equal to the product of their LCM and HCF: a × b = LCM(a, b) × HCF(a, b).

HCF of 13, 65, 91

The Highest Common Factor is the largest number that divides all given numbers. Here, HCF = 13.

Co-prime Numbers

If the HCF of two numbers is 1, they are called co-prime, and their LCM is simply their product.

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Q37. Answer: (b) 581

Follow BODMAS rule to solve this question, as per the order given below,

Step-1-Parts of an equation enclosed in 'Brackets' must be solved first,

Step-2-Any mathematical 'Of' or 'Exponent' must be solved next,

Step-3-Next, the parts of the equation that contains 'Division' and 'Multiplication' are calculated,

Step-4-Last but not least, the parts of the equation that contains 'Addition' and 'Subtraction' should be calculated.

Given expression:

572 + 38 × 0.5 = ? + 10

=> ? + 10 = 572 + 19

=> ? = 591 – 10

=> ? = 581

Hence, the required number in place of question mark is 581.

Q38. Answer: (d) 62°

Given:

Two angles of a triangle = 37º and 81º

Formula used:

Sum of angles in a triangle = 180º

Third angle = 180º - (Angle 1 + Angle 2)

Calculation:

Third angle = 180º - (37º + 81º)

=> Third angle = 180º - 118º

=> Third angle = 62º

Therefore The correct answer is option (4).

Q39. Answer: (c) 1156

Shortcut Trick

To find the square of 34, use the $(a+b)^2$ method where a=3 and b=4.

Step 1: Square of 4 = 16 (Write 6, Carry 1)

Step 2: 2 × 3 × 4 = 24 + 1 (carry) = 25 (Write 5, Carry 2)

Step 3: Square of 3 = 9 + 2 (carry) = 11

Result = 1156

Therefore The correct answer is 1156.

Alternate Method

Given: Number = 34

Formula Used: Square of a number x = x × x

=> $34^2 = 34 \times 34$

=> 34 × (30 + 4)

=> (34 × 30) + (34 × 4)

=> 1020 + 136

=> 1156

Therefore The correct answer is 1156.

Additional Information

Square of numbers ending in 5

For a number n5, the square is [n × (n+1)] followed by 25. Example: $35^2 = (3\times4)25 = 1225$.

BODMAS Rule

Always follow the order: Brackets, Orders (powers/roots), Division, Multiplication, Addition, Subtraction.

Algebraic Identity

$(a + b)^2 = a^2 + 2ab + b^2$ can be used to calculate squares of any two-digit number.

Q40. Answer: (b) 2.5 m/s

Shortcut Trick

To convert speed from km/hr to m/s, directly multiply the given value by 5/18.

Speed in m/s = 9 × 5/18

Speed = 5/2 = 2.5 m/s

Therefore The correct answer is 2.5 m/s.

Alternate Method

Given:

Speed = 9 km/hr

Formula Used:

1 kilometre (km) = 1000 metres (m)

1 hour (hr) = 60 minutes = 3600 seconds (s)

Speed = Distance ÷ Time

Calculations:

=> Distance covered in 1 hour = 9 km

=> Convert distance to metres: 9 km = 9 × 1000 = 9000 m

=> Convert time to seconds: 1 hr = 1 × 60 × 60 = 3600 s

=> Speed in m/s = Total Distance in metres ÷ Total Time in seconds

=> Speed = 9000 ÷ 3600

=> Speed = 90 ÷ 36 = 2.5 m/s

Therefore The correct answer is 2.5 m/s.

Additional Information

Conversion from m/s to km/hr

To convert speed from m/s to km/hr, multiply the given value by 18/5.

Average Speed

Average Speed = Total Distance Travelled ÷ Total Time Taken. If two equal distances are covered at speeds S1 and S2, then Average Speed = (2 × S1 × S2) ÷ (S1 + S2).

Relative Speed

When two bodies move in the same direction, relative speed = |S1 − S2|. When moving in opposite directions towards each other, relative speed = S1 + S2.

Q41. Answer: (d) 5,235

Shortcut Trick

Effective rate of Simple Interest for 5 years = 4% × 5 = 20%.

We know that 20% of the Principal = Rs. 1,047

Principal = 1047 × (100 ÷ 20)

Principal = 1047 × 5 = 5235

Therefore The correct answer is Rs. 5,235.

Alternate Method

Given:

Simple Interest (SI) = Rs. 1,047

Time (T) = 5 years

Rate of Interest (R) = 4% per annum

Formula Used:

Simple Interest = (P × R × T) ÷ 100

Calculation:

=> 1047 = (P × 4 × 5) ÷ 100

=> 1047 = (P × 20) ÷ 100

=> 1047 = P ÷ 5

=> P = 1047 × 5

=> P = 5235

Therefore The correct answer is Rs. 5,235.

Additional Information

Compound Interest (CI) Formula

Amount = P(1 + R/100)^T. CI is calculated on the initial principal and also on the accumulated interest of previous periods.

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Difference between CI and SI for 2 Years

Difference = P × (R/100)². This formula directly gives the extra interest earned due to compounding over 2 years.

Amount in Simple Interest

Total Amount = Principal + Simple Interest = P[1 + (R × T)/100].

Q42. Answer: (c) Rs. 2212

Shortcut Trick

Profit = 12% => Multiplier for Selling Price (SP) = (100 + 12) ÷ 100 = 1.12

SP = Cost Price (CP) × 1.12

SP = 1975 × 1.12

SP = 1975 × (1 + 0.1 + 0.02) = 1975 + 197.5 + 39.5 = 2212

Therefore The correct answer is Rs. 2212.

Alternate Method

Given: CP = Rs. 1975, Profit% = 12%

Formulas: Profit = (Profit% ÷ 100) × CP | SP = CP + Profit

=> Profit = (12 ÷ 100) × 1975

=> Profit = 0.12 × 1975 = 237

=> SP = 1975 + 237

=> SP = 2212

Therefore The correct answer is Rs. 2212.

Additional Information

Cost Price and Selling Price

The Cost Price is the price at which an item is purchased, while the Selling Price is the price at which it is sold to a customer.

Profit Percentage

Profit% is always calculated on the Cost Price unless stated otherwise. Formula: Profit% = (Profit ÷ CP) × 100.

Q43. Answer: (a) 91

Given:

16 ÷ 4 - 21 + 12 × 9 = ?

Formula used:

Follow BODMAS rule: Brackets, Orders (powers), Division, Multiplication, Addition, Subtraction

Calculation:

16 ÷ 4 - 21 + 12 × 9

=> 4 - 21 + 108

=> 4 + 108 - 21

=> 112 - 21

=> 91

Therefore The correct answer is option (1).

Q44. Answer: (c) 64

Shortcut Trick

The number 4096 lies between the known squares 60² = 3600 and 70² = 4900.

Since the unit digit of 4096 is 6, the unit digit of its square root must be either 4 or 6.

Testing the midpoint: 65² = 4225.

As 4096 < 4225, the square root must be the value smaller than 65, which is 64.

Therefore The correct answer is 64.

Alternate Method

Given: Number = 4096

Formula Used: Square root via Prime Factorization → $\sqrt{x^n} = x^{n/2}$

=> 4096 = 2 × 2048

=> 4096 = 2 × 2 × 1024

=> 4096 = 22 × 210 (since 1024 = 210)

=> 4096 = 212

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=> √4096 = √(212)

=> √4096 = 212/2 = 26

=> 26 = 2 × 2 × 2 × 2 × 2 × 2 = 64

Therefore The correct answer is 64.

Additional Information

Unit Digit Property

If a perfect square ends in 6, its square root will always end in either 4 or 6.

Squaring Numbers Ending in 5

To square a number like A5, multiply A by (A+1) and suffix 25. Example: 652 = (6 × 7)25 = 4225.

Powers of 2

4096 is a significant power in computing, represented as 212. Its square root is 26 (64) and its cube root is 24 (16).

Q45. Answer: (b) 4.5

Shortcut Trick

Convert the mixed fraction directly to a decimal: $2^1/4 = 2.25$

Dividing any number by 0.5 is mathematically equivalent to multiplying that number by 2.

=> 2.25 × 2 = 4.5

Therefore The correct answer is 4.5.

Alternate Method

Given:

Expression: $2^1/4 \div 0.5$

Calculations:

=> Convert the mixed fraction into an improper fraction:

=> $2^1/4 = (2 \times 4 + 1) / 4 = 9/4$

=> Convert the decimal 0.5 into a fraction:

=> 0.5 = 5/10 = 1/2

=> Substitute the fractions into the given expression:

=> 9/4 ÷ 1/2

=> To divide by a fraction, multiply by its reciprocal:

=> 9/4 × 2/1

=> Multiply the numerators and denominators:

=> 18/4

=> Simplify the resulting fraction:

=> 9/2 = 4.5

Therefore The correct answer is 4.5.

Additional Information

Fraction Division Rule

To divide by a fraction, multiply the first number by the reciprocal of the second fraction: (a/b) ÷ (c/d) = (a/b) × (d/c).

Mixed Fraction to Improper Fraction

Multiply the whole number part by the denominator, add the numerator, and place the result over the original denominator.

Decimal to Fraction Conversion

Decimals can be easily converted to fractions by placing the number over its place value (e.g., 0.5 = 5/10 = 1/2, or 0.25 = 25/100 = 1/4).

Q46. Answer: (d) North

When the hour hand points east direction at 6 p.m., we can represent it as follows,

So at 9:15 p.m.

Thus at 9:15 p.m. minute hand faces in the north direction.

Q47. Answer: (b) 66

The logic followed here is:

Logic: a : b → $b = a^2 + 2$

7 : 51 → $7^2 + 2 = 49 + 2 = 51$

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Similarly,

8 : ? → $8^2 + 2 = 64 + 2 = 66$.

Thus, 8 is related to 66.

Hence, the correct answer is "Option 2".

Q48. Answer: (a) 149

The logic followed here is:

So, '149' is the missing number in the given series.

Hence, the correct answer is "Option 1".

Q49. Answer: (c) 36

Formula used:

Total = [{(The rank of A from the top) + (The rank of A from the bottom)} - 1]

Given:

Total = 50

A's rank from the top = 15

50 = [{(15) + (The rank of A from the bottom)} - 1]

The rank of A from the top = (50 -15 + 1) = 51 - 15 = 36

The rank of A from the bottom = 36th

Hence, the correct answer is "36".

Q50. Answer: (c) TRROHEB

The logic followed here is :-

DANIEL : NLIEDA

Similarly,

BROTHER : ?

Hence, the correct answer is "TRROHEB".

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