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**SCIENCE AND  
TECHNOLOGY**

**APPSC GROUP 1  
PAPER II**

**MENTAL  
ABILITY**



# EXPLANATIONS FOR SCIENCE & TECHNOLOGY

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1. Answer (A):

3300-3670MHZ has emerged as the prime spectrum for 5G deployment in India.

2. Answer (C):

It is the first zoo to enter into World association of zoos and Aquariums in 2009

It was established in 1960 in Bhubaneswar, Odisha

It is the first zoo to breed white tiger and melanistic tiger

3. Answer (A)

## Phobos

- Phobos is the innermost and larger of the two natural satellites of Mars, the other being Deimos.
- Both moons were discovered in 1877 by American astronomer Asaph Hall.
- Phobos is a small, irregularly shaped object with a mean radius of 11 km (7 mi).
- Phobos orbits 6,000 km (3,700 mi) from the Martian surface, closer to its primary body than any other known planetary moon.
- It is so close that it orbits Mars much faster than Mars rotates, and completes an orbit in just 7 hours and 39 minutes.

4. Answer(A)

Village Palli in Jammu & Kashmir has become first village fully carbon neutral village

5. Answer (A)

Fava bean are rich in L-Dopa and our body Convert it into a Dopamine which is also called a happy hormone



6. Answer (D)

All the statements about Ramgiri Vasdhari Wildlife Sanctuary are correct

7. Answer (D)

- Mullaperiyar dam is constructed on periyar river and it is 126 years old dam
- Periyar river originates from Shivgiri hills of Western Ghats, in Tamil Nadu and flows through the Periyar National Park(Kerala)
- Tamil Nadu maintained dam for several purposes like irrigation, drinking water, and Hydro-electric power generation
- Supreme court ordered for reconstruction of the dam with expert committee with members from Tamil Nadu and Kerala
- Muthirapuzha, Mullayar, Cheruthoni, Perinjankutti are the tributaries of Periyar river

8. Answer (C):

- It is situated in Odisha and it is Asia's largest teak and Sal forest
- It was named after the wife of British officer
- Barbara forest will be open for everyone soon, it is to encourage ecotourism in the state

9. Answer (B)

Energy and Climate Index released by NITI Aayog

10. Answer (A)

KAVACH: Indigenously developed automated train protection system designed to improve train safety

Indian technology which prevents trains from colliding, it was developed in 2012 under the name of Train collision avoidance system (TACS)

11. Answer (C)

Both Statements are correct

- An mRNA vaccine instructs the body itself to create a part of the virus.



- The Covid-19 vaccines from Pfizer BioNTech and Moderna both use mRNA to deliver a message to the immune system.
- Genetically engineered mRNA instructs cells to make the spike protein found on the surface of the Covid-19 virus.
- The expectation is that the immune system will mount a response against the spike protein and when an actual infection happens, the immune cells will recognize the spike protein and act against it.
- The advantage of an mRNA vaccine is that it requires a smaller dose than a traditional vaccine, given that the required amount of antigen will be created in the body.

#### 12. Option (B)

Though mangrove trees are adopted to grow in salt water, they require regular flushing with fresh water. They will die if immersed in saltwater all the time.

#### 13. Answer (B)

Water hyacinth, scientifically known as *Eichhornia crassipes* Mart. (Pontederiaceae), is an aquatic weed common in **waterbodies across South Asia, including India.**

This is **not an indigenous species but was introduced to India during the British colonial rule** as an ornamental aquatic plant from South America

#### 14. Answer (D)

An aneurysm is a swelling of the arteries and veins in any part of the body and is caused by the weakening of the walls. It occurs most commonly in the aorta, back of the knees, brain or intestines. If the aneurysm gets ruptured, it can even cause internal bleeding and stroke.

Potential risk factors for aneurysm include smoking, age, high cholesterol, obesity, and hypertension or tissue disorders. Pregnancy can also increase the risk of an aneurysm of the spleen.

#### 15. Answer (D)



Osgood-Schlatter disease is caused by irritation of the bone growth plate. Bones do not grow in the middle, but at the ends near the joint, in an area called the growth plate. While a child is still growing, these areas of growth are made of cartilage instead of bone. The cartilage is never as strong as the bone, so high levels of stress can cause the growth plate to begin to hurt and swell.

**16. Answer (C)**

Both statements are true

**17. Answer (B)**

The Global Alliance for Vaccines and Immunisation, the Lumpy Skin Disease (LSD) disease is caused by a virus called the Capripoxvirus and is “an emerging threat to livestock worldwide”. It is genetically related to the goatpox and sheeppox virus family.

The current HFMD cases are mainly caused by Coxsackievirus A-6 and A-16. Another pathogen — Enterovirus71 — that also causes the disease is not very prevalent now.

**18. Answer (C)**

Lightning is not classified as a natural disaster in India. But recent efforts have resulted in the setting up of an early warning system

**19. Answer (D)**

Both Statements are incorrect

NASA launched the CAPSTONE-new satellite which will test unique lunar orbit for future missions

A microwave oven-sized Cubesat weighing just 25kgs. It is designed to test a unique elliptical lunar orbit



CAPSTONE aims to help reduce the risk for future spacecraft by validating innovative navigation technologies, and by verifying the dynamics of the halo-shaped orbit

**20. Answer (D)**

All the statements are correct

**21. Answer (C)**

Both the statements are correct

**22. Answer (A)**

Russia has promised its ally Belarus delivery of nuclear-capable missiles to take on an aggressive west.

Russia will transfer to Belarus Iskander-M tactical missile systems, which can use ballistic or cruise missiles, in their conventional and nuclear versions

**23. Answer (B)**

It is located in the state of Assam, covering 42,996 hectares, declared a National Park in 1974.

**24. Answer (C)**

Lightning is not classified as a natural disaster in India. But recent efforts have resulted in the setting up of an early warning system

**25. Option-D-West Bengal**

Mangroves are certain shrubs & trees that grow in dense bushes or forests along tidal estuaries, in salt marshes and on muddy coasts. India has a total mangrove cover of 4,975 sq.km. West Bengal has 42.45% of India's mangrove cover, followed by Gujarat at 23.66% & Andaman & Nicobar Islands at 12.39%.

**26. Option-C-Odisha**

**27. (Answer D)**

**Rare Species:**



Species with small population will move into endangered or vulnerable if the negative factors are continue to operate

Ex: Himalayan brown bear, wild Asiatic buffalo, desert fox, hornbill

**28. (Answer A)**

Scientists from ISRO have mapped out the global distribution of sodium on the moon surface.

**29. (Answer D)**

Bacillus thuringiensis is the 1<sup>st</sup> bacteria used as biopesticide in cotton crop to protect from ball borers.

Beauveria bassiana is the best example of fungi used as biopesticide.

Neem tree, sugar apple, mugwort are some of the examples of biopesticide flowering plants.

**30. (Answer B)**

### **Vulnerable Species:**

These are the species whose population has declined to a level where they will move into endangered category in near future if they continue to operate in the same way

Ex: Blue sheep, Asiatic Elephant, Gangetic dolphin

**31. (Answer D)**

### **Endemic species:**

These species are isolated only in particular location due to natural or geographical barriers

Ex: Andaman teal, nicobar pigeon Andaman wild pig, mithun in Arunachal Pradesh

**32. (Answer C)**



### **Extinct Species:**

These are the species are not found even after searching in their areas and locations where they may occur. A species may be extinct from a local area, region, country, continent or entire earth

Ex: Asiatic cheetah, pink head duck

### **33. Answer (D)**

Functions of an ecosystem include homeostasis, energy flow through food chain, ecological succession, and biogeochemical cycles.

### **34. Answer (C)**

Brackish water ecosystems in river deltas are covered by mangroves and are world's most productive ecosystems in biomass production

### **35. Answer (D)**

The Ministry of Environment, Forest & Climate Change (MoFECC) framed some laws in action for EIA. Water act, air act, wild life act, environmental act & biological diversity act are included in this.

### **36. Answer (D)**

Category A projects is appraised at national level by Impact Assessment Agency, Expert Appraisal committee & category B projects are appraised at state level.

As per 2006 amendment, category a projects does not undergo the screening process but category B projects undergo screening process.

### **37. Answer (C)**



Nitric oxide/nitrogen monoxide (NO) is not considered to be hazardous to environment, health at typical ambient conditions. But excess nitric oxide & its products may cause respiratory ailments etc.

High levels of NO<sub>x</sub> have a negative effect on vegetation by making it more susceptible to disease & frost damage.

**38. (Answer A)**

- **Thermo photovoltaic (TPV)** energy conversion is a direct conversion process from heat to electricity via photons.
- A basic thermo photovoltaic system consists of a **thermal emitter and a photovoltaic diode cell**.
- The temperature of thermal emitters varies from about 900 °C to about 1300 °C, although in principle TPV devices can extract energy from any emitter with a temperature elevated above that of the photovoltaic device (forming an optical heat engine).

**39. (Answer D)**

Both statements are false.

**40. (Answer C)**

Lotic water is composed of flowing water bodies.

Lake is not a flowing water body; it is a still water body which is an example of lentic water.

**41. (Answer C)**

Lichens need clean air to flourish and hence act as indicators of good air quality in their surroundings.

**42. (Answer A)**



Eutrophication creates a detritus layer in ponds, and lakes and produces a successively shallower depth of surface water. Eutrophication causes the ecosystem to become competitive by transforming the normal limiting nutrient to an abundant level. This causes a decrease in water transparency and increased turbidity.

Turbidity increases and affects navigation as the water is not transparent.

43. (Answer D)

The productivity of oceans is 55 billion tons & it is because the penetration of the light decreases with increasing water depth.

44. (Answer D)

Functions of the ecosystem include energy flow through the food chain, ecological succession, homeostasis, nutrient cycling or biochemical cycles.

45. (Answer C)

Trophic levels in an ecosystem are not linear; they are interconnected & make a food web. The Food web is a network of interconnected food chains existing in an ecosystem.

46. (Answer D)

The freshwater ecosystems have running water as streams & rivers. Ponds and lakes are ecosystems where water doesn't flow. In freshwater, we can find both running water and stagnant water.

47. (Answer B)

A pyramid of energy is always upright. It can never be inverted because when energy flows from a particular trophic level to the next trophic level, some energy is always lost as heat at each step.



**48. (Answer D)**

Statement 1 correct - Biodiversity is normally greater in the lower latitudes as compared to the higher latitudes.

Statement 2 correct - Along the mountain gradients, biodiversity is normally greater in the lower altitudes as compared to the higher altitudes

**49. (Answer B)**

Indian wild ass is categorized as endangered species under Schedule 1. IUCN recently moved the wild ass from the vulnerable to endangered category.

**50. (Answer B)**

Red Data Book is a source that maintains an international list of all endangered animal & plant species. The red data book helps us in providing complete information for research, and studies & also for monitoring the programs on rare & endangered species & their habitats.

**51. (Answer A)**

Invasive alien species, climate change, nutrient loading & pollution, habitat change & exploitation are the threats to the biodiversity of geographical areas.

**52. (Answer B)**

An area can be notified as a national park by the state government, because of its ecological, faunal, floral, geomorphological/zoological association of importance, needed for protecting or developing wildlife within or its environment.

No human activity is permitted inside the national park except for the ones permitted by the chief wildlife warden of the state under the conditions, wildlife protection act, 1972.

**53. (Answer A)**

An endangered species is a type of organism that is threatened by extinction. Species become endangered for habitat loss & loss of genetic variation. Musk Deer, Great Indian bustard, Red panda, Asiatic wild ass.

**54. (Answer B)**



The key cause of vulture deaths is food poisoning. The birds were feeding dead animals that had been administered the non-steroidal anti-inflammatory drugs (NSAID) diclofenac as a pain killer.

55. **(Answer A)**

Corbett National park is located in the foothills of the Himalayas, the Ramganga river flows through the park.

Kaziranga National park –Brahmaputra River

Silent valley national park- Kaveri River

56.

**(Answer C)**

The Animal Welfare Board of India was established in 1962 under The Prevention of Cruelty to Animals Act, 1960.

57. **(Answer D)**

Dudhwa national park is located in Terai region is an area covered with dense forests & tall elephant grasses. It is a protected forest area located in the Lakhimpur Kheri district of Uttar Pradesh. It is the largest & richest biodiversity region of Uttar Pradesh which is world famous for Tigers & reindeer.

58. **(Answer A)**

Keibul National Park is the only floating park in the world, located in Loktak Lake. It is located in the Bishnupur District of Manipur, which is home to brow-antlered deer.

59. **(Answer D)**

Buxa Tiger reserve, located in West Bengal was established in 1983 and was the 15<sup>th</sup> tiger reserve in India.

60. **(Answer B)**



Namdapha National Park is the largest protected area in the Eastern Himalayan sub-region, located in Arunachal Pradesh. Even harbours vast dipterocarp forests, covering the northwestern parts of the eco-region rainforests Mizoram-Manipur-Kachin.

61. (Answer B)

Nagarhole/ Rajiv Gandhi National Park are located in the Mysore & Kodagu districts of Karnataka.

62. (Answer D)

Valmiki National Park is located in Bihar.

63. (Answer B)

The Marine National Park & the Marine Sanctuary, India's first marine reserve is located along the southern part of the Gulf of Kutch. It is the first Marine Park in India with 42 islands on Jamnagar Coast in the Marine National Park

64. (Answer A)

Kazinag/qazinag national park is present in Jammu & Kashmir.

Kuno National Park is present in Madhya Pradesh.

Manas & Nameri national parks are present in Assam.

65. (Answer C)

Manas national park is located in Assam and is UNESCO World Heritage Site.

Kanha national park is located in Madhya Pradesh.

Ranthambore national park is located in Rajasthan.

Chandoli national park is located in Maharashtra.

66. (Answer B)



The union ministry of environment & forests, the government of India, under the environmental protection act 1986, made an EIA notification making environmental clearance mandatory.

67. Answer (C)

Both Statements are incorrect

68. (Answer B)

Decomposers are organisms that break down dead or decaying organisms. Bacteria & fungi are considered decomposer organisms. Viruses invade other organisms, but they are not decomposers.

69. (Answer C)

The Gangetic dolphin(*Platanista gangetica*), is considered as the national aquatic animal, which was announced on the occasion of 74<sup>th</sup> independence day, 15 August 2020, by the Indian Ministry of Environment, Forest & Climate Change.

70. (Answer D)

Both the options are correct

71. Answer (D)

Geologists use the radiometric dating of uranium and the isotopes of other radioactive elements, combined with observations of fossils and sediment layers, to chart the course of Earth's natural history and the evolution of life. To measure the age of plant and animal remains from the more recent past, scientists use a radioactive isotope of carbon, called carbon-14, as their clock. As carbon-14 decays, with a half-life of about 5,730 years, it becomes nitrogen-14. Using this clock, they have dated bones, campfires and other objects as old as 60,000 years, and in some cases even older.

72. Answer (D)

ACE2 (angiotensin-converting enzyme 2) is a protein on the surface of many cell types. It is an enzyme that generates small proteins – by cutting up the larger protein angiotensinogen – that then go on to regulate functions in the cell. Using the spike-like protein on its surface, the SARS-CoV-2 virus binds to ACE2 – like a key being inserted into a lock – prior



to entry and infection of cells. Hence, ACE2 acts as a cellular doorway – a receptor – for the virus that causes COVID-19.

In the search for treatments for COVID-19, many researchers are focusing their attention on a specific protein that allows the virus to infect human cells.

73. Answer (C)

Statement 1 is correct. Genetic engineering is applied in the development of Recombinant vector vaccines. Genetic engineering involves techniques to alter the chemistry of genetic material (DNA and RNA), to introduce these into host organisms and thus change the phenotype of the host organism. The techniques of genetic engineering include creation of recombinant DNA, use of gene cloning and gene transfer.

Statement 2 is correct. Recombinant vaccines are made of a viral or bacterial vector. They are used as channels for entry into host organisms

74. Option-C-Methane

Paddy fields produces methane, a greenhouse gas, 30 times more potent as carbon dioxide.

Flooded rice fields emit methane, which is second in importance to carbon dioxide as a greenhouse gas.

75. Option-B

National Action Plan on Climate Change (NAPCC) is a government of India program launched in 2008 to mitigate & adapt to the adverse impact of climate change. The missions under NAPCC include:

National solar mission, National mission for enhanced energy efficiency, National Mission on sustainable habitat, National water mission, National mission for sustaining Himalayan ecosystem, Green India Mission, National mission for sustainable agriculture, National mission on strategic knowledge for climate change.

76. Option-B

Greenhouse gases can absorb & emit radiant energy within the thermal infrared range.

Nearly 76% of global human-caused emissions, carbon dioxide sticks around for a quite a while.



#### 77. Option-C

UV-C rays are most dangerous because they penetrate the second layer of skin & causes skin cancer.

UV-C rays are shortest waves, usually do not penetrate the earth's ozone layer. Their wavelength is 100nm.

#### 78. Option-B-Saudi Arabia

One of the world's largest oil producers, Saudi Arabia, announced that it aims to reach 'net zero' greenhouse gas emissions by 2060, joining more than 100 countries in a global effort to try & curb man-made climate change.

#### 79. Option-D-USA

India & USA launched the climate action & finance mobilization dialogue (CAFMD). The CAFMD is one of the two tracks of the India-US. Climate & Clean Energy Agenda 2030 partnership launched at the Leader's Summit on Climate.

#### 80. Option-C

The United Nations Human Rights Council unanimously voted to recognize a clean, healthy & sustainable environment as a universal human right.

The right to a clean environment is rooted in the 1972 Stockholm Declaration, popularly called as the Magna Carta of human environment

#### 81. Option-B-German watch

The Global Climate Risk Index 2021 analyses to what extent countries & regions have been affected by impacts of weather-related loss events.

The most recent data available from 2000-2019 were taken into account. The countries & territories affected most in 2019 were Mozambique, Zimbabwe as well as the Bahamas. The international think tank 'German watch' released the Global Climate Risk Index 2021.

#### 82. Option-C- Convention on Biological Diversity

The Kunming Declaration was adopted by over 100 countries at 15<sup>th</sup> meeting of the conference of the Parties to the United Nations Convention on Biological Diversity. By



adopting to this, the nations have committed themselves to support the development, adoption & implementation of an effective post-2020 implementation plan, capacity building action plan for the Cartagena Protocol on biosafety.

83. Option-D

Paris Agreement on Climate Change was signed by 190 countries as of March 2017. As of now, the agreement was signed by 197 countries.

The Intended Nationally Determined Contribution (INDC) pledged during the 2015 Climate Change Conference was not withdrawn in the Paris Agreement

84. Answer: D

ISRO was previously the Indian National Committee for Space Research (INCOSPAR), set up by the Government of India in 1962, as envisioned by Dr. VikramA Sarabhai.

85. Answer: C

ISRO was formed on August 15, 1969 and superseded INCOSPAR with an expanded role to harness space technology. DOS was set up and ISRO was brought under DOS in 1972.

86. Answer: D

ISRO has its headquarters in Bengaluru. Its activities are spread across various centres and units. Launch Vehicles are built at VikramSarabhai Space Centre (VSSC), Thiruvananthapuram; Satellites are designed and developed at U R Rao Satellite Centre (URSC), Bengalure; Integration and launching of satellites and launch vehicles are carried out from Satish Dhawan Space Centre (SDSC), Sriharikota;

87. Answer: D

All of the above are true

88. Answer: C

Sensors for Communication and Remote Sensing satellites and application aspects of the space technology are taken up at Space Applications Centre Ahmedabad

Remote Sensing Satellite data reception processing and dissemination is entrusted to National Remote Sensing Centre Hyderabad



89. Answer: C

Both statements are true

90. Answer: D

Operational flights of Polar Satellite Launch Vehicle, Geo-synchronous Satellite Launch Vehicle and Small Satellite Launch Vehicle

91. Answer: D

All of the above are true

92. Answer: B

IPRC : ISRO propulsion Centre

IISU : ISRO Inertial Systems Unit

ISTRAC : ISRO Telemetry, Tracking and command Network

IIRS : Indian Institute of Remote Sensing

93. Answer: B

Antrix Corporation Limited

NewSpace India Limited

94. Answer: D

The establishment of space systems and their applications are coordinated by the national level committees, namely, INSAT Coordination Committee (ICC), Planning Committee on National Natural Resources Management System (PC-NNRMS) and Advisory Committee of on Space Sciences (ADCOS)

95. Answer: D

ISTRAC has established a network of ground stations at Bengaluru, Lucknow, Mauritius, Sriharikota, Port Blair, Thiruvananthapuram, Brunei, Biak (Indonesia) and the Deep Space Network Stations.



96. Answer: C

**LPSC, Bengaluru** is responsible for design and realisation of propulsion systems for remote sensing and communication satellites and other scientific missions. Development and production of transducers and sensors are all undertaken here.

**LPSC, Valaimala** is responsible for R&D, System Design I Engineering and Project Management functions.

97. Answer: D

|                     |                                         |
|---------------------|-----------------------------------------|
| Dr. Prakash Chauhan | : National Remote Sensing Centre        |
| Dr. V. Narayanan    | : LPSC, Valiamala                       |
| Dr. K V Sriram      | : Laboratory for Electro-Optics Systems |
| Mr. K Alguvelu      | : ISRO Propulsion Complex (IPRC)        |

98. Answer: D

The major business areas of NSIL include:

- Production of Polar Satellite Launch Vehicle (PSLV) and Small Satellite Launch Vehicle (SSLV) through industry;
- Production and marketing of space-based services, including launch services and space-based applications like transponder leasing, remote sensing and mission support services;
- Building of Satellites (both Communication and Earth Observation) as per user requirements.
- Transfer of technology developed by ISRO centres/ units and constituent institutions of Dept. of Space;
- Marketing spin off technologies and products/ services emanating out of ISRO activities
- Consultancy services

99. Answers (D)

India's largest floating solar plant is now fully operational at Ramagundam in Telangana.

100. Answer (A)



As of today, the most sensitive dark matter detector experiment in the world is LUX-ZEPLIN (LZ) in South Dakota in U.S.

To give an idea of the degree of difficulty in measuring evidence of a dark particle.

## Mental Ability

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### Blood relations

1. Answer D

The boy in the photograph is the only son of the son of Ramesh's mother i.e., the son of Ramesh. Hence, Ramesh is the father of boy.

2. Answer D

If D is Male, the answer is Nephew.

If D is Female, the answer is Niece.

As the sex of D is not known, hence, the relation between D and A cannot be determined.

Note: Niece - A daughter of one's brother or sister, or of one's brother-in-law or sister-in-law.

Nephew - A son of one's brother or sister, or of one's brother-in-law or sister-in-law.

3. Answer A

The father of the boy's uncle → the grandfather of the boy and daughter of the grandfather → sister of father.

4. Answer C



The man in the photograph is the son of the only son of Lela's grandfather i.e., the man is the son of Lela's father. Hence, the man is the brother of Lela.

5. Answer D

Given: D is the brother of B.

From statement 1, we can detect that D is son of C (son of D is the grandson of C).

From statement 2, we can detect that B is 'Female' (sister of D).

Therefore, B is daughter of C.

6. Answer D

Ashok is the only brother of Sudeep and Veena is the sister-in-law of Ashok. Hence Veena is the wife of Sudeep. Kalyani is the mother-in-law of Veena. Kalyani is the mother of Ashok.

7. Answer A

Daughter of Mahesh's brother → niece of Mahesh. Thus the granddaughter of the woman is Mahesh's niece.

Hence, the woman is the mother of Mahesh.

8. Answer D

Brother of Mother-Uncle

Uncle's Son-Cousin

9. Answer D

Only Daughter of Arun's Mother-Arun's Sister

So Vimal's mother is Arun's Sister or

Arun is the Brother of Vimal's Mother i.e. Vimal's maternal Uncle.

10. Answer B



A-B couples

A is the father of C

C's daughter is E; so E's grandmother is B.

### Calenders (Printed as Clocks)

1. Answer D

On 31st December, 2005 it was Saturday.

Number of odd days from 2006 to 2009 =  $(1 + 1 + 2 + 1) = 5$  days.

On 31st December 2009, it was Thursday.

Thus, on 1st Jan, 2010 it is Friday

2. Answer A

Weekend means Saturday & Sunday together. In total we have 52 weeks in a year. So there are 52 weekends in a year. In normal we have 104 Weekend Days.

We know that an each normal year has 365 days or 52 weeks plus one day, and each week has two weekend days, which means there are approximately 104 weekend days each year. Whereas in a leap year we have 366 days it adds one more day to the year and what makes the change is the starting day of the year.

3. Answer B

$x \text{ weeks } x \text{ days} = (7x + x) \text{ days} = 8x \text{ days}$



4. Answer A

The year 2004 is a leap year. It has 2 odd days.

The day on 8<sup>th</sup> Feb, 2004 is 2 days before the day on 8<sup>th</sup> Feb, 2005. Hence, this day is Sunday.

5. Answer C

Given that first day of a normal year was Friday

Odd days of the mentioned year = 1 (Since it is an ordinary year)

Hence First day of the next year = (Friday + 1 Odd day) = Saturday

Therefore, last day of the mentioned year = Friday

6. Answer B

Number of days from 26-Jan-1996 to 15- May-1996 (Both days Included).

= 6(Jan) + 29(Feb) + 31(Mar) + 30(Apr) + 15(May).

=111.

7. Answer A

94 days =  $(13 \times 7) + 3 = 3$  Odd Days.

The required day is 3 days beyond Thursday i.e., Sunday.

8. Answer D

Clearly it can be understood from the question that 9 days ago was a Thursday.

Number of odd days in 9 days = 2 (As  $9 - 7 = 2$ , reduced perfect multiple of 7 from the total days).

Hence Today = (Thursday + 2 odd days) = Saturday.



9. Answer A

Given that seventh day of the month is three days earlier than Friday

Seventh day is Tuesday

14<sup>th</sup> is Tuesday and 19<sup>th</sup> is Sunday.

10. Answer D

This is a leap year. So, none of the next 3 years will be leap years.

Each ordinary year has one odd day, so there are 3 odd days in next 3 years. So the day of the week will be 3 odd days beyond Wednesday i.e. it will be Saturday.

## Number series

1. Answer C

Explanation:

Cube roots  $1^3=1$ ,  $2^3=8$ ,  $3^3=27$ ,  $4^3=64$ ,  $5^3=125$ , and  $6^3=216$

2. Answer C

Explanation:

+11=17

+33=50

+55=105

+77=182

3. Answer C



Explanation:

The given series follows a logic that

11 x 12, 12 x 13, 13 x 14, 14 x 15, 15 x 16,...

So the missing number is  $13 \times 14 = 182$

4. Answer B

Explanation:

11

$$11 + (3^2 - 3) = 17$$

$$17 + (5^2 - 3) = 39$$

$$39 + (7^2 - 3) = 85$$

$$85 + (9^2 - 3) = 163$$

5. Answer D

Explanation:

The pattern is 1 x 2, 2 x 3, 3 x 4, 4 x 5, 5 x 6, 6 x 7, 7 x 8.

So the next number is  $8 \times 9 = 72$ .

6. Answer B

Explanation:

Each number is the proceeding number multiplied by -2

So the required number is -160

7. Answer C

Explanation:

The pattern is +5, +7, +9, +11, and +13



The missing number is  $33 + 13 = 46$ .

8. Answer B

Explanation:

$$16 \times 2 + 1 = 33$$

$$33 \times 2 - 1 = 65$$

$$65 \times 2 + 1 = 131$$

$$131 \times 2 - 1 = 261$$

$$261 \times 2 - 1 = 523$$

9. Answer C

Explanation:

$$6 (+5) \rightarrow 11 (+10) \rightarrow 21 (+15) \rightarrow 36 (+20) \rightarrow 56 (+25) \rightarrow 81$$

10. Answer C

Explanation:

$$(8 \times 3) + 4 = 28$$

$$(28 \times 4) + 4 = 116$$

$$(11 \times 5) + 4 = 584$$

$$(584 \times 6) + 4 = 3508$$

**Odd man out**

1. Answer A

Explanation

All except Thermodynamics are topics of mathematics



2. Answer A

Explanation

Cat, Dog and Tiger are Carnivores but Elephant is a Herbivore.

3. Answer D

Explanation

Bangalore, Hyderabad and Chennai are state capitals while Calicut is not a state capital.

4. Answer D

Explanation

Skin, Nose and Eye are sensory organs while Leg is a Limb

5. Answer B

Explanation

Except Mirage, all other are sources of water.

6. Answer D

Explanation

Except Regiment, all others are cadets of Army Officers.

**Percentage**

1. Answer B



$$12\% = 12/100 = 3/25$$

## 2. Answer A

A sugar does not evaporate; its quantity will remain same in the remaining solution that is  $8 - 2 = 6$  liters of solution

$$\text{Thus, } x = \frac{5 \times 8}{2} = 40/2 = 20\%$$

## 3. Answer B

Let the original price = 100

Price after first increase =  $100 + 20 = 120$

Price after second increase =  $120 + (10\% \text{ of } 120) = 120 + 12 = 132$

Net increase =  $132 - 100 = 32\%$ .

## 4. Answer C

Let the original price = 100

Price after increase =  $100 + 40 = 140$

Price after decrease =  $140 - (20\% \text{ of } 140) = 140 - 28 = 112$

Net increase in price =  $112 - 100 = 12\%$ .

## 5. Answer C

$$\text{The income of A} = \frac{60}{100 \times 15000} = 9000$$

#### 6. Answer D

Suppose originally he had  $x$  apples

Then  $(100-40)\%$  of  $x = 420$

$$\frac{60}{100} \times x = 420$$

$$x = \left( \frac{420 \times 100}{60} \right) = 700.$$

#### 7. Answer C

Let their marks be  $(x+9)$  and  $x$ .

$$\text{Then, } x+9 = \frac{56}{100} (x + 9 + x)$$

$$25(x+9) = 14(2x+9)$$

$$3x = 99$$

$$x = 33.$$

So, their marks are 42 and 33.

#### 8. Answer D

Let the number be  $x$ .

$$\text{Then, error} = \frac{5}{3}x - \frac{3}{5}x = \frac{16}{15}x$$

$$\text{Error \%} = \left( \frac{16x}{15} \times \frac{3}{5x} \times 100 \right) \% = 64\%$$

#### 9. Answer A

Number of valid votes =  $80\%$  of  $7500 = 6000$

Valid votes polled by other candidate = 45% of 6000

$$= \left( \frac{45}{100} \times 6000 \right) = 2700.$$

10. Answer B

Increase in 10 years = 262500 - 175000 = 87500

$$\text{Increase \%} = \left( \frac{87500}{175000} \times 100 \right) \% = 50\%$$

$$\text{Required Average} = \left( \frac{50}{10} \right) \% = 5 \%$$

## Profit & Loss

1. Answer C

C.P of toffees = Rs.1

S.P of 6 toffees = 120% of Rs.1 = Rs.6/5

For Rs.  $\frac{6}{5}$ , toffees sold = 6

For Rs.1, toffees sold =  $\left( 6 \times \frac{5}{6} \right) = 5.$

2. Answer B

Let C.P be x and the S.P be y

$$\text{Then } 3(y-x) = (2y-x)$$

$$Y=2x$$

$$\text{Profit} = (y-x) = (2x-x) = x$$

$$\text{Profit \%} = \left( \frac{x}{y} \times 100 \right) \% = 100\%.$$

3. Answer B



Let C.P of each article be Rs.1 of x articles = Rs. X

S.P of x articles = Rs.20

Profit = Rs. 20- x

$$\left(\frac{20-x}{x} \times 100 = 25\right)$$

$$2000-100x = 25x$$

$$125x = 2000$$

$$x = 16.$$

4. Answer B

Cost price (C.P) = Rs. (4700 + 800) = 5500

Selling Price (S.P) = 5800

Gain = S.P – C.P = Rs. (5800- 5500) = 300

$$\text{Gain \%} = \left(\frac{300}{5500} \times 100\right) \% = 5\frac{5}{11} \%$$

5. Answer B

$$\text{S.P} = \left(\frac{100+20}{100}\right) \times 180$$

$$\text{S.P} = 12 \times 18 = 216.$$

Therefore, the S.P of the umbrella is 216.

6. Answer C



$$\text{C.P} = \text{Rs.} \left( \frac{100}{122.5} \times 392 \right) = \left( \frac{1000}{1225} \times 392 \right) = \text{Rs.} 320$$

$$\text{Profit \%} = \text{Rs.} (392 - 320) = \text{Rs.} 72$$

7. Answer C

$$\text{S.P} = 85\% \text{ of } 1400 = \text{Rs.} \left( \frac{85}{100} \times 1400 \right) = \text{Rs.} 1190.$$

8. Answer A

$$\text{C.P of 56 kg rice} = \text{Rs} (26 \times 20 + 30 \times 36) = (520 + 1080) = 1600$$

$$\text{S.P of 56 kg rice} = \text{Rs} (56 \times 30) = \text{Rs.} 1680$$

$$\text{Gain} = \left( \frac{80}{1600} \times 100 \right) \% = 5\%.$$

9. Answer A

$$\text{CP of AC} = \text{Actual CP} + \text{Transportation cost} = 12160 + 340 = 12500$$

$$\text{SP of AC} = 12875$$

$$\text{Profit} = 12875 - 12500 = 375$$

$$\text{Profit \%} = 375 / 12500 \times 100 = 3\%.$$

10. Answer D

Let the cost price of 1 liter pure milk is Rs.1 then

$$6 \text{ liters (milk)} \rightarrow \text{C.P} = \text{Rs.} 6$$

$$2 \text{ liters (water)} \rightarrow \text{C.P} = \text{Rs.} 0$$

Then C.P = Rs.6 only



8 Liter mixture

$$S.P = 8 \times 2 = 16$$

$$\text{Profit \%} = \frac{16-6}{6} \times 100 = \frac{1000}{6} = 166.66\%.$$

## Ratio & Proportion

1. Answer (A)

C's share = [C's ratio/ sum of ratios] \* total amount

$$\text{C's share} = (5/10) * 1500$$

$$\text{C's share} = 750$$

2. Answer (B)

The ratio of a: b is 4: 5

The ratio of b: c is 3: 6

**Note:** To find the ratio in such questions, multiply a to b, then b to b, and then b to c.

$$a: b: c = 4*3: 5*3: 5*6$$

$$a: b: c = 12: 15: 30$$

$$\text{So, } a: b: c = 4: 5: 10$$

3. Answer (D)

$$A: B = 3: 2 \dots\dots\dots (i)$$

$$B: C = 5: 3 \dots\dots\dots (ii)$$

$$C: D = 1: 3 \dots\dots\dots (iii)$$

Now,

Find A: B: C: D

Step 1, A: B: C: D

$$3: 2 \text{ (A: B value by equation i)}$$

**Note:** To understand the shortcut, remember you need to make the right-hand side missing numbers the same as that of last given number, and for the left-hand side the same is done.

i.e., C: D will contain 2: 2 because 2 is the last number on the right side.



Or, A: B: C: D

3: 2: 2: 2

5: 3: 3: 3 (B: C value by equation ii)

1: 3: 3: 3 (C: D value by equation iii)

Now, multiply vertically and get A: B: C: D.

So, A: B: C: D =  $(3*5*1): (2*3*3): (2*3*3): (2*3*3)$

Or, A: B: C: D = 15: 18: 18: 18

=5:6:6:6

4. Answer (D)

A: B = 1: 2..... (i)

B: C = 3: 1..... (ii)

C: D = 2: 3.....(iii)

Now,

Find A: B: C: D

Step 1: A: B: C: D

1: 2 (A: B value by equation i)

**Note:** To understand the shortcut, remember you need to make the right-hand side missing numbers the same as that of last given number, and for the right-hand side the same is done.

i.e., C: D will contain 2: 2 because 2 is the last number on the right side.

Or, A: B: C: D

1: 2: 2: 2

3: 3: 1: 1 (B: C value by equation ii)

2: 2: 2: 3 (C: D value by equation iii)

Now, multiply vertically and to get A: B: C: D.

So, A: B: C: D =  $(1*3*2): (2*3*2): (2*1*2): (2*1*3)$

= 6: 12: 4: 6

= 3: 6: 2: 3

**Now, the share of A and C =  $[(A+C)/ (A+B+C+D)] * \text{total amount}$**

Or, the share of A and C =  $[(3+2)/ (3+6+2+3)] * 4800$

Or the share of A and C =  $(5/14)*4800 = 1714$

Similarly, the share of B and C =  $(8/14)*4800 = 2742$



5. Answer (C)

The total salary of males: the total salary of females = 3:5  
The salary of each male: salary of each female = 2:3

To find the number of men and women, divide the total salary of males and females by salary of each male and female.

i.e.,  $3\frac{1}{2} : 5\frac{1}{3}$

Or,  $9 : 10 = 9 : 10$

So, the ratio of the number of males and females = 9:10

6. Answer (A)

$$\frac{1}{4} : \frac{1}{3} : \frac{1}{2} = 6 : 8 : 12$$

$$= 3 : 4 : 6$$

7. Answer (A)

$$a/b = 5/1 \Rightarrow a = 5b$$

$$(a - 3b) / (2a - b) = (5b - 3b) / (10b - b) \\ = 2b/10b \Rightarrow 1/5$$

8. Answer (B)

The savings of Chetan and Dinesh are  $3x - 5y$  and  $4x - 7y$  respectively.

$$4x - 6y = 200 \text{ --- (1)}$$

$$5x - 8y = 200 \text{ --- (2)}$$

Multiplying (1) by 5 and (2) by 4 and subtracting the resultant equation (2) from resultant equation (1), we get  $x = 200$ .

The incomes of Chetan and Dinesh are  $3x = \text{Rs.}600$  and  $4x = \text{Rs.}800$  respectively.

9. Answer (B)

Let the third number be  $x$

$$\text{Then, first number} = 120\% \text{ of } x = 120x/100 = 6x/5$$

$$\text{Second number} = 150\% \text{ of } x = 150x/100 = 3x/2$$

$$\text{Ratio of first two numbers} = 6x/5 : 3x/2 = 12x : 15x = 4 : 5$$

10. Answer (D)

Correct Option: D

$$\text{Amount of zinc} = (100 * 14/20) \text{ kg} = 70 \text{ kg}$$

Hence, option D is correct.

## Time and Work

### 1. Answer: B

A's 1 day's work =  $\frac{1}{10}$  and B's 1 day's work =  $\frac{1}{15}$

(A+B)'s 1 day's work =  $(\frac{1}{10} + \frac{1}{15}) = \frac{1}{6}$

So, both together will finish the work in 6 days

### 2. Answer: C

Let A & B finish the piece of work together in 12 days

$$1/a + 1/b = 1/12$$

B alone can finish it in 30 days, B = 30

$$\text{So, } 1/a + 1/30 = 1/12$$

$$1/a = 1/12 - 1/30 = (5-2)/60 = 3/60 = 1/20$$

$$a = 20$$

### 3. Answer: B

$$\text{Speed} = \left(\frac{600}{5 \times 60}\right) \text{m/sec} = 2 \text{m/sec}$$

$$\text{Converting m/sec to km/hr} = \left(2 \frac{18}{5}\right) \text{km/hr} = 7.2 \text{km/hr}$$

### 4. Answer: D

$$\text{Distance} = (240 \times 5) = 1200 \text{km}$$

$$\text{Speed} = \text{Distance} / \text{Time}$$

$$\text{Speed} = 1200 / (5/3) \text{ km/hr} \quad (\text{we can write } (1 \frac{2}{3}) \text{ hours as } 5/3 \text{ hours})$$

$$\text{So the required speed} = \left(1200 \times \frac{3}{5}\right) \text{km/hr} = 720 \text{ km/hr}$$

### 5. Answer: A

Let the actual distance travelled by x km.

$$\text{Then } \frac{(x)}{10} = \frac{x+20}{14} = 14x=10x+200$$

$$4x=200$$

$$x=50 \text{ km}$$

### 6. Answer: A

Let speed of the car be x kmph. Then, speed of the train =  $\left(\frac{150}{100}x\right) = \left(\frac{3}{2}x\right)$  kmph

$$\text{So, } \frac{75}{x} - \frac{75}{(3/2)x} = \frac{125}{10 \times 60}$$

$$= \frac{75}{x} - \frac{50}{x} = \frac{5}{24}$$

$$x = \left(\frac{25 \times 24}{5}\right) = 120 \text{ kmph}$$

### 7. Answer: B

Due to stoppages, it covers 9 km less.

$$\text{Time taken to cover 9 km} = \left(\frac{9}{54} \times 60\right) \text{ min} = 10 \text{ min}$$

### 8. Answer: A

Let the duration of the flight be x hours

$$\text{Then } \frac{600}{x} - \frac{600}{x+(1/2)} = 200$$

$$= \frac{600}{x} - \frac{1200}{2x+1} = 200$$

$$= x(2x+1) = 3$$

$$= 2x^2 + x - 3 = 0$$

$$= (2x+3)(x-1) = 0$$



$$= x = 1 \text{ hr.}$$

**9. Answer: D**

Calculate it by using formula of average speed

$$X=21 \text{ and } y=24$$

**Formula of average speed =  $\frac{2xy}{x+y}$**

$$= \frac{2(21 \times 24)}{21+24}$$

$$= \frac{1008}{45} = 22.4 \text{ km/hr}$$

$$\text{Average speed} = 22.4 \text{ km/hr}$$

**Distance = Speed  $\times$  Time**

$$\text{So, } 22.4 \times 20 = 448 \text{ km/hr}$$

**10. Answer: B**

Let the speed of two trains be  $6x$  and  $8x$  km/hr

$$\text{Then, } 8x = \left( \frac{400}{4} \right) = 100$$

$$X = \left( \frac{100}{8} \right) = 12.5$$

$$\text{Speed of first train} = (6 \times 12.5) \text{ km/hr} = 75 \text{ km/hr}$$



