NATIONAL TALENT SEARCH EXAMINATION-2019-20, UTTAR PRADESH

SCHOLASTIC APTITUDE TEST (SAT) PAPER & HINTS & SOLUTION

PHYSICS

101. Unit of momentum is
(1) meter/second (2) Newton ×meter (3) kg-meter/second (4) kg^{-1} meter $second^{-1}$

Ans. (3)

Sol. kg-meter/second
SINCE, MOMENTUM (p) = mass (m) x velocity (v)
Then, unit of 'p' = kg meter/second

102. Which one of the following physical quantity is constant in simple harmonic motion?
(1) Restoring force (2) Kinetic energy (3) Potential energy (4) Total energy

Ans. (4)

Sol. as during simple harmonic motion there is continous interchange of kinetic energy and potential energy, so total mechanical energy (KE + PE) is conserved.

103. A ray of light passes from glass $\left(\mu = \frac{3}{2}\right)$ to water $\left(\mu = \frac{4}{3}\right)$. The value of critical angle will be

(1) $\sin^{-1}\left(\frac{1}{2}\right)$ (2) $\sin^{-1}\left(\sqrt{\frac{8}{9}}\right)$ (3) $\sin^{-1}\left(\frac{8}{9}\right)$ (4) $\sin^{-1}\left(\frac{5}{7}\right)$

Ans. (3)

Sol. As we have refractive index(μ) formula in terms of critical angle (c) as,
$\mu_1 / \mu_2 = 1/\sin c$
so, we can write
(3/2)/ (4/3) = 1/sin c
sin c = 8/9
$c = \sin^{-1}(8/9)$
here, $\mu_1 = \mu_{glass} = 3/2$
$\mu_1 = \mu_{water} = 4/3$

104. The value of acceleration due to gravity (g) on the earth will be maximum at
(1) surface (2) poles (3) equator (4) center

Ans. (2)

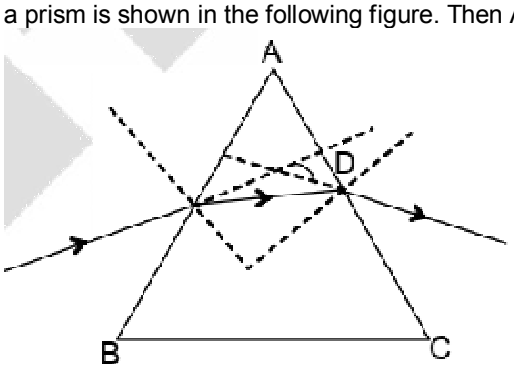
Sol. since radius of earth at poles are minimum and at equater is maximum
Therefore, acceleration due to gravity increases when we move from equator to poles

105. Which one of the following is an example of Biomass Energy source.
(1) Nuclear Energy (2) Sun energy (3) Gobar Gas (4) Wind energy

Ans. (3)

Sol. since gobar gas or bio gas is obtained from decomposition of biomass

106. The refraction of light by a prism is shown in the following figure. Then Angle $\angle D$ is:



(1) Angle of prism (2) Angle of refraction (3) Angle of emergent (4) Angle of deviation

Ans. **(4)**

Sol. since angle of deviation is the angle made between incident ray and emergent ray from the prism.

107. The unit of power of a lens is dioptre. Then one dioptre (1 dioptre) is equal to

(1) 100 cm^{-1} (2) 1 $meter^{-1}$ (3) 1 meter (4) 100 cm

Ans. **(2)**

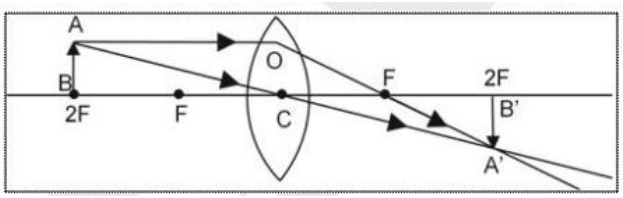
Sol. AS S.I. UNIT OF POWER OF LENS IS dioptre (D).
FORMULA OF POWER OF LENS (P) = 1/ FOCAL LENGTH (in meters)
P = 1/f (in meters)
So,
1 dioptre = 1/(meter) = 1 $meter_{-1}$

108. If F be the focal length of a convex lens, then the nature of image of an object placed at a distance of 2F will be

(1) Real, inverted and same size (2) Virtual, erect and small
(3) Real, erect and same size (4) Virtual, inverted and same size

Ans. (1)

Sol. When the object is placed at 2F



When the object is placed at the centre of curvature of a lens then a ray of light AO which is parallel to the principal axis after refraction pass through the focus F along the direction OF. While the other ray AC pass through the optical centre C and goes straight without any deviation. These two refracted light rays intersect each other at point A', on the other side of the lens at the centre of curvature 2F. So, the image A'B' formed in this case is at the centre of curvature, of same size as the object, real and inverted.

109. The power of a plane mirror is

(1) Zero (2) + 1 (3) - 1 (4) Infinity (∞)

Ans. (1)

Sol. The power of a mirror is the reciprocal of its focal length. As the focal length of a plane mirror is infinite, its power
is zero.
P = 1/f
P = (1/∞) = 0

110. The resistance of a wire is 4Ω. If length of wire is made double and area of cross section is made half, then the new resistance will be

(1) 1Ω (2) 6Ω (3) 4Ω (4) 12Ω

Ans. (2)

Sol. As given in question that old resistance of a wire is = 4 ohm
Resistance= Resistivity x length/area
When the wire is stretched to double the length, the area of cross section gets reduced to half.
So
New Resistance = Resistivity x (2 length) / (area/2)
New resistance = (Resistivity x length/area) x 4
New resistance = Resistance x 4
So, New resistance = 4 x 4 = 16 ohm

111. Which one of the following alternating current is supplied in our house hold circuits?

(1) 110 V and 50 Hz (2) 220 V and 60 Hz (3) 110 V and 60 Hz (4) 220 V and 50 Hz

Ans. (4)

Sol. In INDIA we work on 50 Hz frequency and 220 V supply in house hold circuits.

112. How much time will be taken by a 100 watt bulb to consume one unit of energy:

(1) 1 hour (2) 10 hour (3) 100 hour (4) 1000 hour

Ans. (2)

Sol. given , power (P) = 100 watt
and Energy (E) = 1unit = 1 kWh = 1000 Wh
To find , time(t) = ?
energy = power x time
E = P X t
so, t = E/P t = 1000/100 = 10 hour

113. Which one of the following is not a conventional source of energy?

(1) Coal (2) Petroleum (3) Hydro (4) Solar energy

Ans. (4)

Sol. as only solar energy is non conventional as well as renewable source of energy.

CHEMISTRY

114. Which of the following element is more electro positive?

(1) Br (2) F (3) Cl (4) I

Ans. (4)

Sol. On moving down to the group electropositive character increases because ionization energy decreases as size of atom increases. So in halogens, iodine is the most electropositive element.

115. The name of metal which decomposes water in cold is

(1) Cu (2) Pt (3) Ag (4) Na

Ans. (4)

Sol. According to metal reactivity series Na is more reactive than hydrogen and Pt, Cu and Ag are less reactive than
hydrogen.
$2Na + 2H_2O \rightarrow 2NaOH + H_2$

116. On heating camphor in a porcelain dish it got mixed in air without melting. This phenomenon is known as

(1) Condensation (2) Sublimation (3) Suspension (4) Evaporation

Ans. (2)

Sol. Camphor is an example of sublime substance which upon heating gets converted from solid state into gaseous state without undergoing into liquid state.

117. Ethylene and Sulpher monochloride on heating gives
(1) Chloroethane (2) Ethylene chloride (3) Mustard Gas (4) Ethylene glycol

Ans. (2)

Sol. $2C_2H_4 + S_2Cl_2 \rightarrow S(C_2H_4Cl)_2 + S$

Ethylene — Sulphur Mono Chloride — bis(2- Chloroethyl) sulphide (Mustard gas)

118. The H_+ ion concentration of a solution is 2×10^{-8} mol L^{-1}. The pH value of the solution is ($\log_{10} 2 = 0.3010$)
(1) 7.699 (2) 7.599 (3) 7.799 (4) 7.899

Ans. (1)

Sol. Here $[H^+]$ of given solution is very less so $[H^+]$ from water has to be considered.

$[H^+]_{total} = [H^+]_{solution} + [H^+]_{water}$

$= 2 \times 10^{-8} + 10^{-7}$

$= 10^{-8}(2 + 0.1)$

$[H^+]_{total} = 2.01 \times 10^{-8}$

$pH = -\log 10\,[H^+]$

$= -\log 10(2.01 \times 10^{-8})$

$= -\log 10\ 2.01 + (-\log 10\ 10^{-8})$

$= -0.3010 + -(-8)$

$= -0.3010 + 8$

$pH = 7.699$

119. Which of the following elements exhibit variable valency?
(1) Normal element (2) Typical element (3) Transitional element (4) None of these

Ans. (3)

Sol. The transition elements have their valence electrons into different sets of orbitals i.e. (n–1)d and ns. As there is very little difference in the energies of these orbitals. Both energy levels can be used for bond formation. So, transition elements show variable valencies

120. Which one is addition reaction?
(1) $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$ (2) $2KBr + Cl \rightarrow KCl + Br_2$ [2]
(3) $2H_2 + O_2 \rightarrow 2H_2O$ (4) $HgO \rightarrow 2Hg + O_2$2

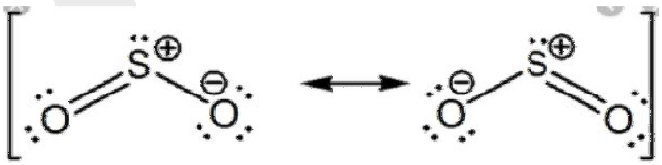
Ans. (3)

Sol. When two or more reactants combine together to form a product known as addition reaction.

121. Which compound has both covalent as well as co-ordinate bond?
(1) H_2S (2) CO_2 (3) H_2O (4) SO_2

Ans. (4)

Sol. Central sulphur atom is connected to one oxygen by a double bond and to the other by a co- ordinate bond due to presence of lone pair of electron on sulphur atom.



122. Complex salt is
(1) Zinc Sulphate (2) Sodium hydrogen Sulphate
(3) Iron ammonium Sulphate (4) Tetraamine Copper (II) Sulphate

Ans. (4)

Sol. A compound composed of central metal atom having coordinate bonds and with legends around it, is

123. Calamine is the ore of metal
(1) Copper (2) Aluminium (3) Zinc (4) Iron
Ans. (3)
Sol. The formula of calamine is $ZnCO_3$ or it is also known as zinc carbonate

124. Acid used in Lead Batteries is
(1) HCl (2) H_2SO_4 (3) HNO_3 (4) H_2CO_3
Ans. (2)
Sol. Sulphuric acid is used in Lead - Acid storage batteries.

125. Which type of ores are concentrated by Froth floatation process?
(1) Oxide ores (2) Sulphide ores (3) Carbonate ores (4) Nitrate ores
Ans. (2)
Sol. Only sulphide ores are concentrated by froth floatation process because pine oil selectively wets the sulphide ores and hence brings it to froth.

126. Which of the following is amphoteric oxide?
(1) Na_2O (2) SO_2 (3) Al_2O_3 (4) CaO
Ans. (3)
Sol. Aluminium Oxide is amphoteric oxide because it can react with acids as well as base.
$Al_2O_3 + HCl \rightarrow AlCl_3 + H_2O$
$Al_2O_3 + NaOH \rightarrow NaAlO_2 + H_2O$

BIOLOGY

127. In human body temperature control centre is
(1) Epithalamus (2) Hypothalamus (3) Thalamus (4) Medula oblongata
Ans. (2)
Sol. Hypothalamus
Brain is contral center of our body. Its different part control different function & hypothalamus is control the body temperature.

128. Which factor is responsible for Green House Effect?
(1) H_2O (2) CO (3) SO_2 (4) CO_2
Ans. (4)
Sol. CO_2
CO_2 trap the UV rays & UV rays donot move out complete to the space & temperature of earth increase. This is green house effect.

129. Which one of the following element is essential for synthesis of Thyroxin Hormones?
(1) Zinc (2) Iodine (3) Boron (4) Nitrogen
Ans. (2)
Sol. Iodine
Self explanatory.

130. Smallest unit of classification is
(1) Species (2) Class (3) Order (4) Kingdom
Ans. (1)
Sol. Species
Kingdome
Phylum
Class TAXONOMIC Classification
order
family
Genus
Species $\rightarrow$Basic & smallest unit and Taxon

131. Which of the following is not a part of the female reproductive system in human beings?
(1) Ovary (2) Uterus (3) Fallopian tube (4) Vas defereus

Ans. (4)

Sol. Vas defereus
Vas defereus is part of male reproductive system. which carry sperm

132. Most powerful digestive enzyme occurs in which cell organelles.
(1) Mitochondria (2) Chloroplast (3) Golgibody (4) Lysosome

Ans. (4)

Sol. Lysosome
Lysosome is digestive body of cell & its function to digest unwanted particle of cell & dead cell organelle with help of digestive engyme so it contain most powerful enzyme.

133. Causative agent of Kala azar (Black fever) is
(1) Bacteria (2) Virus (3) Protozoan (4) Fungi

Ans. (4)

Sol. Protozoan
Kala azar or Black fever is caused by leishmania which is member of protozoa group

134. Unisexual flowers occur in which of the following plants
(1) Mustard (2) Tomato (3) Pea (4) Watermelon

Ans. (4)

Sol. Watermelon
Tomato, musturd, Pea contain male & female reproductive parts in their flower so they are known as bisexual flower.
But in watermelon contain either male or female reproductive part so it is known as unisexual flower

135. Biotic components of ecosystem are
(1) Producers (2) Consumers (3) Decomposers (4) All of above

Ans. (4)

Sol. All of these
Producer, consumers, decomposers are living so they all are known as biotic component of ecosystem

136. Which one of the following substance is changed into amino acid after digestion
(1) Protein (2) Carbohydrate (3) Fat (4) Nucleic acid

Ans. (1)

Sol. Protein is polymer of aminoacid

$$\text{Protein} \xrightarrow{\text{pepsin}} \text{pepides} \xrightarrow{\text{peptidase}} \text{Amino acid.}$$

137. Source of Penicillin antibiotic is
(1) Bacteria (2) Fungi (3) Virus (4) Algae

Ans. (2)

Sol. Fungi
Penicillium is obtain from Penicillium notatum which is a fungi

138. Testosteron Hormone is produced in
(1) Leyding cell (2) Kupffer cell (3) Granulosa cell (4) None of above

Ans. (1)

Sol. Leyding cells
Leyding cells are present in side the testis & they are responsible for secretion of testosteron & This hormone is responsible for secondary sexual character in male. Testis is part of male reproductive system.

139. Number of sex chromosomes in human beings are
(1) 23 (2) 46 (3) 1 (4) 2

Ans. (4)

Sol. 2
Human contain 46 number of chromosome in which 44 are autosomal chromosome & 2 are sex chromosome which are xx in female & xy in male.

140. Which of the following is known as the 'suicide bag' of the cell?
(1) Plastid (2) Mitochondria (3) Ribosome (4) Lysosome
Ans. (4)
Sol. Lysosome
because lysosome contain hydrolytic enzymes & when programing of cell is disturbed then digestive enzymes come outs in cytoplasm of cell & it digest its own cell

SOCIAL SCIENCE

141. The Harappan Civilization was discovered in the year
(1) 1910 (2) 1921 (3) 1935 (4) 1942
Ans. (2)
Sol. It was discovered in 1921 by Rakhal Das Banerjee

142. The First Literary Source is
(1) Rigveda (2) Samveda (3) Yajurved (4) Atharvaved
Ans. (1)
Sol. As per ancient history first literacy source is Rig veda

143. During whose reign Megasthenes visited to India?
(1) Ashoka (2) Harsh Vardhan (3) Chandragupta Maurya (4) Kumar Gupta
Ans. (2)
Sol. During the reign of Chandra Gupta Maurya Megasthense visited India.

144. Which dynasty was ruling over North India at the time of Alexander's invasion?
(1) Nand (2) Maurya (3) Shunga (4) Kanva
Ans. (2)
Sol. Mauryan Empire was ruling over North India

145. The name of Shershah in childhood was
(1) Hasan (2) Farid (3) Sher Khan (4) None of the above
Ans. (2)
Sol. Farid was his childhood name of Shershah Suri

146. Which sultan of Delhi has also been called 'A mixture of opposites'?
(1) Balban (2) Alauddin Khilji
(3) Mohammad Tughalaq (4) Ibrahim Lodhi
Ans. (3)
Sol. Mohammad Tughalaq was called as opposite of mixture because of his insensible decisions

147. The Emperor was called 'Kalandar'
(1) Babar (2) Humayun (3) Akbar (4) Shahjahan
Ans. (1)
Sol. Kalandar means honesty (Babar)

148. Famous ' Peacock Throne' was taken away out of India by
(1) Ahmad Shah Abdali (2) Taimur (3) Dalhousie (4) Nadir Shah
Ans. (4)
Sol. Nadir Shah took away Peacock Throne

149. 'Subsidiary Alliance' was implemented during period of
(1) Lord Cornwallis (2) Lord Wellesley (3) Sir John Shore (4) Lord Auckland
Ans. (2)
Sol. Lord wellesley initiated Subsidiary Alliance

150. Which one of the following writing is Not related to Mahatma Gandhi?
(1) My Experiments with truth (2) Harijan
(3) Das Capital (4) Hind Swaraj
Ans. (3)

Sol. Das Capital was written by Karl Marx

151. Name the founder of 'Gadar Party'
(1) Lal Hardayal (2) Subhash Chandra Bose
(3) Madam Cama (4) Madan Lal Dhingra
Ans. (1)
Sol. Lala Hardayal started the 'Gadar Party

152. Who among the following was not known as Moderate in the Indian National Movement?
(1) Bal Gangadhar Tilak (2) Dadabhai Naoroji
(3) M.G. Ranade (4) Gopal Krishna Gokhale
Ans. (1)
Sol. Bal Gangadhar Tilak was a moderate while others were exteruist

153. The Himalayan mountain range is an example of
(1) Block mountain (2) Folding mountain (3) Volcanic mountain (4) Residual mountain
Ans. (2)
Sol. Himalayan mountain are called as Young fold moutains

154. The forest of Ganga-Brahmputra-delta is known as
(1) Evergreen Forest (2) Monsoon Forest (3) Sundan Ban (4) Deciduous Forest
Ans. (3)
Sol. Sundar Ban being the most fertile land are called as deltas where river Ganga and Brahmputra meet

155. How many districts are in Uttar Pradesh?
(1) 70 (2) 75 (3) 80 (4) 85
Ans. (2)
Sol. 75 Districts are there in UP

156. In which continent the Sahara desert is situated
(1) South America (2) Africa (3) Asia (4) North America
Ans. (2)
Sol. Sahara desert is situated in Africa

157. The Blue Revolution is related with
(1) Food Grain (2) Fish Production (3) Milk Production (4) Oil seed Production
Ans. (2)
Sol. Fish production is called blue rebellion

158. The Oil and Natural Gas Commission (ONGC) was set up in
(1) 1956 (2) 1957 (3) 1959 (4) 1961
Ans. (1)
Sol. ONGC was set up in 1956

159. What is the name of Mid Latitude grass land in South America?
(1) Prairie (2) Pampas (3) Veld (4) Steppes
Ans. (2)
Sol. Pampas are the name given to Mid Latitude grass land in South America

160. Where Thar Desert is located?
(1) Pakistan (2) China (3) India (4) United State of America
Ans. (3)
Sol. Thar desert is located in India

161. Where Gobind Sagar reservoir is situated?
(1) Uttar Pradesh (2) Haryana (3) Himanchal Pradesh (4) Punjab
Ans. (3)
Sol. Gobind Sagar reservoir is situated in Punjab

162. When Tourism day is celebrated?
(1) 5 January (2) 10 December (3) 5 June (4) 27 September
Ans. **(4)**
Sol. 27th September is celebrated as Tourism day

163. According to Census 2011 the population of U.P. is
(1) 18.8 Crores (2) 19.98 Crores (3) 24.70 Crores (4) 30.00 Crores
Ans. **(2)**
Sol. The population of UP according to 2011 report was 19.98 crores

164. I.M.F. was established by the recommendations of which Committee?
(1) Bretton woods committee (2) Goswami committee
(3) Narsingham committee (4) None of them
Ans. **(1)**
Sol. Bretton woods Committee was recommended by International monetary fund during world war II (1944)

165. In which year India devalued its currency for the first time
(1) 1949 (2) 1966 (3) 1991 (4) None of them
Ans. **(2)**
Sol. The currency of India was devalued for the first time in the year 1966

166. The least Population State in India is
(1) Sikkim (2) Mizoram (3) Uttar Pradesh (4) Bihar
Ans. **(1)**
Sol. Sikkim is the least populated state

167. Where is situated the Headquarter of World Bank?
(1) Texas (2) Canada (3) Washington (4) Geneva
Ans. **(3)**
Sol. World Bank is situated in Washington (USA)

168. Who has first developed the theory of Rent?
(1) Recardo (2) Adam Smith (3) Marshall (4) None of them
Ans. **(1)**
Sol. David Ricardo developed the theory of Rent

169. Which Canal is largest in the world?
(1) Panama Canal (2) Ram Ganga Canal (3) Kra Canal (4) Suez Canal
Ans. **(4)**
Sol. Suez canal is the largest canal which is 193.5 km

170. 'Chipko Movement' was basically against
(1) Water Pollution (2) Noise Pollution (3) Soil Pollution (4) Deforestation
Ans. **(4)**
Sol. Deforestation give rise to 'Chipko Movement' against cutting of trees.

171. The President's Rule in a state means that the state is ruled by
(1) The President (2) The Chief Minister
(3) The Governor of The State (4) The Prime Minister State
Ans. **(1)**
Sol. During President's rule in the state, the state is ruled by The President

172. In which year "The Right to Information Act" was passed
(1) 2001 (2) 2003 (3) 2005 (4) 2007
Ans. **(3)**
Sol. The Right to Information Act was passed in 2005 by central government

173. The Constitution of India primarily did not include in its preamble
(1) Sovereign (2) Socialist (3) Democratic (4) Republic
Ans. **(2)**
Sol. Socialist was the word which was included in the 42nd Arnendment Act 1976

174. Article – 370 was associated with
(1) Uttar Pradesh (2) Nagaland (3) Jammu & Kashmir (4) Telangana
Ans. **(3)**
Sol. Article 370 is related to the state Jammu and Kashmir

175. Who presided over the first meeting of the Indian Constituent Assembly?
(1) Sachchidanand Sinha (2) Dr. Rajendra Prasad
(3) Dr. B.R. Ambedkar (4) H.V. Kamath
Ans. **(1)**
Sol. Sachchidanand Sinha presided over the 1st meeting of the Indian Constituent Assembly

176. Who appoints the Chairman of Union Public Service Commission?
(1) President (2) Prime Minister (3) Chief Justice of India (4) Vice President
Ans. **(1)**
Sol. The President of the country appoints the chairman of union Public service commission

177. Which of the following appointments is not made by the President of India?
(1) Speaker of The Lok Sabha (2) Chief Justice of India
(3) Chief of Army (4) Prime Minister
Ans. **(1)**
Sol. The Speaker of the Lok Sabha is not appointed by the President of India but he/she elected by the majority in the Lok Sabha

178. The first female speaker of Lok Sabha is
(1) Vijay Laxmi Pandit (2) Sucheta Kriplani
(3) Tarkeshwari Sinha (4) Meira Kumar
Ans. **(4)**
Sol. Meira Kumar was the first female speaker in Lok Shabha

179. The state in which Panchayati Raj was introduced first
(1) Uttar Pradesh (2) Bihar (3) Rajasthan (4) Gujarat
Ans. **(3)**
Sol. Rajasthan was the first state in which Panchayati Raj was introduced in 2nd Oct. 1959

180. Who was the first Muslim President in India?
(1) Fakhruddin Ali Ahmed (2) Dr. Zakir Hussain
(3) Salman Khursheid (4) Dr. Abdul Kalam Azad
Ans. **(2)**
Sol. Dr. Zakir Hussain was first Muslim president of India

MATHEMATICS

181. Which of the following statement is true?
(1) $\left(\frac{1}{2}\right)^{\frac{1}{2}} = \left(\frac{1}{3}\right)^{\frac{1}{3}}$ (2) $\left(\frac{1}{2}\right)^{\frac{1}{2}} < \left(\frac{1}{3}\right)^{\frac{1}{3}}$
(3) $\left(\frac{1}{2}\right)^{\frac{1}{2}} > \left(\frac{1}{3}\right)^{\frac{1}{3}}$ (4) $\left(\frac{1}{2}\right)^{\frac{1}{2}}$ and $\left(\frac{1}{3}\right)^{\frac{1}{3}}$ are rational numbers
Ans. (3)

Sol. $\left(\frac{1}{2}\right)^{\frac{1}{2}} = \left(\frac{1}{2^3}\right)^{\frac{1}{6}} = \left(\frac{1}{8}\right)^{\frac{1}{6}}$

$\left(\frac{1}{3}\right)^{\frac{1}{3}} = \left(\frac{1}{3^2}\right)^{\frac{1}{6}} = \left(\frac{1}{9}\right)^{\frac{1}{6}}$

As $\frac{1}{8} > \frac{1}{9}$

$\therefore \quad \left(\frac{1}{8}\right)^{\frac{1}{6}} > \left(\frac{1}{9}\right)^{\frac{1}{6}}$

So $\left(\frac{1}{2}\right)^{\frac{1}{2}} > \left(\frac{1}{3}\right)^{\frac{1}{3}}$

182. The mean of 15 observations written in some order is 50. If the mean of first eight observations and last eight observations are 48 and 53 respectively then the eighth observation is

(1) 35 (2) 80 (3) 72 (4) 58

Ans. (4)

Sol. Mean of 15 observations = 50

Mean of first eight observations = 48

Mean of last eight observations = 53

$\therefore$ Sum of 15 observations = 15 × 50 = 750

Sum of first eight observations = 8 × 48 = 384

Sum of last eight observation = 8 × 53 = 424

$\therefore$ 8th observation = 384 + 424 – 750 = 808 – 750 = 58

183. The point on the y –axis, which is equidistant from points A(6, 5) and B(-4, 3) is

(1) (9, 0) (2) (0, 9) (3) (0, 4) (4) (0, 3)

Ans. (2)

Sol. Let the point Y axis is P(0,y)

PA = PB

$\sqrt{(\quad)^2 + (\quad)} = \sqrt{(\quad)^2 + (\quad)^2}$

$\sqrt{0-6^2 + y-5} = \sqrt{0+4^2 + y-3^2}$

36 + y2 – 10y + 25 = 16 + y2 – 6y + 9

61 – 25 = 4y

36 = 4y

y = 9

$\therefore$ Coordinate of point P (0, 9)

184. If (sec θ – tanθ) = *k* where $\neq 0$ then the value of (sec θ + tanθ) is

(1) $1-\frac{1}{k}$ (2) $1-k$ (3) $1+k$ (4) $\frac{1}{k}$

Ans. (4)

Sol. We know $\sec^2 q - \tan^2\theta = 1$

(sec θ – tanq) (sec θ + tan θ) = 1

k (sec θ + tan θ) = 1

$\frac{1}{}$

185. The value of k for which the system of linear equation x + 2y $=5$ and 3x + ky = 15 has no solution, is

(1) 6 (2) – 6 (3) $\frac{3}{2}$ (4) $\frac{2}{3}$

Ans. Bouns

x + 2y = 5

3x + ky = 15

For no solutions

$\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}$

$\frac{1}{3}=\frac{2}{k}\neq\frac{5}{15}$

$\frac{1}{3}=\frac{2}{k}$ and $\frac{2}{k}\neq\frac{5}{15}$

k = 6 and $k\neq 6$

OR

Sol. System of linear equations x + 2y = 5 and 3x + ky = 15 has no solution

By using condition of no solution

$\Rightarrow \frac{1}{3}=\frac{2}{k}\neq\frac{-5}{-15}$ $\left(\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}\right)$

$\Rightarrow \frac{1}{3}=\frac{2}{k}\neq\frac{1}{3}$

$\Rightarrow \frac{1}{3}=\frac{2}{k}$ and $\frac{2}{k}\neq\frac{1}{3}$

$\Rightarrow$ k = 6 and $k\neq 6$

Hence contradtion.

$\therefore$ None of the options is correct.

186. If x = 1 is a common root of the equations $ax^2 + ax + 3 = 0$ and $x^2 + x + b = 0$ then the value of ab is

(1) 3 (2) 3.5 (3) 6 (4) – 3

Ans. (1)

Sol. Given, x = 1 is a common root of the equations ax2 + ax + 3 = 0 and x2 + x + b = 0

$\therefore ax^2 + ax + 3 = 0$

$a(1)^2 + a(1) + 3 = 0$

a + a + 3 = 0

2a + 3 = 0

$a=\frac{-3}{2}$

and $x^2 + x + b = 0$

$1^2 + 1 + b = 0$

1 + 1 + b = 0

2 + b = 0

b = –2

$\therefore ab=\left(\frac{-3}{2}\right)(2)=3$

187. If points (a, 0), (0, b) and (1, 1) are collinear, then the value of $\left(\frac{1}{a}+\frac{1}{b}\right)$ is

(1) 1 (2) 2 (3) 0 (4) - 1

Ans. (1)

Sol. As the point (a, 0), (0, b) and (1,1) are collinear.

$\therefore$ Ar $\Delta = 0$

$$\frac{1}{2}\left|a(b-1)+0(1-0)+1(0-b)\right| = 0$$

$$\left|ab-a+0-b\right| = 0$$

$ab = a + b$

$$1 = \frac{a+b}{ab}$$

$$1 = \frac{1}{a}+\frac{1}{b}$$

188. If the centroid of the triangle formed by points (a, b), (b, c) and (c, a) is at the origin, then $a^3 + b^3 + c^3$ is equal to

(1) abc (2) 0 (3) a + b + c (4) 3abc

Ans. (4)

Sol. Given ; Coordinates of vertices of triangle are
A(a, b), B(b, c) and C(c, a)

$$\therefore \text{Coordinates of centroid } G\left(\frac{a+b+c}{3},\frac{b+c+a}{3}\right)$$

since centroid is at the origin

Therefore, $G\left(\frac{a+b+c}{3},\frac{b+c+a}{3}\right) = (0,0)$

$$\therefore \quad \frac{a+b+c}{3} = 0$$

$\Rightarrow a + b + c = 0$

$\Rightarrow a + b = – c$

$\Rightarrow (a + b)^3 = (–c)^3$

$\Rightarrow a^3 + b^3 + 3ab (a + b) = –c^3$

$\Rightarrow a^3 + b^3 + 3ab (–c) = –c^3$

$\Rightarrow a^3 + b^3 – 3abc = –c^3$

$\Rightarrow a^3 + b^3 + c^3 = 3abc$

189. The distance between the points $(\cos\theta, \sin\theta)$ and $(\sin\theta, -\cos\theta)$ is

(1) $\sqrt{3}$ (2) $\sqrt{2}$ (3) 2 (4) 1

Ans. **(2)**

Sol. $$AB = \sqrt{(\cos\theta+\sin\theta)^2+(\sin\theta+\cos\theta)^2}$$

$$= \sqrt{\cos^2\theta+\sin^2\theta-2\sin\theta\cos\theta+\sin^2\theta+\cos^2\theta+2\sin\theta\cos\theta} = \sqrt{1+1} = \sqrt{2}$$

190. If 35% of income of A is equal to 25% of income of B then the ratio of incomes of A and B is

(1) 4:3 (2) 5:7 (3) 7:5 (4) 4:3

Ans. (2)

Sol. 35% of incame of A = 25% of income of AB

$$\frac{35}{100}\times I_A = \frac{25}{100}\times I_B$$

$$\frac{I_A}{I_B} = \frac{25}{100}\times\frac{100}{35} = \frac{5}{7}$$

191. If the ratio of volumes of two cubes is 27.64 then the ratio of their surface area is

(1) 3:4 (2) 4:3 (3) 9:16 (4) 16:9

Ans. (3)

Sol. Given, Ratio of volumes of two cubes = 27 : 64

$\because$ Ratio of volumes = (Ratio of sides of two cubes)^3

27 : 64 = (Ratio of sides of two cubes)^3

$\therefore$ Ratio of sides of two cubes = 3 : 4

Now, Ratio of surface area = (Ratio of sides)^2

$= \left(\frac{3}{4}\right)^2 = \frac{9}{16} = 9 : 16$

192. If the base of a triangle is decrease by 30% and its height is increased by 25% then percentage decrease in area of triangle is

(1) 20% (2) 15% (3) 22.5% (4) 12.5%

Ans. (4)

Sol. Let the base and height of triangle are b ahd h respectively

Original Area = $\frac{1}{2}bh$

Now, base is decreased by 30% and height is increased by 25%

$\therefore$ New Area = $= \frac{1}{2}\left(b - \frac{30}{100}b\right)\left(h + \frac{25}{100}h\right) = \frac{1}{2}\left(\frac{70}{100}b\right)\left(\frac{125}{100}h\right) = \frac{1}{2} \times \frac{7}{10} \times \frac{5}{4}bh = \frac{7}{16}bh$

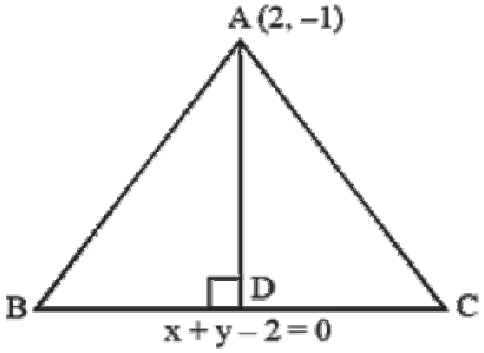
% Change = $\frac{\text{Change in area}}{\text{original area}} \times 100$

$$= \frac{\frac{1}{2}bh - \frac{7}{16}bh}{\frac{1}{2}bh} \times 100 = \frac{\frac{1}{2} - \frac{7}{16}}{\frac{1}{2}} \times 100 = \frac{\frac{8-7}{16}}{\frac{1}{2}} \times 100 = \frac{\frac{1}{16}}{\frac{1}{2}} \times 100 = \frac{1}{8} \times 100 = 12.5\%$$

193. The equation of the base of an equilateral triangle is $x + y - 2 = 0$. If one its vertex is (2, - 1) then area of triangle is

(1) $\frac{1}{2\sqrt{3}}$ sq. unit (2) $\frac{\sqrt{3}}{12}$ sq. unit (3) $\frac{2}{3}$ sq. unit (4) $\frac{3\sqrt{3}}{4}$ sq. unit

Sol. Length of l^r distance from (x_1, y_1) to ax + by + c = 0 is $\left|\frac{ax_1 + by_1 + c}{\sqrt{a^2 + b^2}}\right|$



$\therefore$ $AD = \left|\frac{2(1) + (-1)(1) - 2}{\sqrt{1^2 + 1^2}}\right| = \frac{1}{\sqrt{2}}$

(AD) Altitude of equilateral Δ = $\frac{\sqrt{3}}{2}$ride $= \frac{1}{\sqrt{2}}$

ride = $\sqrt{\frac{2}{3}}$

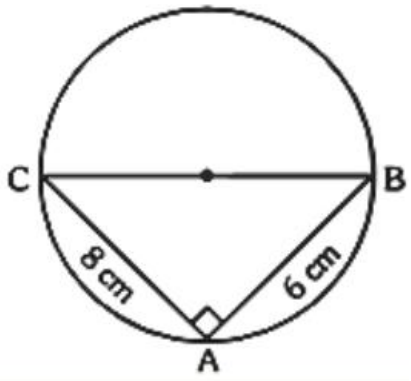
$\Rightarrow$ Ar. eq. $\Delta = \sqrt{\frac{3}{4}}\text{side}^2 = \frac{\sqrt{3}}{4}\left(\frac{\sqrt{2}}{\sqrt{3}}\right)^2 = \frac{1}{2\sqrt{3}}$

194. The lengths of chords AB and AC of a circle are 6 cm and 8 cm respectively. If $\angle BAC = 90^\circ$ then the radius of the circle is

(1) 2.5 cm (2) 3 cm (3) 4 cm (4) 5 cm

Ans. (4)

Sol.



In ΔABC

$AB^2 + AC^2 = BC^2$ (Pythagoras Theorum)

$62 + 82 = BC^2$

$10^2 = BC^2$

10 cm = BC

BC = 10 cm

It is given that $\angle BAC = 90^\circ$

BC is diameter of circle. ($\because$ Angle in semicircle is 90°)

Therefore radius is 5 cm

195. If $\cos 43^\circ = \frac{x}{\sqrt{x^2+y^2}}$ then the value of $\tan 47^\circ$ is

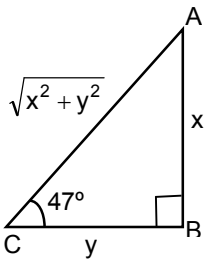
(1) $\frac{y}{x}$ (2) $\frac{y}{\sqrt{x^2+y^2}}$ (3) $\frac{x}{y}$ (4) $\frac{x}{\sqrt{x^2+y^2}}$

Ans. (3)

Sol. $\cos 43^\circ = \frac{x}{\sqrt{x^2+y^2}}$

We know cos 43 = sin (90 – 43)

$\frac{x}{\sqrt{x^2+y^2}} = \sin 47^\circ$



$AC = \sqrt{x^2 + y^2}$

AB = x

$\therefore \quad CB = \sqrt{AC^2 - AB^2} = y$

$\therefore \quad \tan 47° = \frac{AB}{BC} = \frac{x}{y}$

196. If the quadratic equations $2x^2 + 4x + (a + 5) = 0$ have equal roots and $(a + 4)x^2 + ax - 3b = 0$ have distinct real roots then which of the following is true:

(1) $a = -3, b < \frac{3}{4}$ (2) $a = 3, b > \frac{3}{4}$ (3) $a = -3, b > \frac{3}{4}$ (4) $a = 3, b < \frac{3}{4}$

Ans. (3)

Sol. Equation $2x^2 + 4x + (a + 5) = 0$ have equal roots

$\therefore B^2 - 4AC = 0$

$42 - 4(2)(a+5) = 0$

$16 - 8(a + 5) = 0$

$8(2 - a - 5) = 0$

$8(-3 - a) = 0$

$-3 - a = 0$

$a = -3$

Equation $(a + 4)x2 + ax - 3b = 0$ have real and distinct roots

$B^2 - 4AC > 0$

$a^2 - 4\times (a + 4)(-3b) > 0$

$a^2 + 12(a + 4)b > 0$

$(-3)^2 + 12(-3 + 4)b > 0$

$9 + 12b > 0$

$b > \frac{-9}{12}$

$b > \frac{-3}{4}$

$a = -3$ and $b > \frac{-3}{4}$

197. The value of $\tan 1° \tan 2° ..... \tan 89°$ is:

(1) 0 (2) 1 (3) $\frac{1}{\sqrt{3}}$ (4) not defined

Ans. (2)

Sol. $\tan(90 - \theta) = \cot\theta$

$\Rightarrow \tan 89° \tan(90 - 1)°$

$\tan 89° = \cot 1°$

$\Rightarrow \tan 88° \tan(90 - 2)°$

$\tan 88° \cot 2°$

$\tan 1° \tan 2° ..... \tan 44° \tan 45° \tan 46° .....\tan 88° \tan 89°$

= tan1° tan2° ..... tan44° tan45° cot44°.....cot2° cot1°

= tan1° tan2° ..... tan44° × 1 × $\frac{1}{\tan 44^\circ} \times ..... \frac{1}{\tan 2^\circ} \times \frac{1}{\tan 1^\circ}$ = 1

198. The digit at the unit place in $(3157)^{2020}$ is

(1) 1 (2) 3 (3) 7 (4) 9

Ans. (1)

Sol. Unit place digit is depend on powers of unit digit

= unit digit of $(3157)^{2020}$

= unit digit of 7^{2020}

= unit digit of $7^{4 \times 505}$

= unit digit of $(7^4)^{505}$ (Cyclicity of 7 is 4)

= unit digit of $(2401)^{505}$

= unit digit of $(1)^{505}$

$\therefore$ Unit place digit is 1

199. A metallic cuboid of dimension 9 cm × 11 cm × 12 cm is melted and recasted into spherical balls of diameter 0.3 cm. The number of balls will be

(1) 84000 (2) 10500 (3) 78000 (4) 86000

Ans. **(1)**

Sol. Volume of cuboid = N × Volume of sphere

$9 \times 11 \times 12 = N \times \frac{4}{3} \times \frac{22}{7} \times \frac{3}{20} \times \frac{3}{20} \times \frac{3}{20}$

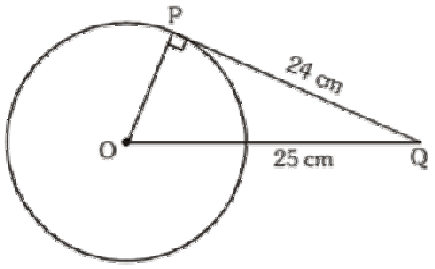
(No of balls) N = 84000

200. The length of tangent drawn from a point Q to a circle is 24 cm and distance from Q from the centre of circle is 25 cm. The radius of circle is

(1) 7 cm (2) 12 cm (3) 15 cm (4) 24.5 cm

Ans. **(1)**

Sol.



$OP \perp PQ$

In DOPQ

$OP = \sqrt{OQ^2 - OP^2} = \sqrt{25^2 - 24^2} = 7$