

NATIONAL TALENT SEARCH EXAMINATION-2019-20, DELHI

SCHOLASTIC APTITUDE TEST (SAT) PAPER & HINTS & SOLUTION

101. A bomb of Mass 30kg at rest explodes into two pieces of masses 18kg and 12kg. The velocity of 18 kg mass is 6m/s. The kinetic energy of the other mass is?

- (1) 324 J (2*) 486 J (3) 256 J (4) 524 J

Sol. Total mass = 30kg

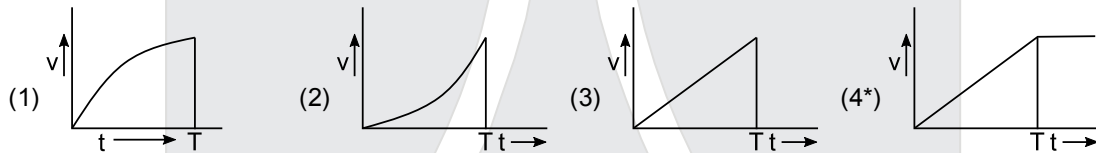
$m_1 = 18\text{kg}, v_1 = 6\text{m/sec}$

$m_2 = 12\text{kg}, v_2 = ?$

By L.O.C.M, $0 = m_1v_1 + m_2 v_2$
 $= 18 \times 6 + 12 (-v_2) \Rightarrow v_2 = 9 \text{ m/sec}$

$\text{K.E.} = \frac{1}{2} m_2 v_2^2 = \frac{1}{2} \times 12 \times 9 \times 9 = 486\text{J}$

102. A body initially at rest start moving when a constant external force F is applied on it. The force F is applied for time t = 0 to time t = T. Which of the following graph represents the variation of the speed (v) of the body with time (t) :



103. A person cannot clearly see objects at a distance more than 40cm. He is advised to use lens of power?

- (1*) -2.5D (2) 2.5D (3) -1.5D (4) 1.5D

Sol. $u = \infty, v = -40\text{cm}$

By lens formula, $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$
 $\Rightarrow f = -40 \text{ cm}$

Now, $P = \frac{1}{f(\text{metre})} = \frac{100}{-40} = -2.5\text{D}$

104. Gravitational force is essentially required for?

- (1) Stirring in liquid (2*) Convection (3) Conduction (4) Radiation

105. An observer moves towards a stationary plane mirror at a speed of 4m/s the speed with which his image move towards him?

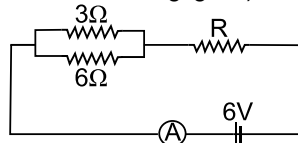
- (1) 2m/s (2) 4m/s (3*) 8m/s (4) Image will stay at rest

Sol. Speed of man = 4m/sec

Speed of image = 4m/sec

Speed of image with respect to man = $4 - (-4) = 8\text{m/sec}$

106. If the ammeter in the given circuit reads 2A. What is the value of resistance R (the resistance of ammeter is negligible).



- (1*) 1 Ω (2) 2 Ω (3) 3 Ω (4) 4 Ω

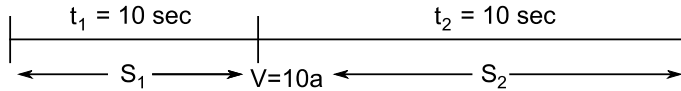
Sol. Req = $\left(\frac{6 \times 3}{6+3}\right) + R = (2 + R)\Omega$

$$I = \frac{6}{\text{Req}} \Rightarrow 2A = \frac{6}{2+R} \Rightarrow R = 1\Omega$$

107. A particle starts its motion from rest under the action of a constant force. If the distance covered in next 10 seconds is S_2 then

- (1) $S_2 = 6 S_1$ (2) $S_2 = 2 S_1$ (3) $S_2 = 8 S_1$ (4*) $S_2 = 3 S_1$

Sol.



$$S_1 = \frac{1}{2}at_1^2 = \frac{1}{2}a \times (10)^2 = 50a$$

$$S_2 = vt + \frac{1}{2}at_2^2 = 10a \times 10 + \frac{1}{2}a(10)^2$$

$$\frac{S_1}{S_2} = \frac{50a}{150a} = \frac{1}{3} \Rightarrow S_2 = 3 S_1$$

108. Two planets of radii r^1 and r^2 are made from the same material having same density. The ratio of acceleration due to gravity $g_1|g_2$ at the surfaces of the planets is

- (1*) $r_1|r_2$ (2) $r_2|r_1$ (3) $(r_1|r_2)^2$ (4) $(r_1|r_2)^2$

Sol. 1st Planet

$$g_1 = \frac{GH_1}{r_1^2}$$

$$= \frac{G \times \frac{4}{3} \pi r_1^3}{r_1^2}$$

$$= \frac{4}{3} G \pi \times r_1$$

$$\Rightarrow \frac{g_1}{g_2} = \frac{r_1}{r_2}$$

Second Planet

$$g_2 = \frac{GH_2}{r_2^2}$$

$$= \frac{G \times \frac{4}{3} \pi r_2^3}{r_2^2}$$

$$= \frac{4}{3} G \pi \times r_2$$

109. A concave mirror of focal length 15cm forms an image. The position of the object when the image is virtual and linear magnification is 2 is.

- (1) 22.5 cm (2*) 7.5 cm (3) 30 cm (4) 45cm

Sol. $f = -15\text{cm}$, $m = +2$

$$\Rightarrow \frac{-v}{4} = 2 \quad \Rightarrow v = -2u$$

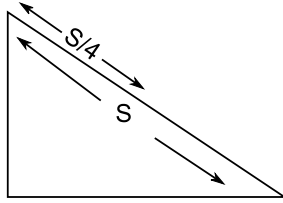
$$\text{Now, } \frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

$$\Rightarrow \frac{1}{-2u} + \frac{1}{u} = \frac{1}{f} \Rightarrow \frac{-1+2}{2u} = -\frac{1}{15} \Rightarrow u = \frac{-15}{2} \text{cm} = -7.5\text{cm}$$

110. A body on an inclined plane slides down $\frac{1}{4}$ th of distance in 2 seconds. It will slide down the complete distance along the plane in (the inclined plane have zero friction)

- (1*) 4s (2) 5s (3) 2s (4) 3s

Sol.



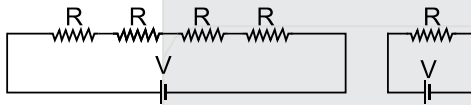
$$\Rightarrow \frac{S}{4} = \frac{1}{2}at^2 \Rightarrow a = \frac{S}{8} \text{ m/s}^2$$

$$\Rightarrow \text{Now } S = \frac{1}{2}at^2 = \frac{1}{2} \times \frac{S}{8} \times t^2$$

$$\Rightarrow t = 4 \text{ sec}$$

111. When four equal resistors are connected in series with a battery they dissipate a power of 10W. The power dissipated through any of them if connected across the same battery will be—
 (1*) 40W (2) 10/3W (3) 90W (4) 10W

Sol.



$$\Rightarrow P = \frac{V^2}{4R} = 10W$$

$$\Rightarrow P = \frac{V^2}{R} = 40W$$

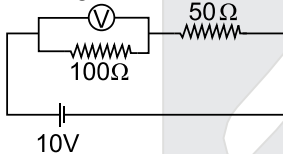
112. An electron move with velocity v in a uniform magnetic field B . The magnetic force experienced by the electron is
 (1) Always zero (2) Never zero
 (3) Zero if v is perpendicular to B (4*) Zero if v is parallel to B

Sol. $F = q (\vec{v} \times \vec{B}) = q v B \sin \theta$

If V & B are parallel, $\sin \theta = \sin 0$

$$F = q v B \times 0 = 0$$

113. In the given circuit the voltmeter reads 5V. The resistance of the voltmeter in Ohm is?



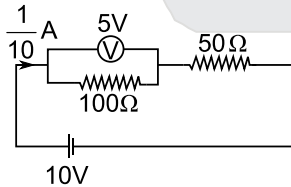
(1) 200

(2*) 100

(3) 10

(4) 50

Sol.



Voltage across $50\Omega = V$

$$I = \frac{5}{50} \text{ A} = \frac{1}{10} \text{ A}$$

Current through $100\Omega =$ Current through voltmeter

$$= \frac{1}{2} \times \frac{1}{10} = \frac{1}{20} \text{ A}$$

$$\text{So, resistance of voltmeter} = \frac{V}{I} = \frac{5}{\frac{1}{20}} = R = 100 \Omega$$

- 114.** Which of the following contain seven molecule of water of crystallization?
 (1) Epsom Salt (2) Green Vitriol (3) Blue vitriol (4) White vitriol
Ans. 1,2,4
- 115.** Which elements are used for galvanisation?
 (1*) Zn and Sn (2) Na and K (3) Cu and Fe (4) Ca and Mg
- 116.** Ramesh dropped a metal piece 'A' in the solution of another metal 'M'. After some time a new colourless compound 'N' is formed. A, M, N respectively can be:-
 (1) Mg, NaCl, MgCl₂ (2) Fe, ZnSO₄, FeSO₄
 (3*) Zn, CuSO₄, ZnSO₄ (4) Cu, ZnSO₄, CuSO₄
- 117.** Which fuel has highest calorific value?
 (1) LPG (2) Petrol (3) CNG (4*) Hydrogen
- 118.** The pH of acid rain is:
 (1*) Less than 5.6 (2) More than 5.6 (3) Equal to 5.6 (4) More than 6.6
- 119.** IUPAC name of the following compound will be:

$$\text{CH}_3 - \overset{\text{O}}{\parallel}{\text{C}} - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{COOH}$$

 (1) 2-Keto hexan -6 oic acid (2*) 5- Keto hexanoic acid
 (3) Methyl Ketone butanoic acid (4) 5-Aldo hexanoic acid
- 120.** Products obtained on electrolysis of brine are:
 (1) NaHCO₃, H₂, Cl₂ (2) H₂, NaOH, NaHCO₃
 (3) Cl₂, NaOH, Na₂O₂ (4*) NaOH, H₂, Cl₂
- 121.** In balanced chemical equation $a \text{KMnO}_4 + b \text{H}_2\text{SO}_4 \rightarrow c \text{K}_2\text{SO}_4 + d \text{MnSO}_4 + e \text{H}_2\text{O} + f[\text{O}]$
 Which of the following alternative are correct?
 (1*) a = 2, b = 3, c = 1, d = 2, e = 3, f = 5 (2) a = 1, b = 2, c = 1, d = 3, e = 2, f = 3
 (3) a = 2, b = 3, c = 2, d = 3, e = 2, f = 5 (4) a = 3, b = 1, c = 3, d = 3, e = 1, f = 3
- 122.** Benzene (C₆H₆) have:
 (1) 12 covalent bonds (2*) 15 covalent bonds (3) 18 covalent bonds (4) 9 covalent bonds
- 123.** 1.0Kg of Iron (Fe), having atomic mass equal to 56g mol⁻¹ contains
 (1) 2.88 × 10²⁴ atoms (2) 6.93 × 10²³ atoms (3) 6.93 × 10²¹ atoms (4*) 1.075 × 10²⁵ atoms
- 124.** Aqueous solution of CsO₂ is:
 (1*) Basic (2) Neutral (3) Acidic (4) Amphoteric
- 125.** A student added a drop of universal indicator to 1.00mL of given solution and found that a green colour is produced. The pH value of the solution will be:
 (1*) 7 – 9 (2) 0 – 9 (3) 10 – 12 (4) 4 – 6
- 126.** Elements present in any group have the same number of:
 (1*) Valence electrons (2) Neutrons (3) Protons (4) None of the above
- 127.** Which of the following reactions take place during break down of molecules in the respiration in our body?
 (1*) Oxidation (2) Reduction (3) Oxidation–reduction (4) Photo–oxidation



128. Lactic acid is produced when pyruvate is broken down.
 (1) In presence of oxygen in mitochondria (2) In absence of oxygen in mitochondria
 (3) In presence of oxygen in muscle cells (4*) In absence of oxygen in muscle cells
129. Separation of oxygenated and deoxygenated blood.
 I. Fulfils energy requirements of the body
 II. Ensures the effect transfer of oxygen in the body
 (1*) Both statements are true (2) Statement I is true but statement II is false
 (3) Statement I is false but statement II is true (4) Both the statements are false
130. Root pressure is effective way transporting water in xylem. This pressure is generated?
 (1) In bright sunlight (2*) During night
 (3) At very low temperature (4) In high trees
131. Choose the correct option to complete 'A', 'B', 'C' and 'D' in the following table?
- | Hormone | Function |
|---------|--|
| A | Stimulates growth in all organs |
| B | Stimulates pituitary to release growth hormone |
| C | Controls blood sugar level |
| D | Regulates carbohydrate metabolism |
- (1) A – Insulin, B – Thyroxine, C – Growth Hormone, D – Growth Hormone Release Factor
 (2) A – Growth Hormone, B – Insulin, C – Thyroxine, D – Growth Hormone Releasing Factor
 (3) A – Thyroxine, B – Insulin, C – Growth Hormone, D – Growth Hormone Releasing Factor
 (4*) A – Growth Hormone, B – Growth Hormone Releasing Factor, C – Insulin, D – Thyroxine
132. If a pea plant with wrinkled seeds and heterozygous tall plants were self-pollinated. What will be the phenotypes of plants of F₂ generation?
 (1*) 75% plants will be tall and have wrinkled seeds and other 25% will be dwarf with wrinkled seeds
 (2) 50% plants will be tall and have wrinkled seeds and 50% will be dwarf with wrinkled seeds
 (3) 50% plants will be tall and have wrinkled seeds and other 50% will be dwarf with round seeds
 (4) 25% plants will be tall and have wrinkled seeds and other 75% will be dwarf with wrinkled seeds
133. Two similar pea plants are growing in two different islands separated by a vast ocean. The phenomenon of geographical isolation will?
 (1*) Not be seen as the plants get self-pollinated
 (2) Be seen as the plants are growing in isolated regions
 (3) Not be seen as the plants get pollinated by ocean water currents
 (4) Be seen as the plants do not get pollinated and reproduces asexually
134. DDT is non-biodegradable chemical when it enters food chain it gets accumulated in each trophic level. This phenomenon is called as?
 (1) Eutrophication (2) Chemical Amplification
 (3*) Bio magnification (4) Chemical Magnification
135. Presence of is an indicator of pollution level in water
 (1) Colour (2*) Coliform bacteria (3) Rhizo bacteria (4) Spiral bacteria
136. Leaves of tendu are the source of income of large number of people in India. These Leaves are used to make?
 (1) Thatched roofs (2*) Bidis (3) Leaf Plates (4) Teeth cleaning agent
137. Maximum number of trophic levels supported in any ecosystem is?
 (1) One (2) Two (3) Three (4*) Four
138. Correct sequence of reflex are is?

- (1) Receptor → Motor Neuron → Sensory Neuron → Effector organ → Relay Neuron
 (2) Receptor → Sensory Neuron → Motor Neuron → Effector organ → Relay Neuron
 (3) Receptor → Sensory Neuron → Motor Neuron → Relay Neuron → Effector organ
 (4*) Receptor → Sensory Neuron → Relay Neuron → Motor Neuron → Effector organ

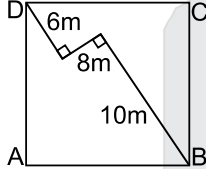
139. Tricuspid valve is present in?

- (1*) Right atria and right ventricle (2) Left atria and left ventricle
 (3) Wall of atrium (4) Wall of ventricle

140. BCG vaccine provide protection against?

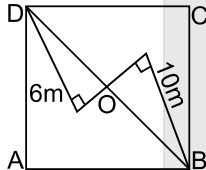
- (1) Measles (2*) T.B. (3) Cholera (4) Small pox

141. Find the area of the square ABCD?



- (1*) 160m² (2) 140 m² (3) 125 m² (4) 120 m²

Sol.



⇒ Join BD
 ⇒ $\triangle DOE \sim \triangle BOF$ (AA)

$$\Rightarrow \therefore \frac{DE}{BF} = \frac{OE}{OF}$$

$$\Rightarrow \frac{6}{10} = \frac{OE}{OF}$$

$$\Rightarrow \frac{3}{5} = \frac{OE}{OF}$$

⇒ As $EF = 8m$

$$\therefore OE = 3m, OF = 5m$$

⇒ In $\triangle DOE$

⇒ By pyth. Th m

$$\Rightarrow DO = \sqrt{45} = 3\sqrt{5}m$$

$$\Rightarrow BO = \sqrt{125} = 5\sqrt{5}m$$

$$\therefore BD = 8\sqrt{5}m$$

$$\begin{aligned} \Rightarrow \text{Hence Ar}(ABCD) &= \frac{1}{2}(d)^2 \\ &= \frac{1}{2}(8\sqrt{5})^2 = 160m^2 \end{aligned}$$

142. If $(2^x - 4)^3 + (4^x - 2)^3 = (4^x + 2^x - 6)^3$, then the sum of all real values of x is?

- (1) 0.5 (2) 1.5 (3) 2.5 (4*) 3.5

Sol. $\Rightarrow (2^x - 4)^3 + (4^x - 2)^3 = (4^x + 2^x - 6)^3$

$$\Rightarrow \text{Let } 2^x - 4 = a$$

$$\Rightarrow 4^x - 2 = b$$

$$\therefore a^3 + b^3 = (a + b)^3$$

$$\Rightarrow 3ab(a + b) = 0$$

$$\begin{aligned} &\Rightarrow a + b = 0 && \text{or } a \cdot b = 0 \\ &\Rightarrow 2^x + 4^x - 6 = 0 && \text{or } a = 0 && \text{or } b = 0 \\ &\Rightarrow 2^x + 4^x = 6 && \text{or } 2^x - 4 = 0 \\ &\Rightarrow 2^x + (2^x)^2 - 6 = 0 && \text{or } 2^x = 2^2 \\ &\Rightarrow \text{This is a quad.} && x = 2 \\ &\therefore (2^4 + 3)(2^x - 2) = 0 && \text{or } 4^x - 2 = 0 \\ &\Rightarrow 2^x = -3, 2^x = 2 && 4^x = 2 \\ &\Rightarrow x = 1 && 2^{2x} = 2 \\ &&& x = \frac{1}{2} \end{aligned}$$

$$\Rightarrow \text{Sum of roots} = 2 + 1 + \frac{1}{2} = 3.5$$

143. If $2019^x + 2019^{-x} = 3$, then the value of $\sqrt{\frac{2019^{6x} - 2019^{-6x}}{2019^x - 2019^{-x}}}$ is:

- (1) 3 (2) 6 (3) 9 (4*) 12

Sol. $\Rightarrow 2019^x + 2019^{-x} = 3$

$$\Rightarrow 2019 + \frac{1}{2019^x} = 3$$

\Rightarrow Let $2019^x = a$

$$\Rightarrow a + \frac{1}{a} = 3 \quad \dots\dots\dots(1)$$

\Rightarrow to final. $\sqrt{\frac{2019^{6x} - 2019^{-6x}}{2019^x - 2019^{-x}}}$

$$\Rightarrow \sqrt{\frac{a^6 - \frac{1}{a^6}}{a - \frac{1}{a}}}$$

$$\Rightarrow \sqrt{\frac{(a^2)^3 - \left(\frac{1}{a^2}\right)^3}{a - \frac{1}{a}}}$$

$$\Rightarrow \sqrt{\frac{\left(a^2 - \frac{1}{a^2}\right)\left(a^4 + \frac{1}{a^4} + 1\right)}{\left(a - \frac{1}{a}\right)}}$$

$$\Rightarrow \sqrt{\left(a + \frac{1}{a}\right)\left(a^4 + \frac{1}{a^4} + 1\right)}$$

$$\Rightarrow a + \frac{1}{a} = 3 \quad \therefore a^2 + \frac{1}{a^2} + 2 = 9$$

$$\Rightarrow a^2 + \frac{1}{a^2} = 7$$

$$\Rightarrow a^4 + \frac{1}{a^4} + 2 = 49$$

$$\Rightarrow a^4 + \frac{1}{a^4} = 47$$

$$\therefore \sqrt{3(47+1)} = 12$$

144. Let 'p' be a root of the equation $x^2 - 5x + 7 = 0$, then the area of the circle with centre at (P, P) and passing through point (1, 4) is
 (1*) 3π sq. units (2) 5π sq. units (3) 7π sq. units (4) None of these

Sol. $x^2 = 5x + 7$

'P' is a root.

$$\therefore P^2 - 5P + 7 = 0 \dots\dots\dots(i)$$

$$\begin{aligned} \text{Radius} &= \sqrt{(P-1)^2 + (P-4)^2} \\ &= \sqrt{P^2 + 1 - 2P + P^2 + 16 - 8P} \\ &= \sqrt{2P^2 - 10P + 17} \\ &= \sqrt{2P^2 - 10P + 14 + 3} \\ &= \sqrt{2(P^2 - 5P + 7) + 3} \\ &= \sqrt{3} \end{aligned}$$

$$\text{Area} = \pi(\sqrt{3})^2 = 3\pi$$

145. If $\frac{1}{x+y} = \frac{1}{x} + \frac{1}{y}$, then the value of $\left(\frac{x}{y}\right)^6 + \left(\frac{x}{y}\right)^3$ is:-
 (1) 0 (2) $\frac{1}{2}$ (3) 1 (4*) 2

Sol. $\Rightarrow \frac{1}{x+y} = \frac{1}{x} + \frac{1}{y}$
 $\Rightarrow xy = x^2 + y^2 + 2xy$
 $\Rightarrow x^2 + y^2 + xy = 0$
 $\Rightarrow x^3 - y^3 = (x-y)(x^2 + y^2 + xy)$
 $\Rightarrow x^3 = y^3 \Rightarrow x = y$
 $\therefore \left(\frac{x}{y}\right)^6 + \left(\frac{x}{y}\right)^3 = 1 + 1 = 2$

146. Let a, b and c are the roots of the polynomial equation $x^3 - 597x - 5236 = 0$ then the value of $(a^3 + b^3 + c^3)$ is:-
 (1) 597 (2*) 15708 (3) 5236 (4) 10472

Sol. $\Rightarrow x^3 - 597x - 5236 = 0$
 $\Rightarrow a, b, c$ are the roots
 $\Rightarrow a^3 + b^3 + c^3 = 3abc$
 $\Rightarrow (\text{As } a + b + c = 0)$
 $\therefore a^3 + b^3 + c^3 = 3 \times 5236 = 15708$

147. If $\text{cosec } x + \cot x = a$, then the value of $\cos x$ is?
 (1) $a^2 + \frac{1}{a^2}$ (2) $\frac{a^2 + 1}{a^2 - 1}$ (3*) $\frac{a^2 - 1}{a^2 + 1}$ (4) $\frac{a^2 + 1}{2a}$

Sol. $\Rightarrow \text{cosec } x + \cot x = a$. (i)
 \Rightarrow As we know
 $\Rightarrow \text{cosec}^2 x - \cot^2 x = 1$
 $\therefore (\text{cosec } x - \cot x)(\text{cosec } x + \cot x) = 1$
 $\therefore \text{cosec } x - \cot x = \frac{1}{a}$ (ii)
 \Rightarrow From (i) & (ii)
 $\Rightarrow 2 \text{ cosec } x = a + \frac{1}{a}$

$$\Rightarrow \operatorname{cosec} x = \frac{a^2 + 1}{2a}$$

$$\Rightarrow \cos x = \frac{a^2 - 1}{a^2 + 1}$$

- 148.** In an AP 2, 5, 8, 11,.....452. The mean of 15th, 16th, 136th and 137th terms is?
 (1) 120 (2*) 227 (3) 220 (4) 454

Sol. $\Rightarrow 2, 5, 8, 11, \dots, 452.$

$$\begin{aligned} \Rightarrow \text{Mean} &= \frac{a_{15} + a_{16} + a_{136} + a_{137}}{4} \\ &= \frac{4a + 300d}{4} \Rightarrow \frac{4(a + 75d)}{4} \\ &= 2 + 75(3) \\ &= 227 \end{aligned}$$

- 149.** The minimum value of $\tan^2 x + \cot^2 x$ is:
 (1) 1 (2) 0 (3*) 2 (4) 3

Sol. $\Rightarrow \tan^2 x + \cot^2 x$
 \Rightarrow its minimum value occurs at 45°
 $\Rightarrow 1 + 1 \Rightarrow 2$

- 150.** If $f(x) = x^4 + ax^3 + bx^2 + cx + d$ is a polynomial such that $f(1) = 5, f(2) = 10, f(3) = 15, f(4) = 20$. Find the value of $\frac{f(12) + f(-8)}{100}$

(1) 198 (2) 198.4 (3) 198.6 (4) 199.2
Sol. $\Rightarrow f(x) = x^4 + ax^3 + bx^2 + cx + d$
 $\Rightarrow f(1) = 5, f(2) = 10, f(3) = 15, f(4) = 20$
 \Rightarrow let $f(x) = (x - 1)(x - 2)(x - 3)(x - 4) + 5x$
 $\Rightarrow \therefore \frac{f(12) + f(-8)}{100} = 198.2$ **Bonus**

- 151.** The product of two 2 digits numbers is 2160 and their H.C.F. is 12. Then sum of the number is?
 (1) 72 (2) 84 (3*) 96 (4) 60

Sol. \Rightarrow HCF = 12
 \Rightarrow Let the numbers be $12x, 12y$
 \Rightarrow HCF \times LCM = $12x \times 12y$
 $\Rightarrow 12x \times 12y = 2160$
 $\Rightarrow x \times y = 15$
 $\Rightarrow x = 3, y = 5$
 \Rightarrow Sum of numbers = 96

- 152.** The angles of a pentagon are in arithmetic progression. The sum of the smallest and largest angle is?
 (1) 172° (2) 108° (3) 180° (4*) 216°

Sol. \Rightarrow Let the angles be
 $\Rightarrow a - 2d, a - d, a, a + d, a + 2d$
 $\Rightarrow a - 2d + a - d + a + a + d + a + 2d = 540$
 $\Rightarrow 5a = 540$
 $\Rightarrow A = 108$
 \Rightarrow Sum of smallest and largest = $2a$
 $= 2(108^\circ)$
 $= 216^\circ$

153. If $\sqrt{p} - \sqrt{q} = 20$, then the maximum value of $\left(\frac{p-5q}{100}\right)$ is:

- (1*) 5 (2) 10 (3) 15 (4) 25

Sol. $\Rightarrow \sqrt{P} - \sqrt{q} = 20$

$\Rightarrow (\sqrt{P})^2 = (20 - \sqrt{q})^2$

$\Rightarrow P = 400 + q - 40\sqrt{q}$

$\Rightarrow \frac{P-5q}{100} \Rightarrow \frac{400 + q - 40\sqrt{q} - 5q}{100}$

$\Rightarrow \frac{400 - 4q - 40\sqrt{q}}{100} \Rightarrow \frac{-4(q + 10\sqrt{q} - 100)}{100}$

\Rightarrow For completing square

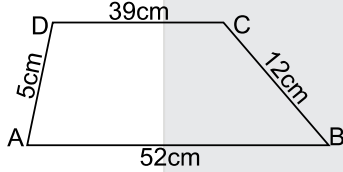
$\Rightarrow \frac{-4(q + 10\sqrt{q} + 25) + 500}{100}$

$\Rightarrow \frac{-4(\sqrt{q} + 5)^2 + 500}{100}$

\Rightarrow its maximum value occurs when $\sqrt{q} + 5 = 0$

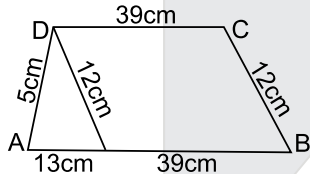
\Rightarrow maximum value = 5

154. The area of trapezium ABCD where AB = 52cm, BC = 12cm, CD = 39cm and DA = 5cm and $AB \parallel CD$, is?



- (1*) 210 sq.cm (2) 234 sq.cm. (3) 260 sq.cm (4) 280 sq.cm

Sol.



$\Rightarrow \therefore \angle D = 90^\circ$

$\Rightarrow \text{ar}(ADE) = \frac{1}{2} \times 5 \times 12 = 30$

$\Rightarrow \text{ar}(ADE) = \frac{1}{2} \times 13 \times h$

$\Rightarrow 30 = \frac{1}{2} \times 13 \times h \Rightarrow h = \frac{60}{13}$

$\Rightarrow \text{Area of trapezium} = \frac{1}{2}(39 + 52) \times \frac{60}{13} = 210\text{m}^2$

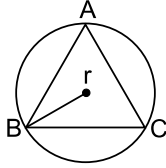
155. The difference between areas of a triangle of largest area inscribed in a circle of radius 'r' units and a triangle of largest area inscribed in a semicircle of radius 'r' units is?

- (1) $\left(\frac{2\sqrt{3}-1}{4}\right)r^2$ sq. units (2) $\left(\frac{4-2\sqrt{3}}{4}\right)r^2$ sq. units

$$(3) \left(\frac{3\sqrt{3} + 4}{4} \right) r^2 \text{ sq. units}$$

$$(4^*) \left(\frac{3\sqrt{3} - 4}{4} \right) r^2 \text{ sq. units}$$

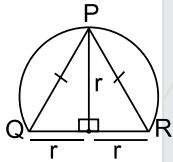
Sol. $\Rightarrow \Delta ABC$ must be equilateral



$\Rightarrow \therefore$ its sides would be $a = \sqrt{3}r$

$$\Rightarrow \text{ar}(\Delta ABC) = (3r^2) \times \frac{\sqrt{3}}{4}$$

$$\Rightarrow \text{ar}(\Delta PQR) = \frac{1}{2} \times 2r \times r = r^2$$



$$\Rightarrow \text{Difference} = r^2 \left(\frac{3\sqrt{3} - 4}{4} \right)$$

156. If p, q, r and s are distinct prime numbers such that $p + q + r = 72, p + r + s = 74, q + r + z = 89$. The largest of these, p, q, r and s is?

- (1*) $r = 53$ (2) $q = 53$ (3) $s = 53$ (4) $s = 49$

Sol. $p + q + r = 72, p + r + s = 74, q + r + s = 89$

Sum of prime is even

$\therefore p = 2$

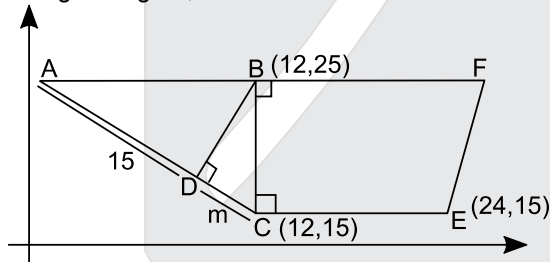
$q + r = 70,$

$r = 53$

$r + s = 72$

$q = 17$

157. In the given figure, the value of m is:



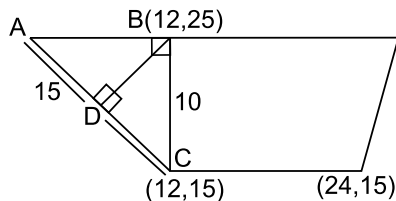
(1*) 5

(2) 10

(3) 7

(4) 12

Sol.



$\Rightarrow \Delta ABC \sim \Delta BDC$

$$\Rightarrow \frac{BC}{DC} = \frac{AC}{BC}$$

$$\Rightarrow 100 = AC \cdot DC$$

$$\Rightarrow 100 = (m + 15)m$$

$$\Rightarrow 100 = m^2 + 15m$$

$$\Rightarrow m^2 + 15m - 100 = 0$$

$$\Rightarrow m^2 + 20m - 5m - 100 = 0$$

$$\Rightarrow m(m + 20) - 5(m + 20) = 0$$

$$\Rightarrow m = -20, m = 5$$

- 158.** Find the sum of all real values of x which satisfy $\frac{1}{x^2 - 10x - 45} + \frac{1}{x^2 - 10x - 45} = \frac{2}{x^2 - 10x - 69}$
- (1) 7 (2*) 10 (3) 13 (4) -3

Sol. $\Rightarrow \frac{1}{x^2 - 10x - 45} + \frac{1}{x^2 - 10x - 29} = \frac{2}{x^2 - 10x - 69}$

\Rightarrow Let $x^2 - 10x - 29 = a$

$\Rightarrow \frac{1}{a - 16} + \frac{1}{a} = \frac{2}{a - 40}$

$\Rightarrow \frac{2a - 16}{(a - 16)a} = \frac{2}{a - 40}$

$\Rightarrow (a - 8)(a - 40) = a^2 - 16a$

$\Rightarrow a^2 - 48a + 320 = a^2 - 16a$

$320 = 32a$

$a = 10$

$\Rightarrow x^2 - 10x - 29 = 10$

$\Rightarrow x^2 - 10x - 39 = 0$

$\Rightarrow (x - 13)(x + 3) = 0$

$\Rightarrow x = 13, x = -3$

\Rightarrow sum of roots = $13 - 3 = 10$

- 159.** If $N = \sqrt[3]{4} + \sqrt[3]{2} + 1$, then the value of $\frac{1}{N^3} + \frac{3}{N^2} + \frac{3}{N}$ is:
- (1) 2 (2) 4 (3) 7 (4*) 1

Sol. $\Rightarrow N = (4)^{\frac{1}{3}} + (2)^{\frac{1}{3}} + 1$

$\Rightarrow (N - 1)^3 = \left(4^{\frac{1}{3}} + 2^{\frac{1}{3}}\right)^3$

$\Rightarrow N^3 - 1 - 3N^2 + 3N = 4 + 2 + 3(8)^{\frac{1}{3}}(N - 1)$

$\Rightarrow N^3 - 1 - 3N^2 + 3N = 6 + 6N - 6$

$\Rightarrow N^3 - 3N^2 - 3N = 1 \dots\dots\dots(i)$

\Rightarrow To find $\frac{1}{N^3} + \frac{3}{N^2} + \frac{3}{N}$

$\Rightarrow = \frac{1 + 3N + 3N^2}{N^3} \Rightarrow \frac{N^3}{N^3} = 1$

- 160.** In a class average height of all students is 'p' cm. Among them, average height of 10 students is 'q' cm and the average height of the remaining students is 'r' cm. The number of students in the class is:

(1) $\frac{p(q-r)}{(p-r)}$ (2) $\frac{q-r}{p-r}$ (3) $\frac{q-r}{10(p-r)}$ (4*) $\frac{10(q-r)}{(p-r)}$

Sol. Let the total students = x

$$px = 10q + (x - 10)r$$

$$px - rx = 10q - 10r$$

$$x = \frac{10(q - r)}{p - r}$$

- 161.** What are the National colours of France?
(1) Blue-Green-Red (2) Green-White-Red (3) Green-Yellow-Red (4*) Blue-White-Red
- 162.** Which was not included in Lenin's April these?
(1*) Formation of Duma (2) Bank be Nationalized
(3) Land of transformed to peasant (4) War be brought to a close
- 163.** Hitler assigned the responsibility of Economic recovery to?
(1) Herbert Spancer (2*) Hyalmar Schacht (3) W Shirer (4) Robert Lay
- 164.** Which of these had worked as indentured Labourer?
(1) Shaukat Ali (2) Alluri Sita Ram Raju (3) Jawahar Lal Nehru (4*) Baba Ramchandra
- 165.** Who wrote the Book "Hind Swaraj"?
(1) Subhash Chandra Bose (2) J.L. Nehru
(3) Kamla Nehru (4*) Mahatma Gandhi
- 166.** Which country was known as 'Siam'
(1) England (2*) Thailand (3) Holand (4) Swaziland
- 167.** Which of the following Prime Minister Constituted "Simon Commission"?
(1) Robert Walpole (2*) Stanley Baldwin (3) Ramsay Mac Donald (4) Winston Churchill
- 168.** Dr. B.R. Ambedkar formed the 'Depressed Classes Association in?
(1) 1928 (2) 1929 (3*) 1930 (4) 1931
- 169.** 'Jeevita Samaram' is the autobiography of?
(1*) C. Kesavan (2) Saudamini (3) Mankojee (4) R.C. Dutt
- 170.** Who established the Vietamese Communist Party?
(1) Phu So (2) Mao Zedong (3*) Ho Chi Minh (4) Phan Boi
- 171.** "When France sneezes the rest of Europe catches cold" who remarked this?
(1) Mazzini (2*) Metternich (3) Gottfried (4) John Lock
- 172.** Which one of the following is the main cause of land degradation in Punjab?
(1) Intensive Cultivation (2) Deforestation (3*) Over Irrigation (4) Over Grazing
- 173.** Traditional rain water harvesting is called in Rajasthan?
(1) Tank (2*) Tanka (3) Pond (4) Lake
- 174.** Which of the state has most sugar mills in India?
(1) Haryana (2) Punjab (3*) Maharashtra (4) Bihar
- 175.** In which industry Bauxite is used as raw industrial?
(1) Steel (2) Cement (3*) Aluminum (4) Jute
- 176.** Roof top rain water harvesting is the most common practice in which of the following cities?
(1*) Shillong (2) Imphal (3) Guwahati (4) Patna
- 177.** Which of the following groups constitute the basic rock form?
(1) Sandy, Igneous, Metamorphic (2*) Igneous, Sedimentary, Metamorphic
(3) Lignite, Volcanic, Sedimentary (4) Sandy, Volcanic, Igneous
- 178.** Mango showers occur in which one of the following group of two states?
(1) Bihar & West Bengal (2) Tamil Nadu & Andhra Pradesh
(3*) Karnataka & Kerala (4) Maharashtra & Andhra Pradesh

179. Tropic of Cancer does not pass through?
(1) Chattishgarh (2*) Odisha (3) Rajasthan (4) Tripura
180. AMUL milk scheme is an example of which type of industry?
(1) Basic Industry (2) Agro based Industry (3) Joint Industry (4*) Co-operative Industry
181. Which one of the figures represents the working age group of the population?
(1) 15–65 years (2) 15–66 years (3*) 15–59 years (4) 15–64 years
182. Chemical Industries usually are located near:
(1) Iron & Steel Industries (2) Thermal Power Plant
(3*) Oil Refineries (4) Automobiles Industry
183. BAMCEF means?
(1*) Backward and Minority Community Employees Federation
(2) Backward and Mining Community Employees Federation
(3) Backward and Majority Community Employees Federation
(4) Backward and Malabar Coastal Employees Federation
184. General Election are called as?
(1) One death of any member
(2) Election before specific time in whole country and states
(3*) On completing five years
(4) Empty seat due to any reason
185. In 44th Amendment which fundamental right has been removed from the list of fundamental rights?
(1) Freedom to Speech (2) Freedom to make groups
(3) Right to work (4*) Right to property
186. Which of the following statement is correct?
(1) Union list – 66 subjects; state list – 97 subjects; Concurrent list – 47 subjects
(2) Union list – 47 subjects; state list – 97 subjects; Concurrent list – 66 subjects
(3) Union list – 97 subjects; state list – 47 subjects; Concurrent list – 66 subjects
(4*) Union list – 97 subjects; state list – 66 subjects; Concurrent list – 47 subjects
187. A person who is not a member of any house of Parliament, if he is appointed as minister. He has to get elected to the one of the house of Parliament within?
(1) A month (2*) Six month
(3) Three month (4) Stipulated time is fixedly the President
188. Why is “Power Sharing” regarded as good?
(1) Reduces Poverty (2) Maximizes Wealth
(3) Provides Employment (4*) Reduces Social Conflict
189. Main feature of ‘Pressure Groups’ is:
(1) Direct control on political power (2*) Try to influence the politics of Government
(3) Lax organization (4) Direct participation in political powers.
190. Among the following which are is the main aim of starting civil rights movements in America:
(1) Adult Franchise (2) Vote to right for women
(3*) Abolishing social discrimination (4) Fan direct election of Congress
191. President can declare emergency when:
(1) Prime Minister advises him to do so
(2) Parliament advises him to declare emergency
(3*) The council of minister, in writing advices him to do so
(4) Home Minister asks him to do so.

192. Amnesty International is an international organisation which works for:
(1) Work peace (2) Justice
(3) Restoration of democracy (4*) Human Rights
193. In which year 'Universal Adult Franchise' was implemented in India?
(1) 1947 (2*) 1950 (3) 1919 (4) 1935
194. In which year, consumer protection act was enacted?
(1*) 1986 (2) 1988 (3) 1985 (4) 1987
195. Which among the following is considered to be most liquid assets?
(1) Gold (2) Demand Deposits (3) Land (4*) Money
196. Food security is ensured in a country only if?
(1) Enough food is available for all the person
(2) All persons have the capacity to buy food of acceptable quality
(3) There is not barrier on access to food
(4*) All above
197. The headquarter of World Trade Organisation is situated in?
(1) New York (2) China (3) Japan (4*) Geneva
198. Under National Rural Employment Guarantee Act (2005), How many days of work are Guaranteed in a year?
(1) 80 days (2*) 100 days (3) 200 days (4) 300 days
199. Who is the founder of Grameen Bank of Bangladesh?
(1) Abdul Rehman (2*) M. Yunis (3) Mujibur Rehman (4) Amartya Sen
200. From the following in which state of India the use of chemical 'fertiliser' is highest?
(1*) Punjab (2) Haryana (3) Rajasthan (4) Himanchal Pradesh