NATIONAL TALENT SEARCH EXAMINATION-2018-19, MAHARASTHRA

SCHOLASTIC APTITUDE TEST (SAT) HINTS & SOLUTIONS

4.

Sol: **(2)**

$$T = \frac{2\pi(R+h)}{V} = \frac{2\times 3.140\times(3600+6400)}{3.14}$$

= 20,000 sec

5.

Sol: **(3)**

$$\frac{dA}{dt} = \text{constant} = \frac{1}{2}r^2\omega$$

$$\frac{r_1}{r_2} = \sqrt{\frac{\omega_2}{\omega_1}} = \sqrt{\frac{10°/t}{160°/t}} = \frac{1}{4}$$

$\therefore$ $r_2 - 4r_1 = 4 \times 140 \times 10^6 = 560 \times 10^6$.

$= 56 \times 10^7$ km

7.

Sol: **(1)**

H = M. S. θ = 5000 × 1 × (100 –20) Calories

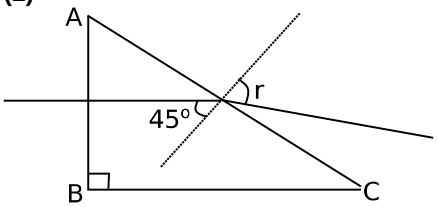
= 5000 × 80 × 4.18 J

= 167200 J

= 1672 kJ

8.

Sol: **(2)**



$$\frac{\sin i}{\sin r} = \frac{\mu_2}{\mu_1}$$

$$\frac{\sin 45°}{\sin r} = \frac{1}{3/2} = \frac{2}{3}$$

$$\therefore \sin r = \frac{3}{2\sqrt{2}}$$

9.

Sol: **(2)**

$$\left(40\times 10^{18}\right)\times 2\times 1.6\times 10^{-19} + n\left(-1.6\times 10^{-19}\right) = 8$$

$$12.8 - -8 = n\times 1.6\times 10^{-19}$$

$$4.8 = n\times 1.6\times 10^{-19}$$

$$\therefore n = \frac{4.8}{1.6\times 10^{-19}} = 3\times 10^{19}$$

Sol: **(3)**

$$\frac{3f}{2}-\frac{f}{2}=30 \text{ cm}$$

$$\therefore F=30 \text{ cm}$$

12

Sol: **(3)**

$$n_1=5=\frac{360^0}{\theta_1}-1$$

$$\Rightarrow 6=\frac{360^0}{\theta_1}$$

$$\therefore \theta_1=60^0$$

$$\theta_2=\theta_1-30^0$$

$$=60^0-30^0$$

$$=30^0$$

$$n_2=\frac{360^0}{\theta_2}-1$$

$$=12-1$$

$$=11$$

81.

Sol: **(4)**

For x = 2 ; y = 3

$x-4y-14=0$ and $5x-y-13=0$

i.e $(2)-4(-3)-14$ i.e $5(2)-3(-3)-13$

$=2+12-14$ $=10+3-13$

$=14-14$ $=13-13$

$=0$ $=0$

82.

Sol: **(3)**

$$\alpha+\beta=-3, \qquad \alpha\beta=\frac{-5}{2}$$

Quadratic equation

$$\Rightarrow \left(x^2-(\alpha+\beta)x+\alpha\beta\right)=0$$

$$\Rightarrow \left(x^2+3x-\frac{5}{2}\right)=0$$

$$2x^2+6x-5=0$$

83.

Sol: **(3)**

$$\frac{1}{7}$$

84.

Sol: **(2)**

$17,23,.....,497$

$a_1 = 17$

$d = 23 - 17 = 5$

$a_n = 497$

$17 + (n-1) = 497$

$(n-1) = \frac{480}{6}$

$n - 1 = 80$

$n = 81$

85.

Sol: **(2)**

$$\begin{vmatrix} \frac{5}{3} & \frac{7}{2} \\ \frac{3}{4} & \frac{3}{2} \end{vmatrix}$$

$= \frac{5}{3} \times \frac{3}{2} - \frac{7}{2}\left(\frac{3}{4}\right)$

$= \frac{15}{6} - \frac{21}{8}$

$= \frac{-6}{48} = \frac{-1}{8}$

86.

Sol: **(2)**

$3ax^2 + 2bx + c = 0$

$\alpha + \beta = \frac{-2b}{3a}$

$\alpha\beta = \frac{c}{3a}$

$\alpha = 2k$

$\beta = 3k$

$2k + 3k = \frac{-2b}{3a}$

$5k = \frac{-2b}{3a}$

$k = \frac{-2b}{15a}$

$6k^2 = \frac{c}{3a}$

$k^2 = \frac{c}{18a}$

$25ac = 8b^2$

87.

Sol: **(2)**

$a_1\ a_2\ \ldots\ a_{\frac{n+1}{2}}\ \ldots\ a_n$

Middle term $(n \in \text{odd})$

$$= \left(\frac{n+1}{2}\right)^{th} = \frac{a_n + 1}{2} = m$$

$$a_1 + a_n = 2\frac{a_n + 1}{2} = 2m$$

$$s_n = \frac{n}{2}\left[a_1 + a_n\right] = \frac{n}{2}\left[2m\right] = mn$$

88.

Sol: **(3)**

N = 70
h = 10
cf = 22
f = 10
L = 30

$$\text{Median} = L + \left(\frac{\frac{N}{2} - cf}{f}\right) \times h$$

$$= 30 + \left(\frac{35 - 22}{10}\right) \times 10$$

$$= 30 + 13$$

$$= 43$$

89.

Sol. **(2)**

(1, 1) (1, 2) (1, 4) (1, 6)
(2, 1) (2, 3) (2, 5)
(3, 2) (3, 4)
(4, 1) (4, 3)
(5, 2) (5, 6)
(6, 1) (6, 5)

90.

Sol. **(1)**

(8 + 3) × 8 – 5 = 83
16(8 – 3) + 3 = 83

91.

Sol: **(3)**

BD = AD=DC by theorem

So $\angle DBE = 20^0$

$\angle CDE = 70^0$

So $\angle CDE - \angle DBE = 50^0$

92.

Sol. **(1)**

$$\sin 30° = \frac{BC}{12\sqrt{2}} = BC = 6\sqrt{2}$$

$$\cos 30° = \frac{AB}{12\sqrt{2}} = AB = 6\sqrt{6}$$

$$AB + BC + AC = 18\sqrt{2} + 6\sqrt{6}$$

93.

Sol. **(3)**

Statement A is correct but B is false.

94.

Sol. **(4)**

all the given statements are wrong.

95.

Sol. **(1)**

$\angle EDB = 20°$ (Altemate interior angles)

$\angle DCB = 50° \longrightarrow$ by angle sum property

96.

Sol. **(4)**

In ΔPQR

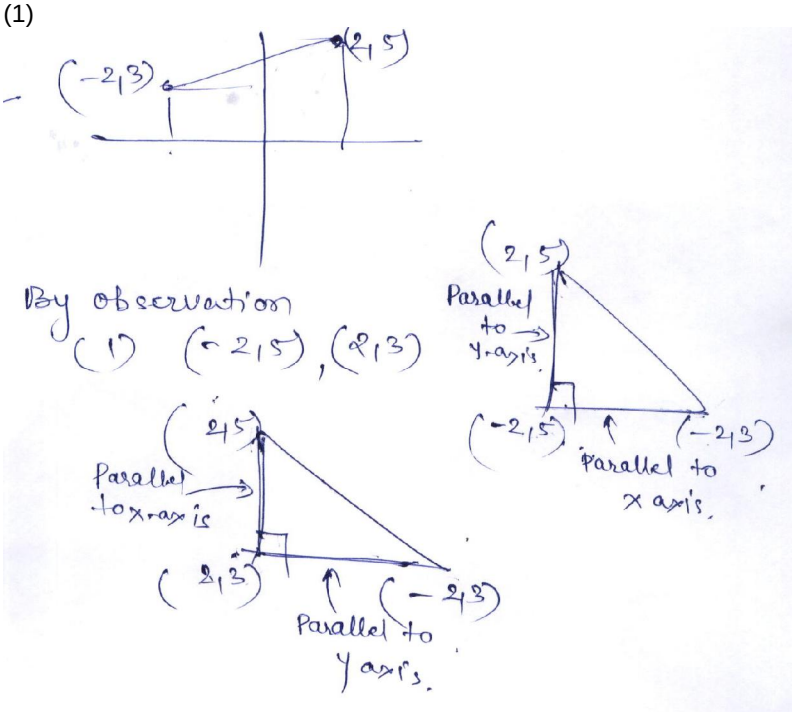
$\text{Sin}30° = \frac{QR}{\sqrt{3}} \Rightarrow QR = \frac{\sqrt{13}}{2}$

$\text{Cos } 30° = \frac{PR}{\sqrt{13}} \Rightarrow \frac{\sqrt{39}}{2} = PR$

$\text{Cosec } 60° = \frac{2}{\sqrt{3}}$ and sec 60° = 2

97.

Sol. (1)



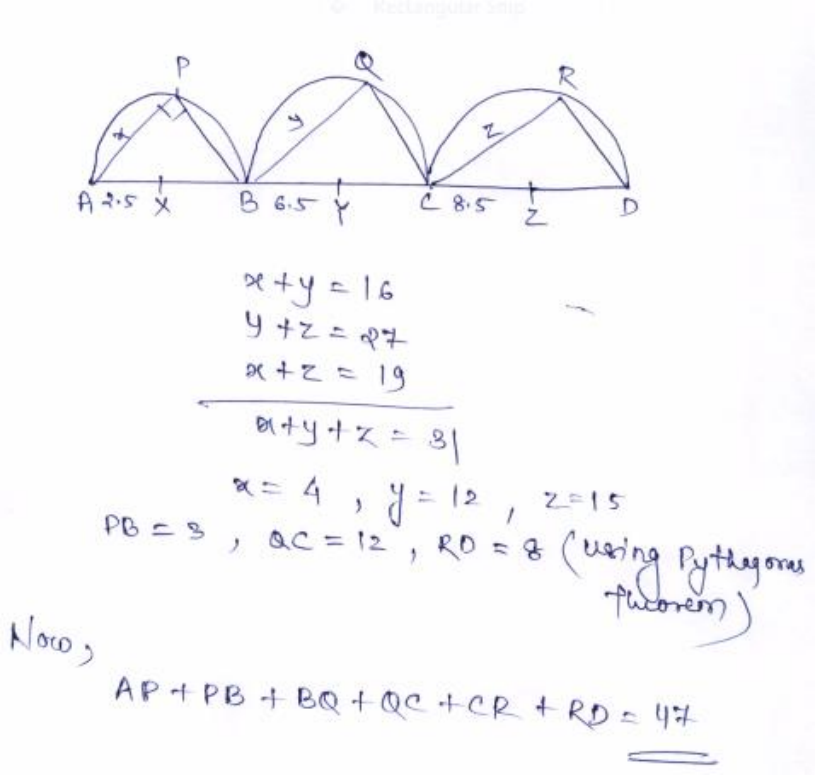
98.

Sol. **(4)**

It is a square

99.

Sol. **(4)**



$x + y = 16$

$y + z = 27$

$x + z = 19$

$x + y + z = 31$

$x = 4, \; y = 12, \; z = 15$

$PB = 3, \; QC = 12, \; RD = 8$ (using Pythagoras theorem)

Now,

$AP + PB + BQ + QC + CR + RD = 47$

100.

Sol. **(3)**

PQRS is a square

Qs = 2r

Side of square is $r\sqrt{2}$

So

Area of shaded postion

$$\pi r^2 - 2r^2 = \frac{72}{7}$$

$$\Rightarrow \frac{22}{7} r^2 - 2r^2 = \frac{72}{7}$$

$$\Rightarrow \frac{8r^2}{7} = \frac{72}{7}$$

$r^2 = 9$

$r = 3$