HSSC MOCK TEST – 177 (SOLUTION)

1. (C) (a, b), $(c - d)$ and $(a - c, b - d)$ are collinear, then $\begin{vmatrix} a & b & 1 \\ c & d & 1 \\ a-c & b-d & 1 \end{vmatrix} = 0$

$\Rightarrow a(d-b+d)-b(c-a+c)+1(bc-cd-ad+cd)=0$
$\Rightarrow ad - ab + ad - bc + ab - bc + bc - ad = 0$
$\Rightarrow ad - bc = 0 \Rightarrow ad = bc$

2. (B) $\tan A = \frac{1}{7}$ and $\tan B = \frac{1}{3}$

Now, $\tan 2B = \frac{2\tan B}{1-\tan^2 B}$

$\Rightarrow \tan 2B = \frac{2\times\frac{1}{3}}{1-\frac{1}{9}}$

$\Rightarrow \tan 2B = \frac{\frac{2}{3}}{\frac{8}{9}} \Rightarrow \tan 2B = \frac{3}{4}$

Now, $\tan(A+2B) = \frac{\tan A + \tan 2B}{1-\tan A.\tan^2 B}$

$\Rightarrow \tan(A+2B) = \frac{\frac{1}{7}+\frac{3}{4}}{1-\frac{1}{7}\times\frac{3}{4}}$

$\Rightarrow \tan(A+2B) = \frac{\frac{4+21}{28}}{\frac{28-3}{28}}$

$\Rightarrow \tan(A+2B) = \frac{25}{25}$

$\Rightarrow \tan(A+2B) = 1$
$\Rightarrow \tan(A+2B) = \tan 45° \Rightarrow A + 2B = 45°$

3. (C) Let circumcentre(P) of $\Delta ABC = (x_1, y_1)$
$AP = BP = CP$
Now, $AP^2 + BP^2$
$\Rightarrow (x_1 + 3)^2 + (y_1 - 0)^2 = (x_1 - 4)^2 + (y_1 - 5)^2$
On solving
$\Rightarrow 7x_1 + 5y_1 = 16$ ...(i)
Now, $AP^2 = CP^2$
$\Rightarrow (x_1+3)^2 + (y_1 - 0)^2 = (x_1+1)^2 + (y_1- 2)^2$
$\Rightarrow x_1^2 + 9 + 6x_1 + y_1^2 = x_1^2 + 1 + 2x_1 + y_1^2 + 4 - 9y_1$
$\Rightarrow 9 + 6x_1 = 1 + 2x_1 + 4 - 4y_1$
$\Rightarrow 4x_1 + 4y_1 = -4$
$\Rightarrow x_1 + y_1 = -1$ ...(ii)
from eq(i) and eq(ii),

$x_1 = \frac{21}{2}$ and $y_1 = \frac{-23}{2}$

Hence circumcentre of $\Delta ABC = \left(\frac{21}{2}, \frac{-23}{2}\right)$

4. (B) Centroid of $\Delta ABC = \left[\frac{(-3)+4+(-1)}{3}, \frac{0+5+2}{3}\right]$

Centroid of $\Delta ABC = \left(0, \frac{7}{3}\right)$

5. (B) $\tan^{-1}\left(\frac{a}{b}\right) + \tan^{-1}\left(\frac{a+b}{a-b}\right)$

$\Rightarrow \tan^{-1}\left[\frac{\frac{a}{b}+\frac{a+b}{a-b}}{1-\frac{a}{b}\times\frac{a+b}{a-b}}\right]$

$\Rightarrow \tan^{-1}\left[\frac{a^2-ab+ab+b^2}{ab-b^2-a^2-ab}\right]$

$\Rightarrow \tan^{-1}\left[\frac{a^2+b^2}{-(a^2+b^2)}\right]$

$\Rightarrow \tan^{-1}(-1)$

$\Rightarrow \tan^{-1}\left[\tan\left(\frac{-\pi}{4}\right)\right] = \frac{-\pi}{4}$

6. (A) Let X and Y are two persons and they hit a target with the probability A and B respectively.

$\therefore P(A) = \frac{1}{3}$ and $P(B) = \frac{1}{4}$

P(Probability of hitting the target by anyone X or Y)

$\Rightarrow P(A \cap \overline{B}) + P(\overline{A} \cap B)$

$\Rightarrow P(A).P(\overline{B}) + P(\overline{A}).P(B)$

$\Rightarrow \frac{1}{3}\times\frac{3}{4}+\frac{2}{3}\times\frac{1}{4}$

$\Rightarrow \frac{1}{4}+\frac{1}{6} = \frac{5}{12}$

7. (B) word "SELECTION"

Total no. of arrangements = $\frac{9!}{2!}$

when 'E' come together

the total no. of arrangements = 8!
when 'E' do not come together

The total no. of arrangement = $\frac{9!}{2!} - 8!$

$= \frac{7}{2} \times 8!$

The required probability = $\frac{\frac{7}{2} \times 8!}{\frac{9!}{2!}} = \frac{7}{9}$

8. (C) Equation of line is $ax\tan\alpha - by\sec\alpha = ab$
Perpendicular distance from point $(0, \sqrt{a^2+b^2})$

$$d_1 = \left|\frac{0 - b\sec\alpha\left(\sqrt{a^2+b^2}\right) - ab}{\sqrt{(a\tan\alpha)^2 + (-b\sec\alpha)^2}}\right|$$

$$d_1 = \frac{b\left(\sqrt{a^2+b^2}\right)\sec\alpha - ab}{\sqrt{a^2\tan^2\alpha + b^2\sec^2\alpha}}$$

Similarly perpendicular distance from point $(0, -\sqrt{a^2+b^2})$

$$d_2 = \left|\frac{0 - b\sec\alpha\left(-\sqrt{a^2+b^2}\right) - ab}{\sqrt{(a\tan\alpha)^2 + (-b\sec\alpha)^2}}\right|$$

$$d_2 = \frac{b\left(\sqrt{a^2+b^2}\right)\sec\alpha - ab}{\sqrt{a^2\tan^2\alpha + b^2\sec^2\alpha}}$$

Now, $d_1 \times d_2 = \frac{\left[b\left(\sqrt{a^2+b^2}\right)\sec\alpha + ab\right]\left[b\sqrt{a^2+b^2}\sec\alpha - ab\right]}{\sqrt{a^2\tan^2\alpha + b^2\sec^2\alpha}\sqrt{a^2\tan^2\alpha + b^2\sec^2\alpha}}$

$$\Rightarrow d_1 \times d_2 = \frac{b^2(a^2+b^2)\sec^2\alpha - a^2b^2}{a^2\tan^2\alpha + b^2\sec^2\alpha}$$

$$\Rightarrow d_1 \times d_2 = \frac{b^2[a^2\sec^2\alpha + b^2\sec^2\alpha - a^2]}{a^2\tan^2\alpha + b^2\sec^2\alpha}$$

$$\Rightarrow d_1 \times d_2 = \frac{b^2[a^2(\sec^2\alpha - 1) + b^2\sec^2\alpha]}{a^2\tan^2\alpha + b^2\sec^2\alpha}$$

$$\Rightarrow d_1 \times d_2 = \frac{b^2[a^2(\sec^2\alpha - 1) + b^2\sec^2\alpha]}{a^2\tan^2\alpha + b^2\sec^2\alpha}$$

$$\Rightarrow d_1 \times d_2 = \frac{b^2(a^2\tan^2\alpha + b^2\sec^2\alpha)}{(a^2\tan^2\alpha + b^2\sec^2\alpha)} = b^2$$

9. (B) $x = 7 + 7^{1/3} + 7^{1/3}$

$\Rightarrow x - 7 = 7^{1/3} + 7^{2/3}$ ...(i)

$\Rightarrow (x-7)^3 = (7^{1/3} + 7^{2/3})^3$

$\Rightarrow x^3 - 243 - 3 \times x \times 7(x-7) = 7 + 7^2 + 3 \times 7^{1/3} \times 7^{2/3}(7^{1/3} + 7^{2/3})$

$\Rightarrow x^3 - 243 - 21x^2 + 147x = 56 + 21(x-7)$ [from eq(i)]

$\Rightarrow x^3 - 243 - 21x^2 + 147x = 56 + 21x - 147$

$\Rightarrow x^3 - 21x^2 + 126x = 152$

10. (A) A.T.Q,

$2a = 4 \times 2b \Rightarrow a = 4b$

Now, $e = \sqrt{1 - \frac{b^2}{a^2}}$

$\Rightarrow e = \sqrt{1 - \frac{b^2}{16b^2}} \Rightarrow e = \frac{\sqrt{15}}{4}$

11. (C) Class size = Difference between two consecutive class marks = 9.5 – 8 = 1.5

12. (B) $n(S) = {}^{12}C_3 = 220$

$n(E) = {}^3C_1 \times {}^4C_2 \times {}^5C_0 + {}^3C_1 \times {}^4C_1 \times {}^5C_1 + {}^3C_1 \times {}^4C_0 \times {}^5C_2 + {}^3C_2 \times {}^4C_1 \times {}^5C_0 + {}^3C_2 \times {}^4C_0 \times {}^5C_1 + {}^3C_3 \times {}^4C_0 \times {}^5C_0$

$n(E) = 3\times6\times1 + 3\times4\times5 + 3\times1\times10 + 3\times4\times1 + 3\times1\times5 + 1\times1\times1$

$n(E) = 18 + 60 + 30 + 12 + 15 + 1 = 136$

The required Probability $P(E) = \frac{n(E)}{n(S)}$

$= \frac{136}{220} = \frac{34}{55}$

13. (A) $x\sqrt{1+y} + y\sqrt{1+y} = 0$

$\Rightarrow x\sqrt{1+y} = -y\sqrt{1+y}$

On squaring

$\Rightarrow x^2(1+y) = y^2(1+x)$

$\Rightarrow x^2 + x^2y = y^2 + xy^2$

$\Rightarrow x^2 + y^2 = xy^2 - x^2y$

$\Rightarrow (x-y)(x+y) = -xy(x-y)$

$\Rightarrow x + y = -xy$

$\Rightarrow y + xy = -x$

$\Rightarrow y(1+x) = -x$

$\Rightarrow y = -\frac{x}{1+x}$

On differentiating both side w.r.t.'x'

$\Rightarrow \frac{dy}{dx} = -\frac{(1+x).1 - x.1}{(1+x)^2}$

$\Rightarrow \frac{dy}{dx} = -\frac{1+x-x}{(1+x)^2}$

$\Rightarrow \frac{dy}{dx} = \frac{-1}{(1+x)^2}$

70. (C) As, Virus is the cause of disease.
Similarly, War is the cause of **distruction**.

71. (B) As, $(33)^2 - (30)^2 = 189$
Similarly, $(55)^2 - (54)^2 =$ **109**

72. (D) Except **Rangoon**, all others are the cities of India.

73. (C) M P V C F L
+3 +6 +3 +6
I K O G J P
+2 +6 +3 +6

74. (A) As, 3 + 6 +1+ 8 +3+7 = 28
and, 4 + 2+ 2 +1+ 6 + 5 = 20
Similarly, 8 +1+ 2 + 9 + 7+2 = **29**

75. (A) As, 16 × 3 – 4 = 44
and, 41 × 3 – 6 = 117
Similarly, **37** × 3 – 5 = 106

76. (A) 80 ×16 + 4 – 9 ÷ 120
After changing the signs.
according to questions,
80 +16 ÷ 4 × 9 – 120
= 80 + 4 × 9 – 120
= 80 + 36 – 120 = – **4**

77. (D)

HSSC MOCK TEST – 177 (ANSWER KEY)

1.	(C)	11.	(C)	21.	(C)	31.	(A)	41.	(C)	51.	(C)	61.	(C)	71.	(B)	81.	(B)
2.	(B)	12.	(B)	22.	(A)	32.	(C)	42.	(D)	52.	(B)	62.	(A)	72.	(D)	82.	(A)
3.	(C)	13.	(A)	23.	(B)	33.	(B)	43.	(D)	53.	(C)	63.	(C)	73.	(C)	83.	(D)
4.	(B)	14.	(D)	24.	(C)	34.	(A)	44.	(C)	54.	(C)	64.	(C)	74.	(A)	84.	(B)
5.	(B)	15.	(C)	25.	(B)	35.	(A)	45.	(B)	55.	(C)	65.	(B)	75.	(A)	85.	(B)
6.	(A)	16.	(C)	26.	(A)	36.	(A)	46.	(B)	56.	(A)	66.	(D)	76.	(A)	86.	(D)
7.	(B)	17.	(C)	27.	(C)	37.	(C)	47.	(D)	57.	(B)	67.	(C)	77.	(D)	87.	(C)
8.	(C)	18.	(C)	28.	(D)	38.	(D)	48.	(C)	58.	(A)	68.	(C)	78.	(A)	88.	(C)
9.	(B)	19.	(B)	29.	(D)	39.	(D)	49.	(A)	59.	(C)	69.	(A)	79.	(A)	89.	(B)
10.	(A)	20.	(A)	30.	(A)	40.	(B)	50.	(D)	60.	(D)	70.	(C)	80.	(D)	90.	(D)