NIMCET

Mathematics

1.	2	**11.**	1	**21**	**3**	31	A	**41**	C
2.	3	**12.**	1	**22**	**1**	32	A	**42**	C
3.	3	**13.**	D	**23**	**1**	33	A	**43**	A
4.	2	**14.**	2	**24**	**4**	34	D	**44**	A
5.	4	**15.**	1	**25**	**3**	35	C	**45**	A
6.	4	**16.**	3	**26**	**2**	36	A	**46**	B
7.	2	**17.**	3	**27**	**d**	37	B	**47**	B
8.	3	**18.**	3	**28**	**D**	38	A	**48**	B
9.	3	**19.**	4	**29**	**B**	39	D	**49**	D
10	4	**20**	1	**30**		40	b	**50**	a

27.

Suppose the required point is (x_1, y_1)

$$\frac{dy}{dx} = 6 - 2x$$

$6 - 2x_1 = 0 \Rightarrow 2x_1 = 6 \Rightarrow x_1 = 3$

Point must lie on the curve

$\Rightarrow y_1 = 6x_1 - x_1^2$

Putting $x_1 = 3$, $y_1 = 18 - 9 = 9$, the point is (3, 9).

Choice (D)

28.

$$I = \int_0^{\pi/2} \log \tan x dx \qquad \text{(i)}$$

Using property $\int_0^a f(x)dx = \int_0^a (a-x)dx$

$$I = \int_0^{\pi/2} \log \tan \frac{\pi}{2} - x \; dx$$

$$I = \int_0^{\pi/2} \log \cot x dx \qquad \text{(ii)}$$

Adding (i) & (ii)

$2I = 0 \Rightarrow I = 0$ **Choice (D)**

29.

Total number of determinants of order 2×2, which can be formed by using 1 and 0 only is 2×2×2×2= 16

Non zero determinants are

$$\begin{vmatrix}1 & 0\\0 & 1\end{vmatrix}, \begin{vmatrix}1 & 0\\1 & 1\end{vmatrix}, \begin{vmatrix}1 & 1\\0 & 1\end{vmatrix},$$

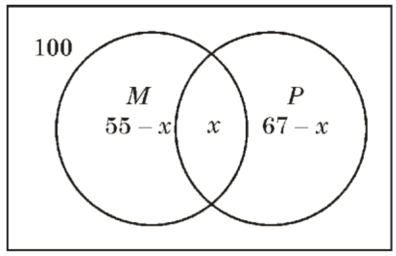
$$\begin{vmatrix}0 & 1\\1 & 0\end{vmatrix}, \begin{vmatrix}1 & 1\\1 & 0\end{vmatrix}, \begin{vmatrix}0 & 1\\1 & 1\end{vmatrix}$$

Required probability is $\frac{6}{16} = \frac{3}{8}$ **Choice (B)**

30.

Question seems to be wrong as $5t < 1$, so that $t < 0.2$, thus $\sin^2 x < 0.2$ and $\cos^2 x < 0.2$ which is not possible simultaneously.

31.



$55 - x + x + 67 - x = 0$

x = 182 – 100 = 22

Students who have passed only in physics = 67 – 22 = 45 **Choice (D)**

32.

Given that $A - B = \frac{\pi}{4}$

$\Rightarrow \tan(A - B) = \tan\frac{\pi}{4}$

$\Rightarrow \frac{\tan A - \tan B}{1 + \tan A \tan B} = 1$

$\Rightarrow \tan A - \tan B = 1 + \tan A \tan B$

$\Rightarrow \tan A - \tan B - \tan A \tan B = 1$

Adding 1 on both sides

$(1 + \tan A) - \tan B(1 + \tan A) = 2$

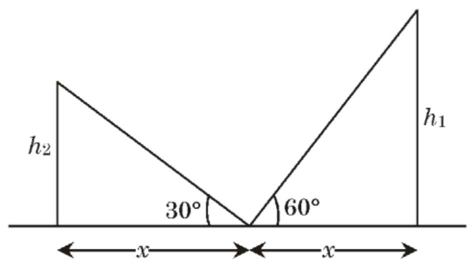
$(1 + \tan A)(1 - \tan B) = 2$ **Choice (A)**

33.

When digits and letters can repeat then number of license plates = $26^3 \bullet 10^4$ **Choice (A)**

34.

Heights of the two buildings are h_1 and h_2



$\frac{h_1}{x} = \sqrt{3} \Rightarrow x = \frac{h_1}{\sqrt{3}}$

$\frac{h_2}{x} = \frac{1}{\sqrt{3}} \Rightarrow$ x = $\sqrt{3}h_2$

$\frac{h_1}{\sqrt{3}} = \sqrt{3}h_2 \Rightarrow \frac{h_1}{h_2} = \frac{3}{1}$ **Choice (D)**

35.

Since the function is continuous, hence

L.H.L. = R.H.L.

$$\lim_{h\to 0} \sin \frac{\pi}{2} - h = \lim_{h\to 0} a \frac{\pi}{2} + h$$

$1 = a.\frac{\pi}{2} \Rightarrow$ a = $\frac{2}{\pi}$ **Choice (C)**

36.

Given that $\cos(\alpha+\beta)=\frac{4}{5}$ and $\sin(\alpha-\beta)=\frac{5}{13}$

Thus $\tan(\alpha+\beta)=\frac{1}{4}$ and $\tan(\alpha-\beta)=\frac{5}{12}$

Now $\tan 2\alpha = \tan((\alpha+\beta)+(\alpha-\beta))$

$$=\frac{\tan(\alpha+\beta)+\tan(\alpha-\beta)}{1-\tan(\alpha+\beta)\tan(\alpha-\beta)}$$

$$=\frac{\frac{3}{4}+\frac{5}{12}}{1-\frac{3}{4}\bullet\frac{5}{12}}=\frac{\frac{27+15}{36}}{1-\frac{5}{16}}=\frac{\frac{42}{36}}{\frac{11}{16}}=\frac{56}{33}$$

Choice (A)

37.

The given equations have many solutions if

$$\frac{k+1}{k}=\frac{8}{k+3}=\frac{4k}{3k-1}$$

Taking equations in pairs, we have these values, $k = 1, 3, 2$.

Out of these only k = 1 satisfies all the conditions.

Choice (B)

38.

The given question can be written as

$$\tan^{-1}\frac{1}{21}+\tan^{-1}\frac{1}{13}+\tan^{-1}-\frac{1}{8}$$

$$=\tan^{-1}\frac{\frac{1}{21}+\frac{1}{13}}{1-\frac{1}{21}\bullet\frac{1}{13}}+\tan^{-1}-\frac{1}{8}$$

$$=\tan^{-1}\frac{34}{272}+\tan^{-1}-\frac{1}{8}$$

$$=\tan^{-1}\frac{1}{8}+\tan^{-1}-\frac{1}{8}=0.$$

Choice (A)

39.

$P(A)=\frac{1}{2}$, $P(B)=\frac{1}{3}$ and $P(C)=\frac{1}{4}$

Problem will be solved if any one of them can solve the problem

$$\therefore P(A\blacklozenge B\blacklozenge C)=1-P(\overline{A})+P(\overline{B})+P(\overline{C})$$

$$=1-\frac{1}{2}\bullet\frac{1}{4}\bullet\frac{3}{4}=1-\frac{1}{4}=\frac{3}{4}$$

Choice (D)

40.

$\vec{a}+\vec{b}=-\vec{c}$

Squaring both the sides

$$|\vec{a}|^2+|\vec{b}|^2+2\vec{a}.\vec{b}=|\vec{c}|^2$$

$$9+25+2.|\vec{a}|.|\vec{b}|.\cos\theta=|\vec{c}|^2$$

$$34+2.3.5.\cos\theta=49$$

$$30.\cos\theta=15\Rightarrow\cos\theta=\frac{15}{30}=\frac{1}{2}=\cos 60°$$

$\Rightarrow \theta = 60°$

Choice (b)

41.

Given that $f(a+b)=f(a).f(b)$

Putting $a = b = 0$, we have $f(0+0)=f(0)\times f(0)$

$\Rightarrow f(0) = 1$ or 0

Now $f'(0)=\lim_{h\to 0}\frac{f(0+h)-f(0)}{h}$

$$\lim_{h\to 0}\frac{f(0).f(h)-f(0)}{h}=f(0)\lim_{h\to 0}\frac{f(h)-1}{h}$$

Since $f'(0)=3$, hence $f(0)$ cannot be 0, thus $f(0)=1$.

$$\Rightarrow f(0)\lim_{h\to 0}\frac{f(h)-1}{h}=3 \text{ or } \lim_{h\to 0}\frac{f(h)-1}{h}=3$$

Now $f'(5)=\lim_{h\to 0}\frac{f(5+h)-f(5)}{h}$

$$=f(5)\lim_{h\to 0}\frac{f(h)-1}{h}=2\times 3=6.$$

Choice (C)

42.

Suppose the third vertex is (x, y), then according to the given condition

$$\frac{x+4-9}{3}=1 \text{ and } \frac{y-3+7}{3}=4$$

$\Rightarrow x, y = (8, 8)$

Hence area of the triangle is

$$\frac{1}{2}[4\bullet 7+(-9\bullet 8)+(8\bullet -3)-(-9\bullet -3)-8\bullet 7-4\bullet 8]$$

$$=\frac{183}{2}.$$

Choice (C)

43.

Radius of first circle is $\sqrt{1^2+k^2-6}=\sqrt{k^2-5}$

Radius of second circle $=\sqrt{k^2-k}$

Distance between their centres

$$=\sqrt{(-1-0)^2+(k-k)^2}=1$$

Circles are cutting orthogonally if

$(k^2-5)+(k^2-k)=1\Rightarrow 2k^2-k-6=0$

$\Rightarrow (2k+3)(k-2)=0$ or $k=-\frac{3}{2}$ or 2

Choice (A)

44.

Equation can be written as $(x-y)^2=4(x+y-1)$

Suppose $(x-y)=Y$ and $(x+y-1)=X$,

then equation becomes

$Y^2=4X$, whose focus will be (1,0).

Thus $X = 1$ and $Y = 0$

Or $x+y-1=1$ and $x-y=0$

$\Rightarrow x=1, y=1$

Choice (A)

45. (A)

46. Let us check determinent of coefficient

$$\begin{vmatrix}1 & \omega^2 & \omega\\ \omega & 1 & \omega^2\\ \omega^2 & \omega & 1\end{vmatrix}=\begin{vmatrix}1+\omega+\omega^2 & \omega^2 & \omega\\ 1+\omega+\omega^2 & 1 & \omega^2\\ 1+\omega+\omega^2 & \omega & 1\end{vmatrix}=0$$

Hence there are many solutions.

Choice (B)

47.

$e^2 = 1+\frac{b^2}{a^2}$ and $e'^2 = 1+\frac{a^2}{b^2}$

Hence $\frac{1}{e^2}+\frac{1}{e'^2}=1$ **Choice (b)**

48.

$^{100}C_{50}(p)^{50}(1-p)^{50} = {}^{100}C_{51}(p)^{51}(1-p)^{49}$

$\frac{100!}{50!50!}(1-p) = \frac{100!}{51!49!}.p$

$\frac{1-p}{50} = \frac{p}{51} \Rightarrow 51-51p = 50p$

or $p = \frac{51}{101}$ **Choice (d)**

49.

To obtain real roots,

$(\cos p)^2 \geq 4(\cos p - 1)\sin p.$

$(\cos p)^2 - 4\cos p \sin p + 4\sin p \geq 0$

$\Rightarrow \cos^2 p - 4\cos p \sin p + 4\sin^2 p$

$+ 4\sin p - 4\sin^2 p \geq 0$

$\Rightarrow (\cos p - 2\sin p)^2 + 4(\sin p - \sin^2 p) ‡ 0$

$(\cos p - 2\sin p)^2$ is always + ve. $(\sin p - \sin^2 p)$ is also positive, where $< p < \pi$, it can be shown that when p lies in III or IV quadrants, $(\sin p - \sin^2 p)$ becomes negative. **Choice (D)**

50.

$\log_3 5 = \log_{3^2} 5^2 = \log_9 25$

Clearly $\log_9 25 > \log_{17} 25$

Hence $x > y$ **Choice (A)**

Reasoning

51.	D	**61.**	C	**71**	**D**	81	B
52.	D	**62.**	B	**72**	**C**	82	B
53.	B	**63.**	D	**73**	**B**	83	D
54.	C	**64.**	B	**74**	**C**	84	B
55.	D	**65.**	D	**75**	**A**	85	C
56.	A	**66.**	A	**76**	**D**	86	B
57.	B	**67.**	B	**77**	**A**	87	D
58.	A	**68.**	C	**78**	**A**	88	A
59.	C	**69.**	C	**79**	**C**	89	D
60	a	**70**	A	**80**	**a**	90	c

ENGLISH

91.	D	**101.**	B
92.	C	**102.**	C
93.	C	**103.**	C
94.	B	**104.**	B
95.	A	**105.**	A
96.	D	**106.**	A
97.	B	**107.**	C
98.	D	**108.**	C
99.	C	**109.**	B
100	D	**110**	A

computer

111.	B
112.	C
113.	A
114.	B
115.	A
116.	C
117.	B
118.	C
119.	C
120	D