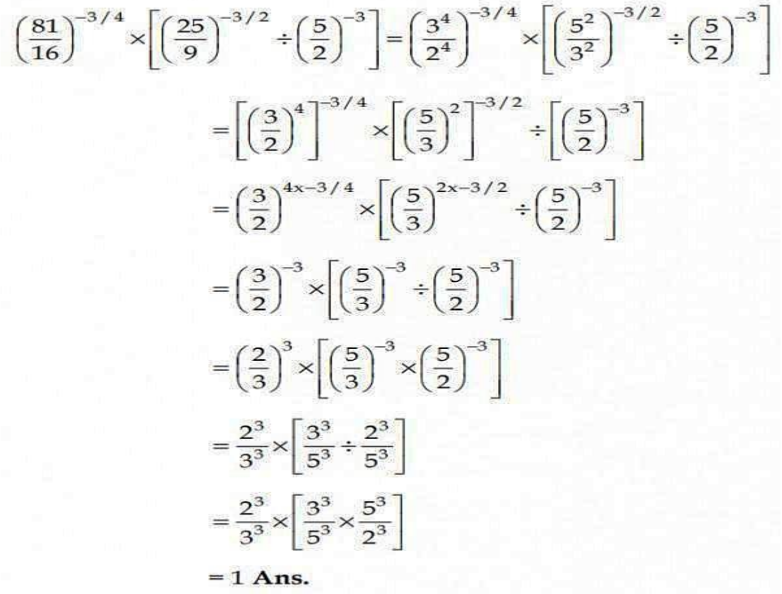
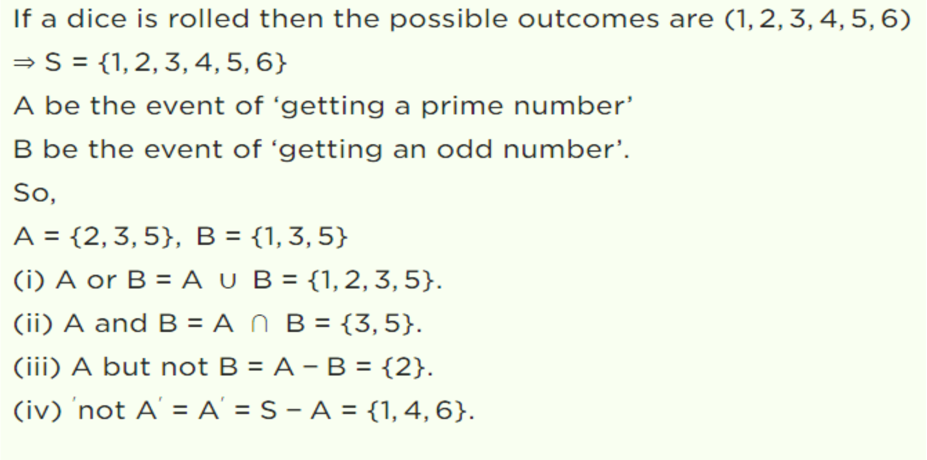
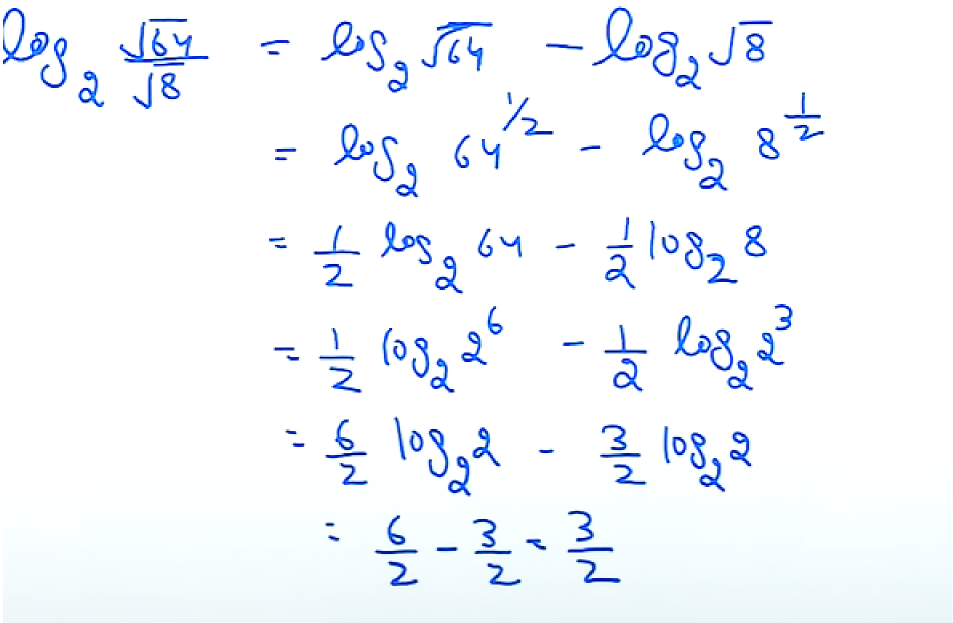
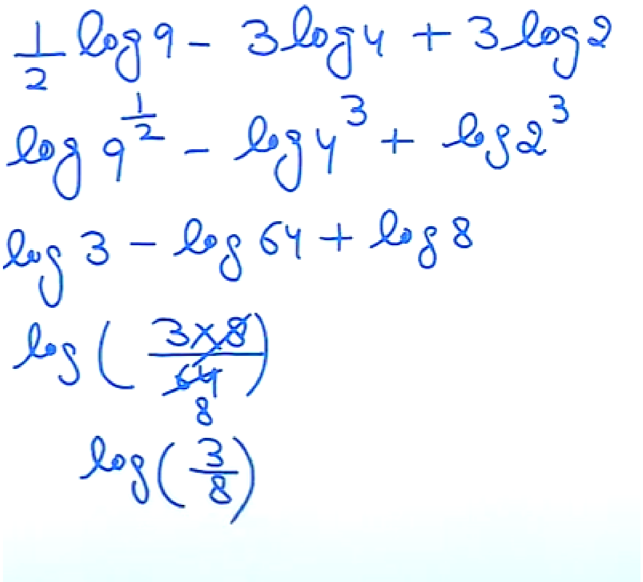
THE VILLAGE
INTERNATIONAL SCHOOL
"We Nurture Dreams"

AIM HIGH, TOGETHER WE FLY

:

Q.No.	ANSWERS
1	(c) 2
2	(c) 1110
3	(b) 1
4	Statements a, b and d are true
5	-24
6	 $\left(\frac{81}{16}\right)^{-3/4}\times\left[\left(\frac{25}{9}\right)^{-3/2}\div\left(\frac{5}{2}\right)^{-3}\right]=\left(\frac{3^4}{2^4}\right)^{-3/4}\times\left[\left(\frac{5^2}{3^2}\right)^{-3/2}\div\left(\frac{5}{2}\right)^{-3}\right]$ $=\left[\left(\frac{3}{2}\right)^4\right]^{-3/4}\times\left[\left(\frac{5}{3}\right)^2\right]^{-3/2}\div\left[\left(\frac{5}{2}\right)^{-3}\right]$ $=\left(\frac{3}{2}\right)^{4x-3/4}\times\left[\left(\frac{5}{3}\right)^{2x-3/2}\div\left(\frac{5}{2}\right)^{-3}\right]$ $=\left(\frac{3}{2}\right)^{-3}\times\left[\left(\frac{5}{3}\right)^{-3}\div\left(\frac{5}{2}\right)^{-3}\right]$ $=\left(\frac{2}{3}\right)^{3}\times\left[\left(\frac{5}{3}\right)^{-3}\times\left(\frac{5}{2}\right)^{-3}\right]$ $=\frac{2^3}{3^3}\times\left[\frac{3^3}{5^3}\div\frac{2^3}{5^3}\right]$ $=\frac{2^3}{3^3}\times\left[\frac{3^3}{5^3}\times\frac{5^3}{2^3}\right]$ $=1$ **Ans.**
7	 If a dice is rolled then the possible outcomes are (1, 2, 3, 4, 5, 6) ⇒ S = {1, 2, 3, 4, 5, 6} A be the event of 'getting a prime number' B be the event of 'getting an odd number'. So, A = {2, 3, 5}, B = {1, 3, 5} (i) A or B = A ∪ B = {1, 2, 3, 5}. (ii) A and B = A ∩ B = {3, 5}. (iii) A but not B = A − B = {2}. (iv) ′not A′ = A′ = S − A = {1, 4, 6}.

8	$i^{30}+i^{40}+i^{60}=i^{4\times7+2}+i^{4\times10}+i^{4\times15}$ $=\left[\left(i^4\right)^7\times i^2\right]+\left[\left(i^4\right)^{10}\right]+\left[\left(i^4\right)^{15}\right]$ $=-1+1+1\left(\because i^4=1,i^2=-1\right)$ $=1$
9	(a)  $\log_2 \frac{\sqrt{64}}{\sqrt{8}} = \log_2 \sqrt{64} - \log_2 \sqrt{8}$ $= \log_2 64^{1/2} - \log_2 8^{\frac{1}{2}}$ $= \frac{1}{2} \log_2 64 - \frac{1}{2} \log_2 8$ $= \frac{1}{2} \log_2 2^6 - \frac{1}{2} \log_2 2^3$ $= \frac{6}{2} \log_2 2 - \frac{3}{2} \log_2 2$ $= \frac{6}{2} - \frac{3}{2} = \frac{3}{2}$ (b)  $\frac{1}{2}\log 9 - 3\log 4 + 3\log 2$ $\log 9^{\frac{1}{2}} - \log 4^3 + \log 2^3$ $\log 3 - \log 64 + \log 8$ $\log\left(\frac{3\times\cancel{8}}{\underset{8}{\cancel{64}}}\right)$ $\log\left(\frac{3}{8}\right)$

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$$\frac{4i+1}{1-4i} = \frac{(4i+1)(1+4i)}{(1-4i)(1+4i)} = \frac{(1+4i)^2}{1^2-(4i)^2}$$

$$= \frac{1+8i+16i^2}{1-16i^2} = \frac{1-16+8i}{1+16}$$

$$= \frac{-15+8i}{17}$$

$$= \frac{-15}{17}+\frac{8i}{17}$$

$$\bar{z}^{1} = \frac{\bar{z}}{|z|^2} = \frac{\frac{-15-8i}{17}}{\left(\frac{15}{17}\right)^2+\left(\frac{8}{17}\right)^2}$$

$$= \frac{\frac{-15-8i}{17}}{\frac{15^2+8^2}{17^2}} = \frac{\frac{-15-8i}{17}}{\frac{289}{17^2}}$$

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Let A be the event in which the selected student has opted for NCC and B be the event in which the selected student has opted for NSS

Total number of students = 60

Given, number of students who have opted for NCC i.e. n(A) = 30

$\therefore P(A) = \frac{30}{60} = \frac{1}{2}$

Also, given number of students who have opted for NSS i.e. n(B) = 32

$\therefore P(B) = \frac{32}{60} = \frac{8}{15}$

Also, given number of students who have opted for both NCC and NSS i.e. $n(A \cap B) = 24$

$\therefore P(A \cap B) = \frac{24}{60} = \frac{2}{5}$

(i) We know that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$\therefore P(A \cup B) = \frac{1}{2} + \frac{8}{15} - \frac{2}{5} = \frac{15 + 16 - 12}{30} = \frac{19}{30}$

Thus the probability that the selected student has opted for NCC or NSS is $\frac{19}{30}$

(ii) P(not A and not B)

= P(A' and B')

$= P(A' \cap B')$

$= P(A \cup B)'$ $[(A' \cap B') = (A \cup B)'$ (by De Morgan's law)]

$= 1 - P(A \cup B)$

$= 1 - P(A or B)$

$= 1 - \frac{19}{30}$

$= \frac{11}{30}$

Thus the probability that the selected students has neither opted for NCC nor NSS is $\frac{11}{30}$

(iii) Number of students who have opted for NSS but not NCC

$= n(B - A) = n(B) - n(A \cap B)$

$= 32 - 24 = 8$

So, the probability that the student has opted for NSS but not NCC is $\frac{8}{60} = \frac{2}{15}$