Vernacular

Ultimate kcet crash course 2026

Maths

DPP: 1

Sequence and Series, Straight Lines and complex numbers

Q1 For G.P. $\sqrt{5}, -5, 5\sqrt{5}, -25.$ Find the sum for n terms.

(A) $\frac{-\sqrt{5}}{(\sqrt{5}+1)}\left[(-\sqrt{5})^{n} - 1\right]$

(B) $\frac{\sqrt{5}}{\sqrt{5}+1}\left((\sqrt{5})^{n} - 1\right)$

(C) $\frac{-\sqrt{5}}{\sqrt{5}+1}\left((\sqrt{5})^{n} - 1\right)$

(D) $\frac{\sqrt{5}}{\sqrt{5}+1}\left((\sqrt{5})^{n} - 1\right)$

Q2 If a G.P. consists of an even number of terms. If the sum of all the terms is five times the sum of those terms occupying the odd places, then common ratio is

(A) 2 (B) 3
(C) 4 (D) 5

Q3 If 2 is the sum to infinity of a G.P, whose first element is 1, then the sum of the first n terms is

(A) $\frac{2^{n}-1}{2^{n}}$

(B) $\frac{2^{n}-1}{2^{n-1}}$

(C) $\frac{2^{n-1}-2}{2}$

(D) $\frac{2^{n-1}-1}{2^{n}}$

Q4 If the sum of three numbers in a G.P. is 26 and the sum of products taken two at a time is 156, then the numbers are

(A) 2, 6, 18 (B) 1, 8, 4
(C) 1, 5, 25 (D) 1, 4, 1

Q5 The sum of the infinite series

$1 + \frac{2}{3} + \frac{7}{3^{2}} + \frac{12}{3^{3}} + \frac{17}{3^{4}} + \frac{22}{3^{5}} + \ldots$ is equal to

(A) $\frac{15}{4}$ (B) $\frac{13}{4}$
(C) $\frac{11}{4}$ (D) $\frac{9}{4}$

Q6 Let two numbers have A.M. and G.M. 4. Then the two numbers ae the roots of

(A) $x^{2} + 18x + 16 = 0$

(B) $x^{2} - 18x - 16 = 0$

(C) $x^{2} + 18x - 16 = 0$

(D) $x^{2} - 16x + 16 = 0$

Q7 If x, 2y, 3z are in A.P., where the distinct numbers x, y, z are in G.P., the common ratio of the G.P. is

(A) 1 (B) $\frac{1}{2}$
(C) $\frac{1}{3}$ (D) $\frac{2}{5}$

Q8 The arithmetic mean of two numbers x and y is 3 and geometric mean is.

Then $x^2 + y^2$ is equal to.

(A) 34 (B) 31
(C) 32 (D) 33

Q9 If the arithmetic mean of two numbers a and b, a > b > 0 , is five times their geometric mean, then $\frac{a+b}{a-b}$ is equal to

(A) $\frac{\sqrt{6}}{2}$ (B) $\frac{3\sqrt{2}}{4}$
(C) $\frac{5\sqrt{6}}{12}$ (D) $\frac{7\sqrt{3}}{12}$

Q10 If the arithmetic mean of two numbers a and b, a > b > 0 , is five times their geometric mean, then $\frac{a+b}{a-b}$ is equal to

(A) $\frac{\sqrt{6}}{2}$ (B) $\frac{3\sqrt{2}}{4}$
(C) $\frac{5\sqrt{6}}{12}$ (D) $\frac{7\sqrt{3}}{12}$

Q11 If the angle between two lines is π/4 and slope of one of the lines is 1/2, then find the slope of the other line.

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(A) 3 or -1/3 (B) 2 or -1/2
(C) 4 or -1/4 (D) 3 or -3

Q12 The acute angle between the lines $lx + my = l + m$; $l(x - y) + m(x + y) = 2m$ is
(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{6}$
(C) $\frac{\pi}{2}$ (D) $\frac{\pi}{3}$

Q13 Find the equation of a line passing through (2, –3) and inclined at an angle of 135° with the positive direction of x-axis.
(A) x – y + 1 = 0
(B) x + y + 1 = 0
(C) x – y – 1 = 0
(D) x + y - 1 = 0

Q14 The slope of the line passing through the points (3, –2) and (–1, 4) is
(A) 2/3 (B) –2/3
(C) 3/2 (D) –3/2

Q15 If the slope of the line passing through the points (2,5) and (x,1) is 2 then x =
(A) -2 (B) 0
(C) 8 (D) 6

Q16 A line through (2, 2) is perpendicular to the line $3x + y = 3$. Its y-intercept is
(A) 1/3 (B) 2/3
(C) 1 (D) 4/3

Q17 The equation of straight line which makes intercepts 5 and -4 on the coordinate axes is
(A) 4x + 5y - 20 = 0
(B) 4x - 5y - 20 = 0
(C) 4x - 5y + 20 = 0
(D) None of these

Q18 The equation of the line perpendicular to the line 2x-3y+5=0 and making an intercept 3 with y-axis is
(A) $3x + 2y - 6 = 0$
(B) $3x + 2y - 12 = 0$
(C) $3x - 2y - 6 = 0$
(D) $3x + 2y + 6 = 0$

Q19 Find the foot of perpendicular of the line drawn from p(–3, 5) on the line x – y + 2 = 0.
(A) (0, 2) (B) (0, 1)
(C) (0, –1) (D) (2, –1)

Q20 The perpendicular distance from the point (1, -1) to the line 5x + y – 9 = 0 is equal to
(A)
$\sqrt{\frac{2}{13}}\,unit$
(B) $\sqrt{\frac{13}{2}}\,unit$
(C) $\frac{13}{2}unit$
(D) $\frac{5}{\sqrt{26}}unit$

Q21 Find the image of the point (5, 7) with respect to the line 3x + y = 7 assuming the line to be plane mirror.
(A) (4,4)
(B) (–4,4)
(C) (–4,–4)
(D) (4,–4)

Q22 Find the distance of the point (3, -5) from the line 3x - 4y - 26 = 0
(A) 2/5 unit (B) 4 unit
(C) 3/5 unit (D) 6 units

Q23 The perpendicular distance from the point (1, -1) to the line 5x + y – 9 = 0 is equal to
(A)
$\sqrt{\frac{2}{13}}\,unit$
(B) $\sqrt{\frac{13}{2}}\,unit$
(C) $\frac{13}{2}unit$
(D) $\frac{5}{\sqrt{26}}unit$

Q24 If for the complex numbers z_1 and z_2 $|1-\bar{z}_1 z_2|^2 - |z_1 - z_2|^2$ $= k\left(1-|z_1|^2\right)\left(1-|z_2|^2\right)$ then find the value of k

(A) 2 (B) 3
(C) 1 (D) 4

Q25 If $z = \frac{4}{1-i}$, then $\bar{z}$ is (where $\bar{z}$ is complex conjugate of z)

(A) 2(1+i) (B) (1+i)
(C) 2/(1-i) (D) 4/(1+i)

Q26 If the conjugate of (x + iy) (1 - 2i) is 1 + i, then

(A) $x = -\frac{1}{5}$
(B) $x - iy = \frac{1+i}{1-2i}$
(C) $x + iy = \frac{1+i}{1-2i}$
(D) x = 1/5

Q27 The expression $\frac{(1+i)^n}{(1-i)^{n-2}}$ equals

(A) $-i^{n+1}$ (B) i^{n+1}
(C) $-2i^{n+1}$ (D) 1

Q28 If $\left(\frac{1+i}{1-i}\right)^3 - \left(\frac{1-i}{1+i}\right)^3 = a + ib$, then a and b are

(A) 1, 1 (B) 2, –2
(C) 0, –1 (D) 0, –2

Q29 The value of $(1+i)^4\left(1+\frac{1}{i}\right)^4$ is

(A) 12 (B) 2
(C) 8 (D) 16

Q30 $\left(\frac{1-i}{1+i}\right)^2 =$

(A) 1 (B) -1
(C) $-\frac{1}{2}$ (D) $\frac{1}{\sqrt{2}}$

Answer Key

Q1	(A)
Q2	(C)
Q3	(B)
Q4	(A)
Q5	(B)
Q6	(D)
Q7	(C)
Q8	(A)
Q9	(C)
Q10	(C)
Q11	(A)
Q12	(A)
Q13	(B)
Q14	(D)
Q15	(B)
Q16	(D)
Q17	(B)
Q18	(A)
Q19	(A)
Q20	(D)
Q21	(B)
Q22	(C)
Q23	(D)
Q24	(C)
Q25	(D)
Q26	(C)
Q27	(C)
Q28	(D)
Q29	(D)
Q30	(B)

Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Text Solution:

$a=\sqrt{5}, r=\frac{-5}{\sqrt{5}}=-\sqrt{5}<1$

$S_n=\frac{a(1-r^n)}{1-r}$, for $r<1$

$=\frac{\sqrt{5}[1-(-\sqrt{5})^n]}{1-(-\sqrt{5})}=\frac{\sqrt{5}}{1+\sqrt{5}}\left[1-(-\sqrt{5})^n\right]$

$=\frac{-\sqrt{5}}{(\sqrt{5}+1)}\left[(-\sqrt{5})^n-1\right]$

Video Solution:

Q2 Text Solution:

Let a_{11}, a_{21}, a_{31}..., a_{2n} be the terms

Given $a_1 + a_2 + a_3 + \ldots + a_{2n} = 5\,(a_1 + a_3 + \ldots + a_{2n-1})$

$\frac{a[r^{2n}-1]}{r-1}=5\left[a+ar^2+ar^4+\ldots+ar^{2n-2}\right]$

$= 5a[1 + r^2 + r^4 + \ldots + (r^{n-1})^2$

$\frac{a[r^{2n}-1]}{r-1}=\frac{5a[(r^2)^n-1]}{r^2-1}$

$\frac{1}{r-1}=\frac{5}{(r-1)(r+1)}$

$r + 1 = 5$

$r = 4$

Video Solution:

Q3 Text Solution:

By data, $2=\frac{1}{1-r}\quad(\because a=1)$

$\Rightarrow\quad 2(1-r)=1\quad\Rightarrow\quad r=\frac{1}{2}$

$S_n=\frac{a(1-r^n)}{1-r}=\frac{1-\left(\frac{1}{2}\right)^n}{1-\frac{1}{2}}$

$=2\left[1-\left(\frac{1}{2}\right)^n\right]=\frac{2^n-1}{2^{n-1}}$

Video Solution:

Q4 Text Solution:

Let $\frac{a}{r}$, a, ar be the 3 terms

Given $\frac{a}{r}+a+ar=26$

$a\left[\frac{1}{r}+1+r\right]=26$ ....(i)

$\&\quad\left(\frac{a}{r}\right)a+a\,(ar)+ar\left(\frac{a}{r}\right)=156$

$a^2\left[\frac{1}{r}+r+1\right]=156$ ....(ii)

(ii) ÷ (i)

$a=\frac{156}{26}=6$

Consider (i)

$a\left[\frac{1}{r}+1+r\right]=26$

$6\left[\frac{1+r+r^2}{r}\right]=26$

$6 + 6r + 6r^2 = 26r$

$6r^2 - 20r + 6 = 0$

$3r^2 - 10r + 3 = 0$

$r=\frac{1}{3}$ or $r=3$

terms are 2, 6, 18

Video Solution:

Q5 Text Solution:

let $S=1+\frac{2}{3}+\frac{7}{3^2}+\frac{12}{3^3}+\ldots.\infty$

$S=1+\frac{2}{3}+\frac{7}{3^2}+\frac{12}{3^3}+\ldots.\infty$

Subtracting (ii) from (i), we get

$\frac{2}{3}S=1+\frac{1}{3}+\frac{5}{3^2}+\frac{5}{3^3}+\ldots\infty$

$\Rightarrow\ \frac{2}{3}S=\frac{4}{3}+\left(\frac{5}{3^2}+\frac{5}{3^3}+\ldots\infty\right)$

$\Rightarrow\ \frac{2}{3}S=\frac{4}{3}+\left(\frac{\frac{5}{3^2}}{1-\frac{1}{3}}\right)=\frac{4}{3}+\frac{5}{6}=\frac{13}{6}\ \therefore\ S$

$=\frac{13}{6}\times\frac{3}{2}=\frac{13}{4}$

Video Solution:

Q6 Text Solution:

(D)

If α,β are the two numbers, then

$\frac{\alpha+\beta}{2}$ = A.M. = 8, $\sqrt{\alpha\beta}$ = G.M.= 4

$\Rightarrow\alpha+\beta=16,\ \ \alpha.\beta=16$

$\therefore$ The equation whose roots are α,β is

$x^2-16x+16=0$

Video Solution:

Q7 Text Solution:

x, y, z are in G.P. $\Rightarrow x=\frac{y}{r}, z=yr\ \ x,$

$2y, 3z$ are in A.P.

$\Rightarrow\ \ \frac{y}{r}, 2y, 3yr$ are in A.P. $\Rightarrow\frac{y}{r}+3yr$

$=4y$

$\Rightarrow\ \ 3r^2-4r+1=0\Rightarrow r=1,\frac{1}{3}$

But $r\neq1\ \ \therefore r=\frac{1}{3}$.

Video Solution:

Q8 Text Solution:

Given, arithmetic mean of x and y is 3.

i.e. $\frac{x+y}{2}=3\quad\Rightarrow x+y=6.$ (1)

and geometric mean of x and y is 1.

i.e. $\sqrt{xy}=1\quad\Rightarrow xy=1$ (2)

Squaring (1) on both sides. We get.

$(x+y)^2=6^2$

$\Rightarrow x^2+y^2+2xy=36.$

$x^2+y^2+2=36$

$\because xy=1$

$x^2+y^2=34$

Video Solution:

Q9 Text Solution:

Arithmetic mean of a and b $= \frac{a+b}{2}$ and geometric mean of a and b $= \sqrt{ab}$

According to question, $\frac{a+b}{2} = 5\sqrt{ab}$

$\Rightarrow (a+b)^2 = 100\,ab$

Now, $(a+b)^2 - (a-b)^2 = 4\,ab$

$\Rightarrow \quad 100ab - (a-b)^2 = 4ab \Rightarrow 96ab$

$= (a-b)^2$

$\therefore \quad \frac{(a+b)^2}{(a-b)^2} = \frac{100}{96} \Rightarrow \frac{a+b}{a-b} = \frac{10}{4\sqrt{6}}$

$\Rightarrow \frac{a+b}{a-b} = \frac{5}{2\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}} = \frac{5\sqrt{6}}{12}$

Video Solution:

Q10 Text Solution:

Arithmetic mean of a and b $= \frac{a+b}{2}$ and geometric mean of a and b $= \sqrt{ab}$

According to question, $\frac{a+b}{2} = 5\sqrt{ab}$

$\Rightarrow (a+b)^2 = 100\,ab$

Now, $(a+b)^2 - (a-b)^2 = 4\,ab$

$\Rightarrow \quad 100ab - (a-b)^2 = 4ab \Rightarrow 96ab$

$= (a-b)^2$

$\therefore \quad \frac{(a+b)^2}{(a-b)^2} = \frac{100}{96} \Rightarrow \frac{a+b}{a-b} = \frac{10}{4\sqrt{6}}$

$\Rightarrow \frac{a+b}{a-b} = \frac{5}{2\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}} = \frac{5\sqrt{6}}{12}$

Video Solution:

Q11 Text Solution:

We know that the acute angle θ between two lines with slope m_1 and m_2 is given by

$\tan\theta = \left|\frac{m_2 - m_1}{1 + m_1 m_2}\right|$

Let $m_1 = \frac{1}{2},\ m_2 = m$ and $\theta = \frac{\pi}{4}$

Now, putting these values in (i), we get

$\tan\frac{\pi}{4} = \left|\frac{m - \frac{1}{2}}{1 + \frac{1}{2}m}\right| \Rightarrow 1 = \left|\frac{2m-1}{2+m}\right|$

which gives $\frac{2m-1}{2+m} = 1$ or $\frac{2m-1}{2+m} = -1$

Therefore m = 3 or m = -1/3

Hence, slope of the other line is 3 or -1/3.

Video Solution:

Q12 Text Solution:

Given $lx + my = l + m$

$\Rightarrow m_1 = \frac{-A}{B} = \frac{-l}{m}$

And $lx - ly + mx + my = 2m$

$(l+m)x + y(m-l) = 2m$

$m_2 = \frac{-A}{B} = \frac{-(l+m)}{m-l} = \frac{l+m}{l-m}$

$\therefore \tan\theta = \left|\frac{m_2 - m_1}{1 + m_1 m_2}\right| = \left|\frac{\frac{l+m}{l-m} + \frac{l}{m}}{1 + \left(\frac{l+m}{1-m}\right)\left(\frac{-l}{m}\right)}\right|$

$= \left|\frac{ml + m^2 + l^2 - lm}{ml - m^2 - l^2 - lm}\right| = \left|\frac{m^2 + l^2}{-(m^2 + l^2)}\right|$

$\tan\theta = 1$

$\theta = \frac{\pi}{4}$

Video Solution:

Q13 Text Solution:

Here, m = slope of the line

= tan 135° = tan(90° + 45°)

= –cot 45° = –1;

Also, $x_1 = 2$, $y_1 = -3$

So, the equation of line is $y - y_1 = m(x - x_1)$

$\Rightarrow y - (-3) = -1(x - 2)$

$\Rightarrow y + 3 = -x + 2$

$\Rightarrow x + y + 1 = 0$

Video Solution:

Q14 Text Solution:

$m = \frac{6}{-4} = \frac{-3}{2}$

Video Solution:

Q15 Text Solution:

$m = 2, \quad (x_1,\ y_1) = (2,\ 5) \quad (x_2,\ y_2) = (x,\ 1)$

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$\Rightarrow \ 2 = \frac{1-5}{x-2}$

$2x - 4 = -4$

$2x = 0$

$x = 0$

Video Solution:

Q16 Text Solution:

Given equation of line is $3x + y = 3$ ....(i)

$\Rightarrow y = -3x + 3$

On comparing to $y = mx + c$

$\therefore$ slope of the line $m = -3$

$\therefore$ Slope of the perpendicular to (i) is 1/3

$\therefore$ Equation of the line passing through point (2, 2) and slope 1/3 is

$y - 2 = \frac{1}{3}(x - 2)$

$y - 2 = \frac{x}{3} - \frac{2}{3}$

$y = \frac{x}{3} + \frac{4}{3}$

$\therefore$ The y-intercept of the line is 4/3.

Video Solution:

Q17 Text Solution:

a = 5, b = -4

Equation of line is

$\frac{x}{a}+\frac{y}{6}=1$

$\frac{x}{5}+\frac{y}{-4}=1$

$\frac{-4x+5y}{-20}=1$

$-4x+5y=-20$

$4x-5y-20=0$

Video Solution:

Q18 Text Solution:

Slope of line 2x - 3y + 5 = 0 is $m_1 = 2/3$

Slope of line perpendicular to 2x - 3y + 5 = 0 is

$m_2 = -3/2$

Equation of perpendicular line making an intercept 3 with y-axis and slope

$=\frac{-3}{2}$ is $(y-3)=\frac{-3}{2}(x-0)$

$\Rightarrow\ 3x+2y-6=0$

Video Solution:

Q19 Text Solution:

Let m be the foot of the perpendicular

slope of pm = –1

∴ Equation of pm is x + y - 2 = 0

on solving two equations we get

m = (0, 2)

Video Solution:

Q20 Text Solution:

Video Solution:

Q21 Text Solution:

(B)

Given point (x_1, y_1) = (5, 7) and line 3x + y – 7 =0

Now image P(x, y) of any point (x_1, y_1) is

$\frac{x-x_1}{1}=\frac{y-y_1}{b}=\frac{-2(ax_1+by_1+c)}{a^2+b^2}$

$\therefore\ \frac{x-5}{3}=\frac{y-7}{1}=\frac{-2(3\times5+1\times7-7)}{1^2+3^3}$

$\Rightarrow\frac{x-5}{3}=\frac{y-7}{1}=\frac{-2(15)}{10}]$

$\Rightarrow\frac{x-5}{3}=\frac{y-7}{1}=-3$

⇒x = –9 + 5, y = –13 + 7

⇒x = –4, y = 4

∴ Image of (5, 17) is (–4, 4)

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Q22 Text Solution:

Givne line is 3x - 4y - 26 = 0

Here, A = 3, B = -4 and C = -26.

Given point is $(x_1, y_1) = (3, -5)$.

The distance of the given point from given line is

$$d = \frac{|Ax_1+By_1+C|}{\sqrt{A^2+B^2}} = \frac{|3\cdot3+(-4)(-5)-26|}{\sqrt{3^2+(-4)^2}}$$

$$= \frac{3}{5} \text{ unit}$$

Video Solution:

Q23 Text Solution:

Video Solution:

Q24 Text Solution:

$$\text{LHS} = \left|1-\bar{z}_1z_2\right|^2 - \left|z_1-z_2\right|^2$$

$$= (1-\bar{z}_1z_2)\left(\overline{1-\bar{z}_1z_2}\right) - (z_1-z_2)\left(\overline{z_1-z_2}\right)$$

$$= (1-\bar{z}_1z_2)(1-z_1\bar{z}_2) - (z_1-z_2)(\bar{z}_1-\bar{z}_2)$$

$$= 1 + z_1\bar{z}_1z_2\bar{z}_2 - z_1\bar{z}_1 - z_2\bar{z}_2$$

$$= 1 + |z_1|^2\cdot|z_2|^2 - |z_1|^2 - |z_2|^2 = (1-|z_1|^2)(1-|z_2|^2)$$

$$\text{RHS} = k(1-|z_1|^2)(1-|z_1|^2)$$

Hence, equating LHS and RHS we get $k = 1$.

Video Solution:

$$\left|\frac{ax_1+by_1+c}{\sqrt{a^2+b^2}}\right|$$

Q25 Text Solution:

$$D = \left|\frac{5x_1+y_1-9}{\sqrt{1^2+5^2}}\right| = \left|\frac{5-1-9}{\sqrt{26}}\right| = \left|\frac{-5}{\sqrt{26}}\right| = \frac{5}{\sqrt{26}}$$

$$\because z = \frac{4}{1-i} \quad \therefore \bar{z} = \frac{4}{1+i}$$

Video Solution:

Q26 Text Solution:

$$\overline{(x+iy)(1-2i)} = 1+i$$

$$\Rightarrow \left(x-iy\right)\left(1+2i\right) = 1+i,$$

$$\Rightarrow x-iy = \frac{1+i}{1+2i} \Rightarrow x+iy = \frac{1-i}{1-2i}$$

Video Solution:

Q27 **Text Solution:**

$$\left(\frac{1+i}{1-i}\right)^n(1-i)^2=\left\{\frac{(1+i)^2}{1-i^2}\right\}^n\left(1+i^2-2i\right)$$

$$=\left\{\frac{1-1+2i}{2}\right\}^n\left(-2i\right)=-2i^{n+1}$$

Video Solution:

Q28 **Text Solution:**

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

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

$\therefore\left(\frac{1+i}{1-i}\right)^3-\left(\frac{1-i}{1+i}\right)^3=i^3-(i)^3$

$=-i-i=-2i=0-2i$

$\therefore\ a=0, b=-2$

Video Solution:

Q29 **Text Solution:**

$$(1+i)^4\times\left(1+\frac{1}{i}\right)^4=(1+i)^4\times(1-i)^4$$

$$=\left(1-i^2\right)^4=(1+1)^4=2^4=16$$

Video Solution:

Q30 **Text Solution:**

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

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