Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

askIITians
ENGINEERING | MEDICAL | FOUNDATION

**Class: XI**
**Subject: Mathematics (OASK1511SA102)**
**No. of Questions: 29**
**Duration: 3 hours**
**Maximum Marks: 100**

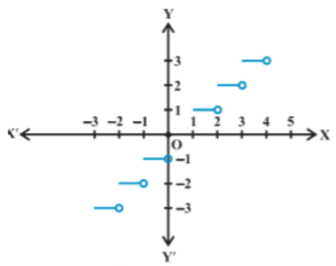
**Time: 3 Hrs.** **M.M. 100**

**General Instructions:**

1. The all the questions are compulsory.
2. The question paper consist of 29 questions divided into three section A,B and C. Section A comprises of 10 question of one mark each, section B comprises of 12 questions of four marks each and section C comprises of 07 questions of six marks each.
3. All questions in Section A are to be answer in one word, one sentence or as per the exact required of the question.
4. There is no overall choice. However, internal choice has been provide in some questions
5. Use of calculators is not permitted. You may ask for logarithmic table, if required.

## Section –A

Q1. Identify the function that the given graph represents.




Sol. Such a function is called the greatest integer function.

From the definition [X] = -1 for -1 ≤ x < 0

[X] = 0 for 0 ≤ x < 1

[X] = 1 for 1 ≤ x < 2

[X] = 2 for 2 ≤ x < 3 and so on

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

Q2. Let $f(x) = x^2$ and $g(x) = 2x^2$ and $g(x) = 2x + 1$ be two real valued functions. Find (fg) (x).

Sol. $f(x) = x^2$, $g(x) = (2x+1)$

$(fg)\ (x) = f(x)\ g(x) = x^2\ (2x+1) = 2x^3 + x^2$

Q3. Let A = {1, 2} and B = {3, 4}. Find the number of relations from A to B.

Sol. Given A = {1, 2} B = {3, 4}

A × B = {(1, 3), (1, 4), (2, 3), (2, 4)}.

Since n (A × B) = 4, the number of subsets of A × B is $2^4$

Therefore, the number of relations from A to B will be 16

Q4. Find the values of 'k' for which $-\frac{2}{7}$ , K, $-\frac{7}{2}$ are in G.P. Find the common ratios / s of the GP.

Sol. $-\frac{2}{7}, \mathrm{K}, -\frac{7}{2}$ are in GP

$\Rightarrow\ k^2 = \left(-\frac{2}{7}\right) \times \left(-\frac{7}{2}\right) = 1$

$\Rightarrow k^2 = 1$

$\Rightarrow k = \pm 1$

When k = 1; GP: $-\frac{2}{7}, 1, -\frac{7}{2}$

$r = \frac{1}{-\frac{2}{7}} - \frac{7}{2}$

When K = -1; GP: $-\frac{2}{7}, -1, -\frac{7}{2}$

$r = \frac{-1}{-\frac{2}{7}} = \frac{7}{2}$

Q5. Solve the given quadratic equation: $9x^2 - 12x + 20 = 0$

Sol. $9x^2 - 12x + 20 = 0$

$\Rightarrow 3x^2 - 4x + \frac{20}{3} = 0$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$\Rightarrow x = \frac{-(-4)\pm\sqrt{(-4)^2-4.3.\frac{20}{3}}}{2.3} \quad = \frac{4\pm\sqrt{16-4.20}}{6}$

$= \frac{4\pm\sqrt{16-80}}{6} \quad = \frac{4\pm\sqrt{-64}}{6} = \frac{4\pm8\sqrt{-1}}{6} = \frac{2\pm4i}{3}$

$\Rightarrow x = \frac{2}{3} \pm \frac{4}{3}i \;\Rightarrow x = \frac{2}{3} + \frac{4}{3}i\,; \frac{2}{3} - \frac{4}{3}i$

Q6. A = {2, 3, 5, 7, 9} ∪ = {1, 2, 3, 4 ….10}. Write (A-B)

Sol. A – B = {1, 4, 6}

$(A - C)^{-2} = \{2, 3, 5, 7, 8\,, 9, 10\}$

Q7. Express $(1-2i)^{-2}$ in the standard form a + ib

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

$= \frac{1}{1+4i^2-4i} = \frac{1}{-3-4i} \times \frac{-3+4i}{-3+4i}$

$= \frac{-3+4i}{9-16i^2}$

$\frac{-3}{25} + \frac{4}{25}\, i$

Q8. Find 20th terms from each of the A.P. 3, 7, 11 ….407.

Sol. The given A.P. can be written in reverse orders as 407, 403, 399, …

Now $20^{th}$ terms = a+19d

$= 407 + 19 \times (-4)$

$= 407 - 76$

$= 331$

Q9. Evaluate $5^2+6^2 + 7^2 + …. +20^2$

Sol. $5^2 + 6^2 + 7^2 + \cdots + 20^2$

$$\sum_{r=1}^{20} r^2 - \sum_{k=1}^{4} k^2 \qquad \because \sum n^2 = \frac{n(n+1)(2n+1)}{6}$$

$$= \frac{20\times21\times41}{6} - \frac{4\times5\times9}{6}$$

$$= 2870 - 30 = 2840$$

Q10. If the angle A, B, C of a triangle are in A.P. and sides a, b, c are in G.P., then Prove that $a^2$, $b^2$, $c^2$ are in A.P.

Sol. Given, $2B = A + C = \pi - B \Rightarrow B = \frac{\pi}{3}$

Also, a, b, c are in G.P. $\Rightarrow b^2 = ac$

Now , $cosB = \ cos60° = \frac{1}{2} = \frac{c^2+a^2-b^2}{2ac} \Rightarrow ca = c^2 + a^2 - b^2$

$\Rightarrow b^2 = c^2 + a^2 - b^2 \Rightarrow 2b^2 = a^2 + c^2 \Rightarrow a^2, b^2, c^2\ are\ in\ A.P.$

**Section – B**

Q11. Let A = {1, 2, 3, 4, 6}. Let R be the relation on A defined by {(a, b): a, b ϵ A, a divides b}

(a) Write in the roster form
(b) Find the domain of R
(c) Find the range of R

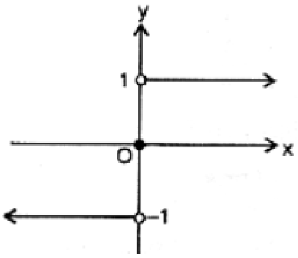
Sol. R: {(a, b): a, b ϵ A, a divides b}, Also A = P {1, 2, 3, 4, 6}

(a) R = {(1, 1), (1,2), (1,3), (1,4), (1,5), (1,6), (2,2), (2,4), (2,6), (3,3), (4,4), (6,6)}
(b) Domain of R = {1, 2, 3, 4, 6}
(c) Range of R = {1, 2, 3, 4, 5,6 }

Q12. Draw the graph of the given signum function.

$$\mathrm{f(x)} = \begin{cases} 1 & \text{if} \quad x > 0 \\ 0 & \text{if} \quad x = 0 \\ -1 & \text{if} \quad x < 0 \end{cases}$$

Sol. Given Signum function:




The two Branches

Bold bullet at (0, 0)

Circle at (0, 1) and (0, -1)

Q13. Solve the given equation $2\cos^2 x + 3\sin x = 0$

Sol. $2\cos^2 x + 3\sin x = 0$

Using $\cos^2 x = 1 - \sin^2 x$

$\Rightarrow 2\sin^2 x - 3\text{sinx} - 2 = 0$

$\Rightarrow (\text{sinx} - 2)(2\ \text{sinx} + 1) = 0$

$\Rightarrow \text{sinx} = 2\ (\text{not possible})$ and $\sin x = -\frac{1}{2}$

$\Rightarrow \sin x = -\sin\frac{\pi}{6} = \sin\left(\pi + \frac{\pi}{6}\right)$

$\Rightarrow \sin x = \sin\frac{7\pi}{6}$

$x = n\pi + (-1)^n \frac{7\pi}{6}$

Q14. Prove that $\frac{\cos 4x + \cos 3x + \cos 2x}{\sin 4x + \sin 3x + \sin 2x} = \cot 3x$

Sol. LHS = $\frac{\cos 4x + \cos 3x + \cos 2x}{\sin 4x + \sin 3x + \sin 2x}$

$= \frac{(\cos 4x + \cos 2x) + \cos 3x}{(\sin 4x + \sin 2x) + \sin 3x}$

$= \frac{2\cos 3x \cos x + \cos 3x}{2\sin 3x \cos x + \sin 3x}$

$= \frac{\cos 3x\ (2\cos x + 1)}{\sin 3x\ (2\cos x + 1)}$

$= \cot 3x$

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

Q15. Insert three numbers between 1 and 256 so that the resulting sequence is a GP

Sol. Let $G_1$, $G_2$, $G_3$, 256 is a G.P.

Now 1 is the I term and 256 is the V term of the GP

Let r be the common difference of the GP

$256 = r^4$ giving $r = \pm 4$ (Taking real roots only)

For r = 4, we have $G_1 = ar = 4$, $G_2 = ar^2 = 16$, $G_3 = ar^3 = 64$

Similarly, for r = -4, numbers are -4, 16 and -64

Hence, we can insert 4, 16, 64 or 4, 16, 64, between 1 and 256 so that the resulting sequences are in G.P

Q16. Solve $\sqrt{5}\,x^2 + x + \sqrt{5} = 0$

Sol. Given equation is, $\sqrt{5}x^2 + x + \sqrt{5} = 0. a = \sqrt{5} b = 1\ c = \sqrt{5}$

Discriminant of the equation is

$b^2 - 4ac = 1^2 - 4 \times \sqrt{5} \times \sqrt{5} = 1 - 20 = -19$

Therefore, the roots are $\frac{-1 \pm \sqrt{-19}}{2\sqrt{5}} = \frac{-1+\sqrt{19}i}{2\sqrt{5}}, \frac{-1-\sqrt{19}i}{2\sqrt{5}}$

Q17. Find the $r^{th}$ term from the end in the expansion of $(x + a)^n$

Sol. There are (n +1) terms in the expansion of $(x + a)^n$

Observing the terms we can say that the first term from the end is the last term,

i.e., $(n+1)^{th}$ term of the expansion and n+1 = (n+1) – (1 - 1).

The second terms from the end is the $n^{th}$ term of the expansion, and n = (n + 1) – (2 - 1).

The third terms from the end is the $(n - 1)^{th}$ term of the expansion and n-1 = (n+1) – (3-1) and so on.

Thus $r^{th}$ term from the end will be term number (n+1) – (r-1) = $(n-r+2)^{th}$ of the expansion.

The $(n-r+2)^{th}$ term is ${}^9C_{n-r+1}\, x^{r-1} a^{n-r+1}$

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

Q18. If $1+\frac{(1+2)}{2}+\frac{(1+2+3)}{3}+\cdots$ to n terms is S, then find S.

Sol. $a_n=\frac{(1+2+3+\ldots n)}{n}=\frac{n(n+1)}{2n}$

$$S_n=\sum_n a_n$$

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

$=\frac{1}{2}\frac{n(n+1)}{2}+\frac{n}{2}$

$=\frac{(n^2+n)}{4}+\frac{n}{2}$

$=\frac{n(n+3)}{4}$

Q19. Find the coefficient of $x^5$ in the expansion of the product $(1+2x)^6(1-x)^7$

Sol. To find the coefficient of $x^5$ in the expansion of the product $(1+2x)^6(1-x)^7$

Let us find the expansions of the 2 binomials.

$(1+2x)^6={}^6C_0(2x)^0+{}^6C_1(2x)^1+{}^6C_2(2x)^2+{}^6C_3(2x)^3+{}^6C_4(2x)^4+{}^6C_5(2x)^5+{}^6C_6(2x)^6$

$=1.1+6.(2x)+15.(2x)^2+20.(2x)^3+15.(2x)^4+6.(2x)^5+1.(2x)^6$

$=1+12x+60x^2+20.(2x)^3+15.(2x)^4+6.(2x)^5+1.(2x)^6$

$(1-x)^7={}^7C_0(-x)^0+{}^7C_1(-x)^1+{}^7C_2(-x)^2+{}^7C_3(-x)^3+{}^7C_4(-x)^4+{}^7C_5(-x)^6+{}^7C_6(-x)^6+{}^7C_7(-x)^7$

$=1.1-7.(x)+21.(x)^2-35.(x)^3+35.(x)^4-21.(x)^5+7.(x)^6-1.(x)^7$

$(1+2x)^6\times(1-x)^7=[1+12x+60x^2+20.(2x)^3+15.(2x)^4+6.(2x)^5+(2x)^6]$

$\times[1-7.(x)+21.(x)^2-35.(x)^3+35.(x)^4-21.(x)^5+7.(x)^6-(x)^7]$

We will find only those terms that contain $x^5$

$6.(2x)^5-7.(x)15.(2x)^4+21.(x)^2\,20.(2x)^3-35.(x)^3.60x^2+35.(x)^4.12x-21.(x)^5$

Coefficient of $x^5$

$6.(2)^5-7.15\,(2)^4+21.20.(2)^3-35.60+35.12-21.$

$=-21+420-2100+3360-1680+192=171$

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

Q20. Show that $\tan 3x \tan 2x \tan x = \tan 3x - \tan 2x - \tan x$

Sol. Consider 3x = 2x +x

Operating tan 3x = tan (2x +x)

$\tan(x+y) = \frac{\tan x + \tan y}{1 - \tan x \tan y}$

$\tan 3x = \frac{\tan 2x + \tan x}{1 - \tan 2x \tan x}$

$\tan 3x - \tan 3x \tan 2x \tan x = \tan 2x + \tan x$

or $\tan 3x - \tan 2x - \tan x = \tan 3x \tan 2x \tan x$

or $\tan 3x \tan 2x \tan x = \tan 3x - \tan 2x - \tan x$

Q21. Prove that $\frac{\sec 8A - 1}{\sec 4A - 1} = \frac{\tan 8A}{\tan 2A}$

Sol. $\frac{\sec 8A - 1}{\sec 4A - 1} = \frac{\tan 8A}{\tan 2A}$

Consider L.H.S.

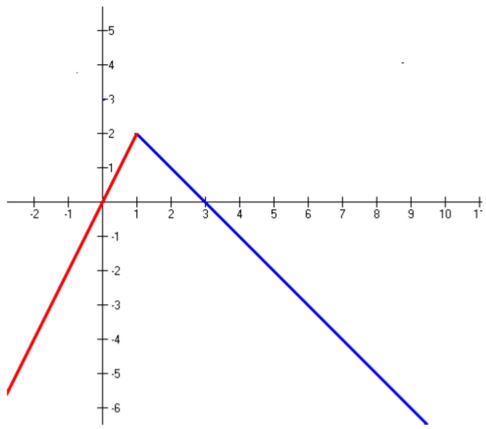
$$= \frac{\frac{1 - \cos 8A}{\cos 8A}}{\frac{1 - \cos 4A}{\cos 4A}} = \frac{2\sin^2 4A}{\cos 8A} \times \frac{\cos 4A}{2\sin^2 2A}$$

$$= \frac{2\sin 4A \cos 4A \,.\sin 4A}{2\cos 8A \times 2\sin 2A \times \sin 2A}$$

$$= \frac{\sin 8A}{\cos 8A} \times \frac{2\sin 2A \cos 2A}{2\sin 2A \times \sin 2A} = \frac{\tan 8A}{\tan 2A}$$

Q22. Draw the graph of f(x) $\begin{cases} 3 - x, & x > 1 \\ 1, & x = 1 \\ 2x, & x < 1 \end{cases}$ and find the Range of f.

Sol. Range of $f = (-\infty, 2)$



**Section –C**

Q23. Prove that $2\cos\frac{\pi}{13}\cos\frac{9\pi}{13} + \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13} = 0$

Sol. Consider L.H.S: $2\cos\frac{\pi}{13}\cos\frac{9\pi}{13} + \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13}$

$= \cos\left(\frac{9\pi}{13} + \frac{\pi}{13}\right) + \cos\left(\frac{9\pi}{13} - \frac{\pi}{3}\right) + \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13}$

$= \cos\frac{10\pi}{13} + \cos\frac{8\pi}{13} + \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13}$

$= \cos\left(\pi - \frac{3\pi}{13}\right) + \cos\left(\pi - \frac{5\pi}{13}\right) + \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13}$

$= -\cos\frac{5\pi}{13} - \cos\frac{5\pi}{13} + \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13} = 0 = \text{RHS}$

Thus LHS = RHS

Q24. Find the solution region for the following system of in equations:

$x + 2y \le 10, x + y \ge 1,\ x - y \le 0, x \ge 0$

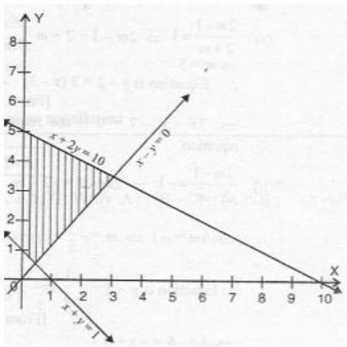
Sol. Given in equations:

$x + 2y \le 10, x + y \ge 1,\ x - y \le 0, x \ge 0,$

Consider the corresponding equations x+2y = 10, x + y = 1 and x – y = 0

On plotting these equations on the graph, we get the graph as shown.

Also we find the shaded portion by substituting (0, 0) in the in equations.




Q25. For all n ≥ 1, Prove using Principle of Mathematical Induction

$$\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+\cdots+\frac{1}{n(n+1)}=\frac{n}{n+1}$$

Sol. Let $P(n):\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+\cdots+\frac{1}{n(n+1)}=\frac{n}{n+1}$

$P(1):\frac{1}{1.2}=\frac{1}{1+1}$ , which is true. Thus . P(n) is true for $n = 1$

Assume that P (k) is true for some natural number, K,

$P(K):\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+\ldots+\frac{1}{k(k+1)}=\frac{k}{k+1}$

We need to prove that P(K) that P(k+1) is true whenever P(k) is true.

We have, P(k+1) =

$$\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+\cdots+\frac{1}{k(k+1)}+\frac{1}{(k+1)(k+2)}=\frac{(k+1)}{(k+2)}$$

RHS of P (K) = $\left[\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+..+\frac{1}{k(k+1)}\right]+\frac{1}{(k+1)(k+2)}$

$$=\frac{K}{(k+1)}+\frac{1}{(k+1)(k+2)}=\frac{k^2+2k+1}{(k+1)(k+2)}=\frac{k+1}{k+2}=RHS$$

So, P (K+1) is true whenever P(K) is true

So the result holds for all natural numbers.

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

Q26. Using mathematical induction prove the following:

$$\frac{1}{1.2.3}+\frac{1}{2.3.4}+\frac{1}{3.4.5}+\cdots+\frac{1}{n(n+1)(n+2)}=\frac{n(n+3)}{4(n+1)(n+2)}$$

Sol. Let the statement P (n) be: $\frac{1}{1.2.3}+\frac{1}{2.3.4}+\frac{1}{3.4.5}+.\ldots+\frac{1}{(n)(n+1)(n+2)}=\frac{(n)(n)}{4(n+1)}$

Consider P (1) : $\frac{1}{1.2.3}=\frac{(1)(1+3)}{4(1+1)(1+2)}$

$\Rightarrow \frac{1}{1.2.3}=\frac{(1)(1+3)}{4(1+1)(1+2)}=\frac{1.4}{4.2.3}=\frac{1}{1.2.3}$ [P(1)is true]

Let us assume that P(k) is true

P (k): $\frac{1}{1.2.3}+\frac{1}{2.3.4}+\frac{1}{3.4.5}+\ldots.+\frac{1}{k\,(k+1)(k+2)}=\frac{(k)(k+3)}{4(k+1)(k+2)}$

To Prove:

P (k+1): $\frac{1}{1.2.3}+\frac{1}{2.3.4}+\frac{1}{3.4.5}+\cdots+\frac{1}{(k)(k+1)(k+2)}+\frac{1}{(k+1)(k+2)(k+3)}=\frac{(k+1)}{4(k+2)}$

LHS = $\frac{1}{1.2.3}+\frac{1}{2.3.4}+\frac{1}{3.4.5}+\cdots+\frac{1}{(k)\,(k+1)(k+2)}+\frac{1}{(k+1)(k+2)(k+3)}$

$=\frac{1}{1.2.3}+\frac{1}{2.3.4}+\frac{1}{3.4.5}+\cdots+\frac{1}{k(k+1)(k+2)}+\frac{1}{(k+1)(k+2)(k+3)}$

$=\frac{k(k+3)}{4(k+1)(k+2)}+\frac{1}{(k+1)(k+2)(k+3)}$ (using P(k))

$=\frac{1}{(k+1)(k+2)}\left[\frac{k(k+3)}{4}+\frac{1}{(k+3)}\right]$

$=\frac{1}{(k+1)(k+2)}\left[\frac{k(k+3)^2+4}{4(k+3)}\right]$

$=\frac{1}{(k+1)(k+2)}\left[\frac{k(k^2+9+6k)+4}{4(k+3)}\right]$

$=\frac{1}{(k+1)(k+2)}\left[\frac{k^3+9k+6k^2+4}{4(k+3)}\right]$

$=\frac{1}{(k+1)(k+2)}\left[\frac{(k+1)^2(k+4)}{4(k+3)}\right]$

$=\frac{(k+1)(k+4)}{4(k+2)(k+3)}$ = RHS

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

Q27. Prove that $\cos^2 x + \cos^2\left(x + \frac{\pi}{3}\right) + \cos^2(x + \frac{\pi}{3}) = \frac{3}{2}$

Sol. $\cos^2 x + \cos^2\left(x + \frac{\pi}{3}\right) + \cos^2\left(x - \frac{\pi}{3}\right)$

$= \cos^2 x + \cos^2\left(x + \frac{\pi}{3}\right) + 1 - \sin^2\left(x - \frac{\pi}{3}\right)$

$= 1 + \cos^2 x + \left[\cos^2\left(x + \frac{\pi}{3}\right) - \sin^2\left(x - \frac{\pi}{3}\right)\right]$

$= 1 + \cos^2 x + \left[\cos\left(x + \frac{\pi}{3} + x - \frac{\pi}{3}\right)\cos\left(x + \frac{\pi}{3} - x + \frac{\pi}{3}\right)\right]$

$= 1 + \cos^2 x + \cos(2x)\cos\left(\frac{2\pi}{3}\right)$

$= 1 + \cos^2 x + \cos(2x)\,(-\frac{1}{2})$

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

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

$= 1 + \frac{1}{2} = \frac{3}{2}$

Q28. Solve the inequalities and represent the solution graphically

$5(2x - 7) - 3(2x + 3) \le 0;\ \ 2x + 19 \le 6x + 47 \text{ and } 7 \le \frac{(3x+11)}{2} \le 11$

Sol. $5\,(2x - 7) - 3(2x + 3) \le 0;\ \ 2x + 19 \le 6x + 47\ \text{ and } 7 \le \frac{(3x+11)}{2} \le 11$

Let us solve the in equalities one by one and then work out the common solution Inequality 1:

$5\,(2x - 7) - 3\,(2x + 3) \le 0$

$\Rightarrow 10x - 35 - 6x \le 0$

$\Rightarrow 4x - 44 \le 0$

$\Rightarrow 4x \le 44$

$\Rightarrow x \le 11$

Inequality 2

$2x + 19 \le 6x + 47$

$\Rightarrow 2x - 6x \le\ -19 + 47$

$\Rightarrow\ -4x \le 28$

$\Rightarrow\ -x \le 7$

$\Rightarrow x \ge\ -7$

Inequality:

$7 \le \frac{(3x+11)}{2} \le 11$

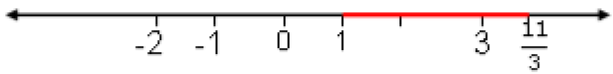
$\Rightarrow 14 \le 3x + 11 \le 22$

$\Rightarrow 14 - 11 \le 3x \le 22 - 11$

$\Rightarrow 3 \le 3x \le 11$

$\Rightarrow 1 \le x \le \frac{11}{3}$

$x \le 11, x \ge\ -7, 1 \le x \le \frac{11}{3}$ together $\Rightarrow 1 \le x \le \frac{11}{3}$




Q29. Find n, it the ratio of the fifth term from the beginning to the fifth term from the end in the expansion of $\left[\sqrt[4]{2} + \frac{1}{\sqrt[4]{3}}\right]^n$ is $\sqrt{6} : 1$

Sol. 5th term from beginning in $\left(\sqrt[4]{2} + \frac{1}{\sqrt[4]{3}}\right)^n$

$^nC_4 2^{\frac{n-4}{4}} . \left(\frac{1}{3}\right)$

5th term from the end in $\left(\sqrt[4]{2} + \frac{1}{\sqrt[4]{2}}\right)^n$ is

$^nC_4 (2) . \left(\frac{1}{3}\right)^{\frac{n-4}{4}}$

According to given question,

$$\frac{^nC_4 2^{\frac{n-4}{4}} . \left(\frac{1}{3}\right)}{^nC_4 (2) . \left(\frac{1}{3}\right)^{\frac{n-4}{4}}} = \frac{\sqrt{6}}{1}$$

$2^{\frac{n-4}{4}-1} \times 3^{\frac{n-4}{4}-1} = \sqrt{6}$

$6^{\frac{n-8}{4}} = 6^{1}/2$

Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

$\Rightarrow \frac{n-8}{4} = \frac{1}{2} \qquad \Rightarrow n = 10$