GGSRDN

Educational Services Private Limited

9th, 10th, NEET, JEE(Main/Advanced)

अभ्यास ही सबसे बड़ा गुरू है।

CLASS : XI (MATHS)

DPP

DAILY PRACTICE PROBLEM

DPP-21 to 30

MATHEMATICS DPP

DAILY PRACTICE PROBLEMS

DPP No. 21

Total Marks : 24

Max. Time : 27 min.

Topic : Sequence & Series

Type of Questions		M.M., Min.
Single choice Objective (no negative marking) Q.1,2,3	(3 marks, 3 min.)	[9, 9]
Assertion and Reason (no negative marking) Q.4	(3 marks, 3 min.)	[3, 3]
Subjective Questions (no negative marking) Q.5,6,7	(4 marks, 5 min.)	[12, 15]

1. If the product of two positive numbers is 9, then the possible value of the sum of their reciprocals lies in the interval :

(A) $\left[\frac{1}{3}, \infty\right)$ (B) $[1, \infty)$ (C) $\left[\frac{4}{3}, \infty\right)$ (D) $\left[\frac{2}{3}, \infty\right)$

2. Let the sequence $a_1, a_2, a_3, \ldots\ldots\ldots a_{2n-1}, a_{2n}$ form an A.P. Then the value of,

$$a_1^2 - a_2^2 + a_3^2 - \ldots\ldots\ldots + a_{2n-1}^2 - a_{2n}^2 \text{ is :}$$

(A) $\frac{2n}{n-1}\left(a_{2n}^2 - a_1^2\right)$ (B) $\frac{n}{2n-1}\left(a_1^2 - a_{2n}^2\right)$ (C) $\frac{n}{n+1}\left(a_1^2 + a_{2n}^2\right)$ (D) $\frac{n}{n-1}\left(a_1^2 + a_{2n}^2\right)$

3. If a, b, c are three unequal numbers such that a, b, c are in A.P. and b – a, c – b, a are in G.P., then a : b : c is

(A) 1 : 2 : 3 (B) 1 : 3 : 5 (C) 2 : 3 : 4 (D) 1 : 2 : 4

4. **STATEMENT-1 :** If x, y, z are the sides of a triangle such that x + y + z = 1,

then $\left(\frac{2x-1+2y-1+2z-1}{3}\right) \geq ((2x-1)(2y-1)(2z-1))^{1/3}$.

STATEMENT-2 : For positive numbers A.M. ≥ G.M. ≥ H.M.

(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(C) Statement-1 is True, Statement-2 is False
(D) Statement-1 is False, Statement-2 is True

5. A postman delivered daily for 42 days 4 more letters each day than on the previous day. The total delivery for the first 24 days of the period was the same as that for the last 18 days. How many letters did he deliver during the whole period ?

6. K is a positive integer such that 36 + K, 300 + K, 596 + K are the squares of three consecutive terms of an AP. Find K.

7. If n^{th} term of the series $3\frac{1}{3}, 2, 1\frac{3}{7}, 1\frac{1}{9}, \ldots\ldots$ is $\frac{an+10}{bn+c}$, $\forall n \in N$, then find the value of $(a + b + c)$

MATHEMATICS

DPP

DAILY PRACTICE PROBLEMS

DPP No. 22

Total Marks : 21

Max. Time : 21 min.

Topic : Sequence & Series

Type of Questions		M.M.,	Min.
Comprehension (no negative marking) Q.1 to Q.3	(3 marks, 3 min.)	[9,	9]
Single choice Objective (no negative marking) Q.4,5,6,7	(3 marks, 3 min.)	[12,	12]

COMPREHENSION (Q. No. 1 to 3)

Consider $S_n = \frac{8}{5} + \frac{16}{65} + ...+ \frac{8r}{4r^4+1}$

1. Sum of infinite terms of above series will be

(A) 0 (B) 1/2 (C) 2 (D) None of these

2. The value of S_{16} must be

(A) $\frac{80}{41}$ (B) $\frac{1088}{545}$ (C) $\frac{107}{245}$ (D) None of these

3. If $S_n = \frac{an^2+bn}{cn^3+dn^2+en+1}$ when a, b, c, d, e are independent of 'n', then

(A) a = 4, e = 2 (B) c = 0, d = 4 (C) b = 4, e = 4 (D) None of these

4. If $< a_n >$ and $< b_n >$ be two sequences, given by $a_n = x^{2^{-n}} + y^{2^{-n}}$; $b_n = x^{2^{-n}} - y^{2^{-n}}$ $\forall$ n $\in$ N, then value of $a_1 . a_2 . a_3 ....a_n$ is ?

(A) $\frac{x^2+y^2}{b_n}$ (B) $\frac{x-y}{b_n}$ (C) $\frac{x+y}{b_n}$ (D) $\frac{x^2-y^2}{b_n}$

5. The sum of first p-terms of a sequence is p(p + 1) (p + 2). The 10^{th} term of the sequence is

(A) 396 (B) 600 (C) 330 (D) 114

6. 50^{th} term of the squence 3 + 12 + 25 + 42 + ... is

(A) 5145 (B) 5148 (C) 5142 (D) 5195

7. If 2a + 3b + c = 3 ; a > 0, b > 0, c > 0, then the greatest value of $a^2 b^5 c^2$

(A) $\frac{5^5\ 2^2}{3^{23}}$ (B) $\frac{5^5 . 2^2}{3^{14}}$ (C) $\frac{4.5^5}{9^9}$ (D) $\frac{5^6 . 2^2}{3^4 . 9^{10}}$

GGSRDN

MATHEMATICS DPP

DAILY PRACTICE PROBLEMS

DPP No. 23

Total Marks : 23

Max. Time : 25 min.

Topic : Sequence & Series

Type of Questions		**M.M., Min.**
Single choice Objective (no negative marking) Q.1,2,3,4,5	**(3 marks, 3 min.)**	**[15, 15]**
Subjective Questions (no negative marking) Q.6,7	**(4 marks, 5 min.)**	**[8, 10]**

1. Find the sum of the sequence : $\frac{1}{9}+\frac{1}{18}+\frac{1}{30}+\frac{1}{45}+\frac{1}{63}+........\infty$

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

2. Greatest positive term of a H.P. whose first two terms are 2/5 and 12/23 is–

(A) 6 (B) 5 (C) 1/6 (D) 37/7

3. The value of the sum $\frac{1}{3^2+1}+\frac{1}{4^2+2}+\frac{1}{5^2+3}+\frac{1}{6^2+4}$ .... ∞ is equal to

(A) $\frac{13}{36}$ (B) $\frac{12}{36}$ (C) $\frac{15}{36}$ (D) $\frac{18}{36}$

4. If a, b,c,d, e are five positive numbers, then

(A) $\left(\frac{a}{b}+\frac{b}{c}\right)\left(\frac{c}{d}+\frac{d}{e}\right) \geq 4\sqrt{\frac{a}{e}}$

(B) $\frac{b}{a}+\frac{c}{b}+\frac{d}{c}+\frac{e}{d}+\frac{a}{e} \geq \frac{1}{5}$

(C) $\frac{a}{b}+\frac{b}{c}+\frac{c}{d}+\frac{d}{e}+\frac{e}{a} < 5$

(D) None of these

5. Let the n^{th} term of a series be given by $t_n = \frac{n^2-n-2}{n^2+3n}$, $n \geq 3$. The product $t_3\, t_4 \,......t_{50}$ equals

(A) $\frac{1}{5^2.7.13.53}$ (B) $\frac{1}{5.7^2.12.53}$ (C) $\frac{1}{5^2.7.12.51}$ (D) $\frac{1}{5.7^2.13.53}$

6. If $\sqrt{1+\frac{1}{1^2}+\frac{1}{2^2}}+\sqrt{1+\frac{1}{2^2}+\frac{1}{3^2}}+\sqrt{1+\frac{1}{3^2}+\frac{1}{4^2}}+.......+\sqrt{1+\frac{1}{(1999)^2}+\frac{1}{(2000)^2}} = x-\frac{1}{x}$,

then find the value of x.

7. Find the sum of infinite terms of the series : $\frac{3}{2.4}+\frac{5}{2.4.6}+\frac{7}{2.4.6.8}+\frac{9}{2.4.6.8.10}+........$

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MATHEMATICS

DPP

DAILY PRACTICE PROBLEMS

DPP No. 24

Total Marks : 27

Max. Time : 30 min.

Topics : Sequence & Series, Trigonometric Ratio & Trigonometric Equations

Type of Questions		M.M., Min.
Single choice Objective (no negative marking) Q.1,2	(3 marks, 3 min.)	[6, 6]
Multiple choice objective (no negative marking) Q.3	(5 marks, 4 min.)	[5, 4]
Subjective Questions (no negative marking) Q.4,5,6,7	(4 marks, 5 min.)	[16, 20]

1. If abcd = 1, where a, b, c, d are positive reals, then the minimum value of $a^2 + b^2 + c^2 + d^2 + ab + ac + ad + bc + bd + cd$ is

(A) 6 (B) 10 (C) 12 (D) 20

2. The A.M of the nine numbers in the given set {9, 99, 999, ..., 9999999999} is a 9 - digit number N, all whose digits are distinct then, the number N does not contain the digit.

(A) 0 (B) 2 (C) 5 (D) 9

3. If the first & the $(2n + 1)^{th}$ terms of an A.P., a G.P. & an H.P. of positive terms are same and their $(n + 1)^{th}$ terms are a, b & c respectively, then:

(A) a = b = c (B) $a \geq b \geq c$ (C) a + c = 2b (D) $ac = b^2$.

4. If $\sin\theta + \sin^2\theta = 1$, then prove that $\cos^2\theta + \cos^4\theta = 1$

5. Prove that : $\dfrac{1-\sin\theta}{1+\sin\theta} = (\sec\theta - \tan\theta)^2$

6. Find θ lying in the interval $[0, 2\pi]$ satisfying the following equations :

(i) $\sin\theta = \dfrac{1}{2}$ (ii) $\cos\theta = \dfrac{\sqrt{3}}{2}$ (iii) $\tan\theta = \sqrt{3}$

(iv) $\sin\theta = -\dfrac{1}{\sqrt{2}}$ (v) $\cos\theta = -\dfrac{1}{2}$ (vi) $\tan\theta = -\dfrac{1}{\sqrt{3}}$

7. Find the sum to 'n' terms and the sum to infinite terms of the series

$$\frac{3}{1^2} + \frac{5}{1^2+2^2} + \frac{7}{1^2+2^2+3^2} + \frac{9}{1^2+2^2+3^2+4^2} + \text{............upto n terms}$$

MATHEMATICS DPP

DAILY PRACTICE PROBLEMS

DPP No. 25

Total Marks : 26

Max. Time : 26 min.

Topics : Sequence & Series, Trigonometric Ratio

Type of Questions		M.M., Min.
Single choice Objective (no negative marking) Q.1,2,3,4,5,6	(3 marks, 3 min.)	[18, 18]
Match the Following (no negative marking) Q.7	(8 marks, 8 min.)	[8, 8]

1. If the expression

$$\cos\left(x-\frac{3\pi}{2}\right)+\sin\left(\frac{3\pi}{2}+x\right)+\sin(32\pi+x)-18\cos(19\pi-x)+\cos(56\pi+x)-9\sin(x+17\pi)$$

is expressed in the form of a sinx + b cosx, then (a + b) is equal to

(A) 17 (B) 27 (C) 13 (D) 23

2. $\cos(2001)\pi+\cot(2001)\frac{\pi}{2}+\sec(2001)\frac{\pi}{3}+\tan(2001)\frac{\pi}{4}+\text{cosec}(2001)\frac{\pi}{6}$ equals to

(A) 0 (B) 1 (C) – 2 (D) not defined

3. There is a certain sequence of positive real numbers. Beginning from the third term, each term of the sequence is equal to the sum of all the previous terms. The seventh term is equal to 1000 and the first term is equal to 1. The second term of this sequence is equal to

(A) 246 (B) $\frac{123}{2}$ (C) $\frac{123}{4}$ (D) 124

4. If in a sequence $< T_n > = \frac{n}{4n^4+1}$, then find sum upto infinite terms of the sequence

(A) $\frac{1}{4}$ (B) $\frac{1}{8}$ (C) $\frac{1}{5}$ (D) $\frac{4}{5}$

5. Let p, q, r $\in R^+$ and $27(pqr) \geq (p+q+r)^3$ and $3p + 4q + 5r = 12$, then $p^3 + q^4 + r^5$ is equal to

(A) 3 (B) 6 (C) 2 (D) none of these

6. If n is any positive integer, then find the number whose square is $\underbrace{111........1}_{2n\text{ times}} - \underbrace{222........2}_{n\text{ times}}$

7. **Match the following**

Column – I		**Column – II**	
(A)	$\cos\frac{73\pi}{4}$	(p)	$-\frac{1}{\sqrt{3}}$
(B)	$\tan\frac{1397\pi}{6}$	(q)	0
(C)	$\sin\frac{2007\pi}{6}$	(r)	$\frac{1}{\sqrt{2}}$
(D)	$\sin(10^4\pi)$	(s)	1

MATHEMATICS

DPP

DAILY PRACTICE PROBLEMS

DPP No. 26

Total Marks : 23

Max. Time : 25 min.

Topics : Sequence & Series, Trigonometric Ratio

Type of Questions		M.M., Min.
Comprehension (no negative marking) Q.1 to Q.2	(3 marks, 3 min.)	[6, 6]
Single choice Objective (no negative marking) Q.3,4,5	(3 marks, 3 min.)	[9, 9]
Subjective Questions (no negative marking) Q.6,7	(4 marks, 5 min.)	[8, 10]

COMPREHENSION : (Q. 1 to Q. 2)

Between two numbers whose sum is $2\frac{1}{6}$, an even number of arithmatic means are inserted. If the sum of these means exceeds their number by unity, then the number of means is t., then answer the following questions.

1. The value of t is

(A) 12 (B) 11 (C) 15 (D) 16

2. The third term of a G.P. is the square of the first term. If the second term is 8, then the 6th term is (in terms of t)

(A) 10t – 8 (B) 10t + 8 (C) 8t + 10 (D) 8t – 10

3. If $P = \frac{\sin 300^\circ . \tan 330^\circ . \sec 420^\circ}{\tan 135^\circ . \sin 210^\circ . \sec 315^\circ}$ & $Q = \frac{\sec 480^\circ . \text{cosec}\, 570^\circ . \tan 330^\circ}{\sin 600^\circ . \cos 660^\circ . \cot 405^\circ}$,

then P & Q are respectively :

(A) 2 , 16 (B) $\sqrt{2}$, $\frac{16}{3}$ (C) – 2 , $\frac{3}{16}$ (D) none of these

4. The product cot 123º . cot 133º . cot 137º . cot 147º , when simplified is equal to :

(A) – 1 (B) tan 37º (C) cot 33º (D) 1

5. In a sequence, if the sum of the first 'n' terms is given by $S_n = 2^{np} - 1$, where 'p' is a fixed non zero real number the nature of the sequence, is

(A) A.P. (B) G.P. (C) H.P. (D) None of these

6. If θ lies in III quadrant and $\sin\theta = -\frac{12}{13}$, find $\cos\theta$, $\tan\theta$, $\cot\theta$

7. Find the sum of the series

$1 + 2(1 - x) + 3(1 - x)(1 - 2x) + ...+ n\ (1 - x)(1 - 2x) ...... (1 - (n - 1)x)$

MATHEMATICS

DPP

DAILY PRACTICE PROBLEMS

DPP No. 27

Total Marks : 24

Max. Time : 30 min.

Topic : Fundamentals of Mathematics

Type of Questions		**M.M., Min.**
Subjective Questions (no negative marking) Q.1,2,3,4,5,6	**(4 marks, 5 min.)**	**[24, 30]**

1. If [x] denotes greatest integer $\le$ x and {x} denotes fractional part of x then evaluate / simpilfy the folowing :

(i) $\left|\sqrt{7-4\sqrt{3}}\right|$ (ii) $\left|\pi-3-\sqrt{8-2\sqrt{15}}\right|$

(iii) $[|\, e^2 - \pi^2 \,|]$ (iv) $\{|\, \pi - e + 1 \,|\}$

(v) $\left|\sqrt[3]{2}-\sqrt[4]{3}\right|$

2. Make the following expressions free from modulus sign : ($x \in R$)

(i) $|\, x^2 - x + 3 \,|$ (ii) $|\, 2x - x^2 - 3 \,|$

(iii) $|\, x + 1 \,|$ if $x > -\frac{1}{2}$

3. Make the following expressions free from modulus sign : ($x \in R$)

(i) $|\, x^2 - 3x - 4 \,|$ (ii) $|\, x^2 - 7x + 10 \,|$ if $x < 5$

(iii) $|\, x + 2 \,| + |\, x - 2 \,|$ if $x^2 \le 2$ (iv) $|\, x^3 + 8 \,|$

(v) $|\, x + 3 \,| + |\, x \,| + |\, x - 1 \,|$

4. Draw graph of the following expressions. Also find extremum value if it exists.

(i) $y = |\, x - 2 \,| + |\, x - 1 \,| + |\, x + 1 \,| + |\, x + 2 \,|$

(ii) $y = |\, 2x - 5 \,| - 2\,|\, 2x + 5 \,|$

(iii) $y = |\, 2x - 1 \,| + |\, x - 1 \,|$

(iv) $y = |\, x - 1 \,| - |\, x - 6 \,|$

5. Solve the following equations :

(i) $|\, x - 3 \,| = x - 1$ (ii) $|\, x^2 - 3x \,| = 2x - 6$

(iii) $|\, x - 4 \,| + |\, x - 7 \,| = 11$

6. Solve the following equations :

(i) $|\, x^2 - 2 \,| = 2\,|\, x - 3 \,|$ (ii) $|\, x^2 - 4 \,| + |\, x^2 - 9 \,| = 0$

(iii) $|\, x - 1 \,| + |\, x + 5 \,| = 6$

MATHEMATICS

DPP

DAILY PRACTICE PROBLEMS

DPP No. 28

Total Marks : 24

Max. Time : 30 min.

Topic : Fundamentals of Mathematics

Type of Questions		**M.M., Min.**
Subjective Questions (no negative marking) Q.1,2,3,4,5,6	**(4 marks 5 min.)**	**[24, 30]**

1. Solve the following equations :

(i) $\left||x-1|-e\right| = 3$

(ii) $|x-3|^2 + |x-4| + x^2 + 7 = 0$

(iii) $|x-2| = \sqrt{x-4}$

(iv) $\dfrac{|x-2|}{x-1} = \dfrac{1}{x-1}$

2. Solve :

(i) $-2 \le \left||x^2+1|-3\right| \le 7$

(ii) $|x^2 - 4x| \le 5$

(iii) $|x^2 - 2x| \le x$

(iv) $(x^2 - 9)(|x| - 2) \le 0$

3. Solve :

(i) $\dfrac{x^2 - 9|x| + 14}{x^2 - 12x + 36} \le 0$

(ii) $(|x| - 1)(|x| - 2) < 0$

(iii) $(|x^2 - 2| - 2)(x - 1) \ge 0$

4. Solve equation :

(i) $|x^2 - 2x| + |x^2 - 4x + 3| \le |2x - 3|$

(ii) $|x^2 - 4| - |2x - 1| = |x^2 - 2x - 3|$

5. Solve :

(i) $|x| \le a$

(ii) $x^2 \le a^2$

(iii) $a^2 \le x^2 \le b^2$

6. Solve :

(i) $a \le |x| \le b$

(ii) $|x| < \dfrac{a}{x}$

(iiii) $x^2 < 4^{|a|}$

MATHEMATICS

DPP

DAILY PRACTICE PROBLEMS

DPP No. 29

Total Marks : 34

Max. Time : 35 min.

Topics : Trigonometric Ratio & Identities, Sequence & Series

Type of Questions		M.M., Min.
Multiple choice objective (no negative marking) Q.1,2	(5 marks, 4 min.)	[10, 8]
Subjective Questions (no negative marking) Q.3,4,6	(4 marks, 5 min.)	[12, 15]
Fill in the Blanks (no negative marking) Q.5	(4 marks, 4 min.)	[4, 4]
Match the Following (no negative marking) Q.7	(8 marks, 8 min.)	[8, 8]

1. If $\sec A = \frac{17}{8}$ and $\text{cosec } B = \frac{5}{4}$, then sec(A + B) can have the value equal to

(A) $\frac{85}{36}$ (B) $-\frac{85}{36}$ (C) $-\frac{85}{84}$ (D) $\frac{85}{84}$

2. If S_n denotes the sum of first n terms of an arithmetic progression and a_n denotes the n^{th} term of the same A.P. given $S_n = n^2 p$; where p, n $\in$ N, then

(A) $a_1 = p$ (B) common difference = 2p (C) $S_p = p^3$ (D) $a_p = 2p^2 - p$

3. Prove that $\frac{\sin A + 2\sin 3A + \sin 5A}{\sin 3A + 2\sin 5A + \sin 7A} = \frac{\sin 3A}{\sin 5A}$

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

5. If tan 25° = a, then the value of $\frac{\tan 205° - \tan 115°}{\tan 245° + \tan 335°}$ in terms of 'a' is _______.

6. Find the sum of the series $(2^2 - 1)(6^2 - 1) + (4^2 - 1)(8^2 - 1) + ... + (100^2 - 1)(104^2 - 1)$

7. **Column - I**

The roots of the equation $x^3 + bx^2 + cx + d = 0$ are

Column - I		Column-II	
(A)	in A.P. if	(p)	$b^3 = 27d$
(B)	in G.P. if	(q)	$2b^3 - 9bc + 27d = 0$
(C)	in H.P. if	(r)	$27d^3 = 9bcd^2 - 2c^3d$
(D)	equal if	(s)	$b^3d = c^3$

MATHEMATICS DPP

DAILY PRACTICE PROBLEMS

DPP No. 30

Total Marks : 26

Max. Time : 28 min.

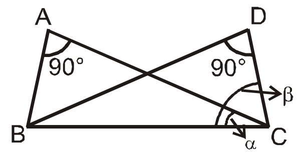
Topics : Quadratic Equations, Trigonometric Ratio & Identities, Sequence & Series

Type of Questions		M.M., Min.
Single choice Objective (no negative marking) Q.1,2,3	(3 marks, 3 min.)	[9, 9]
Multiple choice objective (no negative marking) Q.4	(5 marks, 4 min.)	[5, 4]
Subjective Questions (no negative marking) Q.5,6,7	(4 marks, 5 min.)	[12, 15]

1. Three friends whose ages form a G.P. divide a certain sum of money in proportion to their ages. If they do that three years later, when the youngest is half the age of the oldest, then he will receive 105 rupees more that he gets now and the middle friend will get 15 rupees more that he gets now, then ages of the friends are

(A) 12, 18, 27 (B) 6, 12, 24 (C) 9, 18, 36 (D) none of these

2. In the given figure AB, BC, BD cannot be in



(A) A.P. only (B) A.P., G.P. only

(C) A.P. & H.P. only (D) AP, GP, HP

3. If $2\tan\frac{\alpha}{2} = \tan\frac{\beta}{2}$, then $\frac{3 + 5\cos\beta}{5 + 3\cos\beta}$ is equal to :

(A) $\cos\alpha$ (B) $\cos\beta$ (C) $\sin\alpha$ (D) $\sin\beta$

4. p, q, r are three positive real numbers in A.P., then the roots of the quadratic equation $px^2 + qx + r = 0$ are real for

(A) $\left|\frac{r}{p} - 7\right| \geq 4\sqrt{3}$ (B) $\left|\frac{p}{r} - 7\right| \geq 4\sqrt{3}$ (C) all p and r (D) no p and r

5. If $\frac{3 + \cot(60° + A°)\cot A°}{\cot(60° + A°) + \cot A°} = \tan(\alpha° + A°)$, then find the value of α .

6. Prove that $\frac{\tan 5\theta + \tan 3\theta}{\tan 5\theta - \tan 3\theta} = 4\cos 2\theta \cos 4\theta$

7. If A lies in the first quadrant such that $\log_{\sin A} \tan A$ is negative, then the value of A lies in the interval ______.

ANSWER KEY

DPP NO. - 21

1. (D) **2.** (B) **3.** (A) **4.** (D)

5. 12096 **6.** 925 **7.** 3

DPP NO. - 22

1. (C) **2.** (B) **3.** (A) **4.** (B)

5. (C) **6.** (B) **7.** (B)

DPP NO. - 23

1. (A) **2.** (A) **3.** (A) **4.** (A)

5. (D) **6.** $x = 2000, -\frac{1}{2000}$ **7.** 1/2

DPP NO. - 24

1. (B) **2.** (A) **3.** (B) (D) **6.** (i) $\frac{\pi}{6}, \frac{5\pi}{6}$

(ii) $\frac{\pi}{6}, \frac{11\pi}{6}$ (iii) $\frac{\pi}{3}, \frac{4\pi}{3}$ (iv) $\frac{5\pi}{4}, \frac{7\pi}{4}$ (v) $\frac{2\pi}{3}, \frac{4\pi}{3}$

(vi) $\frac{5\pi}{6}, \frac{11\pi}{6}$ **7.** $S_n = \frac{6n}{n+1}, S_\infty = 6$

DPP NO. - 25

1. (B) **2.** (C) **3.** (B) **4.** (A)

5. (A) **6.** $\underbrace{333........3}_{\text{n times}}$

7. (A)→(r), (B)→(p), (C)→(s), (D)→(q)

DPP NO. - 26

1. (A) **2.** (B) **3.** (B) **4.** (D) **5.** (B)

6. $\cos\theta = -\frac{5}{13}$, $\tan\theta = \frac{12}{5}$, $\cot\theta = \frac{5}{12}$

7. $\Sigma T_r = -\frac{1}{x}$ [(1 – x) (1 – 2x) ...... (1 – nx) – 1]

DPP NO. - 27

1. (i) $2 - \sqrt{3}$ (ii) $-\pi + 3 + \sqrt{5} - \sqrt{3}$ (iii) 2

(iv) $\pi - e$ (v) $\sqrt[4]{3} - \sqrt[3]{2}$ **2.** (i) $x^2 - x + 3$

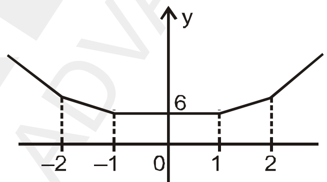
(ii) $x^2 - 2x + 3$ (iii) $x + 1$

3. (i) $\begin{cases} -(x^2 - 3x - 4) \text{ if } x \in (-1, 4) \\ x^2 - 3x - 4 \text{ if } x \in (-\infty, -1] \cup [4, \infty) \end{cases}$

(ii) $\begin{cases} (x^2 - 7x + 10) & \text{if} \quad x \le 2 \\ -(x^2 - 7x + 10) & \text{if} \quad 2 < x < 5 \end{cases}$ (iii) 4

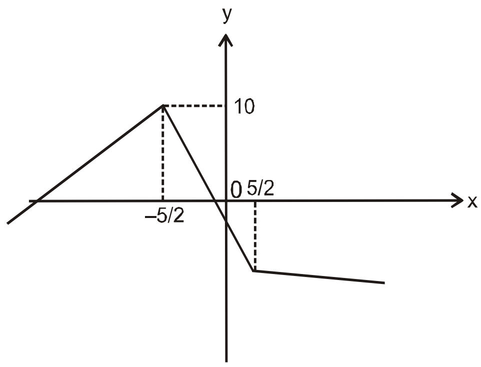
(iv) $\begin{cases} -(x^3 + 8) \text{ if } x < -2 \\ (x^3 + 8) \text{ if } x \ge -2 \end{cases}$

(v) $\begin{cases} -3x - 2 & , \quad x < -3 \\ -x + 4 & , \quad -3 \le x < 0 \\ x + 4 & , \quad 0 \le x < 1 \\ 3x + 2 & , \quad x \ge 1 \end{cases}$

4. (i) 

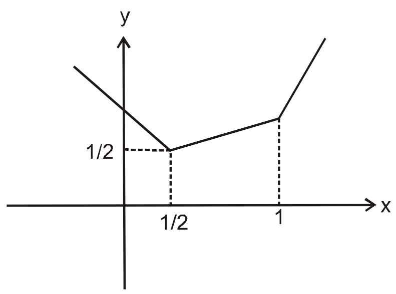
, Min value = 6

(ii) $y = \begin{cases} 2x + 15 & , \quad x < -\frac{5}{2} \\ -6x - 5 & , \quad -\frac{5}{2} \le x < \frac{5}{2} \\ -2x - 15 & , \quad x \ge \frac{5}{2} \end{cases}$



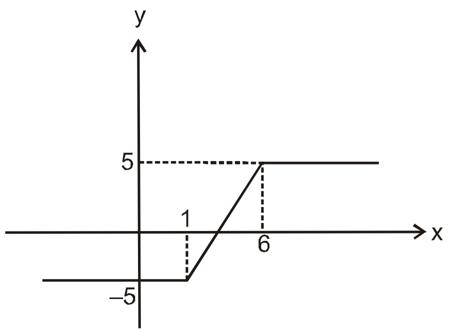
Max. value = 10

(iii) $y = \begin{cases} -3x + 2 & , \quad x < \frac{1}{2} \\ x & , \quad \frac{1}{2} \le x < 1 \\ 3x - 2 & , \quad x \ge 1 \end{cases}$



Min value = $\frac{1}{2}$

(iv) $y = \begin{cases} -5 & , \quad x < 1 \\ 2x-7 & , \quad 1 \le x < 6 \\ 5 & , \quad x \ge 6 \end{cases}$



Min value = – 5
Max. value = 5

5. (i) x = 2 (ii) x = 3 (iii) x = 0, 11

6. (i) x = – 4, 2 (ii) No solution (iii) $x \in [-5, 1]$

DPP NO. - 28

1. (i) x = e + 4, – e – 2 (ii) No solution (iii) $x \in \phi$
(iv) x = 3

2. (i) [–3, 3] (ii)[–1, 5] (iii) $[1, 3] \cup \{0\}$
(iv) $[-3, -2] \cup [2, 3]$

3. (i) $[-7, -2] \cup [2, 6) \cup (6, 7]$ (ii) $(-2, -1) \cup (1, 2)$
(iii) $[-2, 1] \cup [2, \infty)$

4. (i) $x \in [0, 1] \cup [2, 3]$
(ii) $x \in \left[-1, \frac{1}{2}\right] \cup [3, \infty)$

5. (i) $\begin{cases} -a \le x \le a & \text{if} \quad a > 0 \\ x = 0 & \text{if} \quad a = 0 \\ x \in \phi & \text{if} \quad a < 0 \end{cases}$ (ii) $x \in [-|a|, |a|]$

(iii) $x \in [-|b|, -|a|] \cup [|a|, |b|]$

6. (i) $\begin{cases} [-b, -a] \cup [a, b] & \text{if} \quad a \ge 0, b > 0 \\ \phi & \text{if} \quad a < 0, b < 0 \\ [-b, b] & \text{if} \quad a < 0, b > 0 \\ 0 & \text{if} \quad b = 0 \end{cases}$

(ii) $\begin{cases} \left(-\sqrt{-a}, 0\right) & \text{if} \quad a < 0 \\ \phi & \text{if} \quad a = 0 \\ \left(0, \sqrt{a}\right) & \text{if} \quad a > 0 \end{cases}$ (iiii) $x \in (-2^{|a|}, 2^{|a|})$

DPP NO. - 29

1. (A)(B)(C)(D) **2.** (A)(B)(C)(D) **5.** 1

6. $\frac{1}{10}$ [99 . 101 . 103 . 105 . 107 + 1 . 3 . 5 . 7]

7. (A) $\rightarrow$ (q), (B) $\rightarrow$ (s), (C) $\rightarrow$ (r), (D) $\rightarrow$ (p,q,r,s)

DPP NO. - 30

1. (A) **2.** (D) **3.** (A) **4.** (A)(B) **5.** 30°

7. 45° < A < 90°

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CLASS : XI (MATHS)

DPP

DAILY PRACTICE PROBLEM

Solutions

DPP-21 to 30

DPP 21 : **Sequence & Series**
DPP 22 : **Sequence & Series**
DPP 23 : **Sequence & Series**
DPP 24 : **Sequence & Series, Trigonometric Ratio & Trigonometric Equations**
DPP 25 : **Sequence & Series, Trigonometric Ratio**
DPP 26 : **Sequence & Series, Trigonometric Ratio**
DPP 27 : **Fundamentals of Mathematics**
DPP 28 : **Fundamentals of Mathematics**
DPP 29 : **Trigonometric Ratio & Identities, Sequence & Series**
DPP 30 : **Quadratic Equations, Trigonometric Ratio & Identities, Sequence & Series**

HINTS AND SOLUTIONS

DPP NO. - 21

1. ab = 9

$\frac{1}{a} + \frac{1}{b}$

GM ≥ HM

$\sqrt{ab} \geq \frac{2}{\frac{1}{a}+\frac{1}{b}}$

$3 \geq \frac{2}{\frac{1}{a}+\frac{1}{b}}$

$\frac{1}{a}+\frac{1}{b} \geq \frac{2}{3}$

$\frac{1}{a}+\frac{1}{b} \in \left[\frac{2}{3}, \infty\right)$

2. $a_1^2 - a_2^2 + a_3^2 - \ldots\ldots + a_{2n-1}^2 - a_{2n}^2$

$(a_1 - a_2)(a_1 + a_2) + (a_3 + a_4)(a_3 + a_4) + \ldots\ldots(a_{2n-1} - a_{2n})(a_{2n-1} + a_{2n})$

$- d\,[a_1 + a_2 + a_3 + a_4 + \ldots\ldots + a_{2n-1} + a_{2n}]$

$- d.\frac{2n}{2}[a_1 + a_{2n}]$

Now $a_{2n} = a_1 + (2n - 1)\,d$

$\frac{a_{2n} - a_1}{(2n-1)} = d$

$-\frac{(a_{2n} - a_1)(a_{2n} + a_1).n}{2n-1}$

$\frac{n}{2n-1}(a_1^2 - a_{2n}^2)$

3. p p + d p + 2d

a, b, c → A.P.

b – a, c – b, a → G.P.

d, d, p

$d^2 = pd$

d(d – p) = 0

d = p because d ≠ 0

a : b : c = 1 : 2 : 3

4. Sum $\left(\frac{2x-1+2y-1+2z-4}{3}\right) < 0$

when x + y + z = 1

Hence not true.

5. x x + 4, x + 8 ....

(first24) $S_{24} = S_{18}$ (last 18)

$S_{24} + S_{24} = S_{42}$

$\frac{2.24}{2}[2a + 23.4] = \frac{42}{2}[2a + 41.4]$

$\frac{48}{2}[2a + 92] = \frac{42}{2}[2a + 164]$

24(a + 46) = 21 (a + 82)

3a = 21.82 – 24.46 = 1722 – 1104

3a = 618 a = 206

$S = \frac{42}{2}[206 + 41.4]$

= 42[206 + 82]

= 42 × 288 = 12096

6. $a_1^2 = 36 + k$

$a_2^2 = 300 + k$

$a_3^2 = 596 + k$

$a_2^2 - a_1^2 = 264$ $a_2 + a_1 = \frac{264}{d}$

$a_3^2 - a_2^2 = 296$ $a_3 + a_2 = \frac{296}{d}$

$a_3 - a_1 = \frac{32}{d}$ d = 4

$2a_1 + d = \frac{264}{4} \Rightarrow 2a_1 + d = 66$

$a_1 = 31$ $a_1^2 = 36 + k$

k = 925

7. $\frac{10}{3}, 2, \frac{10}{7}, \frac{10}{9}$ ....

$\frac{10}{3}, \frac{10}{5}, \frac{10}{7}, \frac{10}{9}$ ....

$T_n = \frac{10}{2n+1} = \frac{an+10}{bn+c}$

a = 0, b = 2, c = 1

a + b + c = 3

DPP NO. - 22

1 to 3. $T_r = \frac{8r}{4r^4+1} = \frac{8r}{(4r^4+4r^2+1)-4r^2}$

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

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

$S_n = 2\left[\frac{1}{1}-\frac{1}{5}\right] = 2\left[\frac{1}{5}-\frac{1}{13}\right]$

⋮ ⋮

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

$$S_n = \left[1-\frac{1}{2r^2-2r+1}\right]$$

$S_\infty = 2$

$$S_{16} = 2\left[1-\frac{1}{512+32+1}\right] = \frac{1088}{545}$$

$$S_n = 2\left[\frac{2n^2+2n}{2n^2+2n+1}\right] = \frac{4r^2+4r}{2n^2+2n+1}$$

a = 4, b = 4, c = 0 , d = 2, e = 2

4. $x^{2-n} = \dfrac{a_n+b_n}{2}$

$y^{2-n} = \dfrac{a_n-b_n}{2}$

5. $S_p = p(p+1)(p+2)$

$S_{p-1} = (p-1)\,p\,(p+1)$

$T_p = S_p - S_{p-1} = p(p+1).3$

$T_{10} = 3.10.11 \Rightarrow 330$

6. S = 3 + 12 + 25 + 42 + ...

first diff: 9, 13, 17

second diff: 4, 4

$T_n = an^2 + bn + c$

3 = a + b + c ....(1)

12 = 4a + 2n + c ....(2)

25 = 9a + 3b + c ....(3)

9 = 3a + b

13 = 5a + b

2a = 4 $\Rightarrow$ a = 2, b = 3, c = –2

$T_n = 2n^2 + 3n - 2$

$T_{50} = 2(2500) + 3(50) - 2$

= 5000 + 148 = 5148

7. 2a + 3b + c = 3

$$\frac{2a+3b+c}{9} \ge \left[a^2.\left(\frac{3b}{5}\right)^5.\left(\frac{c}{2}\right)^2\right]^{1/9}$$

$$\frac{1}{3^9} \ge \frac{a^2.b^5.c^2.3^5}{5^5.2^2}$$

$$a^2\,b^5\,c^2 \le \frac{5^5\,.\,2^2}{3^{14}}$$

DPP NO. - 23

1. $\dfrac{1}{9}+\dfrac{1}{18}+\dfrac{1}{30}+\dfrac{1}{45}+\dfrac{1}{63}+........\infty$

$$= \frac{1}{3}\left[\frac{1}{3}+\frac{1}{6}+\frac{1}{10}+\frac{1}{15}+\frac{1}{21}+.....\infty\right]$$

3 , 6 , 10 , 15 , 21 , ... which are in

first diff : 3 4 5 6

A.P.

$\therefore$ $T_n = an^2 + bn + c$

$T_1 = a + b + c = 3$

$T_2 = 4a + 2b + c = 6$

$T_3 = 9a + 3b + c = 10$

$T_2 - T_1 = 3a + b = 3$

$T_3 - T_2 = 5a + b = 4$

$\Rightarrow$ 2a = 1 $\Rightarrow$ a = 1/2

$\therefore$ b = 3/2 & c = 1

$$\therefore\ T_n = \frac{n^2}{2}+\frac{3n}{2}+1 = \frac{n^2+3n+2}{2}$$

$$\therefore\ s = \frac{1}{3}\sum\frac{2}{n^2+3n+2} = \frac{2}{3}\sum\frac{1}{(n+1)(n+2)} =$$

$$\frac{2}{3}\sum\frac{(n+2)-(n+1)}{(n+1)(n+2)} = \frac{2}{3}\sum_{n=1}^{n}\left(\frac{1}{n+1}-\frac{1}{n+2}\right)$$

$$= \frac{2}{3}\left[\frac{1}{2}-\frac{1}{3}+\frac{1}{3}-\frac{1}{4}+....+\frac{1}{n+1}-\frac{1}{n+2}\right]$$

when $n \to \infty$

$$S = \frac{2}{3}\times\left[\frac{1}{2}-0\right]$$

$$S = \frac{1}{3}$$

2. $\dfrac{2}{5}, \dfrac{12}{23} \to$ H.P.

$\dfrac{5}{2}, \dfrac{23}{12} \to$ A.P.

$$T_n = \frac{5}{2} + (n-1)\left[\frac{23}{12}-\frac{5}{2}\right]$$

$$T_n = \frac{5}{2} + (n-1)\left[-\frac{7}{12}\right] = \frac{30-7(n-1)}{12}$$

$$T_n \text{ of H.P.} = \frac{12}{37-7n}$$

37 – 7n > 0

$7n < 37 \Rightarrow n < \dfrac{37}{7}$

n = 5

$$T_n = \frac{12}{37-35} = 6$$

3. $\dfrac{1}{3^2+1}+\dfrac{1}{4^2+2}+\dfrac{1}{5^2+3}+\dfrac{1}{6^2+4}$ .... ∞

$$T_r = \frac{1}{(r+2)^2+r} = \frac{1}{r^2+5r+4}$$

$$= \frac{1}{(r+1)(r+4)} = \frac{1}{3}\left(\frac{1}{r+1}-\frac{1}{r+4}\right)$$

$$S_n = \frac{1}{3}\left[\frac{1}{2}-\frac{1}{5}\right] = \frac{1}{3}\left[\frac{1}{3}-\frac{1}{6}\right]$$

$$= \frac{1}{3}\left[\frac{1}{4}-\frac{1}{7}\right]$$

$\vdots$

$$= \frac{1}{3}\left[\frac{1}{n-2}-\frac{1}{n+1}\right]$$

$$= \frac{1}{3}\left[\frac{1}{n-1}-\frac{1}{n+2}\right] = \frac{1}{3}\left[\frac{1}{n}-\frac{1}{n+3}\right]$$

$$= \frac{1}{3}\left[\frac{1}{n+1}-\frac{1}{n+4}\right]$$

$$S_n = 3\left[\frac{1}{2}+\frac{1}{3}+\frac{1}{4}-\frac{1}{n+2}-\frac{1}{n+3}-\frac{1}{n+4}\right]$$

$$S_\infty = \frac{1}{3}\frac{6+4+3}{12} = \frac{13}{36}$$

4. $\frac{a}{b}+\frac{b}{c} \geq 2\sqrt{\frac{a}{c}}$

$\frac{c}{d}+\frac{d}{e} \geq 2\sqrt{\frac{c}{e}}$

multiply both these

$$\left(\frac{a}{b}+\frac{b}{c}\right)\left(\frac{c}{d}+\frac{d}{e}\right) \geq 4\sqrt{\frac{a}{c}\cdot\frac{c}{e}} \geq 4\sqrt{\frac{a}{e}}$$

5. $t_n = \frac{(n-2)(n+1)}{n(n+3)}$

$t_3.t_4.t_5$ .... t_{50}

$$= \left[\frac{1.4}{3.6}\cdot\frac{2.5}{4.7}\cdot\frac{3.6}{5.8}\cdot\frac{4.7}{6.9}\cdots\cdots\frac{(n-3)(n)}{(n-1)(n+2)}\cdot\frac{(n-2)(n+1)}{n(n+3)}\right]$$

$$= \frac{1.4.2.5}{(n-1)(n+2)n(n+3)}$$

Put n = 50 $\quad \frac{1.4.2.5}{49.52.50.53} = \frac{1}{7^2.5.13.53}$

6. $T_r = \sqrt{1+\frac{1}{r^2}+\frac{1}{(r+1)^2}} = \sqrt{\frac{r^2(r+1)^2+r^2(r+1)^2}{r^2(r+1)^2}}$

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

$$= \sqrt{\frac{r^4+2r^3+3r^2+2r+1}{r^2(r+1)^2}}$$

7. $\frac{3}{2.4}+\frac{5}{2.4.6}+\frac{7}{2.4.6.8}+$ ....

$T_r = \frac{3+(r-1).2}{2.4.6.8......2(r+1)} = \frac{2r+1}{1.2.4.6......(2r+2)}$

$T_r = \frac{2r+2-1}{1.2.4.6......2(r+1)}$

$T_r = \frac{1}{1.2.4.6......(2r)} - \frac{1}{1.2.4.6......2(r+1)}$

$S_n = \sum T_r$

$$S_n = \left[\frac{1}{2}-\frac{1}{1.2.4.6.....2(n+1)}\right]$$

$S_\infty = \frac{1}{2}$

DPP NO. - 24

1. $\frac{a^2+b^2+c^2+d^2+ab+ac+ad+bc+bd+cd}{10} \geq \left[a^3.b^5.c^3.d^3\right]^{1/10}$

p ≥ 10
minimum value = 10

2. $\frac{(10-1)+(10^2-1)+(10^3-1)+....+(10^9-1)}{9}$

$\frac{(10+10^2+10^3+......+10^9)-9}{9}$

$\frac{10\left[\frac{10^9-1}{9}\right]-9}{9}$

$\frac{10[111.........9\,\text{times}]-9}{9}$

$= 1111 = 1 + 10 + 10^2 + 10^3$

3. (n + 1)th term be the middle term
a be the AM
b be the GM
c be the HM
a ≥ b ≥ c

4. We have,
$\sin\theta + \sin^2\theta = 1$
$\Rightarrow \sin\theta = 1 - \sin^2\theta \quad \Rightarrow \sin\theta = \cos^2\theta$
Now, $\cos^2\theta + \cos^4\theta = \cos^2\theta + (\cos^2\theta)^2$
$\Rightarrow \cos^2\theta + \cos^4\theta = \cos^2\theta + \sin^2\theta$
$\Rightarrow \cos^2\theta + \cos^4\theta = 1$

5. We have,

LHS = $\frac{1-\sin\theta}{1+\sin\theta}$

$\Rightarrow$ LHS = $\frac{1-\sin\theta}{1+\sin\theta} \times \frac{1-\sin\theta}{1-\sin\theta}$

$\Rightarrow$ LHS = $\frac{(1-\sin\theta)^2}{1-\sin^2\theta}$

$\Rightarrow$ LHS = $\frac{(1-\sin\theta)^2}{\cos^2\theta}$ $\quad [\because\ 1-\sin^2\theta = \cos^2\theta]$

$\Rightarrow$ LHS = $\left(\frac{1-\sin\theta}{\cos\theta}\right)^2 \Rightarrow$ LHS = $\left(\frac{1}{\cos\theta}-\frac{\sin\theta}{\cos\theta}\right)^2$

$\Rightarrow$ LHS = $(\sec\theta - \tan\theta)^2$ = RHS

6. (i) $\sin\theta = \frac{1}{2} = \sin\left(\frac{\pi}{6}\right)$

$\theta = n\pi + (-1)n\ \frac{\pi}{6}$

$n = 0;\ \theta = \frac{\pi}{6}$

$n = 1;\ \theta = \pi - \frac{\pi}{6} = \frac{5\pi}{6}$

(ii) $\cos\theta = \frac{\sqrt{3}}{2} = \cos\frac{\pi}{6}$

$\theta = 2n\pi \pm \frac{\pi}{6}$

$n = 0;\ \theta = \frac{\pi}{6}$

$n = 1;\ \theta = 2\pi - \frac{\pi}{6} = \frac{\pi}{6}$

(iii) $\tan\theta = \sqrt{3} = \tan\frac{\pi}{3}$

$\theta = n\pi + \frac{\pi}{3}$

$n = 0;\ \frac{\pi}{3}$

$n = 1;\ \frac{4\pi}{3}$.

(iv) $\sin\theta = \frac{-1}{\sqrt{2}} = \frac{-\pi}{4}$

$\theta = n\pi + (-1)^n = \frac{-\pi}{4}$

$n = 1;\ \ \pi + \frac{\pi}{4} = \frac{5\pi}{4}$

$n = 2;\ \ 2\pi - \frac{\pi}{4} = \frac{7\pi}{4}$

(v) $\cos\theta = \frac{-1}{2} = \cos\frac{2\pi}{3}$

$\theta = 2n\pi \pm \frac{2\pi}{3}$

$n = 0;\ \frac{2\pi}{3}$

$n = 1;\ 2\pi - \frac{2\pi}{3} = \frac{4\pi}{3}$

(vi) $\tan\theta = \frac{-1}{\sqrt{3}} = \frac{-\pi}{6}$

$\theta = n\pi - \frac{\pi}{6}$

$n = 1;\ \pi - \frac{\pi}{6} = \frac{5\pi}{6}$

$n = 2;\ 2\pi - \frac{\pi}{6} = \frac{11\pi}{6}$.

7. $T_r = \frac{2r+1}{1^2+2^2+......r^2}$

$= \frac{6(2r+1)}{r(r+1)(2r+1)} = \frac{6}{r(r+1)} \Rightarrow 6\left[\frac{1}{r}-\frac{1}{r+1}\right]$

$S_n = \Sigma T_n = 6\left[\frac{1}{r}-\frac{1}{r+1}\right] \Rightarrow S_n = 6\left[\frac{1}{1}-\frac{1}{2}\right]$

$6\left[\frac{1}{2}-\frac{1}{3}\right]$

$\vdots$

$6\left[\frac{1}{n}-\frac{1}{n+1}\right]$

$S_n = 6\left[1-\frac{1}{n+1}\right] = \frac{6n}{n+1}$

DPP NO. - 25

1. $\cos\left(x-\frac{3\pi}{2}\right) + \sin\left(\frac{3\pi}{2}+x\right) + \sin(32\pi + x) - 18\cos(19\pi - x)\tan(56\pi + x) - 9\sin(x + 17\pi)$

$= -\sin x - \cos x + \sin x + 18\cos x + \cos x + 9\sin x = 18\cos x + 9\sin x$

$a + b = 27$

2. $\cos 2001\pi + \cot 2001\ \frac{\pi}{2} + \sec\frac{2001\pi}{3} + \tan\frac{2001\pi}{4} + \text{cosec}\frac{2001\pi}{6}$

$= \cos\pi + \cot\frac{\pi}{2} + \sec 667\pi + \tan\frac{\pi}{4} + \text{cosec}\frac{667\pi}{2} = -1 + 0 - 1 + 1 + (-1) = -2$

3. $a, ar, ar^2, ar^3 +$ ....

$1000 = a + ar + ... + ar^5$

$1000 = a\left(\frac{r^6-1}{r-1}\right)$

4. $T_n = \frac{n}{4n^4+1}$

$T_n = (2n^2 - 2n + 1)(2n^2 + 2n + 1)$

$$T_n = \frac{1}{4}\left[\frac{1}{2n^2-2n+1} - \frac{1}{2n^2+2n+1}\right]$$

$$T_1 = \frac{1}{4}\left[1-\frac{1}{5}\right]$$

$$T_2 = \frac{1}{4}\left[\frac{1}{5}-\frac{1}{13}\right]$$

$\vdots \qquad \vdots$

$$S_n = \frac{1}{4}\left[1-\frac{1}{2n^2+2n+1}\right]$$

$$S_\infty = \frac{1}{4}$$

5. $\frac{p+q+r}{3} \ge (pqr)^{1/3}$

$(p + q + r)^3 \ \ge 27pqr$

but given $(p + q + r)^3 \ \le 27pqr$

so $p + q + r = 27pqr$

Only possible when $p = q = r$

$3p + 4q + 5r = 12$

$p = q = r = 1$

$p^3 + q^4 + r^5 = 1 + 1 + 1 = 3$

6. $\underbrace{111........1}_{2n\text{ times}} - \underbrace{222........2}_{n\text{ times}}$

$[1+10+10^2+...+10^{2n-1}]-2[1+10+10^2+.....+10^{n-1}]$

$$\left[\frac{10^{2n}-1}{10-1}\right] - 2\left[\frac{10^n-1}{9}\right]$$

$$\frac{10^{2n}-2.10^n+1}{9}$$

$$\Rightarrow \frac{(10^n-1)^2}{9} = \left(\frac{10^n-1}{3}\right)^2 = \left[\underbrace{333.........3}_{n\text{ times}}\right]^2$$

7. (A) $\cos\frac{73\pi}{4} = \cos\left(\frac{72\pi}{4}+\frac{\pi}{4}\right) = \cos\left(18\pi+\frac{\pi}{4}\right) = \frac{1}{\sqrt{2}}$

(B) $\tan\frac{1397\pi}{6} = \tan\left(\frac{232\pi}{1}+\frac{5\pi}{6}\right) = \tan\frac{5\pi}{6} = -\frac{1}{\sqrt{3}}$

(C) $\sin\frac{2007\pi}{6} = \sin\left(334\pi+\frac{\pi}{2}\right) = \sin\frac{\pi}{2} = 1$

(D) $\sin 10^4\pi = \sin 2n\pi = 0$

DPP NO. - 26

1. a A_1 A_2.....A_{2n} b $\quad\Rightarrow\quad a + b = \frac{13}{6}$

$A_1 + A_2 + ...+ A_n = 2n + 1$

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

$n.\left(\frac{13}{6}\right) = 2n + 1 \quad\Rightarrow\quad \frac{n}{6} = 1$

$n = 6$

Total mean = 12

$t = 12$

2. $ar^2 = a^2$ ....(1)

$ar = 8$ ....(2)

$a\left[\frac{8}{a}\right]^2 = a^2 \quad\Rightarrow\quad \frac{64}{a} = a^2$

$a^3 = 64 \quad\Rightarrow\quad a = 4 \qquad [t = 12]$

$r = 2$

$T_6 = ar^3 = 4\ [2^5\ ] = 128 = 10t + 8$

3. $P = \frac{\sin 300 \tan 330 . \sec 420}{\tan 135 . \sin 210 . \sec 315}$

$$= \frac{\sin\left(2\pi-\frac{\pi}{3}\right).\tan\left(2\pi-\frac{\pi}{6}\right)\sec\left(2\pi+\frac{\pi}{3}\right)}{\tan\left(\pi-\frac{\pi}{4}\right)\sin\left(\pi+\frac{\pi}{6}\right)\sec\left(2\pi-\frac{\pi}{4}\right)}$$

$$= \frac{\left(-\frac{\sqrt{3}}{2}\right)\left(-\frac{1}{\sqrt{3}}\right)(2)}{(-1)\left(-\frac{1}{2}\right)\frac{1}{\sqrt{2}}} = \frac{1}{\sqrt{2}}$$

$$Q = \frac{\sec 480 . \operatorname{cosec} 570 . \tan 330}{\sin 600 \cos 660 \cot 405}$$

$$= \frac{\sec\left(2\pi+\frac{2\pi}{3}\right).\operatorname{cosec}\left(3\pi+\frac{\pi}{6}\right)\tan\left(2\pi-\frac{\pi}{6}\right)}{\sin\left(3\pi+\frac{\pi}{3}\right).\cos\left(4\pi-\frac{\pi}{3}\right)\cot\left(2\pi+\frac{\pi}{4}\right)}$$

$$= \frac{(-2)(-2)\left(-\frac{1}{\sqrt{3}}\right)}{\left(-\frac{\sqrt{3}}{2}\right)\left(\frac{1}{2}\right)(1)} = \frac{16}{3}$$

4. cot 123º cot 133º cot 137º cot 147º

= cot (90 + 33) cot (90 + 43) cot (180 – 43) cot (180 – 33)

= (– tan 33) (–tan 43) (–cot43) (– cot 33) = 1

5. $S_n = 2^{np} - 1$

$S_{n-1} = 2^{(n-1)p} - 1$

$T_n = S_n - S_n = 2^{np} - 2^{(n-1)p}$

$T_{n-1} = 2^{(n-1)p} - 2^{(n-2)p} = 2^p\ [2^{np-(n-1)p}]$

$$r = \frac{T_n}{T_{n-1}} = 2^p$$

6. θ lies in III quadrant

$$\sin\theta = -\frac{12}{13}$$

$$\cos\theta = -\sqrt{1-\frac{12^2}{13^2}} = -\frac{5}{13}$$

$\tan\theta = \dfrac{12}{5}$

$\cos\theta = \dfrac{5}{12}$

7. $T_r = \dfrac{r}{-rx}(1-x)(1-2x)\,.......[1-(r-1)x][(1-rx)-1]$

$T_r = -\dfrac{1}{x}[(1-x)(1-2x).....(1-rx)$

$\qquad - (1-x)(1-2x)......(1-(r-1)x)]$

$S_n = \sum T_r$

$S_n = -\dfrac{1}{x}[(1-x)\ \ -1]$

$S_n = -\dfrac{1}{x}[(1-x)(1-2x)-(1-x)]$

$\vdots \qquad \vdots$

$= -\dfrac{1}{x}[(1-x)(1-2x).....(1-nx) - (1-x)(1-2x)(1-(n-1)x)]$

$= -\dfrac{1}{x}[(1-x)(1-2x).....(1-nx)-1]$

DPP NO. - 27

1. (i) $\left|\sqrt{(\sqrt{3})^2+(2)^2-2\cdot 2\sqrt{3}}\right|$

$= \left|\sqrt{(\sqrt{3}-2)^2}\right| = (2-\sqrt{3})$.

(ii) $\left|\pi-3-\sqrt{(\sqrt{5})^2+(\sqrt{3})^2-2\cdot\sqrt{5}\,\sqrt{3}}\right|$

$= \left|\pi-3-\sqrt{(\sqrt{5}-\sqrt{3})^2}\right| = \left|\pi-3-\sqrt{5}+\sqrt{3}\right|$

$= -\pi + 3 + \sqrt{5} - \sqrt{3}$.

(iii) $\left[\,|e^2-\pi^2|\,\right] = \left[\left|(2.7)^2-(3.14)^2\right|\right]$

$= [(3.14)^2 - (2.7)^2] = [(5.84)(.44)] = 2.$

(iv) $\{|\pi-e+1|\} = \pi - e$

Bec. $0 < \pi - e < 1$.

(v) $\left|\sqrt[3]{2}-\sqrt[4]{3}\right|$

$x = (2)^{1/3}$ | $y = (3)^{1/4}$

$\log x = \dfrac{1}{3}\log 2$ | $\log = \dfrac{1}{4}\log 3$

$\log x = \dfrac{.3010}{3}$ | $= \dfrac{.4771}{4}$

$\Rightarrow y > x$.

2. (i) $|x^2 - x + 3|$

$\therefore$ $D < 0 \Rightarrow$ positive $\forall\, x \in R$ and $a > 0$

$\Rightarrow x^2 - x + 3$

(ii) $|2x - x^2 - 3|$ $D < 0$ and $a < 0$

$\Rightarrow$ always positive $\Rightarrow x^2 - 2x + 3$

(iii) $|x + 1|$

If $x > \dfrac{-1}{2}$

since $x + 1 > 0 \Rightarrow x > 1$

$\Rightarrow x + 1$ positive $x > \dfrac{1}{2}$ $\Rightarrow |x + 1| = x + 1$

If $x > \dfrac{-1}{2}$.

3. (i) $|x^2 - 3x - 4|$

$x^2 - 3x - 4 \geq 0 \Rightarrow x \in (-\infty, -1]$

and $x^2 - 3x - 4 < 0 \Rightarrow x \in (-1, 4)$

$\Rightarrow |x^2 - 3x - 4|$

$= \begin{cases} x^2-3x-4, & x \in (-\infty,-1] \cup [4,\infty) \\ -(x^2-3x-4), & x \in (1,4) \end{cases}$.

(ii) $x^2 - 7x + 10 \geq 0 \Rightarrow x < 2$ and $x \geq 5$

$\Rightarrow x^2 - 7x + 10 < 0 \Rightarrow 2 < x < 5$

$\Rightarrow |x^2 - 7x + 10| = \begin{cases} x^2-7x+10, & x \leq 2 \\ (x^2-7x+10), & 2 < x < 5 \end{cases}$.

(iii) $|x + 2| + |x - 2|$

$-2 \leq x \leq 2$

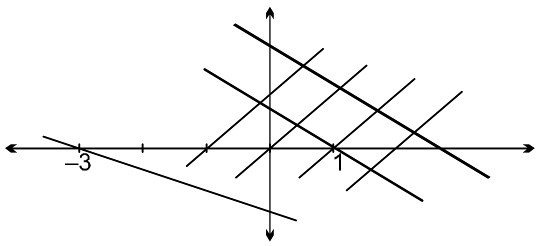
$x + 2 - x + 2 = 4$.

(iv) $|x^3 + 8| = \begin{cases} x^3+8, & x^3+8 \geq 0 \\ -x^3+8), & x^3+8 < 0 \end{cases}$

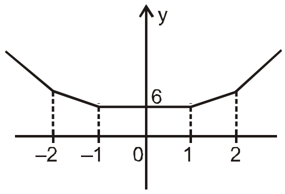
$= \begin{cases} x^3+8, & x \geq -2 \\ -(x^3+8) & x < -2 \end{cases}$.

(v) $|x + 3| + |x| + |x - 1|$

$= \begin{cases} -x-3-x-x+1, & x < -3 \\ x+3-x-x+1, & -3 \leq x < 0 \\ x+3+x-x+1, & 0 \leq x < 1 \\ x+3+x+x-1, & x \geq 1 \end{cases}$

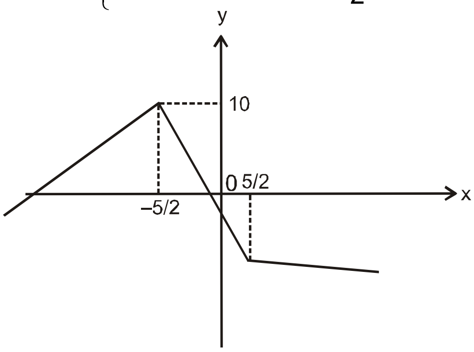


$= \begin{cases} -3x-2\ , & x < -3 \\ -x+4\ , & -3 \leq x < 0 \\ x+4\ , & 0 \leq x < 1 \\ 3x+2\ , & x \geq 1 \end{cases}$.

4. (i) 

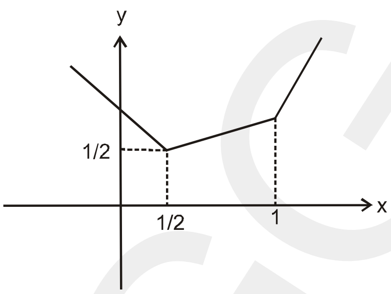
, Min value = 6

(ii) $y = \begin{cases} 2x+15 & , \quad x < -\frac{5}{2} \\ -6x-5 & , \quad -\frac{5}{2} \le x < \frac{5}{2} \\ -2x-15 & , \quad x \ge \frac{5}{2} \end{cases}$



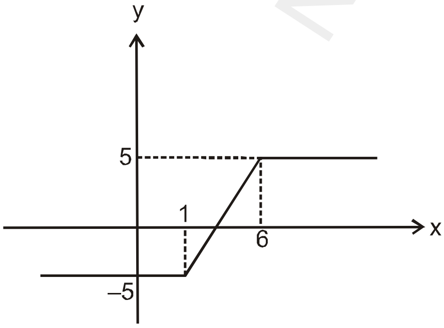
Max. value = 10

(iii) $y = \begin{cases} -3x+2 & , \quad x < \frac{1}{2} \\ x & , \quad \frac{1}{2} \le x < 1 \\ 3x-2 & , \quad x \ge 1 \end{cases}$



Min value = $\frac{1}{2}$

(iv) $y = \begin{cases} -5 & , \quad x < 1 \\ 2x-7 & , \quad 1 \le x < 6 \\ 5 & , \quad x \ge 6 \end{cases}$



Min value = – 5
Max. value = 5

5. (i) $|x-3| = x-1 \Rightarrow \begin{cases} x-3 = x-1, & x > 3 \\ -x+3 = x-1, & x < 3 \end{cases}$

$\Rightarrow$ x = 2.

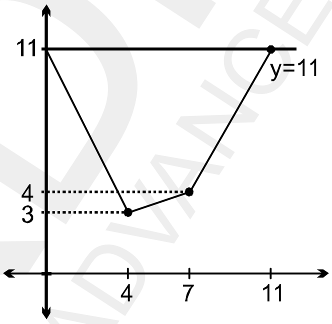
(ii) $|x^2 - 3x| = 2x - 6$

$\Rightarrow \begin{cases} x^2 - 3x = 2x - 6, & x^2 - 3x \ge 0 \\ -x^2 + 3x = 2x - 6, & x^2 - 3x < 0 \end{cases}$

$\Rightarrow \begin{cases} x^2 - 5x + 6 = 0, & x \in (-\infty, 0] \cup [3, \infty) \\ x^2 - x - 6 = 0, & x \in (0, 3) \end{cases}$

$\Rightarrow$ x = 3.

(iii) $|x-4| + |x-7| = 11$



x = 0, x = 11.

6. (i) $|x^2 - 2| = 2|x-3|$

$\Rightarrow$ $x^2 - 2 = 2(x-3)$ $x \ge 3$

$x^2 - 2 = -2(x-3)$ $2 \le x < 3$

$-(x^2 - 2) = -2(x-3)$ $-2 < x < 2$

$x^2 - 2 = -2(x-3)$ $x \le -2$

$\Rightarrow$ x = – 4, x = 2.

(ii) L.H.S. always positive.

(iii) $|x-1| + |x+5| = 6$

$|x| + |y| = |x-y| \Rightarrow xy \le 0$

$\Rightarrow$ $(x = 5)(x-1) \le 0 \Rightarrow x \in [-5, 1]$.

DPP NO. - 29

1. $\sec A = \frac{17}{8}$, $\operatorname{cosec} B = \frac{5}{4}$

$\cos A = \frac{8}{17}$, $\sin B = \frac{4}{5}$

$\sin A = \pm\frac{15}{17}$, $\cos B = \pm\frac{3}{5}$

$\sec(A+B) = \frac{1}{\cos A \cos B - \sin A \sin B}$

$= \frac{1}{\pm\frac{8}{17}\times\frac{3}{5} \pm \frac{4}{5}\times\frac{15}{17}} = -\frac{85}{36}, \frac{85}{36}, -\frac{85}{84}, \frac{85}{84}$

2. $S_n = n^2 p$
$d = 2p$
$T_n = (2n-1)p$
$a_1 = p$

$S_p = \frac{p}{2}[2a_1 + (p-1).d] \Rightarrow \frac{p}{2}[2p + 2p^2 - p] \Rightarrow p^3$

$a_p = a + (p-1)d \Rightarrow p + (p-1).2p = 2p^2 - p$

3. $\frac{\sin A + \sin 5A + 2\sin 3A}{\sin 3A + \sin 7A + 2\sin 5A}$

$= \frac{2\sin 3A\cos 2A + 2\sin 3A}{2\sin 5A\cos 2A + 2\sin 5A} = \frac{2\sin 3A(\cos 2A + 1)}{2\sin 5A(\cos 2A + 1)}$

$= \frac{\sin 3A}{\sin 5A}$

4. $2\cos\frac{\pi}{13}\cos\frac{9\pi}{13} + \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13}$

$= 2\cos\frac{\pi}{13}\cos\frac{9\pi}{13} + 2\cos\frac{4\pi}{13}\cos\frac{\pi}{13}$

$= 2\cos\frac{\pi}{13}\left(\cos\frac{9\pi}{13} + \cos\frac{4\pi}{13}\right)$

$= 2\cos\frac{\pi}{13}\left[\cos\frac{9\pi}{13} + \cos\left(\pi - \frac{9\pi}{13}\right)\right] = 0$

5. $\tan 25° = a$

$\frac{\tan 205° - \tan 115°}{\tan 245° + \tan 335°}$

$= \frac{\tan(180 + 25°) - \tan(90 + 25°)}{\tan(270 - 25°) + \tan(360 - 25°)}$

$= \frac{-\tan 25 + \cot 25}{\cot 25 - \tan 25} = \frac{1 + a^2}{1 - a^2}$

6. $S = (2-1)(2+1)(6-1)(6+1) + (4-1)(4+1)(8-1)(8+1) + ...(100-1)(100+1)(104-1)(104+1)$

$S = 1.3.5.7 + 3.5.7.9 + ...99.101.103.105$

$T_n = (2n-1)(2n+1)(2n+3)(2n+5)$

$T_n = \frac{1}{10}[(2n-1)(2n+1)(2n+3)(2n+5)(2n+7) - (2n-3)(2n-1)(2n+1)(2n+3)(2n+5)]$

$T_1 = \frac{1}{10}[1.3.5.7.9 + 1.1.3.5.7]$

$T_2 = \frac{1}{10}[3.5.7.9.11 - 1.3.5.7.9]$

$T_3 = \frac{1}{10}[5.7.9.11.13 - 3.5.7.9.11]$

$\vdots \quad \vdots$

$S_n = \frac{1}{10}[(2n-1)(2n+1)(2n+3)(2n+5)(2n+7) + 1.3.5.7]$

Put n = 50

$S_n = \frac{1}{10}[99.101.103.105.107 + 1.3.5.7]$

7. $x^3 + bx^2 + cx + d = 0$

$\alpha + \beta + \gamma = -b$ (A.P.)

$2\alpha = \beta + \gamma$

$3\alpha = -b$

$\alpha = -\frac{b}{3}$

$-\frac{b^3}{27} + \frac{b^3}{9} - \frac{bc}{3} + d = 0 \Rightarrow \frac{2b^3}{27} = \frac{bc}{3} - d$

$2b^3 = 9dc - 27d$

$\alpha\beta\gamma = -d$

$\alpha^2 = \beta\gamma$ (G.P.)

$\alpha = (-d)^{1/3}$

$\alpha^3 + b\alpha^2 + c\alpha + d = 0$

$b\alpha^2 + c\alpha = 0$

$\Rightarrow b\alpha + c = 0 \Rightarrow b^3\alpha^3 = -c^3$

$\Rightarrow -b^3d = -c^3 \Rightarrow c^3 = b^3d$

(C) $\frac{2}{\alpha} = \frac{1}{\beta} + \frac{1}{\gamma}$

$2\beta = \alpha\gamma + \alpha\beta$

$\alpha\beta + \beta\gamma + \gamma\alpha = c$

$\alpha\gamma + \alpha\beta = c - \beta\gamma$

$\beta\gamma = c/3$

$\alpha\beta\gamma = -d$

$\alpha = -\frac{3d}{c}$

$\alpha^3 + b\alpha^2 + c\alpha + d = 0$

$\left[\frac{-3d}{c}\right]^3 + b\left[\frac{3d}{c}\right]^2 + c\left[\frac{-3d}{c}\right] + d = 0$

$27d^3 = 9bcd^2 - 2c^3d$

(D) $\alpha + \beta + \gamma = -b$

all are equal AM = GM = HM

DPP NO. - 30

1. A B C A < B < C | r | > 1

a ar ar^2

a+3 ar+3 ar^2+3

$(a+3) = \frac{1}{2}(ar^2 + 3)$

$2a + 3 = ar^2$

$\left(\frac{a+3}{a + ar + ar^2 + 9} - \frac{a}{a + ar + ar^2}\right) = 105$

$\left(\frac{ar+3}{a + ar + ar^2 + 9} - \frac{ar}{a + ar + ar^2}\right) = 15$

$\frac{3(a + ar + ar^2) - 9a}{3(a + ar + ar^2) - 9ar} = 7$

$\frac{a + ar + ar^2 - 3a}{a + ar + ar^2 - 3ar} = 7$

$\frac{-2a + ar + ar^2}{a - 2ar + ar^2} = 7$

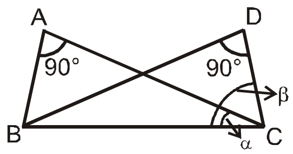
$\frac{r^2 + r - 2}{r^2 - 2r + 1} = 7$

$6r^2 - 15r + 9 = 0$
$2r^2 - 5r + 3 = 0$
$2r^2 - 3r - 2r + 3 = 0$
$r(2r - 3) - 1(2r - 3) = 0$

$r = \frac{3}{2}$, $1 \times 2a + 3 = a$ [9/4]

$9a = 8a + 12$
$a = 12$

A B C
12 18 27

2. 

AB, BC, BD
BC > AB
BC > BD
middle is one mean which does not lie between the number.

3. $2 \tan \frac{\alpha}{2} = \tan \frac{\beta}{2}$

$$\frac{3+5\cos\beta}{5+3\cos\beta} = \frac{3+5\left(\frac{1-\tan^2\frac{\beta}{2}}{1+\tan^2\frac{\beta}{2}}\right)}{5+3\left(\frac{1-\tan^2\frac{\beta}{2}}{1+\tan^2\frac{\beta}{2}}\right)}$$

$$= \frac{3\left(1+\tan^2\frac{\beta}{2}\right)+5\left(1-\tan^2\frac{\beta}{2}\right)}{5\left(1+\tan^2\frac{\beta}{2}\right)+3\left(1-\tan^2\frac{\beta}{2}\right)}$$

$$= \frac{8-2\tan^2\frac{\beta}{2}}{8+2\tan^2\frac{\beta}{2}} = \frac{8-8\tan^2\frac{\alpha}{2}}{8+8\tan^2\frac{\alpha}{2}} = \frac{1-\tan^2\frac{\alpha}{2}}{1+\tan^2\frac{\alpha}{2}} = \cos\alpha$$

4. $2q = p + r$
$px^2 + qx + r = 0$
$D = q^2 - 4pr > 0$

$$= \left(\frac{p+r}{2}\right)^2 - 4pr \Rightarrow p^2 + r^2 - 14\,pr > 0$$

$$\left|\frac{r}{p}-7\right| \geq 4\sqrt{3} \text{ and } \left|\frac{p}{r}-7\right| \geq 4\sqrt{3}$$

5. $\frac{3+\cot(60°+A°)\cot A°}{\cot(60°+A°)+\cot A°}$

$$= \frac{(3\tan(60+A)\tan A+1)(1-\tan A\tan(60+A))}{\tan(60+2A)}$$

$= \tan(\alpha + A)$
$a \equiv 30°$

6. $\frac{\tan 5\theta+\tan 3\theta}{\tan 5\theta-\tan 3\theta} = \frac{\sin 5\theta\cos 3\theta+\cos 5\theta\sin 3\theta}{\sin 5\theta\cos 3\theta-\sin 3\theta\cos 5\theta}$

$$= \frac{\sin 8\theta}{\sin 2\theta} = \frac{2\sin 4\theta\cos 4\theta}{\sin 2\theta} = 4\cos 2\theta\cos 4\theta$$

7. $\log_{\sin A} \tan A < 0$

$0 < A < \frac{\pi}{2}$

since $0 < \sin A < 1$
$\therefore$ $\tan A > (\sin A)$
$\tan A > 1$

$A > \frac{\pi}{4}$ hence $\frac{\pi}{4} < A < \frac{\pi}{2}$