

SAINIK SCHOOL, AMARAVATHINAGAR

HOLIDAY HOMEWORK – 2019 – 2020

Class: XI

Subject: MATHEMATICS

S. No	Topic	Activity / Project	Time period	MCQ (JEE & NEET level)	Annexure No
1	SETS	i). PROBLEM SOLVING (20 questions)	4 HR	10 qns	A
		ii) PPT–DE MORGANS' LAW for sets A, B, C	3 HR		B
2	RELATIONS AND FUNCTIONS	PROBLEM SOLVING ASSIGNMENT	5 HR	16 qns.	C
3	TRIGONOMETRIC FUNCTIONS	i). FORMULA BOOKLET (hand written)	1 HR	1 -20 2- 60	D
		ii). PROJECT	6 HR		E
		iii). ASSIGNMENT	20 HR		F

Annexure:

A. SET :Problem Solving 30 questions

B. SET :Power point presentation: **Verify De Morgan's law** with an example

C. RELATIONS AND FUNCTIONS: Problem Solving 30 questions

D. TRIGONOMETRIC FUNCTIONS: Prepare a formula booklet on trigonometric functions.

E. TRIGONOMETRIC FUNCTIONS : Project :Preparing a working model

F. TRIGONOMETRIC FUNCTIONS :

1. Problem Solving 30 questions

2. Problem Solving 30 questions 60 from NCERT Exemplar, with objective type questions

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Recommended By

Approved By

Vice Principal

Principal



SAINIK SCHOOL AMARAVATHI NAGAR

CLASS: XI MATHEMATICS

ANNEXURE - A

1. SETS

- Q.1 If $U = \{1, 2, 3, 4, \dots, 10\}$ is the universal set for the sets $A = \{2, 3, 4, 5\}$ and $B = \{1, 2, 3, 4, 5, 6\}$, then verify that $(A \cup B)^c = A^c \cap B^c$.
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- Q.2 If $A = \{1, 2, 3, 4, 5\}$, $B = \{1, 3, 5, 8\}$, $C = \{2, 5, 7, 8\}$, verify that $A - (B \cup C) = (A - B) \cap (A - C)$. (2 marks)
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- Q.3 Which type of set is the set of odd natural numbers divisible by 2? (1 mark)
-
- Q.4 Out of 20 members in a family, 11 like to take tea and 14 like coffee. Assume that each one likes at least one of two drinks. how many like, only tea and not coffee?
-
- Q.5 Decide, among the following sets are subsets of one and another :
 $A = \{x : x \in \mathbb{R} \text{ and } x \text{ satisfy } : x^2 - 4x + 3 = 0\}$
 $B = \{1, 3\}$,
 $C = \{1, 3, 5\}$,
 $D = \{4, 5, 6\}$.
-
- Q.6 A market research group conducted a survey of 1000 consumers and reported that 720 consumers like product A and 450 consumers like product B. What is the least number that must have liked both products?
-
- Q.7 Let A and B be two finite sets such that $n(A - B) = 30$, $n(A \cup B) = 180$, $n(A \cap B) = 60$, find $n(B)$. (2 marks)
-
- Q.8 Write the set $A = \{x : x \in \mathbb{N} \text{ and } x^2 < 25\}$ in roster form. (1 mark)
-
- Q.9 In a survey it was found that 21 people liked product A, 26 liked product B and 29 liked C. If 14 people liked products A and B, 12 people liked products C and A, 14 people liked products B and C and 8 liked all the three products. Find how many liked
(i) product C only
(ii) product A and C but not product B
(iii) at least one of three products.
-
- Q.10 If $A \times B = \{(p, q), (p, r), (m, q), (m, r)\}$, find A and B.
-

Q.11 In a survey of 60 people, it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I, 11 read both H and T, 8 read both T and I, 3 read all three newspapers. Find: (5 marks)

(i) the number of people who read at least one of the newspapers.

(ii) the number of people who read exactly one newspaper.

Q.12 In a committee, 50 people speak French, 20 speak Spanish and 10 speak both Spanish and French. How many speak at least one of these two languages?

Q.13 In a survey of 600 students in a school, 150 students were found to be taking tea and 225 taking coffee, 100 were taking both tea and coffee. Find how many students were taking neither tea nor coffee? (3 marks)

Q.14 If $A = \{x : x \text{ is a prime number } \forall x \in \mathbb{N}\}$, then find A^c . (1 mark)

Q.15 If X and Y are two sets such that $n(X) = 17$, $n(Y) = 23$ and $n(X \cup Y) = 38$, find $n(X \cap Y)$.

Q.16 From the sets given below, select equal sets :

$A = \{2, 4, 8, 12\}$, $B = \{1, 2, 3, 4\}$, $C = \{4, 8, 12, 14\}$, $D = \{3, 1, 4, 2\}$, $E = \{-1, 1\}$, $F = \{0, a\}$,

$G = \{1, -1\}$, $H = \{0, 1\}$.

Q.17 Draw appropriate Venn diagram for each of the following: (3 marks)

(i) $(A \cup B)'$

(ii) $A' \cap B'$

(iii) $(A \cap B)'$

(iv) $A' \cup B'$

Q.18 Show that $A \cap B = A \cap C$ need not imply $B = C$. (2 marks)

Q.19 Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ and $A = \{1, 3, 5, 7, 9\}$. Find A''' .

Q.20 In a town of 840 persons, 450 persons read Hindi, 300 read English and 200 read both. Find the number of persons who read neither. (2 marks)

The following description gives the number of students studying one or more of the subjects in a class:

Mathematics 24; Physics 18; Chemistry 23; Mathematics & Physics 11; Mathematics & Chemistry 13; Physics & Chemistry 12; Mathematics, Physics & Chemistry 6. Find:

(i) Total number of students in the class (ii) How many opted Chemistry but not Mathematics? (iii) How many opted exactly one of the three subjects?

(iv) How many opted only Mathematics? (v) How many opted Mathematics & Physics but not Chemistry?

A school awarded 42 medals in hockey, 18 in basketball and 23 in cricket. If these medals were bagged by a total of 65 students and only 4 students got medals in all the three sports; find

(i) How many students received medals in exactly two of the three sports?

(ii) How many students received medals in exactly one of the three sports?

In a class of 35 students, 15 study Economics; 22 study Business studies and 14 study Accountancy. If 11 students study both Economics & Business studies; 8 study both Business studies & Accountancy and 5 study both Economics & Accountancy. If 5 students study none of these subjects, find the number of students who study

(i) All the three subjects (ii) Exactly two subjects (iii) Only one subject.

The following information was observed during a survey of 100 television viewers:

18 watch programme P only; 23 watch programme P but not Q; 8 watch programme P and R; 26 watch programme P; 48 watch programme R; 8 watch programme Q and R; 14 watch none of these programmes. Find the number of people who watch

(i) Exactly two programmes (ii) Only one programme (iii) Only programme Q

In a town of 10,000 families, it was found that 40% families buy newspaper A, 20% families buy newspaper B and 10% families buy newspaper C. 5% families buy A and B, 3% buy B and C, 4% buy A and C. If 2% families buy all the three newspapers, find the number of families which buy (i) A only (ii) B only (iii) none of A, B and C.

In an examination, question A was attempted by 67 students, question B by 46 students and question C by 40 students. 28 students attempted both questions A & B, 8 attempted questions B & C, 26 attempted A & C, 2 students attempted all the three questions. Find how many attempted question A but not question B & C?

In a class of 50 students, 27 study History, 27 study Civics, 25 study Economics, 15 study both History & Civics, 16 study both Civics & Economics, 14 study both History & Economics. 9 study all the three subjects. How many students do not study any of the three subjects?

ANNEXURE - B

1. Prepare a PPT to verify De Morgans' Law.
2. Support the law with an example

ANNEXURE - C

RELATIONS AND FUNCTIONS

- Q1. If $A = \{2, 3\}$, $B = \{4, 5\}$, $C = \{5, 6\}$ Find (i) $A \times B$ (ii) $A \times (B \cup C)$ (iii) $A \times (B \cap C)$
Find (i) $A \times (B \cup C) = (A \times B) \cup (A \times C)$
(ii) $A \times (B - C) = (A \times B) - (A \times C)$
- Q2. If the ordered pairs $(x, -1)$ and $(5, y)$ belong to the set $\{(a, b) : b = 2a - 3\}$, find the values of x and y .
- Q3. If A and B are two sets having 3 elements in common. If $n(A) = 5$, $n(B) = 4$, find $n(A \times B)$ and $n(A \times B) \cap (B \times A)$
- Q4. Determine the domain and range of the following relations:-
(i) $R_1 = \left[\left[x, \frac{1}{x} \right] : 0 < x < 6, x \in \mathbb{N} \right]$ (ii) $R_2 = \left[\left[x, x^3 \right] : x \text{ is a prime number less than a } 10 \right]$
- Q5. Write all possible relation from $A = \{1, 2\}$ to $B = \{0\}$.
- Q6. How many relations are possible from a set A of n elements to another set B of n elements ?
- Q7. Find the domain for which the functions $f(x) = 3x^2 - 1$ and $g(x) = 3 + x$ are equal.
- Q8. Express the following functions as set of ordered pairs and determine their ranges.
(a) $f : A \rightarrow \mathbb{R}$, $f(x) = x^2 + 1$, where $A = \{-1, 0, 2, 4\}$
(b) $g : A \rightarrow \mathbb{N}$, $g(x) = 2x$, where $A = \{x : x \in \mathbb{N}, x \leq 10\}$
- Q9. Let a function f be defined by $f(x) = \frac{x}{x^2 + 1}$, $x \in \mathbb{R}$
Find (i) $f\left(\frac{1}{x}\right)$ $x \neq 0$ (ii) $f(2x)$ (iii) $f(x-1)$
- Q10. If $f(x) = \frac{x-1}{x+1}$, $x \neq -1$, then show that $f(f(x)) = \frac{-1}{x}$, provided that $x \neq 0$

Q11. Let $f(x) = x^2$ and $g(x) = 2x + 1$ be two real functions find (i) $(f + g)(x)$ (ii) $(f - g)(x)$ (iii) $(f \cdot g)(x)$ (iv) $\left(\frac{f}{g}\right)(x)$

Q12. If a real function f is defined by $f(x) = (|x| - x) / 2x$, find its range.

Q13. Find the domain of each of the following real valued functions :-

(i) $f(x) = \frac{1}{x+2},$

(ii) $f(x) = \frac{x-1}{x-3},$

(iii) $f(x) = \frac{2x-3}{x^2-3x+2},$

(iv) $f(x) = \frac{x^2+3x+5}{x^2-5x+4},$

(v) $f(x) = \sqrt{x-2},$

(vi) $f(x) = \frac{1}{\sqrt{1-x}},$

(vii) $f(x) = \sqrt{4-x^2},$

Q14. Find the domain and range of the real function $f(x)$ given by

(i) $f(x) = \frac{x-2}{3-x}$ Ans. $D = \mathbb{R} - \{3\}$ Range = $\mathbb{R} - \{-1\}$

(ii) $f(x) = \frac{1}{\sqrt{x-5}}$ Ans. $D = (5, \infty)$ Range = $(0, \infty)$

(iii) $f(x) = \sqrt{16-x^2}$ Ans. $D = [-4, 4]$ Range = $[0, 4]$

(iv) $f(x) = \frac{x}{1+x^2}$ Ans. $D = (\mathbb{R})$ Range = $[-\frac{1}{2}, \frac{1}{2}] - \{0\}$

(v) $f(x) = \frac{3}{2-x^2}$ Ans. $D = \mathbb{R} - \{-\sqrt{2}, \sqrt{2}\}$ Range = $(\infty, 0) \cup [3/2, \infty]$

(vi) $f(x) = \frac{x^2-9}{x-3}$ Ans. $D = \mathbb{R} - \{3\}$ $\mathbb{R} = \mathbb{R} - \{6\}$

Q15. If $R = \{(x, y) : x, y \in \mathbb{I}, 4x^2 + 8y^2 = 36\}$, then represent R by arrow diagram.

Q16. Give $A = \{-2, -1, 0, 1, 2\}$ and $B = \{-3, -1, 1, 5\}$. List all elements of $f \{(x, y) : y = 2x^2 - 3, x \in A, Y \in B\}$. Is f a function ?

Annexure C

1. Prepare a formula booklet in Trigonometry
2. Collect all the formula and identities in trigonometry

APPENDIX - D
TRIGONOMETRIC FUNCTIONS
PROJECT

<http://www.ncert.nic.in/exemplar/labmanuals.html>

Activity 8,9,10 – page no 32 – 40.

1. Prepare a working model in trigonometric functions

2. Explanation about how the functions value are calculated.

APPENDIX - E

TRIGONOMETRIC FUNCTIONS

WORKSHEET 1

- Q.1 If $\tan A = \sqrt{3}$, then what is $\tan 2A$?
-
- Q.2 Solve : $2 \cos^2 x + 3 \sin x = 0$
-
- Q.3 Evaluate : $\sin(40^\circ + \theta)\cos(10^\circ + \theta) - \cos(40^\circ + \theta)\sin(10^\circ + \theta)$
-
- Q.4 Prove that $\cot x \cot 2x - \cot 2x \cot 3x - \cot 3x \cot x = 1$. (3 marks)
-
- Q.5 Find the value of $\sin 150^\circ + \cos 300^\circ$.
-
- Q.6 If in two circles, arcs of the same length subtend angles 75° and 120° at the centre, find the ratio of their radii.
-
- Q.7 If in two circles, arcs of same length, subtend angles 120° and 150° at the centre, find the ratio of their radii. (3 marks)
-
- Q.8 Write the value of $\tan 15^\circ$.
-
- Q.9 Prove that :
$$(\cos x + \cos y)^2 + (\sin x - \sin y)^2 = 4 \cos^2 \frac{x+y}{2}$$
-
- Q.10 Find the value of $\cos 55^\circ + \cos 125^\circ + \cos 300^\circ$.
-
- Q.11 Find the value of $\sin 15^\circ$.
-
- Q.12 Prove that: $(\sin 3x + \sin x) \sin x + (\cos 3x - \cos x) \cos x = 0$. (3 marks)
-
- Q.13 A wheel makes 360 revolutions in one minute. Through how many radians does it turn in one second? (1 mark)
-
- Q.14 Prove that $\frac{\cos 19^\circ - \sin 19^\circ}{\cos 19^\circ + \sin 19^\circ} = \cot 74^\circ$ (3 marks)
-
- Q.15 If $\cot 2A = \tan(n - 2)A$, then what is A ?
-
- Q.16 Solve $\cos 2\theta - \cos \theta = 0$ (3 marks)
-
- Q.17 Write the general solution of $\cos x = \frac{1}{2}$

Q.18 Prove that

$$\frac{\sec 8\theta - 1}{\sec 4\theta - 1} = \frac{\tan 8\theta}{\tan 2\theta}$$

Q.19 Prove that $\cos^2 A + \cos^2 B - 2 \cos A \cos B \cos (A+B) = \sin^2 (A+B)$

Q.20 Find the principal solutions of the equation $\tan x = \sqrt{3}$.

APPENDIX - F

WORKSHEET 2

Short Answer Type Questions

1. Prove that $\frac{\tan A + \sec A - 1}{\tan A - \sec A + 1} = \frac{1 + \sin A}{\cos A}$

2. If $\frac{2 \sin \alpha}{1 + \cos \alpha + \sin \alpha} = y$, then prove that $\frac{1 - \cos \alpha + \sin \alpha}{1 + \sin \alpha}$ is also equal to y .

[Hint: Express $\frac{1 - \cos \alpha + \sin \alpha}{1 + \sin \alpha} = \frac{1 - \cos \alpha + \sin \alpha}{1 + \sin \alpha} \cdot \frac{1 + \cos \alpha + \sin \alpha}{1 + \cos \alpha + \sin \alpha}$]

3. If $m \sin \theta = n \sin (\theta + 2\alpha)$, then prove that $\tan (\theta + \alpha) \cot \alpha = \frac{m+n}{m-n}$

[Hint: Express $\frac{\sin (\theta + 2\alpha)}{\sin \theta} = \frac{m}{n}$ and apply componendo and dividendo]

4. If $\cos (\alpha + \beta) = \frac{4}{5}$ and $\sin (\alpha - \beta) = \frac{5}{13}$, where α lie between 0 and $\frac{\pi}{4}$, find the value of $\tan 2\alpha$ [Hint: Express $\tan 2\alpha$ as $\tan (\alpha + \beta + \alpha - \beta)$]

5. If $\tan x = \frac{b}{a}$, then find the value of $\sqrt{\frac{a+b}{a-b}} + \sqrt{\frac{a-b}{a+b}}$

6. Prove that $\cos \theta \cos \frac{\theta}{2} - \cos 3\theta \cos \frac{9\theta}{2} = \sin 7\theta \sin 8\theta$.

[Hint: Express L.H.S. = $\frac{1}{2} [2 \cos \theta \cos \frac{\theta}{2} - 2 \cos 3\theta \cos \frac{9\theta}{2}]$]

7. If $a \cos \theta + b \sin \theta = m$ and $a \sin \theta - b \cos \theta = n$, then show that $a^2 + b^2 = m^2 + n^2$

8. Find the value of $\tan 22^\circ 30'$.

[Hint: Let $\theta = 45^\circ$, use $\tan \frac{\theta}{2} = \frac{\sin \frac{\theta}{2}}{\cos \frac{\theta}{2}} = \frac{2 \sin \frac{\theta}{2} \cos \frac{\theta}{2}}{2 \cos^2 \frac{\theta}{2}} = \frac{\sin \theta}{1 + \cos \theta}$]

9. Prove that $\sin 4A = 4 \sin A \cos^3 A - 4 \cos A \sin^3 A$.
10. If $\tan \theta + \sin \theta = m$ and $\tan \theta - \sin \theta = n$, then prove that $m^2 - n^2 = 4 \sin \theta \tan \theta$
 [Hint: $m + n = 2 \tan \theta$, $m - n = 2 \sin \theta$, then use $m^2 - n^2 = (m + n)(m - n)$]
11. If $\tan(A + B) = p$, $\tan(A - B) = q$, then show that $\tan 2A = \frac{p+q}{1-pq}$
 [Hint: Use $2A = (A + B) + (A - B)$]
12. If $\cos \alpha + \cos \beta = 0 = \sin \alpha + \sin \beta$, then prove that $\cos 2\alpha + \cos 2\beta = -2 \cos(\alpha + \beta)$.
 [Hint: $(\cos \alpha + \cos \beta)^2 - (\sin \alpha + \sin \beta)^2 = 0$]
13. If $\frac{\sin(x+y)}{\sin(x-y)} = \frac{a+b}{a-b}$, then show that $\frac{\tan x}{\tan y} = \frac{a}{b}$ [Hint: Use Componendo and Dividendo].
14. If $\tan \theta = \frac{\sin \alpha - \cos \alpha}{\sin \alpha + \cos \alpha}$, then show that $\sin \alpha + \cos \alpha = \sqrt{2} \cos \theta$.
 [Hint: Express $\tan \theta = \tan(\alpha - \frac{\pi}{4}) \Rightarrow \theta = \alpha - \frac{\pi}{4}$]
15. If $\sin \theta + \cos \theta = 1$, then find the general value of θ .
16. Find the most general value of θ satisfying the equation $\tan \theta = -1$ and $\cos \theta = \frac{1}{\sqrt{2}}$.
17. If $\cot \theta + \tan \theta = 2 \operatorname{cosec} \theta$, then find the general value of θ .
18. If $2 \sin^3 \theta = 3 \cos \theta$, where $0 \leq \theta \leq 2\pi$, then find the value of θ .
19. If $\sec x \cos 5x + 1 = 0$, where $0 < x \leq \frac{\pi}{2}$, then find the value of x .

Long Answer Type Questions

20. If $\sin(\theta + \alpha) = a$ and $\sin(\theta + \beta) = b$, then prove that $\cos 2(\alpha - \beta) - 4ab \cos(\alpha - \beta) = 1 - 2a^2 - 2b^2$ [Hint: Express $\cos(\alpha - \beta) = \cos((\theta + \alpha) - (\theta + \beta))$]

21. If $\cos(\theta + \phi) = m \cos(\theta - \phi)$, then prove that $\tan \theta = \frac{1-m}{1+m} \cot \phi$.

[Hint: Express $\frac{\cos(\theta + \phi)}{\cos(\theta - \phi)} = \frac{m}{1}$ and apply Componendo and Dividendo]

22. Find the value of the expression

$$3 \left[\sin^4 \left(\frac{3\pi}{2} - \alpha \right) + \sin^4(3\pi + \alpha) \right] - 2 \left[\sin^6 \left(\frac{\pi}{2} + \alpha \right) + \sin^6(5\pi - \alpha) \right]$$

23. If $a \cos 2\theta + b \sin 2\theta = c$ has α and β as its roots, then prove that

$$\tan \alpha + \tan \beta = \frac{2b}{a+c}.$$

[Hint: Use the identities $\cos 2\theta = \frac{1 - \tan^2 \theta}{1 + \tan^2 \theta}$ and $\sin 2\theta = \frac{2 \tan \theta}{1 + \tan^2 \theta}$].

24. If $x = \sec \phi - \tan \phi$ and $y = \operatorname{cosec} \phi + \cot \phi$ then show that $xy + x - y + 1 = 0$

[Hint: Find $xy + 1$ and then show that $x - y = -(xy + 1)$]

25. If θ lies in the first quadrant and $\cos \theta = \frac{8}{17}$, then find the value of

$$\cos(30^\circ + \theta) + \cos(45^\circ - \theta) + \cos(120^\circ - \theta).$$

26. Find the value of the expression $\cos^4 \frac{\pi}{8} + \cos^4 \frac{3\pi}{8} + \cos^4 \frac{5\pi}{8} + \cos^4 \frac{7\pi}{8}$

[Hint: Simplify the expression to $2 \left(\cos^4 \frac{\pi}{8} + \cos^4 \frac{3\pi}{8} \right)$

$$= 2 \left[\left(\cos^2 \frac{\pi}{8} + \cos^2 \frac{3\pi}{8} \right)^2 - 2 \cos^2 \frac{\pi}{8} \cos^2 \frac{3\pi}{8} \right]$$

27. Find the general solution of the equation $5\cos^2\theta + 7\sin^2\theta - 6 = 0$
28. Find the general solution of the equation $\sin x - 3\sin 2x + \sin 3x = \cos x - 3\cos 2x + \cos 3x$
29. Find the general solution of the equation $(\sqrt{3} - 1)\cos\theta + (\sqrt{3} + 1)\sin\theta = 2$

[Hint: Put $\sqrt{3} - 1 = r \sin\alpha$, $\sqrt{3} + 1 = r \cos\alpha$ which gives $\tan\alpha = \tan\left(\frac{\pi}{4} - \frac{\pi}{6}\right)$

$$\Rightarrow \alpha = \frac{\pi}{12}]$$

Objective Type Questions

Choose the correct answer from the given four options in the Exercises 30 to 59 (M.C.Q.).

30. If $\sin\theta + \operatorname{cosec}\theta = 2$, then $\sin^2\theta + \operatorname{cosec}^2\theta$ is equal to

- (A) 1 (B) 4
(C) 2 (D) None of these

31. If $f(x) = \cos^3 x + \sec^3 x$, then

- (A) $f(x) < 1$ (B) $f(x) = 1$
(C) $2 < f(x) < 1$ (D) $f(x) \geq 2$

[Hint: A.M \geq G.M.]

32. If $\tan\theta = \frac{1}{2}$ and $\tan\phi = \frac{1}{3}$, then the value of $\theta + \phi$ is

- (A) $\frac{\pi}{6}$ (B) π (C) 0 (D) $\frac{\pi}{4}$

33. Which of the following is not correct?

- (A) $\sin\theta = -\frac{1}{5}$ (B) $\cos\theta = 1$
(C) $\sec\theta = \frac{1}{2}$ (D) $\tan\theta = 20$

34. The value of $\tan 1^\circ \tan 2^\circ \tan 3^\circ \dots \tan 89^\circ$ is

- (A) 0 (B) 1
(C) $\frac{1}{2}$ (D) Not defined

35. The value of $\frac{1 - \tan^2 15^\circ}{1 + \tan^2 15^\circ}$ is

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

36. The value of $\cos 1^\circ \cos 2^\circ \cos 3^\circ \dots \cos 179^\circ$ is

- (A) $\frac{1}{\sqrt{2}}$ (B) 0 (C) 1 (D) -1

37. If $\tan \theta = 3$ and θ lies in third quadrant, then the value of $\sin \theta$ is

- (A) $\frac{1}{\sqrt{10}}$ (B) $-\frac{1}{\sqrt{10}}$ (C) $\frac{-3}{\sqrt{10}}$ (D) $\frac{3}{\sqrt{10}}$

38. The value of $\tan 75^\circ - \cot 75^\circ$ is equal to

- (A) $2\sqrt{3}$ (B) $2+\sqrt{3}$ (C) $2-\sqrt{3}$ (D) 1

39. Which of the following is correct?

- (A) $\sin 1^\circ > \sin 1$ (B) $\sin 1^\circ < \sin 1$
(C) $\sin 1^\circ = \sin 1$ (D) $\sin 1^\circ = \frac{\pi}{18^\circ} \sin 1$

[Hint: 1 radian = $\frac{180^\circ}{\pi} = 57^\circ 30'$ approx]

40. If $\tan \alpha = \frac{m}{m+1}$, $\tan \beta = \frac{1}{2m+1}$, then $\alpha + \beta$ is equal to

- (A) $\frac{\pi}{2}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{6}$ (D) $\frac{\pi}{4}$

41. The minimum value of $3 \cos x + 4 \sin x + 8$ is

- (A) 5 (B) 9 (C) 7 (D) 3

42. The value of $\tan 3A - \tan 2A - \tan A$ is equal to

- (A) $\tan 3A \tan 2A \tan A$
(B) $-\tan 3A \tan 2A \tan A$
(C) $\tan A \tan 2A - \tan 2A \tan 3A - \tan 3A \tan A$
(D) None of these

43. The value of $\sin (45^\circ + \theta) - \cos (45^\circ - \theta)$ is

- (A) $2 \cos \theta$ (B) $2 \sin \theta$ (C) 1 (D) 0

44. The value of $\cot\left(\frac{\pi}{4} + \theta\right)\cot\left(\frac{\pi}{4} - \theta\right)$ is
- (A) -1 (B) 0 (C) 1 (D) Not defined

45. $\cos 2\theta \cos 2\phi + \sin^2(\theta - \phi) - \sin^2(\theta + \phi)$ is equal to

- (A) $\sin 2(\theta + \phi)$ (B) $\cos 2(\theta + \phi)$
(C) $\sin 2(\theta - \phi)$ (D) $\cos 2(\theta - \phi)$

[Hint: Use $\sin^2 A - \sin^2 B = \sin(A + B)\sin(A - B)$]

46. The value of $\cos 12^\circ + \cos 84^\circ + \cos 156^\circ + \cos 132^\circ$ is

- (A) $\frac{1}{2}$ (B) 1 (C) $-\frac{1}{2}$ (D) $\frac{1}{8}$

47. If $\tan A = \frac{1}{2}$, $\tan B = \frac{1}{3}$, then $\tan(2A + B)$ is equal to

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

48. The value of $\sin\frac{\pi}{10}\sin\frac{13\pi}{10}$ is

- (A) $\frac{1}{2}$ (B) $-\frac{1}{2}$ (C) $-\frac{1}{4}$ (D) 1

[Hint: Use $\sin 18^\circ = \frac{\sqrt{5}-1}{4}$ and $\cos 36^\circ = \frac{\sqrt{5}+1}{4}$]

49. The value of $\sin 50^\circ - \sin 70^\circ + \sin 10^\circ$ is equal to

- (A) 1 (B) 0 (C) $\frac{1}{2}$ (D) 2

50. If $\sin \theta + \cos \theta = 1$, then the value of $\sin 2\theta$ is equal to

- (A) 1 (B) $\frac{1}{2}$ (C) 0 (D) -1

51. If $\alpha + \beta = \frac{\pi}{4}$, then the value of $(1 + \tan \alpha)(1 + \tan \beta)$ is
- (A) 1 (B) 2
(C) -2 (D) Not defined
52. If $\sin \theta = \frac{-4}{5}$ and θ lies in third quadrant then the value of $\cos \frac{\theta}{2}$ is
- (A) $\frac{1}{5}$ (B) $-\frac{1}{\sqrt{10}}$ (C) $-\frac{1}{\sqrt{5}}$ (D) $\frac{1}{\sqrt{10}}$
53. Number of solutions of the equation $\tan x + \sec x = 2 \cos x$ lying in the interval $[0, 2\pi]$ is
- (A) 0 (B) 1 (C) 2 (D) 3
54. The value of $\sin \frac{\pi}{18} + \sin \frac{\pi}{9} + \sin \frac{2\pi}{9} + \sin \frac{5\pi}{18}$ is given by
- (A) $\sin \frac{7\pi}{18} + \sin \frac{4\pi}{9}$ (B) 1
(C) $\cos \frac{\pi}{6} + \cos \frac{3\pi}{7}$ (D) $\cos \frac{\pi}{9} + \sin \frac{\pi}{9}$
55. If A lies in the second quadrant and $3 \tan A + 4 = 0$, then the value of $2 \cot A - 5 \cos A + \sin A$ is equal to
- (A) $\frac{-53}{10}$ (B) $\frac{23}{10}$ (C) $\frac{37}{10}$ (D) $\frac{7}{10}$

56. The value of $\cos^2 48^\circ - \sin^2 12^\circ$ is

(A) $\frac{\sqrt{5}+1}{8}$

(B) $\frac{\sqrt{5}-1}{8}$

(C) $\frac{\sqrt{5}+1}{5}$

(D) $\frac{\sqrt{5}+1}{2\sqrt{2}}$

[Hint: Use $\cos^2 A - \sin^2 B = \cos(A+B)\cos(A-B)$]

57. If $\tan \alpha = \frac{1}{7}$, $\tan \beta = \frac{1}{3}$, then $\cos 2\alpha$ is equal to

(A) $\sin 2\beta$

(B) $\sin 4\beta$

(C) $\sin 3\beta$

(D) $\cos 2\beta$

58. If $\tan \theta = \frac{a}{b}$, then $b \cos 2\theta + a \sin 2\theta$ is equal to

(A) a

(B) b

(C) $\frac{a}{b}$

(D) None

59. If for real values of x , $\cos \theta = x + \frac{1}{x}$, then

(A) θ is an acute angle

(B) θ is right angle

(C) θ is an obtuse angle

(D) No value of θ is possible

Fill In Blanks Type Questions

60. The value of $\frac{\sin 50^\circ}{\sin 130^\circ}$ is _____.

61. If $k = \sin\left(\frac{\pi}{18}\right)\sin\left(\frac{5\pi}{18}\right)\sin\left(\frac{7\pi}{18}\right)$, then the numerical value of k is _____.

62. If $\tan A = \frac{1 - \cos B}{\sin B}$, then $\tan 2A =$ _____.

63. If $\sin x + \cos x = a$, then

(i) $\sin^6 x + \cos^6 x =$ _____

(ii) $|\sin x - \cos x| =$ _____.

64. In a triangle ABC with $\angle C = 90^\circ$ the equation whose roots are $\tan A$ and $\tan B$ is _____.

[Hint: $A + B = 90^\circ \Rightarrow \tan A \tan B = 1$ and $\tan A + \tan B = \frac{2}{\sin 2A}$]

65. $3(\sin x - \cos x)^4 + 6(\sin x + \cos x)^2 + 4(\sin^6 x + \cos^6 x) =$ _____.

66. Given $x > 0$, the values of $f(x) = -3 \cos \sqrt{3+x+x^2}$ lie in the interval _____.

67. The maximum distance of a point on the graph of the function $y = \sqrt{3} \sin x + \cos x$ from x -axis is _____.