ST. VIVEKANAND PUBLIC SCHOOL, SADABAD

WORKSHEET

Class 11 - Mathematics

Section A

1. If A = {x : x is a multiple of 3, x natural no., x < 30} and B = {x : x is a multiple of 5, x is natural no., x < 30} then A - B is **[1]**

   a) {3, 6, 9, 12, 15, 18, 21, 24, 27, 30}
   b) {3, 6, 9, 12, 18, 21, 24, 27}
   c) {3, 5, 6, 9, 10, 12, 15, 18, 20, 21, 25, 27, 30}
   d) {3, 6, 9, 12, 18, 21, 24, 27, 30}

2. In a set builder method the null set is represented by **[1]**

   a) { x : x = x }
   b) ϕ
   c) { }
   d) (x: x $\neq$x).

3. If A = {0, 1, 5, 4, 7}. Then the total number subsets of A are **[1]**

   a) 20
   b) 32
   c) 64
   d) 40

4. Two finite sets have m and n elements. The total number of subsets of the first set is 56 more than the total number of subsets of the second set. The values of m and n are **[1]**

   a) 7, 4
   b) 6, 4
   c) 3, 3
   d) 6, 3

5. If $A \cup B = B$ then **[1]**

   a) $B \subset A$
   b) $A \subseteq B$
   c) B = ϕ
   d) A $\neq \phi$

6. The smallest set A such that A $\cup$ {1, 2} = {1, 2, 3, 5, 9} is **[1]**

   a) {1, 2, 5, 9}
   b) {4, 5, 6}
   c) {3, 5, 9}
   d) {2, 3, 5}

7. Number of relations that can be defined on the set A = {a, b, c, d} is **[1]**

   a) 24
   b) $_4{}^4$
   c) 16
   d) $_2{}^{16}$

8. Let A = {1, 2, 3} and consider the relation R = {1, 1), (2, 2), (3, 3), (1, 2), (2, 3), (1,3)}. Then R is **[1]**

   a) neither symmetric, nor transitive
   b) symmetric and transitive
   c) reflexive but not symmetric
   d) reflexive but not transitive

9. The minimum value of sin x + cos x is **[1]**

a) $-2\sqrt{2}$ b) $\sqrt{2}$

c) 0 d) $-\sqrt{2}$

10. R = {(1, 1), (2, 2), (1, 2), (2, 1), (2, 3)} be a relation on A, then R is **[1]**

a) not anti symmetric b) symmetric

c) anti symmetric d) Reflexive

11. If f (x) $= \frac{\sin^4 x+\cos^2 x}{\sin^2 x+\cos^4 x}$ for x $\in R$ then f (2002). **[1]**

a) 2 b) 3

c) 4 d) 1

12. The domain of definition of the function f(x) = $\sqrt{\frac{x-2}{x+2}} + \sqrt{\frac{1-x}{1+x}}$ is **[1]**

a) ϕ b) None of these

c) [-1, 1] d) $(-\infty, -2] \cup [2, \infty)$

13. Let $A = \{x \in R : -1 \leq x \leq 1\} = B$ and $C = \{x \in R : x \geq 0\}$ and let S = {(x, y) $\in$ A $\times$ B : $x^2 + y^2 = 1$} **[1]**
and S_0 = {(x, y) $\in$ A $\times$ C : $x^2 + y^2 = 1$}. Then

a) S defines a function from A to C b) S_0 defines a function from A to B

c) S_0 defines a function from A to C d) S defines a function from A to B

14. If 5 cot θ = 4, then $\left(\frac{5\sin\theta-3\cos\theta}{\sin\theta+2\cos\theta}\right)$ = ? **[1]**

a) 1 b) $\frac{3}{14}$

c) $\frac{5}{14}$ d) $\frac{3}{4}$

15. $\sqrt{\frac{1+\sin x}{1-\sin x}}$ = ? **[1]**

a) $\cot\frac{x}{2}$ b) $\tan\frac{x}{2}$

c) $\tan\left(\frac{\pi}{4}+\frac{x}{2}\right)$ d) $\cot\left(\frac{\pi}{4}+\frac{x}{2}\right)$

16. If $0 < x < \frac{\pi}{2}$, and if $\frac{y+1}{1-y} = \sqrt{\frac{1+\sin x}{1-\sin x}}$, then y is equal to **[1]**

a) $\cot\frac{x}{2} - \tan\frac{x}{2}$ b) $\cot\frac{x}{2}$

c) $\cot\frac{x}{2} + \tan\frac{x}{2}$ d) $\tan\frac{x}{2}$

17. sec $\left(\frac{-33\pi}{4}\right)$ = ? **[1]**

a) $\frac{-\sqrt{3}}{2}$ b) $-\sqrt{2}$

c) $\sqrt{2}$ d) $\frac{\sqrt{3}}{2}$

18. sin 36° = ? **[1]**

a) None of these b) $\frac{\sqrt{10-2\sqrt{5}}}{4}$

c) $\frac{(\sqrt{5}-1)}{4}$ d) $\frac{\sqrt{10+2\sqrt{5}}}{4}$

19. ($8\cos^3 20° - 6\cos 20°$) = ? **[1]**

a) $\frac{5}{3}$ b) $\frac{5}{2}$

c) $\frac{\sqrt{3}}{2}$ d) 1

20. If tan $\alpha = \frac{x}{x+1}$ and tan $\beta = \frac{1}{2x+1}$, then $\alpha + \beta$ is equal to **[1]**

a) $\frac{\pi}{6}$ b) $\frac{\pi}{3}$

c) $\frac{\pi}{4}$ d) $\frac{\pi}{2}$

21. Let A = {a, b}, B = {a, b, c}. Is A $\subset$ B? What is A $\cup$ B? **[1]**

22. Are the A = {-2, -1, 0} and B = {1, 2, 3} pairs of equivalent sets? **[1]**

23. Write down the subsets of the set: F = {2, {3}} **[1]**

24. If A = {x : x $\in$ W, x < 2}, B = {x : x N, 1 < x < 5} and C = {3, 5}. Find $\mathbf{A} \times (\mathbf{B} \cup \mathbf{C})$. **[1]**

25. If the function t which maps temperature in degree Celcius into temperature in degree Fahrenheit is defined by t(C) = $\frac{9C}{5}$ + 32, then find the value of C, when t(C) = 212. **[1]**

26. Let f : R $\rightarrow$ R: f(x) = x^3 + 1 and g : R $\rightarrow$ R : g(x) = (x + 1). Find: $\left(\frac{1}{f}\right)(x)$ **[1]**

27. If f (x) = $\begin{cases} x^2, \text{ when } x < 0 \\ x, \text{ when } 0 \leq x < 1 \\ \frac{1}{x}, \text{ when } x > 1 \end{cases}$ Find f(1). **[1]**

28. If A = [1, 3, 5] and B = [2, 3], then find A $\times$ B **[1]**

29. Let A = {1, 2} and B = {2, 3}. Then, write down all possible subsets of $A \times B$. **[1]**

30. A function f: R $\rightarrow$ R is defined by f (x) = x^2, x $\in$ R. Determine range of f. **[1]**

31. Prove that: $\sqrt{\frac{1-\sin x}{1+\sin x}} + \sqrt{\frac{1+\sin x}{1-\sin x}} = \begin{cases} \frac{2}{\cos x}, \text{ if } 0 \leq x < \frac{\pi}{2} \\ -\frac{2}{\cos x}, \text{ if } \frac{\pi}{2} < x \leq \pi \end{cases}$. **[1]**

32. Prove that $\cos(70^\circ + \theta)\cos(10^\circ + \theta) + \sin(70^\circ + \theta)\sin(10^\circ + \theta) = \frac{1}{2}$ **[1]**

33. Find the radius of the circle in which a central angle of 60° intercepts an arc of length 37.4 cm (use $\pi = \frac{22}{7}$). **[1]**

Section B

34. If A = $\{\frac{1}{x} : x \in N \text{ and } x < 8\}$ and B = $\{\frac{1}{2x} : x \in N \text{ and } x \leq 4\}$, find: A $\cup$ B **[2]**

35. Let A = {a, b, c, d}, B = {a, b, c} and C = {b, d}. Find all sets X such that: X $\subset$ A and X $\not\subset$ B. **[2]**

36. Prove that A $\cap$ (A $\cup$ B)' = ϕ. **[2]**

37. Let X = {1, 2, 3, 4, 5, 6}. If n represent any member of X, express the set n + 5 = 8 **[2]**

38. Let A = {0, 1, 2, 3, 4, 5, 6, 7, 8} and let R = {(0, b): a, b $\in$ A and 2a + 3b = 12}. Express R as a set of ordered pairs. Show that R is a binary relation on A. Find its domain and range. **[2]**

39. Find the domain and the range of the real function: f(x) = $\frac{3x-2}{x+2}$ **[2]**

40. Let A = {1, 2, 3, 4, 5, 6}. Let R be a relation on A defined by R = {(a, b): a,b $\in$ A, b is exactly divisible by a}. Find the domain of R. **[2]**

41. The function F(x) = $\frac{9x}{5}$ + 32 is the formula to convert x°C to Fahrenheit units. Find: the value of x when f(x) = 212,

Interpret the result in each case.

Hint: F(x) = 212 $\Rightarrow$ $\frac{9x}{5}$ + 32 = 212 $\Rightarrow$ x = 100 $\Rightarrow$ 212°F = 100°C. **[2]**

42. If θ lies in the first quadrant and cos $\theta = \frac{8}{17}$, then find the value of **[2]**

cos (30° + θ) + cos (45° – θ) + cos (120° – θ).

43. In $\triangle$ABC prove that, if θ be any angle, then b cosθ = c cos (A - θ) + a cos (C + θ). **[2]**

44. Prove that: a sin A - b sin B = c (A - B) **[2]**

45. Show that: sin (B - C) cos (A - D) + sin (C - A) cos (B - D) + sin (A - B) cos (C - D) = 0. **[2]**

Section C

46. For any sets A and B show that **[3]**

i. $(A \cap B) \cup (A - B) = A$

ii. $A \cup (B - A) = A \cup B$

47. Which of the following sets are equal ? **[3]**

i. A = {1, 2, 3}

ii. B = $\{x \in R : x^2 - 2x + 1 = 0\}$

iii. C = {1, 2, 2, 3}

iv. D = $\{x \in R : x^3 - 6x^2 + 11x - 6 = 0\}$

48. Let A, B and C be three sets such that $A \cup B = C$ and $A \cap B = \phi$ then prove that A = C - B. **[3]**

49. Out of 25 members in a family, 12 like to take tea, 15 like to take coffee and 7 like to take coffee and tea both. **[3]**
How many like

i. at least one of the two drinks

ii. only tea but not coffee

iii. only coffee but not tea

iv. neither tea nor coffee

50. Consider the real function $f : R \to R : f(x) = x + 5$ for all $x \in R$. Find its domain and range. Draw the graph of this function. **[3]**

51. Draw the graph of the function f(x) = $\begin{cases} 1 + 2x & x < 0 \\ 3 + 5x, & x \geq 0 \end{cases}$. Also, find its range. **[3]**

52. Find the domain and the range of the function f(x) = $\sqrt{16 - x^2}$ **[3]**

53. The relation f is defined by $f(x) = \begin{cases} x^2, 0 \leq x \leq 3 \\ 3x, 3 \leq x \leq 10 \end{cases}$ and the relation g is defined by **[3]**
$g(x) = \begin{cases} x^2, 0 \leq x \leq 2 \\ 3x, 2 \leq x \leq 10 \end{cases}$. Show that f is a function and g is not a function.

54. In ΔABC, if a^2, b^2, c^2 are in A.P., prove that cot A, cot B, cot C are in A.P. **[3]**

55. Prove that: $\left|\cos x \cos\left(\frac{\pi}{3} - x\right) \cos\left(\frac{\pi}{3} + x\right)\right| \leq \frac{1}{4}$. For all values of x. **[3]**

56. Prove that: $\sin^2 42^o - \cos^2 78^o = \frac{\sqrt{5}+1}{8}$. **[3]**

Section D

57. **Read the text carefully and answer the questions:** **[4]**

A class teacher Mamta Sharma of class XI write three sets A, B and C are such that A = {1, 3, 5, 7, 9}, B = {2, 4, 6, 8} and C = {2, 3, 5, 7, 11}.

(i) Write the intersecting of two set A and C?

(ii) Write the condition for two sets A and B to be disjoint?

(iii) Find $A \cap C$.

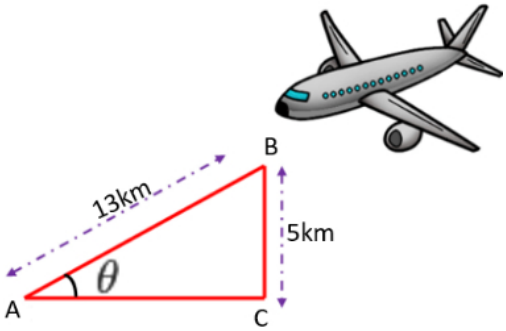
(iv) Find $A \cap B$.

Section E

58. **Read the text carefully and answer the questions:** **[5]**

An airplane is observed to be approaching a point that is at a distance of 13 km from the point of observation and makes an angle of elevation of θ and the height of the airplane above the ground is 5km. Based on the above

information answer the following questions.



(i) The value of $\sin 2\theta$

a) $\sin 2\theta = \frac{10}{13}$ b) $\sin 2\theta = \frac{120}{169}$

c) $\sin 2\theta = \frac{119}{169}$ d) $\sin 2\theta = \frac{10}{144}$

(ii) The value of $\cos 2\theta$

a) $\cos 2\theta = \frac{120}{169}$ b) $\cos 2\theta = -\frac{120}{169}$

c) $\cos 2\theta = \frac{119}{169}$ d) $\cos 2\theta = -\frac{119}{169}$

(iii) The value of $\sin\left(\frac{\theta}{2}\right)$

a) $\sin\frac{\theta}{2} = -\frac{1}{\sqrt{26}}$ b) $\sin\frac{\theta}{2} = \frac{5}{\sqrt{26}}$

c) $\sin\frac{\theta}{2} = -\frac{5}{\sqrt{26}}$ d) $\sin\frac{\theta}{2} = \frac{1}{\sqrt{26}}$

(iv) The value of $\cos\left(\frac{\theta}{2}\right)$

a) $\cos\frac{\theta}{2} = -\frac{5}{\sqrt{26}}$ b) $\cos\frac{\theta}{2} = \frac{1}{\sqrt{26}}$

c) $\cos\frac{\theta}{2} = -\frac{1}{\sqrt{26}}$ d) $\cos\frac{\theta}{2} = \frac{5}{\sqrt{26}}$

(v) The value of $\cot 2\theta$

a) $\cot 2\theta = \frac{144}{120}$ b) $\cot 2\theta = \frac{25}{120}$

c) $\cot 2\theta = \frac{120}{119}$ d) $\cot 2\theta = \frac{119}{120}$

59. If A = {4, 5, 6, 7, 8, 10}, B = {4, 5, 9} and C = {1, 4, 6, 9}, then verify that **[5]**

i. $(A \cap B) \cap C = A \cap (B \cap C)$

ii. $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

iii. $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

60. If U = {a, b, c, d, e, f} , A = {a, b,c}, B = {c, d, e, f} , C = {c, d, e} and D = {d, e, f}, then tabulate the following sets: **[5]**

i. A ∩ D

ii. A ∩ C

iii. U ∩ D

iv. $A \cup \phi$

v. $(U \cap \phi)'$

vi. (U ∪ A)'

61. i. Let R be the relation on the set Z of all integers defined by R = {(x, y): x - y is divisible by n}. Prove that **[5]**

a. (x, y) ∈ R

⇒ (y, x) ∈ R for all x, y ∈ Z.

b. (x, y) ∈ R and (y, z) ∈ R

⇒ (x, z) ∈ R for all x, y, z ∈ Z.

ii. Find the domain and range of the function $f(x) = \frac{x^2-9}{x-3}$.

iii. Find the domain of the function $f(x) = \frac{x^2+3x+5}{x^2+x-6}$.

62. Let A = R – {3} and B = R- {1}. Consider the function of f: A $\rightarrow$ B defined by f(x) = $\frac{x-2}{x-3}$ is one – one and onto. **[5]**

63. If A = {2, 3, 5} and B = {5, 7}, find: **[5]**

i. $A \times B$

ii. $B \times A$

iii. $A \times A$

iv. $B \times B$

64. If A = {a,d}, B = {b, c, e} and C = {b, c, f}, then verify that **[5]**

i. A×(B ∪ C) = (A×B) ∪ (A×C)

ii. A×(B ∩ C) = (A×B) ∩ (A×C)

65. Verify whether tan x tan$\left(x + \frac{\pi}{3}\right)$ + tan x tan$\left(\frac{\pi}{3} - x\right)$ + tan$\left(x + \frac{\pi}{3}\right)$ tan$\left(x - \frac{\pi}{3}\right)$ = -3. **[5]**

66. Prove that: tan 20° tan 30° tan 40° tan 80° = 1 **[5]**

67. Prove that: cos 10° cos 30° cos 50° cos 70° = $\frac{3}{16}$. **[5]**

68. If sinα + sinβ = a and cosα + cosβ = b, prove that cos(α - β)= $\frac{a^2+b^2-2}{2}$. **[5]**