CLASS XII
SAMPLE PAPER
MATHS

Relation &function(XII) sheet 1(1+4=5)

1. Let A = {3, 5} and B = {7, 11}. And R = {(a, b): a $\in A$ and $b \in B$, a – b is odd}, then show that R is an empty relation.
2. Prove that a relation **R** on the set **Z** of all integers defined by: (x, y) $\in R$ ⇔ x – y is divisible by 4 is an equivalence relation on Z.
3. Let * be the binary operation ,defined as a*b = Max (a,b) then find 7*14.
4. binary operation   Show that f : R – (-1) ⟶R –(-1) given by f(x) = x/x+1 is invertible
5. 5.Let * be a defined by a * b =2a+b Is * associative?
6. If $f: R \to R$ is defined by $f(x) = x^2 - 2x + 3$, write the value of $f(f(x))$.
7. How many relations can be defined from a non- empty sets **A** to B if n(A)=2and n(B)=3
8. Consider the binary operation *** : *R x R →R*** and **O: *R x R →R*** defined **a * b = |a - b|** and **a o b = a** for all a, b ε R. Show that * is commutative but not associative, **O** is associative but not commutative. Further, show that for all a, b, c ε R, **a* (b o c) = (a * b) o (a * c).** Does **O** distributes over *? Justify your answer.
9. Show that the binary operation $*$ defined by a*b = ab + 1 on Q is commutative.
10. Consider $f:\{1,2,3\} \to \{a,b,c\}$ and $g:\{a,b,c\} \to \{apple, ball, cat\}$ defined by f(1) = a, f(2) = b , f(3) = c , g(a) = apple , g(b) = ball , g(c) = cat. Show that f, g and gof are invertible. Find out f^{-1} , g^{-1} and
11. Show that operation * on Q – {1},defined by a * b = a + b – ab for all a, b $\in$ Q – {1} satisfies (i) the closure property, (ii) the associative property (iii) the commutative property (iv) What is the identity element? (v) For each a $\in$ Q – {1}, find the inverse of a.

12. Consider f : R→ $[-5, \infty)$ given by f(x) = 9x^2+6x-5. Show that f is Invertible. Find the inverse of f.

If the function f : **R** → **R** defined by $f(x) = 2x^3 + 7$,Prove that f is one-one and onto function. Also find the inverse of the function f and $f^{-1}(23)$

13 If $f(x) = \dfrac{4x+3}{6x-4}$, find $f_0 f(x)$

14 Let A = N x N and * be the binary operation on A defined by (a, b) * (c, d) = (a + c , b + d). Show that * is commutative and associative. Find the identity element for * on A, if any.

15 Give an example to show that the relation R in the set of natural numbers, defined by $R = \{(x, y), x, y \in N, x \le y^2\}$ is not transitive.

16 Let N be the set of all natural numbers and R be the relation on N × N defined by (a ,b) R (c ,d)if ad = bc. Show that R is an equivalence relation.

17 Give an example of a relation which is reflexive and transitive but noT Symmetric;

18. *Check whether the operator* $\oplus$ *defined by* $a \oplus b = a + b - ab$ *is commutative and associative*

19 show that the function f:R→R given by $f(x)=x^3+x$ is a bijection

20 show that the function $f(n)=n-(-1)^n$ $\forall n \in N$ is a bijection

21 if $f(x)=e^x$ and $g(x)=\log x (x>0)$ find *fog* , *gof* is *fog=gof*

22 if $f(x)=\sqrt{x}(x\geq 0)$ and $g(x)=x^2-1$are two real function find *fog* , *gof* is *fog=gof*

Example 41 If R_1 and R_2 are equivalence relations in a set A, show that $R_1 \cap R_2$ is also an equivalence relation.

Example 48 Show that the number of equivalence relation in the set {1, 2, 3} containing (1, 2) and (2, 1) is two.

9. Given a non-empty set X, consider the binary operation $*: P(X) \times P(X) \to P(X)$ given by $A * B = A \cap B$ $\forall A, B$ in P(X), where P(X) is the power set of X. Show that X is the identity element for this operation and X is the only invertible element in P(X) with respect to the operation $*$.