Sets Formative assessment Mathematics

Fill in the blank

(a) If A = {1, 3, 5, 7, 9} and B = {2, 3, 5, 7}, Then A ∪ B is …….

(b) The sets A and B are having elements 10 and 8,n(A∩B) =2, the n(A∪B) is …..

(c) A set Z contains 4 elements, and then the number of elements in the Power set of Z will be……

(d) The set Z={x: x^2 -3=0,x is a rational number) is an…….set

True or False statement

(1) Set of odd natural numbers divisible by 2 is a null set
(2) Set of even prime numbers is not an null set
(3) {*x*:*x* is a natural numbers, *x* < 4 and *x* > 11 } is an infinite set
(4) {*y*:*y* is a point common to any two parallel lines} is an infinite set
(5) The set of months of a year is a finite set
(6) {0,1, 2, 3 ...} is a finite set
(7) {1, 2, 3 ... 999} is an infinite set
(8) The set of positive integers greater than 99 is an infinite set
(9) The set of lines which are parallel to the *y*-axis is an infinite set
(10) The set of letters in the English alphabet is a finite set
(11) The set of natural numbers under 200 which are multiple of 7 is finite set
(12) The set of animals living on the earth is a finite set
(13) The set of circles passing through the origin (0, 0) is a finite set
(14) The set A = {-2, -3}; B = {*x*: *x* is solution of $x_2 + 5x + 6 = 0$} are equal sets
(15) The set P = {*x*: *x* is a letter in the word FOLLOW}; Q = {*y*: *y* is a letter in the word WOLF} are not equal sets
(16) {2, 3, 4} ⊂ {1, 2, 3, 4, 5}
(17) {*a*, *b*, *c*}⊄ {*b*, *c*, *d*}
(18) {*x*: *x* is a student of Class X of your school} ⊄ {*x*: *x* student of your school}
(19) {*x*: *x* is a square in the plane} ⊄ {*x*: *x* is a rectangle in the same plane
}
(20) {*p*: *p* is a triangle in a plane} ⊂{*p*: *p* is a rectangle in the plane}
(21) {*x*: *x* is an equilateral triangle in a plane} ⊂ {*x*: *x* is a triangle in the same plane}
(22) {*y*: *y* is an odd natural number} ⊂ {*y*: *y* is an integer}
(23) {*a*, *b*} ⊄ {*b*, *c*, *a*}
(24) {*a*, *e*} ⊂ {*p*: *p* is a vowel in the English alphabet}
(25) {1, 2, 3} ⊂{1, 3, 5}
(26) {*p*} ⊂ {*p*, *q*, *s*}
(27) {*a*} ∈ (*1*, *2*, *3*)

(28) $\{x: x \text{ is an even natural number less than } 6\} \subset \{x: x \text{ is a natural number which divides } 36\}$
(29) If $x \in A$ and $A \in B$, then $x \in B$
(30) If $A \subset B$ and $B \in C$, then $A \in C$
(31) If $A \subset B$ and $B \subset C$, then $A \subset C$
(32) If $A \not\subset B$ and $B \not\subset C$, then $A \not\subset C$
(33) If $x \in A$ and $A \not\subset B$, then $x \in B$
(34) If $A \subset B$ and $x \notin B$, then $x \notin A$

Solutions

1) T
2) T
3) F
4) F
5) T
6) F
7) F
8) T
9) T
10) T
11) T
12) T
13) F
14) T
15) F
16) T
17) T
18) F
19) F
20) F
21) T
22) T
23) F
24) T
25) F
26) T
27) F
28) T
29) F
30) F
31) T
32) F
33) F
34) T

Subjective Questions

Write the following sets in roster form:

(1) U = {x: x is an integer and $-10 < x < 10$}.
(2) V = {x: x is a natural number less than 18}.
(3) W = {x: x is a two-digit natural number such that the sum of its digits is 9}
(4) X = {x: x is a prime number which is divisor of 90}.
(5) Y= The set of all letters in the word MATHEMATICS.
(6) Z= The set of all letters in the word INTEGRATION.

Linked Type comprehension

If U = {1,2,3, 5, 7, 9, 11}, V = {7, 9, 11, 13}, W = {11, 13, 15} and X = {15, 17,19,21,23}; find
(i) U ∩ V
(ii) V ∩ W
(iii) U ∩ W ∩ X
(iv) U ∩ W
(v) V ∩ X
(vi) U ∩ (V ∪ W)
(vii) U ∩ X
(viii) U ∩ (V ∪ X)
(ix) (U ∩ V) ∩ (V ∪ W)
(x) (U ∪ X) ∩ (V ∪ W)

If A = {3, 6, 9, 12, 15, 18, 21}, B = {4, 8, 12, 16, 20},
C = {2, 4, 6, 8, 10, 12, 14, 16}, D = {5, 10, 15, 20}; find
(i) A – B
(ii) A – C
(iii) A – D
(iv) B – A
(v) C – A
(vi) D – A
(vii) B – C
(viii) B – D
(ix) C – B
(x) D – B
(xi) C – D

Subjective Questions

1) In a group of 400 people in USA, 250 can speak Spanish and 200 can speak English. How many people can speak both Spanish and English?

Solution
Let S be the set of people who speak Spanish, and
E be the set of people who speak English
∴ n(S ∪ E) = 400, n(S) = 250, n(E) = 200
n(S ∩ E) = ?

We know that:
$n(S \cup E) = n(S) + n(E) - n(S \cap E)$
$\therefore\ 400 = 250 + 200 - n(S \cap E)$
$\Rightarrow 400 = 450 - n(S \cap E)$
$\Rightarrow n(S \cap E) = 450 - 400$
$\therefore\ n(S \cap E) = 50$
Thus, 50 people can speak both Spanish and English.

2) If P and Q are two sets such that P has 40 elements, P ∪Q has 60 elements and P ∩Q has 10 elements, how many elements does Y have?

Solution

It is given that:
$n(P) = 40$, $n(P \cup Q) = 60$, $n(P \cap Q) = 10$
We know that:
$n(P \cup Q) = n(P) + n(Q) - n(P \cap Q)$
$\therefore\ 60 = 40 + n(Q) - 10$
$\therefore\ n(Q) = 60 - (40 - 10) = 30$
Thus, the set Q has 30 elements.

Subjective question on number of elements

(a) U={x: x is positive integer less than 1000 and divisible by 7} , n(U) =?
(b) V={x: x is positive integer less than 1000 and divisible by 7 but not by 11} , n(V)=?
(c) P={x: x is positive integer less than 1000 and divisible by 7 and 11} , n(P)=?
(d) Q={x: x is positive integer less than 1000 and divisible by either 7 or 11} , n(Q)=?
(e) A={x: x is positive integer less than 1000 and divisible by exactly one of 7 or 11} , n(A)=?
(f) B={x: x is positive integer less than 1000 and divisible by neither 7 nor 11} , n(B)=?
(g) C={x: x is positive integer less than 1000 and have distinct digits} , n(C)=?
(h) D={x: x is positive integer less than 1000 and have distinct digits and even} , n(D)=?

Solutions

a) 142
b) 130
c) 12
d) 220
e) 208
f) 779
g) 738
h) 373