1. .A ⊆ B 🡨🡪 { x ∈ A 🡪 x ∈ B}

So, C ⊆ D 🡨🡪 { x ∈ C 🡪 x ∈ D}

We want to show A x C ⊆ B x D.

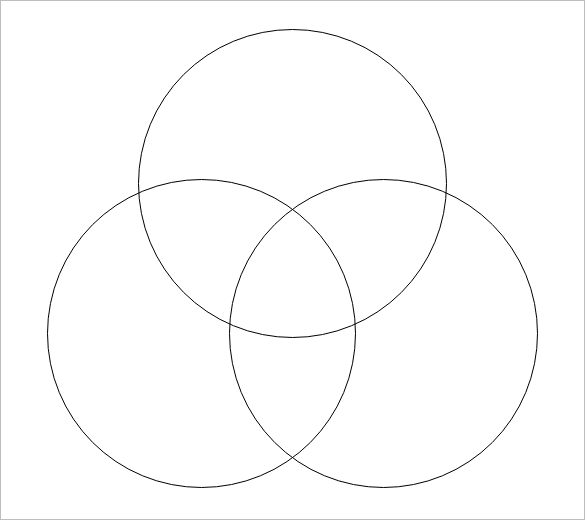
So, (y, z) ∈ A x C 🡪 (y, z) ∈ B x D

(y, z) ∈ A x C implies that {y ∈ A} Λ {y ∈ C}

Which means {y ∈ B} Λ {y ∈ D} because A ⊆ B and C ⊆ D

Therefore, it’s proved that A x C ⊆ B x D

1. Venn Diagram of (B – A) ∪ (C – A)

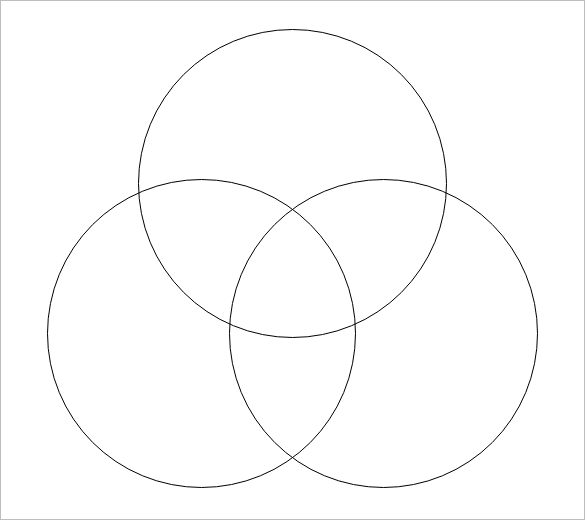


C

A

B

Venn Diagram for (B ∪ C) - A



C

B

A

1. (B – A) ∪ (C – A) = (B ∪ C) – A

Iff argument

Iff (B – A) ∪ (C – A)

Iff x ∈ (B – A) V x ∈ (C – A) Definition of Union

Iff (x ∈ B x ∈ ) V (x ∈ C x ∈ ) Definition of intersection

Iff (x ∈ B V x ∈ C) x ∈

Iff (x ∈ (B V C)) x ∈

Iff (B ∪ C) – A

Logical equivalences

(B ∪ C) – A

(B – A) ∪ (C – A)

1. (a) if A – C = B – C then A = B

A = {1, 2, 3}

B = {2, 3}

C = {1}

A – C = {2, 3}

B – C = {2, 3}

Therefore, the statement is wrong because A – C and B – C both share the same elements but A ≠ B.

(b) if A ∩ C = B ∩ C then A = B

A = {1, 2, 3}

B = {2, 3, 4}

C = {2, 3}

A ∩ C = {2, 3}

B ∩ C = {2, 3}

Therefore, the statement is wrong because A ∩ C and B ∩ C both share the same elements but A ≠ B.

1. Prove that if A − C = B − C and A ∩ C = B ∩ C then A = B.

To proof that A - C = B - C and A ∩ C = B ∩ C then A = B. Let A and B be sets.

Let’s try to prove that if , then . We can assume that , and to conclude that . There are two cases now which are either .

Case 1

If , we assume that , . Since we can conclude that . Hence . Therefore, .

Case 2

If , we assume that , . Since we can conclude that . Hence . Therefore, .

Both of these cases show that . Hence,

Let’s assume the other way, if , then . With the two cases now, which are either .

Case 1

If , we assume that , . Since we can conclude that . Hence . Therefore, .

Case 2

If , we assume that , . Since we can conclude that . Hence . Therefore, .

Both of these cases show that . Hence,

We have shown that , by the definition of equivalency which is If . (This proves ). If  . (This proves ).

(1)

(2)

(1) (2)

Q.E.D

1. f: Z+ 🡪 Z+

f(n) = 5n + 12

f(y) = 5y + 12

f(n) = f(y)

5n + 12 = 5y + 12

5n = 5y

n = y

Therefore, it is one-to-one

f(n) = 5n + 12

Let 5n + 12 = 0

5n = -12

n =

Therefore, f is not onto because domain and co-domain supposed to be positive integers and n is not positive nor integer in this case.

1. f(m, n) = 3mn for f: R x R 🡪 R

Therefore, it is onto because inverse of it gives 1 value only

f(m, n) = 3mn

f(-2, -2) = 3(-2)(-2) = 12

f(2, 2) = 3(2)(2) = 12

f(-2, -2) and f(2, 2) both have different values of m and n but both the equations have the same result. There, it is not one-to-one.