

Name  
Class

Ali Akbar  
BSCS - 5C  
21-Arid-541

1) All humans are mortal

$$\forall x (\text{Human}(x) \rightarrow \text{Mortal}(x))$$

2) Some birds can fly.

$$\exists x (\text{Bird}(x) \wedge \text{CanFly}(x))$$

3) Every student likes mathematics

$$\forall x (\text{Student}(x) \rightarrow \text{Likes}(x, \text{Mathematics}))$$

4) There is a car that is red.

$$\exists x (\text{Car}(x) \wedge \text{Red}(x))$$

5) No cats can swim.

$$\forall x (\text{Cat}(x) \rightarrow \neg \text{Swim}(x))$$

6) Every parent loves their child.

$$\forall x (\text{Parent}(x) \rightarrow \exists y (\text{ChildOf}(y, x) \wedge \text{Love}(x, y)))$$

7) Some apples are green.

$$\exists x (\text{Apple}(x) \wedge \text{Green}(x))$$

8) All triangles have three sides.

$$\forall x (\text{Triangle}(x) \rightarrow \text{HasSides}(x, 3))$$

9) All dogs are loyal

$$\forall x (\text{Dog}(x) \rightarrow \text{Loyal}(x))$$

10) There is a book that was written by an author

$$\exists x \exists y (\text{Book}(x) \wedge \text{Author}(y) \wedge \text{WrittenBy}(x, y))$$

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# Assignment No 01

Mamoona Asif

BSCS 5C EVE

21-ARID-592

10 Sentences in first order logic.

All humans are mortal

$$\forall x : \text{human}(x) \rightarrow \text{mortal}(x)$$

Some birds can fly

$$\exists x : \text{Birds}(x) \rightarrow \text{can\_fly}(x)$$

Every student like chocolate

$$\forall x : \text{Student}(x) \rightarrow \text{Likes}(x, \text{chocolate})$$

There exists a car that is red

$$\exists x : \text{Car}(x) \wedge \text{Red}(x)$$

Some mammals are carnivores

$$\exists x : \text{Mammal}(x) \wedge \text{carnivores}(x)$$

For every book , there exists an author

$$\forall x : \exists y \text{ Book}(x) \rightarrow \text{author}(y, x)$$

21-ARD-548

Alveena Taj

BSCS SC

1. Anyone whom Mary loves is a football player  
 $\forall x : \text{loves}(\text{Mary}, x) \rightarrow \text{Football Player}(x)$

2. John is a child  
 $\text{child}(\text{John})$

3. Every child loves Santa.  
 $\forall x : \text{child}(x) \rightarrow \text{loves}(x, \text{Santa})$

4. Mary does not loves John.  
 $\neg \text{loves}(\text{Mary}, \text{John})$

5. John does not study  
 $\neg \text{study}(\text{John})$

6. Anyone who does not play is not a football star  
 $\forall x : \neg \text{play}(x) \rightarrow \neg \text{football star}(x)$

7. Any student who does not study does not pass.  
 $\forall x : \text{student}(x) \wedge \neg \text{study}(x) \rightarrow \neg \text{pass}(x)$

8. John is a student  
 $\text{student}(\text{John})$

\* Any student who does not pass, does not play.

$$\forall x : \text{Student}(x) \wedge \neg \text{Pass}(x) \rightarrow \neg \text{play}(x)$$

\* John is a student.

$$\text{Student}(\text{John})$$

\* Any student who does not study does not pass

$$\forall x : \text{Student}(x) \wedge \neg \text{Study}(x) \rightarrow \neg \text{Pass}(x)$$

\* Anyone who does not play is not a football star

$$\forall x : \neg \text{play}(x) \rightarrow \neg \text{football Star}(x)$$

\* John does not study.

$$\neg \text{Study}(\text{John})$$

\* Marry does not loves John.

$$\neg \text{Loves}(\text{Marry}, \text{John})$$

\* Every child loves Santa.

$$\forall x : \text{Child}(x) \rightarrow \text{Loves}(x, \text{Santa})$$

\* John is a child

$$\text{Child}(\text{John})$$

MUHAMMAD SOBAN HAMEED

21- ARID- 640

BSCS - AI

To: Sir Tariq

## FIRST ORDER LOGIC

1. All humans are mortal.
- $$\forall x (\text{Human}(x) \rightarrow \text{Mortal}(x))$$

2. Some birds can fly.

$$\exists x (\text{Bird}(x) \wedge \text{Can Fly}(x))$$

3. Every student loves their school.

$$\forall x (\text{Student}(x) \rightarrow \text{Loves}(x, \text{school}))$$

4. If it rains, the ground gets wet.

$$\text{Rainy}(x) \rightarrow \text{Wetground}(x)$$

5. Dogs Bark at strangers.

$$\forall x (\text{Dog}(x) \rightarrow \forall y (\text{stranger}(y) \rightarrow \text{Barks At}(x, y)))$$

Name AbdulRehman  
Section BSCS 5(c) AI  
Subject Knowledge base  
Assignment #1

Convert the sentences into first order logic

① All dogs bark.

$$\forall x : \text{Dog}(x) \rightarrow \text{Bark}(x)$$

② Some birds can fly.

$$\exists x : \text{Bird}(x) \rightarrow \text{Fly}(x)$$

③ Every student passed the exam

$$\forall x : \text{Student}(x) \rightarrow \text{passed}(x, y)$$

Exam (y)

④ There is a cat on the roof.

$$\exists x : \text{Cat}(x) \rightarrow \text{roof}(x)$$

⑤ No one is immortal

$$\forall x : \neg \text{Immortal}(x)$$

⑥ If it rains ground gets wet

$$\text{Rain}(x) \rightarrow \text{WetGround}(x)$$

⑦ All apples are fruits.

$$\forall x : \text{Apple}(x) \rightarrow \text{Fruit}(x)$$

Ali Ayaz

21-ARID-542

BS CS(5C)

Q Make sentence & convert it into first order logic.

1) Every Prime number is greater than 1.

$\forall x (\text{Prime}(x) \rightarrow \text{Greater Than}(x, 1))$

2) If it's a weekday, then people go to work.

$\text{Weekday}(x) \rightarrow \text{GoToWork}(\text{People})$

3) All triangles have 3 sides.

$\forall x (\text{Triangle}(x) \rightarrow \text{HasSides}(x, 3))$

4) There is a black cat and a white cat.

$\exists x (\text{BlackCat}(x)) \wedge \exists y (\text{WhiteCat}(y))$

5) No cats are dogs.

$\forall x (\text{Cat}(x) \rightarrow \neg \text{Dog}(x))$

6) Every student has a teacher.

$\forall x \exists y (\text{Student}(x) \wedge \text{Teacher}(y, x))$

7) All men are mortal, & Socrates is a man.

$\forall x (\text{Man}(x) \rightarrow \text{Mortal}(x))$ ,  $\text{Man}(\text{Socrates})$

8) If it's raining then the ground is wet.

$\text{Rain}(x) \rightarrow \text{WetGround}(x)$

9) Some birds can fly.

$\exists x (\text{Birds}(x) \wedge \text{CanFly}(x))$

10) All humans are mortal.

$\forall x (\text{Human}(x) \rightarrow \text{Mortal}(x))$

CLASS: BSCS SCC) Evening

Name : Ahsan Afzaq  
Arabic Name : احسان افذاق  
Roll No: 55

Date: \_\_\_\_\_

- Name: ~~Aman~~ Arun: 557728  
① Any nice girl does not date anyone who is a rough character.  
Fin: Hy: nice girl(n) \ rough character)  $\rightarrow$  ! date(c)  
② Mary is a nice girl and John is a biker.  
nice girl (Mary) \ biker (John),  
③ All pompeian were Romans  
Fin: pompeian(n)  $\rightarrow$  Roman(n)  
④ Caesar was a ruler  
ruler (Caesar),  
⑤ All Romans were either loyal to Caesar or hated him.  
Fin: Roman(n)  $\rightarrow$  loyal to (n, Caesar)  $\oplus$  hated (Caesar)

Name : M. Hassan

class : BSCS SC EVC

Roll no : 21-ARID-619

## 10 Question of First Order Logic

1- Every even number greater than 2 is divisible by 4 -

$$\forall n (\text{even}(n) \wedge n > 2 \rightarrow \text{divisible by } (n, 4))$$

2- All mammals are warm-blooded

$$\forall n (\text{mammals}(n) \rightarrow \text{warmblooded}(n))$$

3- Everyone loves someone

$$\forall n \exists y \text{ loves}(n, y)$$

4- Some prime numbers are greater than 1000

$$\exists n (\text{number}(n) \wedge n > 1000 \rightarrow \text{prime}(n))$$

5- A person can be teacher and student at the same time

$$\forall n (\text{person}(n) \rightarrow \text{teacher}(n) \wedge \text{student}(n))$$

6- Every dog bark

$$\forall n (\text{dog}(n) \rightarrow \text{bark}(n))$$

7- Are there any unbreakable objects

$$\exists n (\text{object}(n) \rightarrow \neg \text{breakable}(n))$$

MUHAMMAD ASIM SAQLAIN

BSCS 5C (eve) (AI)

Subject: Knowledge Representation

Q) Make 10 sentences and convert it into first order logic.

1) All humans are mortal.

$$\forall x (\text{Human}(x) \rightarrow \text{Mortal}(x))$$

2) Some birds can fly.

$$\exists x (\text{Birds}(x) \wedge \text{CanFly}(x))$$

3) If it's raining, then the ground is wet.

$$\text{Rain}(x) \rightarrow \text{WetGround}(x)$$

4) All men are mortal, and Socrates is a man.

$$\forall x (\text{Man}(x) \rightarrow \text{Mortal}(x)), \text{Man}(\text{Socrates})$$

5) Every Student has a teacher.

$$\forall x \exists y (\text{Student}(x) \wedge \text{Teaches}(y, x))$$

6) No cats are dogs.

$$\forall x (\text{Cat}(x) \rightarrow \neg \text{Dog}(x))$$

7) There is a black cat and a white cat.

$$\exists x (\text{BlackCat}(x)) \wedge \exists y (\text{WhiteCat}(y))$$

8) All triangles have three sides.

$$\forall x (\text{Triangle}(x) \rightarrow \text{HasSides}(x, 3))$$

9) If it's a weekday, then people go to work.

$$\text{Weekday}(x) \rightarrow \text{GoToWork}(\text{People})$$

10) Every Prime number is greater than 1.

$$\forall x (\text{Prime}(x) \rightarrow \text{GreaterThan}(x, 1))$$

01-Arid-605

subject: Knowledge Based  
Assignment # 1

Q 10 Examples of first order logic?

1 All humans are mortal.

$$\forall x (\text{Human}(x) \rightarrow \text{Mortal}(x))$$

2 Some birds can fly.

$$\exists x (\text{Bird}(x) \wedge \text{Canfly}(x))$$

3 Every student likes math.

$$\forall x (\text{student}(x) \rightarrow \text{likes}(x, \text{Math}))$$

4 There is a black cat.

$$\exists x (\text{cat}(x) \wedge \text{Black}(x))$$

5 No one is taller than the Eiffel Tower

Tower

$$\forall x \neg \text{Taller}(x, \text{Eiffel Tower})$$

6 Every parent loves their child.

$$\forall x \forall y (\text{parent}(x, y) \rightarrow \text{loves}(x, y))$$

7. Some apples are red.

$$\exists x \text{Apple}(x) \wedge \text{red}(x)$$

right angle.

$\exists x (\text{triangle}(x) \wedge \text{RightAngle}(x))$

10 No dogs can climb trees.

$\forall x (\text{Dog}(x) \rightarrow \neg \text{CanClimb}(x, \text{Tree}))$

Name: Nawaisa Yasin

Arid no: 21-Arid-653

QUESTION :-

Write ten sentences of first order logic.

Every man respect his parents.

$\forall x \forall y : \text{man}(x) \wedge \text{parents}(y) \rightarrow \text{respects}(x, y)$

Not all students like maths and science.

$\neg \forall x : \text{student}(x) \rightarrow \text{likes}(x, \text{maths}) \wedge \text{likes}(x, \text{science})$ .

Only one student failed in maths.

$\exists x : \text{student}(x) \rightarrow \text{failed}(x, \text{maths}) \wedge$

$\forall y : \neg(x = y) \wedge \text{student}(y) \rightarrow \neg \text{failed}(y, \text{maths})$

Bill takes either analyst or geometry.

takes (bill, analyst)  $\wedge$  takes (bill, geometry)

Some students love bill.

$\exists x : \text{student}(x) \wedge \text{love}(x, \text{bill})$

All graduating people are happy.

$\forall x : \text{people}(x) \rightarrow \text{happy}(x)$

All happy people smile.

$\forall x : \text{people}(x) \rightarrow \text{smile}(x)$

Someone is graduating.

$\exists x : \text{graduating}(x)$

Some boys play cricket.

$\exists x : \text{boys}(x) \wedge \text{play}(x, \text{cricket})$

Gorilla is Black.

$\text{Gorilla}(x) \rightarrow \text{black}(x)$ .

1) No reindeer is a clown.

$$\forall x: \text{reindeer}(x) \rightarrow \neg \text{clown}(x)$$

2) Every biker rides either Harley or BMW

$$\forall x: \text{biker}(x) \rightarrow \text{rides}(x, \text{Harley}) \vee \text{rides}(x, \text{BMW})$$

3) anyone who rides BMW is Yippie

$$\forall x: \text{rides}(x, \text{BMW}) \rightarrow \text{Yippie}(x)$$

4) John is a child

$$\exists x: \text{john}(x) \wedge \text{child}(x)$$

5) Life Saver is a Candy.

$$\text{Candy}(\text{life Saver})$$

6) Any girl does not date anyone who is a rough character

$$\forall x, \forall y: \text{nicegirl}(x) \wedge \text{rough character}(y) \rightarrow \neg \text{date}(x, y)$$

7) Rani likes all kind of food

$$\forall x: \text{food}(x) \rightarrow \text{likes}(\text{Rani}, x)$$

8) Every child loves Candy.

$$\forall x: \text{child}(x) \rightarrow \text{loves}(x, \text{candy})$$

$\forall x : \text{Birds}(x) \rightarrow \text{canfly}(x)$

No one can be younger than themselves.

$\forall x : \neg \text{Younger}(x, x)$

Some fruits are red or green.

$\exists x : \text{Fruits}(x) \wedge (\text{Red}(x) \vee \text{Green}(x))$

Every dog has tail

$\forall x : \text{Dog}(x) \rightarrow \text{tail}(x)$

Some books were written by famous authors.

$\exists x \exists y : \text{Books}(x) \wedge \text{authors}(y, x) \wedge \text{famous}(y)$

All Birds can either fly or swim.

$\forall x : \text{Birds}(x) \rightarrow \text{fly}(x) \vee \text{swim}(x)$

All squares are rectangle, but not all rectangles are squares.

$\forall x : \text{square}(x) \rightarrow \text{rectangle}(x)$

$\exists x : \text{rectangle}(x) \rightarrow \neg \rightarrow \text{square}(x)$

## BSCS 5C (Eve)

Write 10 examples of FOL

Ravi Likes all kind of Food

$$\forall x: \text{food}(x) \rightarrow \text{Likes}(\text{Ravi}, x)$$

Every child loves Santa

$$\forall x: \text{child}(x) \rightarrow \text{Loves}(x, \text{Santa})$$

Everyone who loves Santa loves any reindeers

$$\forall x, \forall y: \text{Loves}(x, \text{Santa}) \wedge \text{reindeer}(y) \rightarrow \text{Loves}(x, y)$$

Anything which has a red nose is weird or is a clown

$$\forall x: \text{rednose}(x) \rightarrow \text{weird}(x) \vee \text{clown}(x)$$

No reindeer is a clown

$$\forall x: \text{reindeer}(x) \rightarrow \neg \text{clown}(x)$$

Every bikes sicks either Hoxley or Bmw.

$$\forall x: \text{bikes}(x) \rightarrow \text{sicks}(x, \text{Hoxley}) \vee \text{sicks}(x, \text{Bmw})$$