SYLLOGISMS

Introduction
A syllogism is a kind of logical argument in which one proposition (the conclusion) is inferred from two others (the promises) of a certain form.

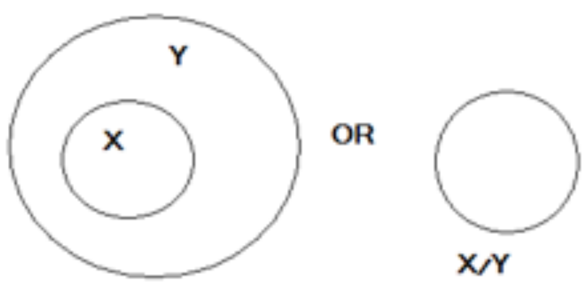
Ex: Consider the statement:

All men are humans; ……………. (1)
All humans are mammals; ……………. (2)

1. The above two statements are called premises.
2. 'Men' is the subject of premise-1. 'Humans' is the subject of premise-2.
3. 'Humans' is the predicate of premise-1. 'Mammals' is the predicate of premise-2.

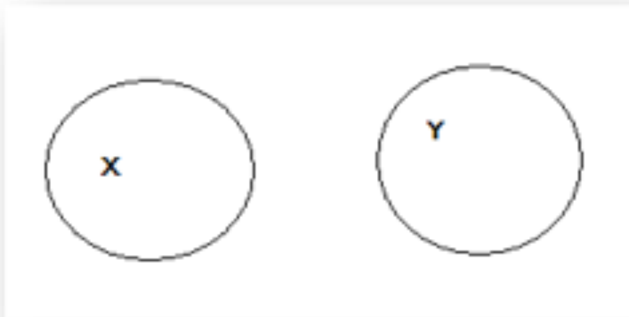
Special Note: Do not go to apply your common sense here. Just use the information given in the premises! Do not bother about the size of circles. Ignore the grammar.

Types of propositions
A. Categorical proposition
1. Universal Affirmative (UA):-
Ex: *All Xs are Ys.*
The above premise can be represented like below:



Immediate reference: *Some Ys are Xs*
Note: We cannot surely say: '*Some Ys are not Xs*'.

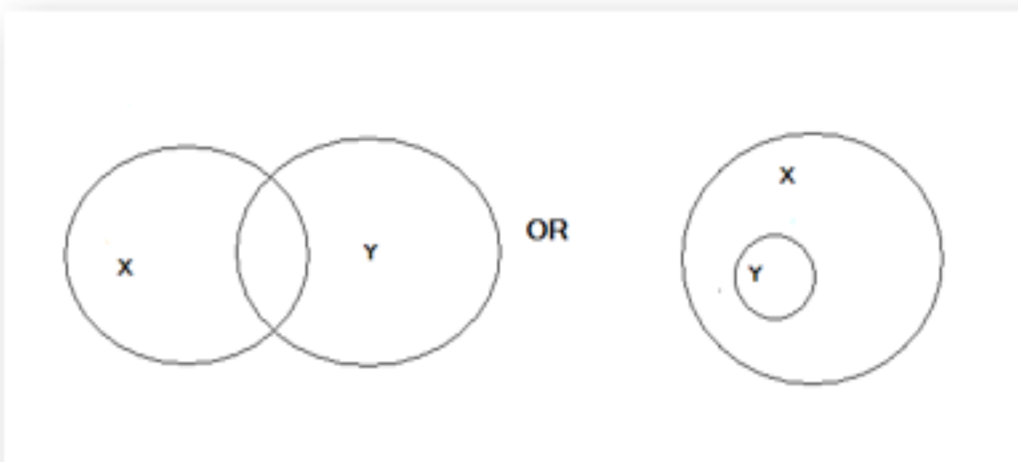
2. Universal Negative (UN):-
Ex: *No X is a Y*



Immediate reference: *No Y is an X*

Note: Some other qualifiers which indicate 'universal' premises are: 'every', 'each' and 'any'.

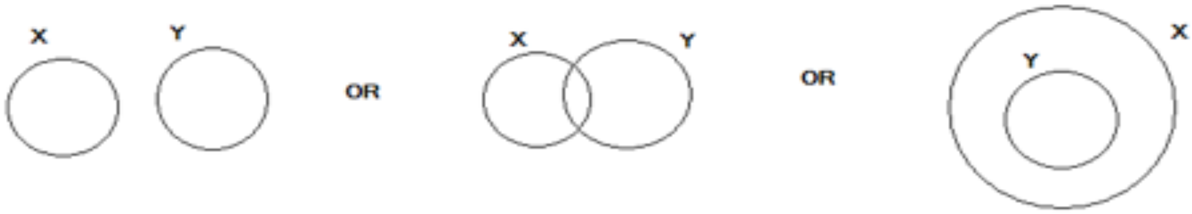
3. Particular affirmative (PA):-
Ex: *Some Xs are Ys*



Immediate references:
Some Ys are Xs
Some Xs are not Ys

Note: We cannot surely say: *Some Ys are not Xs.*

4. Particular Negative (PN):-
Ex: *Some Xs are not Ys* (Same as saying: *All X is not Y*)



Immediate reference: No immediate reference can be drawn in this case.

Special note to students: Do not assume anything what is not given. If it is given that '*Some Xs are not Ys*' should not make you consider '*Some Xs are Ys'.*

Note: Some other qualifiers which indicate 'negative' premises are: 'no', 'none' and 'not'.

Some important notes:
1. '*All Xs are not Ys'* is same as '*Some Xs are not Ys'.*
2. '*Only Xs are Ys'* is same as '*All Ys are Xs'*.
3. '*All students except one are present*' should be taken as '*Some students are present*'.
4. '*Most Xs are Ys*' implies '*Some Ys are Xs*'.

B. Hypothetical Argument

If '*X (occurs) then Y (occurs)'*
Implies
'*Not Y then not X*' [If Y has not occurred then I can say X has not occurred.]

Note:
- ➢ We cannot say '*If Y then X*'
- ➢ We cannot say '*If not X then not Y*'

C. Transitive property
Given: *If X, then Y*; *If Y then Z* implies *If X then Z*
Also implied is: *If not Z then not X*.

D. Embedded If-Then

1.
'*If X then Y1 and Y2*' implies '*If not (Y1 OR Y2) then not X*'.
(If Y1 or Y2 has not occurred, it means X has not occurred.)

2.
'*If X then Y1 or Y2*' implies '*If not (Y1 AND Y2) then not X*'.
(If both Y1 and Y2 have not occurred, it means X has not occurred.)

E. Some other types of propositions:

- *X only if Y* implies *If X then Y*.
- *X and Y cannot both …..* implies

  '*If X then not Y*' or '*If Y then not X*'.

- *X unless Y* implies *If not Y then X*

- The dilemma

  Either X or Y implies

  '*If not X then Y*'
  <u>And</u>
  '*If not Y then X*'

  (Two possible conclusions. Therefore the dilemma.)

We have seen enough theory. How do questions look like?

Example Questions:

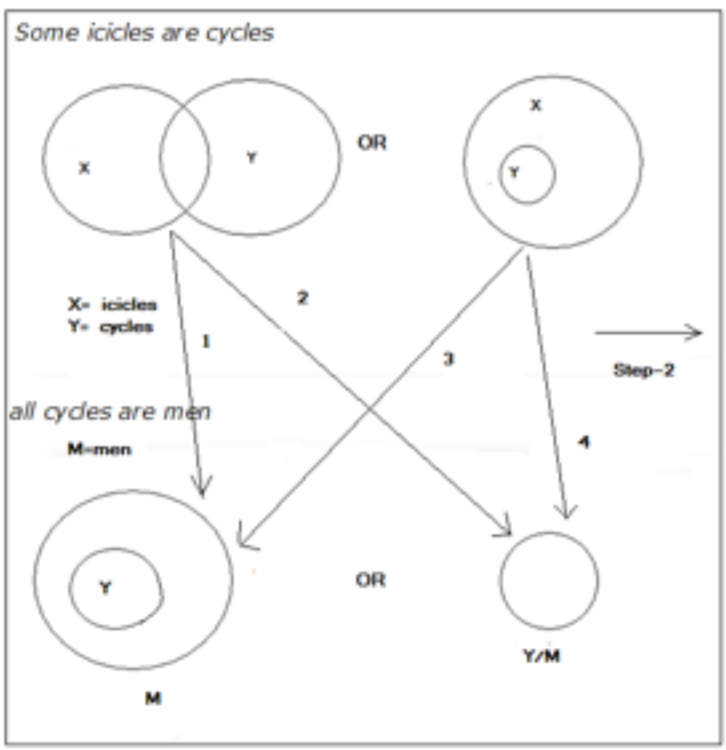
Q1. If *All men are humans*; *All humans are mammals*; are the following conclusions correct?

- All men are mammals. (Answer: Yes)
- All women are mammals. (Answer: No)
- All mammals are men. (Answer: No)

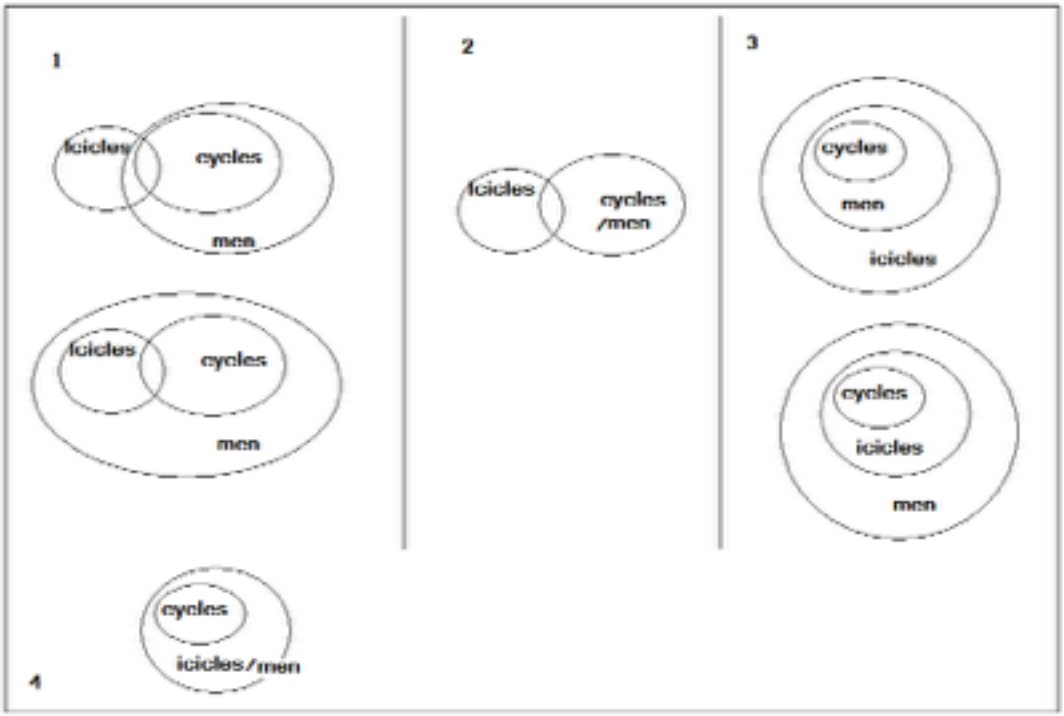
How to solve a syllogism? : Euler's circle method.
Step1:- Represent the premises diagrammatically. (Refer to the diagrams given earlier in the theory.)
Step2:- Combine both the premises (diagrammatic representation). You will have to consider all the combinations of the cases possible.
Step3:- See if conclusion drawn is valid in all combinations.

Q2. If
Some icicles are cycles and *all cycles are men;* is the following conclusion correct:
Some icicles are men?
Answer: Conclusion is correct.
Solution:
Premise1: 'Some icicles are cycles' is Particular affirmative.
Premise2: 'All cycles are men' is Universal Affirmative.

Step1:



Step2:

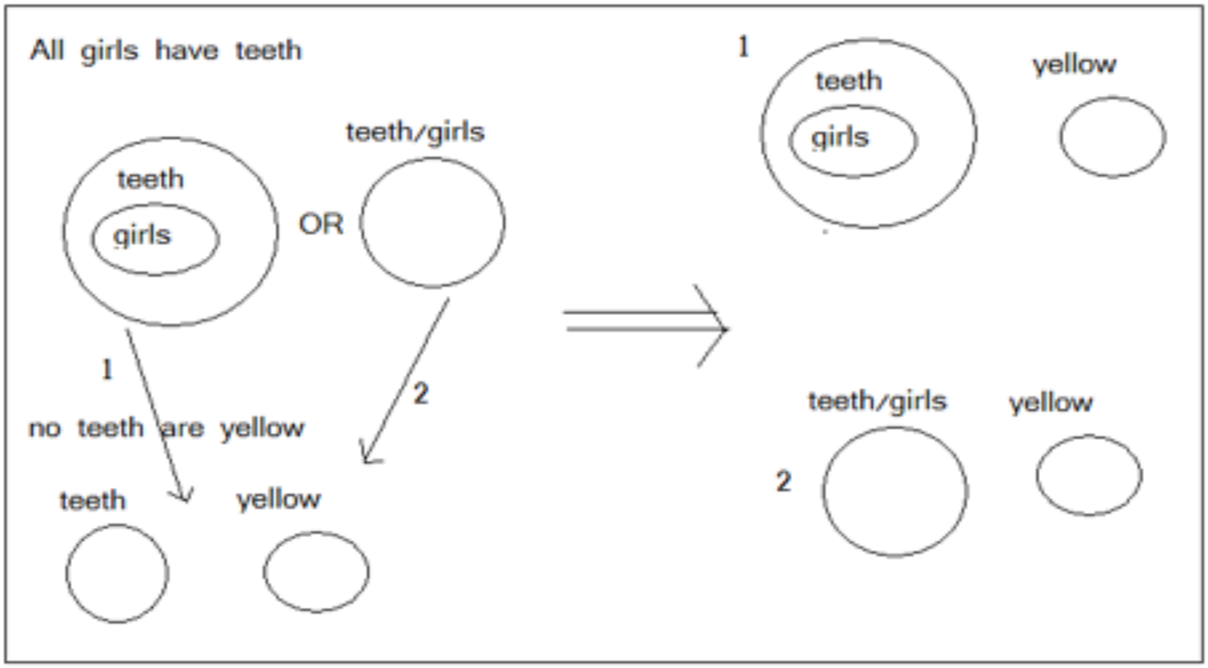


Step3:
Now you can verify that 'Some icicles are men' is true in all the combinations. (All icicles are men will mean some icicles are men also)

Note: To conclude a conclusion is false, you just need to identify one possibility of conclusion being false. Once you get one such, stop proceeding.

Q3:- If
All girls have teeth and *no teeth are yellow;* is the following conclusion correct:
All girls are yellows.
Answer: Conclusion is incorrect.
Solution:
Premise1: 'All girls have teeth' is UA.
Premise2: 'No teeth are yellow' is UN.

Step1 & Step2



Step3:- In both the combinations, ‘girls’ region never intersects with ‘yellow’.

Short-cut to solve syllogisms

Step1:- Eliminate options using the following checks.

- A syllogism must have three and only three distinct terms.
- If both premises are ‘negative’, any conclusion cannot be drawn. Any option with both premises being ‘negative’ should be eliminated.
- If one premise is ‘negative’, the conclusion also should be ‘negative’.
- If both premises are ‘particular’, any conclusion cannot be drawn.
- If one premise is ‘particular’, the conclusion also should be ‘particular’.
- If a term is not distributed in the premise, it cannot be distributed in the conclusion. On the other hand if a term is distributed in the premise, it may or may not be distributed in the conclusion.

Step2:- Use Tick and Cross Method.

What is Tick and Cross method?

1. If I say a subject or predicate of any premise (or conclusion) is **distributed**, I will mark a '**^**' on it.
2. If I say a subject or predicate of any premise (or conclusion) is **not distributed**, I will mark '**x**' on it.
P.S: Do not bother interpreting what is 'distributed' and 'not distributed'.
3. How do you know when a subject or predicate is 'distributed' and 'not distributed'?

	Subject	**Predicate**
UA	Distributed(**^**)	Not distributed(**x**)
UN	Distributed(**^**)	Distributed(**^**)
PA	Not distributed(**x**)	Not distributed(**x**)
PN	Not distributed(**x**)	Distributed(**^**)

5. Each deduction must have 3 and only 3 distinct terms (subjects and predicates). That is to say one term should be repeated.
a. All Xs are Ys; Some Ys are Zs => Conclusion may be arrived at.
b. All Xs are Ys; Some Ks are Zs => Conclusion cannot be arrived at, combining the premises.
6. The common term should be distributed AT LEAST ONCE. Otherwise any conclusion cannot be made.
Ex: Consider
All Xs**^** are Ys**ˣ**. (Refer to table)
Some Ys**ˣ** are not Zs**^**.
Conclusion: Some Xs are Zs. (INCORRECT)
In the above premises Y is 'not distributed' even once.
7. How to solve?

Examples:
Q1:- *All Xs are Ys; All Ys are Zs*; Can we draw following conclusions?
Conclusion1:- All Xs are Zs
Conclusion2:- Some Zs are Xs

Solution:
Step1:- Both premises are PAs. We can represent them as:
All Xs**^** are Ys**ˣ**
All Ys**^** are Zs**ˣ** [From the table]

Step2:- Strike out the common term. Remember the 'signs' remaining terms are carrying. The common term can have (^, ^), (^, x) and (x, ^) as signs. If the common term has (x, x) signs, any conclusion cannot be drawn.

All Xs^ are Ys^{x}

All Ys^ are Zs^{x}

X has **^** its sign.
Z has **x** its sign.

Step3:-
Conclusion1:- X is the subject. Z is the predicate. In that order their signs are:
……X**^** ….Z$^{\mathbf{x}}$ ……… (1)
From the table **^**, **x** represents a Universal Affirmative.
Writing equation (1) as an UA, I write: All Xs are Zs.
So conclusion1 is correct.

Conclusion2:- Z is the subject. X is the predicate. In that order their signs are:
……Z$^{\mathbf{x}}$ ….X**^** ……… (1)
From the table **x**, **^** represents a Particular Negative.
Writing equation (1) as an PN, I write: Some Zs are not Xs.
So conclusion2 is incorrect.

Q2:- *All Ms are Hs; Some Hs are GMs*; what is the conclusion can you draw?
Solution: Let us reduce the number of steps.

All Ms^ are Hs^{X}

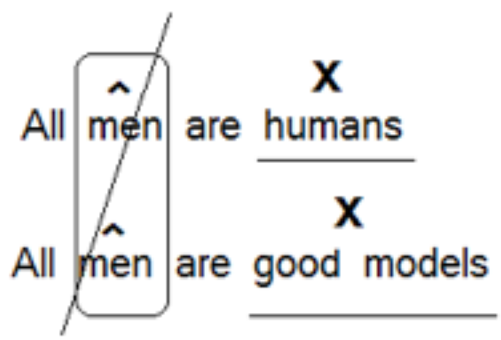
Some Ms^{X} are GM^{X}

H and GM: … H^{x} …… GM^{x} is a Particular Affirmative. So the conclusion I can draw is: Some Hs are GMs.
Similarly, Some GMs are Hs is also true.

Q3:- *All Hs are Ms*; *Some Ms are GMs*; what is the conclusion can you draw?
Solution: Premise1 is a UA (^, x).
Premise2 is a PA (x, x).
The common term M is not distributed even once. So no conclusion can be drawn.

Q4:- *All men are humans*; *All men are good models*; Can we draw following conclusions?
Conclusion1:- All humans are good models
Conclusion2:- Some humans are good models

Solution: Reduce number of steps further.

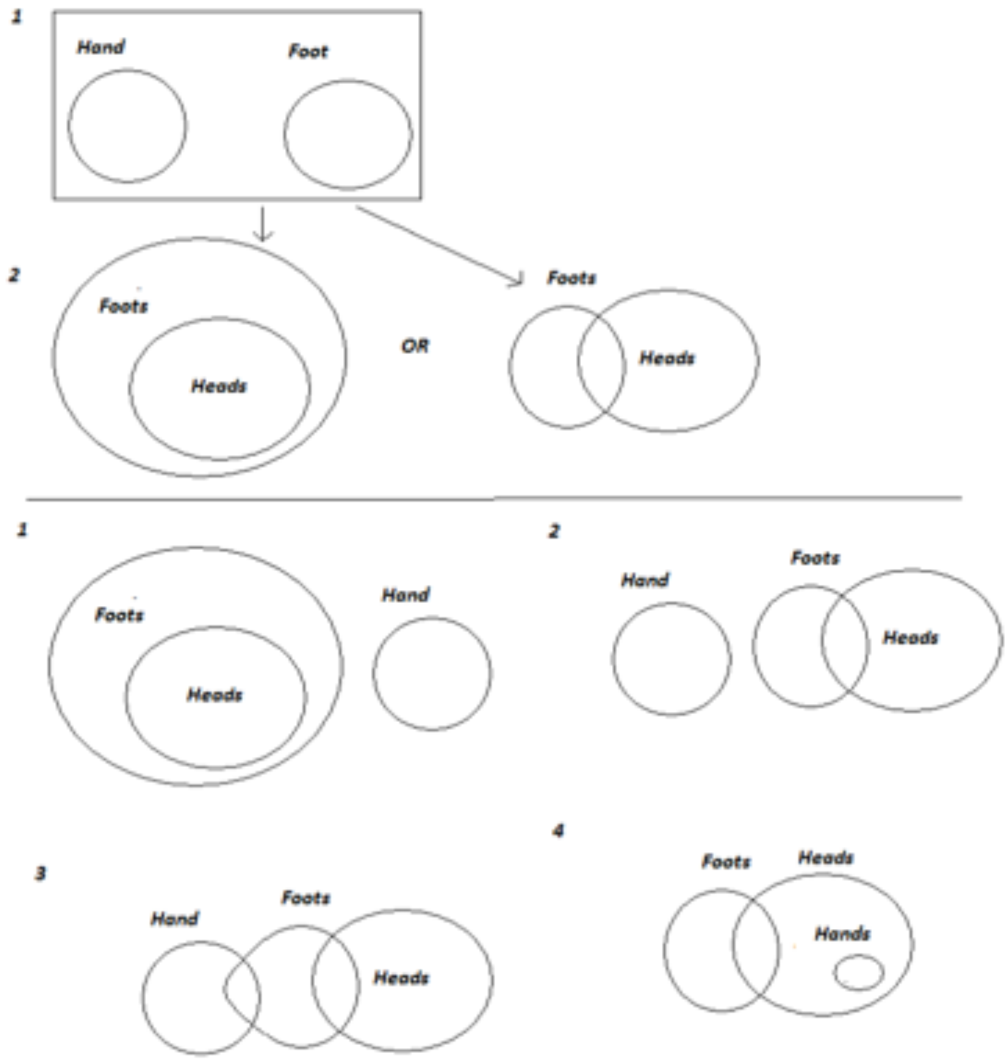


Because humans is carrying 'x' as its sign, it can only lead to a 'particular' solution. (Refer the table). Conclusion1 is incorrect.
Both humans and good models are carrying 'x' as their sign, so the conclusion that can be drawn are
- ➢ Some humans are good models.
- ➢ Some good models are humans.

Q5:- *No hand is foot*; *some foots are heads*.
What is the conclusion can you draw?

Solution:
P1:- UN (^, ^)
P2:- PA (x, x)
Hand: ^; Heads: x
Conclusion: Some heads are not hands. (CORRECT)
Can we draw conclusion that 'All hands are heads'? (INCORRECT. But why???)

Look at the Euler's diagram.



Only in possibility 4, 'All Hands are heads' is possible. It is not valid in other cases. So 'All Hands are heads' is invalid.

Where did we go wrong?

In Q5, one of the the premises was 'particular'. So we could no way have got a universal conclusion. This answer option would have been eliminated in first round itself.

Summary Questions:
The following questions contain six statements followed by four sets of three. You have to choose that set in which the third statement logically follows from the first two.

Q6:

1. All Toms are bright.
2. No bright Toms are Dicks.
3. Some Toms are Dicks.
4. Some Dicks are bright.
5. No Tom is a Dick.
6. No Dick is a Tom

a. 123 **b. 256** **c. 126** **d. 341**

Instruction: Do not use pen. Do not take more than 40 seconds.

Solution:
Thought process: Let me try if I can eliminate some options. 1 and 2 together include a 'negative'. But 3 is not a negative. So I am eliminating Option a.
2 and 5 are both 'negatives'. So no conclusion can be drawn. So I can eliminate b.
1 and 2 together contains a 'negative' and 6 is a negative too. Both premises are 'universals' and so is the conclusion. 'Bright' is common and is distributed once. Option c looks fine. Let me hold this option before using tick and cross method.
Both 3 and 4 are 'particulars'. So I can eliminate d.
So answer is c.

Verification (after the test):
P1. UA (Tom, bright) => (^, x)
P2. UN (bright, Dick) => (^, ^) [All Toms are bright. You can take Toms=bright]
So conclusion should be (Dick, Tom) => (^, ^) a UN.

Q7:

1. Some men are bad.
2. All men are sad.
3. Some bad things are men.
4. All bad things are sad.
5. Some sad are men.
6. Some sad are bad things.

a. 165 **b. 236** **c. 241** **d. 153**
Instruction: Do not use pen. Do not take more than 40 seconds.
Solution:

Option a. and d. are combination of particulars. So then cannot give conclusions so eliminated.
Option c. Common term 'sad' is not distributed even once.
Option b.
P1: (men, sad) => (^, x)
P2: (bad things, men) => (x, x)
C: (sad, bad things) = (x, x) => some sad are bad things.

ALL THE BEST