

F2040
F200917
20Question 1Construct a truth table for $(P \rightarrow Q) \wedge (Q \rightarrow R)$. Is it a tautology?

P	Q	R	$(P \rightarrow Q)$	$(Q \rightarrow R)$	$(P \rightarrow Q) \wedge (Q \rightarrow R)$
T	T	T	T	T	T
T	T	F	T	F	F
T	F	T	F	T	F
T	F	F	F	T	F
F	T	T	T	T	T
F	T	F	T	F	F
F	F	T	T	T	T
F	F	F	T	T	T

$\therefore$ Since there not all possible outcomes are true, therefore the proposition is not a tautology.

Question 2

Given the statements below convert the following sentences into symbolic logic form.

P: Ed goes camping

Q: Mountain lions are near

R: It is snowing.

(a) It is snowing and Ed goes camping.

Answer: $P \vee Q$

(b) It is not true that mountain lions are near but Ed does not go camping.

Answer: $\sim Q \rightarrow \sim P$

(c) It is a clear day or Ed does not camp.

Answer: $\sim R \wedge \sim P$

(d) Either it is a clear day or mountain lions are near.

Answer: $\sim R \wedge Q$

Question 3.

Let $A(x)$ be the predicate "x likes running", $B(x)$ the predicate "x likes playing badminton" and $C(x)$ the predicate "x likes playing tennis" where the universe discourse is the set of all students in university.

Build each of the following quantification in English.

a) $\exists x (B(x) \vee C(x) \wedge \neg A(x))$

Some students in university likes playing badminton or playing tennis but does not like running

b) $\forall x (B(x) \rightarrow A(x))$

If all the students in university likes playing badminton, then all the students likes running.

c) $\exists x (B(x) \vee C(x)) \leftrightarrow \exists x A(x)$

Some students in university likes playing badminton or playing tennis if and only if a few of them likes running

d) $\forall x (A(x) \vee C(x))$

All the students in university likes running or likes playing tennis.

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Question 4

Convert each of the following into a symbolic proof and supply the justifications for each step.

- a) For me to carry my umbrella it is necessary that it rain. When it rains I always wear my hat. Today I did not wear my hat. Therefore, it must not be raining and so I am not carrying my umbrella.

$A(x)$ = for me to carry my umbrella

$B(x)$ = it rain

$C(x)$ = always wear my hat.

$$\begin{array}{c} A \\ B \\ C \\ \hline \therefore \frac{\sim B}{\sim A} \end{array}$$

$$\begin{array}{c} \sim B \\ A \rightarrow B \\ \hline \therefore \sim A \end{array}$$

= modus tollens

- b) You cannot be both happy and rich. Therefore, you are either not happy, or not rich. Now you do appear to be happy. Therefore you must not be rich.

$A(x)$ = x is happy

$B(x)$ = x is rich

$$(A \vee B) \rightarrow (\sim A \vee \sim B) \wedge A \rightarrow \sim B$$

$$\begin{array}{c} A \vee B \\ \hline \therefore \frac{\sim A}{B} \end{array}$$

= disjunctive syllogism

Question 1

 $(P \rightarrow Q) \wedge (Q \rightarrow R)$ Is it a tautology? (4m)

P	Q	R	$P \rightarrow Q$	$Q \rightarrow R$	$(P \rightarrow Q) \wedge (Q \rightarrow R)$
T	T	T	T	T	T
T	T	F	T	F	F
T	F	T	F	T	F
T	F	F	F	T	F
F	T	T	T	T	T
F	T	F	T	F	F
F	F	T	T	T	T
F	F	F	T	T	T

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$\therefore$ Conclusion, the proposition is not a tautology.

Question 2 (4m).

(a) It is snowing and Ed goes camping.

 $R \vee P$

(b) It is not true that mountain lions are near but Ed does not go camping.

 $\sim Q \rightarrow \sim P$

(c) It is a clear day or Ed does not camp.

 $\sim R \wedge \sim P$

(d) Either it is a clear day or mountain lions are near.

 $\sim R \wedge Q$

Question 3. (6m)

(a) $\exists x (B(x) \wedge C(x) \wedge \sim A(x))$

Some

Each of students in university likes playing badminton or likes playing tennis, or but does not likes running.

(b) $\forall x (B(x) \rightarrow A(x))$

If all of the students in university likes playing badminton, then all of the students likes running.

(c) $\exists x (B(x) \wedge C(x)) \leftrightarrow \exists x A(x)$

Some of the students likes playing badminton or likes playing tennis if and only if a few of them likes running.

(d) $\forall x (A(x) \wedge C(x))$

All of the students in university likes running or play likes playing tennis.

Question 4 (6m)

(a) P: carry my umbrella

Q: It rain

R: wear my hat

→

$$\begin{array}{l} P \\ Q \\ R \\ \hline \therefore \sim Q \\ \sim P \end{array}$$

$$\begin{array}{l} \sim Q \\ P \rightarrow Q \\ \hline \therefore \sim P \end{array} \quad \text{modus tollens}$$

(b) P: happy

Q: rich

$$(\sim P \vee \sim Q) \wedge (\sim P \wedge \sim Q) \wedge P \rightarrow \sim Q$$

→

$$\begin{array}{l} P \vee Q \\ \sim P \\ \hline \therefore Q \end{array}$$

disjunctive syllogism

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Tutorial 1

1. $(P \rightarrow Q) \wedge (Q \rightarrow R)$

P	Q	R	$(P \rightarrow Q)$	$(Q \rightarrow R)$	$(P \rightarrow Q) \wedge (Q \rightarrow R)$
T	T	T	T	T	T
T	T	F	T	F	F
T	F	T	F	T	F
T	F	F	F	T	F
F	T	T	T	T	T
F	T	F	T	F	F
F	F	T	T	T	T
F	F	F	T	T	T

It is not a tautology because not all possible value of the propositional variables.

2. P: Ed goes camping

Q: Mountain lions are near

R: It is snowing

a) It is snowing and Ed goes camping

- $R \wedge P$

b) It is not true that mountain lions are near but Ed does not go to camping.

- $\sim Q \vee \sim P$

c) It is a clear day or Ed does not camp.

- $\sim R \vee \sim P$

d) Either it is a clear day or mountain lions are near.

- $\sim R \vee Q$

No pencil

Question 3

a) $\exists x (B(x) \wedge C(x) \wedge \sim A(x))$

- Some student in university likes playing badminton and likes playing tennis but does not likes running

b) $\forall x (B(x) \rightarrow A(x))$

- All student in university likes playing badminton then likes running.

c) $\exists x (B(x) \wedge C(x)) \leftrightarrow \exists x A(x)$

- ~~Some~~ some student in university likes playing badminton and likes playing tennis if and only if some student likes running

d) $\forall x (A(x) \wedge C(x))$

- All student in university likes running and likes playing tennis

Question 4

a) P: I am carrying my umbrella

Q: It is necessary that it rain

R: I always wear my hat

 $\sim R$ $\therefore \sim Q \wedge \sim P$

b) P: Cannot be happy

Q: cannot be rich

$$\frac{P \wedge Q}{\therefore P \vee Q}$$

$$\frac{\sim P}{\therefore \sim Q}$$

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	COURSE CODE / COURSE NAME		DBM2033		
	COURSEWORK ASSESSMENT		TUTORIAL 1		
	SESSION		DECEMBER 2017		
NAME	Muhamad Nuwair Amirruddin bin Yusran Zulhelmi bin Bolhi	DURATION	20MINS	CLO1	
REGISTRATION NO.	05DDT17F2046 05DDT17F2001			CLO2	20 MARKS
				CLO3	
PROGRAMME / SECTION	DDT2-S2	TOTAL MARKS			20 MARKS

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Question 1

Construct a truth table for $(P \rightarrow Q) \wedge (Q \rightarrow R)$. Is it a tautology?

P	Q	R	$(P \rightarrow Q)$	$(Q \rightarrow R)$	$(P \rightarrow Q) \wedge (Q \rightarrow R)$
F	F	F	T	T	T
F	F	T	T	T	T
F	T	F	T	F	F
F	T	T	T	T	T
T	F	F	F	T	F
T	F	T	F	T	F
T	T	F	T	F	F
T	T	T	T	T	T

Question 2

Given the statements below convert the following sentences into symbolic logic form.

P : Ed goes camping.

Q : Mountain lions are near.

R : It is snowing.

a) It is snowing and Ed goes camping.

$R \wedge P$

b) It is not true that mountain lions are near but Ed does not go camping.

$\sim Q \wedge \sim P$

c) It is a clear day or Ed does not camp.

$\sim R \vee \sim P$

d) Either it is a clear day or mountain lions are near.

$\sim R \vee Q$

Question 3

Let $A(x)$ be the predicate "x likes running", $B(x)$ the predicate "x likes playing badminton" and $C(x)$ the predicate "x likes playing tennis" where the universe discourse is the set of all students in university.

Build each of the following quantification in English.

(a) $\exists x (B(x) \wedge C(x) \wedge \sim A(x))$

Some students in university likes playing badminton and likes playing tennis but not likes running.

(b) $\forall x (B(x) \rightarrow A(x))$

All student in university likes playing badminton then also likes running.

(c) $\exists x (B(x) \wedge C(x)) \leftrightarrow \exists x A(x)$

Some student in university likes playing badminton and likes playing tennis if and only if a few student in university likes running.

(d) $\forall x (A(x) \wedge C(x))$

All students in university likes running and likes playing tennis.

Question 4

Convert each of the following into a symbolic proof and supply the justifications for each step.

- (a) For me to carry my umbrella it is necessary that it rain. When it rains I always wear my hat. Today I did not wear my hat. Therefore, it must not raining and so I am not carrying my umbrella.

$P \rightarrow$ carry my umbrella

$Q \rightarrow$ when it rains

$R \rightarrow$ wear my hat

$$\frac{\sim R}{\therefore \sim P \vee \sim Q}$$

Rules of inference : Addition

- (b) You cannot be both happy and rich. Therefore, you are either not happy, or not rich. Now you do appear to be happy. Therefore you must not be rich.

$P \rightarrow$ You cannot be happy

$Q \rightarrow$ You cannot be rich

$$\frac{P \wedge Q}{\therefore P \vee Q}$$

$$\frac{\sim \sim P}{\therefore Q}$$

Rules of inference : Disjunctive syllogism

The hypotheses become $P \wedge Q$, $P \vee Q$, $\sim \sim P$ and conclusion Q

Question 1

Construct a truth table for $(P \rightarrow Q) \wedge (Q \rightarrow R)$. Is it a tautology?

P	Q	R	$P \rightarrow Q$	$Q \rightarrow R$	$(P \rightarrow Q) \wedge (Q \rightarrow R)$
T	T	T	T	T	T
T	T	F	T	F	F
T	F	T	F	T	F
T	F	F	F	T	F
F	T	T	T	T	T
F	T	F	T	F	F
F	F	T	T	T	T
F	F	F	T	T	T

Ans: This statement is not tautology.

Question 2

Given the statements below convert the following sentences into symbolic logic form.

P: Ed goes camping

Q: Mountain lions are near

R: It is snowing

(a) It is snowing and Ed goes camping
 $R \wedge P$ (b) It is not true that mountain lions are near but Ed does not go camping
 $\neg Q \wedge \neg P$ (c) It is a clear day or Ed does not camp.
 $\neg R \vee \neg P$ (d) Either it is a clear day or mountain lions are near
 $\neg R \vee Q$

Question 3

Let $A(x)$ be the predicate "x likes running", $B(x)$ the predicate "x likes playing badminton" and $C(x)$ the predicate "x likes playing tennis" where the universe discourse is the set of all students in university.

Build each of the following quantification in English.

(a) $\exists x (B(x) \wedge C(x) \wedge \neg A(x))$

Some student _{in university} likes playing badminton and likes playing tennis but not likes running

(b) $\forall x (B(x) \rightarrow A(x))$

If all student _{in university} likes playing badminton, then also likes running.

(c) $\exists x (B(x) \wedge C(x)) \leftrightarrow \exists x A(x)$

Some student in university likes playing badminton and likes playing tennis if and only if a few student in university likes running.

(d) $\forall x (A(x) \wedge C(x))$

Every student in university likes running and likes playing tennis.

Question 4

Convert each of the following into a symbolic proof and supply the justifications for each step.

(a) For me to carry my umbrella it is necessary that it rain. When it rains I always wear my hat. Today I did not wear my hat. Therefore, it must not raining and so I am not carrying my umbrella.

$P \rightarrow$ Carry my umbrella

$Q \rightarrow$ That it rain

$R \rightarrow$ Wear my hat

Ans = $\neg R$

$\therefore \neg Q \wedge \neg P$

* Rules of Inference is Addition

* Then, the hypotheses become $P, P \rightarrow R, \neg R, \neg Q \wedge \neg P$ and conclusion $\neg P$.

(b) You cannot be both happy and rich. Therefore, you are either not happy, or not rich. Now you do appear to be happy. Therefore you must not be rich

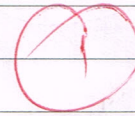
$P \rightarrow$ You cannot be happy

$Q \rightarrow$ You cannot be rich

Ans: $\frac{P \wedge Q}{\therefore P \vee Q} \quad \frac{\sim P}{\therefore Q}$

Rules of Inference is Disjunctive syllogism

* Then, the hypotheses become $P \wedge Q$, $P \vee Q$, $\sim P$ and conclusion Q .



Question 1

(a)	P	Q	R	$P \rightarrow Q$	$Q \rightarrow R$	$(P \rightarrow Q) \wedge (Q \rightarrow R)$
	T	T	T	T	T	T
	T	T	F	T	F	F
	T	F	T	F	T	F
	T	F	F	F	T	F
	F	T	T	T	T	T
	F	T	F	T	F	F
	F	F	T	T	T	T
	F	F	F	T	T	T

This table is not tautology

Question 2

- (a) $R \wedge P$
 (b) $\sim Q \wedge \sim P$
 (c) $\sim R \vee \sim P$
 (d) $\sim R \vee Q$

Question 3

- (a) Some students in university likes playing badminton and likes playing tennis but does not like running.
 (b) All students in university likes playing badminton then likes running.
 (c) Some students in university likes playing badminton and likes playing tennis if and only if they like running.
 (d) All students in university likes running and likes playing tennis.

(a) $P = \text{I am carrying my umbrella}$

$Q = \text{It is necessary that it rain.}$

$R = \text{I always wear my hat}$

$\sim R$

$\therefore \sim Q \wedge \sim P$

Rule of inference is addition

(b) $P = \text{Cannot be happy}$

$Q = \text{Cannot be rich}$

$\therefore$

$\frac{P \wedge Q}{\therefore P \vee Q}$

$\frac{\sim P}{\therefore \sim Q}$

Tutorial 1

Name: Maximilian (05DDT17F2042)
 Helary (05DDT17F2003)

No. 13 1/2
 Date 20

Question ① $(P \rightarrow Q) \wedge (Q \rightarrow R)$

P	Q	R	$(P \rightarrow Q)$	$(Q \rightarrow R)$	$(P \rightarrow Q) \wedge (Q \rightarrow R)$
T	T	T	T	T	T
T	T	F	T	F	F
T	F	T	F	T	F
T	F	F	F	T	F
F	T	T	T	T	T
F	T	F	T	F	F
F	F	T	T	T	T
F	F	F	T	T	T

* The proposition is not tautology

Question ② Given the statement below convert the following sentences into symbolic logic form.

P: Ed goes camping

Q: Mountain lions are near

R: It is snowing.

(a) It is snowing and Ed goes camping.

ans: $R \wedge P$

(b) It is not true that mountain lions are near but Ed does not go camping.

ans: $\sim Q \wedge \sim P$

(c) It is a clear day or Ed does not camp.

ans: $\sim R \vee \sim P$

(d) Either it is a clear day or mountain lions are near

ans: $\sim R \vee Q$

Question 3

Let $A(x)$ be the predicate " x likes running",
 $B(x)$ the predicate " x likes playing badminton" and
 $C(x)$ the predicate " x likes playing tennis" where the
 universe discourse is the set of all students in
 University.

Build each of the following quantification in English.

$$(a) \exists x (B(x) \wedge C(x) \wedge \sim A(x))$$

ans: Some students in university likes playing badminton
 and tennis, ~~but~~ they do not like running.

$$(b) \forall x (B(x) \rightarrow A(x))$$

ans: If All students in university likes playing badminton
 then they also likes running.

$$(c) \exists x (B(x) \wedge C(x)) \leftrightarrow \exists x A(x)$$

ans: If some student in university likes playing badminton
 and tennis if and only if: few student likes running

$$(d) \forall x (A(x) \wedge C(x))$$

ans: All student in university likes running and playing
 Tennis.

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Question 4

convert each of the following into a symbolic proof and supply the justification for each step.

- (a) For me to carry my umbrella it is necessary that it rain. When it rains I always wear my hat. Today I did not wear my hat. Therefore, it must not be raining and so I am not carrying my umbrella

Ans:

P: carry umbrella

Q: wear hat

R: raining

$\sim R$ Elements

$\therefore \sim Q \wedge \sim P$ My umbrella is necessary AD, A R

Rules of inference is Addition

When it rains I always wear my hat. $R \rightarrow Q$

Today I did not wear my hat. $\sim Q$

4 It must not be raining and so I am not carrying my umbrella $\therefore \sim R \wedge \sim P$

I am not carrying my umbrella

It is not true that I am carrying my umbrella

It does not rain

$\sim R \wedge \sim P$

Therefore, it is a clear day at present

$\sim R \wedge \sim P$

It is a clear day at present

$\sim R \wedge \sim P$

$\sim R \wedge \sim P$

⑤ You cannot be both happy and rich. Therefore, you ~~are~~ are either not happy, or not rich. now you do appear to ~~be~~ be happy. Therefore you must not be rich.

$P \rightarrow$ You cannot be happy

$Q \rightarrow$ You cannot be rich

Ans: $\frac{P \wedge Q}{\therefore P \vee Q}$

$\frac{\sim P}{\therefore Q}$

?

Rules of inference is Disjunctive ~~syll~~ syllogism 1
hypotheses $P \wedge Q, P \vee Q, \sim P$ and conclusion Q .

Question 1

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$$(P \rightarrow Q) \wedge (Q \rightarrow R)$$

P	Q	R	$P \rightarrow Q$	$Q \rightarrow R$	$(P \rightarrow Q) \wedge (Q \rightarrow R)$
T	T	T	T	T	T ✓
T	T	F	T	F	F ✓
T	F	T	F	T	F
T	F	F	F	T	F
F	T	T	T	T	T ✓
F	T	F	T	F	F ✓
F	F	T	T	T	T ✓
F	F	F	T	T	T ✓

Amir Jazgi

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Question 2

Given the statements below convert the following sentences into symbolic logic form.

P: Ed goes camping.

Q: Mountain lions are near.

R: It is snowing.

(a) It is snowing and Ed goes camping.

Answer: $R \wedge P$

(b) It is not true that mountain lions are near but Ed does not go camping.

Answer: $\sim Q \wedge \sim P$

(c) It is a clear day or Ed does not camp.

Answer: $\sim R \vee \sim P$

(d) Either it is a clear day or mountain lions are near.

Answer: $\sim R \vee Q$

$\exists$ some
 $\neg$ not
 $\forall$ all
 $\leftrightarrow$ if and only if
 $\rightarrow$ if then

Question 3

Let $A(x)$ be the predicate "x likes running", $B(x)$ the predicate "x likes playing badminton" and $C(x)$ the predicate "x likes playing tennis" where the universe discourse is the set of students in university.

Build each of the following quantification in English.

(a) $\exists x (B(x) \wedge C(x) \wedge \neg A(x))$

Answer: Some students in university likes playing badminton and likes playing tennis but not likes running.

(b) $\forall x (B(x) \rightarrow A(x))$

Answer: If all students in university likes playing badminton then likes running.

(c) $\exists x (B(x) \wedge C(x)) \leftrightarrow \exists x A(x)$

Answer: Some students in university likes playing badminton and likes playing tennis if and only if some students likes running.

(d) $\forall x (A(x) \wedge C(x))$

Answer: All students in university likes running and likes playing tennis.

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Question 4

- (a.) Let P be the proposition "carry my umbrella", Q be the "it rain", R be the proposition "wear my hat",

$$R \rightarrow P$$

$$Q \rightarrow R$$

$$\sim R$$

$$\therefore \sim Q \wedge \sim P$$

- (b.) Let P be the proposition "You can be happy", Q be the proposition "You can be rich", R be .

$$\sim P \wedge \sim Q$$

$$\therefore \sim P \vee \sim Q$$

$$\therefore \sim Q$$