MODULE

MATHEMATICS SPM

MATHEMATICAL REASONING (F4)

1. a) State whether the following statements is true or false

   i. $-6 > -7$ and $12 < (-2)^3$ ( )

   ii. $2 \times 3 = 6$ or $2 \times 3 = 5$ ( )

b) Complete the premise in the following argument

   Premise 1: If a number is a multiple of 6, then t is a multiple of 3

   Premise 2: …….

   Conclusion: 18 is a multiple of 3.

c) Write down two implication based on the following sentence.

   "***x* = *y* + 3 if and only if *x* – *y* = 3**"

Implication 1:

Implication 2:

2. a) Is the sentence below a statement or non-statement?

   i) 3 is a factor of 4 ( )

   ii) $y \leq x + 5$ ( )

b) Write down two implication based on the following sentence.

   "**Two lines are parallel if and only if the two lines have the same gradient'**.

Implication 1:

Implication 2:

c) Complete the premise in the following argument

   Premise 1: All pentagons have five sides

   Premise 2: …….

   Conclusion: KLMNO has five sides.

3. a) Is the sentence below a statement or non-statement?

"$3 + y = 5$" ( )

b) Write down two implication based on the following sentence.

"**$m \subset R$ if and only if $m \cap R$**"

Implication 1:

Implication 2:

c) Make a general conclusion by induction for the following number pattern.

$7 = 7(2 \times 0 + 1)^2$

$63 = 7(2 \times 1 + 1)^2$

$175 = 7(2 \times 2 + 1)^2$

……..

4. a) State whether the following statements is true or false

i. $-2 < -3$ or $5 > 7$

ii. All triangles are isosceles triangle.

b) Complete the premise in the following argument

Premise 1: …….

Premise 2: $a \notin A$

Conclusion: $a \notin A \cap B$

c) Write down two implication based on the following sentence.

"**$a = b$ if and only if $a - b = 0$**"

Implication 1:

Implication 2:

5. a) State whether the following statements is true or false.

"$9 > 6$ and $\sqrt{81} = 8$" ( )

b) Write down two implication based on the following sentence.

"**ABC is an equilateral triangle if and only if AB = BC = AC**"

Implication 1:

Implication 2:

c) Complete the premise in the following argument

Premise 1: …….

Premise 2: 4 is not a positive number.

Conclusion: 4 is less than zero.

6. a) Is the sentence below a statement or non-statement?

"3 and 4 are factors of 8" ( )

b) Write down two implication based on the following sentence.

"***x* is an even number if and only if *x* can be divided by 2"**

Implication 1:

Implication 2:

c) Make a general conclusion by induction for the following number pattern.

$2 = (0)^2 + 2$

$3 = (1)^2 + 2$

$6 = (2)^2 + 2$

$11 = (3)^2 + 2$

…….

7. a) Is the sentence below a statement or non-statement?

"$x + y = 2$" ( )

b) Complete the premise in the following argument

Premise 1: All factors of 12 are factors of 24

Premise 2: 3 is a factor of 12

Conclusion: _____

c) Make a general conclusion by induction for the following number pattern.

$5 = 3(2) - 1$

$10 = 3(2^2) - 2$

$21 = 3(2^3) + 3$

$60 = 3(2^4) + 4$

……

8. a) State whether the following statements is true or false

i. $8 + 2 = 10$ and $2 < -3$ ( )

ii. All square numbers are even numbers ( )

b) Complete the premise in the following argument

Premise 1: If $3y = 0$, then $y=0$.

Premise 2: …….

Conclusion: $3y \neq 0$

c) Write down two implication based on the following sentence.

"$\boldsymbol{x^3 = 64}$ **if and only if** $\boldsymbol{x = 4}$**"**

Implication 1:

Implication 2:

9. a) Complete each of the following statements with the quantifier '**all**' or '**some**' so that it will become a true statement.

i. _____ rhombuses have a total interior angles of 3600.

ii. _____ hexagons are regular.

b) State the converse of the following statement and hence, determine whether its converse is true or false.

"**if *m* > *n*, then 3*m* > *n***"

c) Complete the premise in the following argument

Premise 1: If (p + 2) is greater than 5, then p > 3.

Premise 2:_____

Conclusion: (p+ 2) is less than 5.

10. a) State whether the following statements is true or false

i. $6 \div 2 = 3$ and $3^2 = 6$. ( )

ii. $5^2 = 25$ or $5 \times 5 = 20$ ( )

b) Complete the premise in the following argument

Premise 1: If a is a negative number, then a^2 is a positive number.

Premise 2:_____

Conclusion: $(-3)^2$ is a positive number.

c) Write down two implication based on the following sentence.

"**2p > 10 if and only if p > 5**"

Implication 1:

Implication 2: