

MODULE 6
SKIM TUISYEN FELDA (STF) MATEMATIK SPM “ENRICHMENT”
TOPIC : MATHEMATICAL REASONING
TIME : 2 HOURS

1. (a) Complete each statement in the answer space with the quantifier “all” or “some” so that it will become a true statement.
- a. State the converse of the following statement and hence, determine whether its converse is true or false.

$$\text{If } x > 7, \text{ then } x > 4$$

- b. Write down Premise 2 to complete the following argument :
Premise 1 : If y is less than zero, then y is a negative number.

Premise 2 : _____

Conclusion : -2 is a negative number.

Answer :

- a. (i) _____ of the multiples of 5 are even numbers.
- (ii) _____ hexagons have six sides.
- (b) _____
- (c) Premise 2 : _____
2. (a) State whether the sentence below a statement or non-statement ?
$$x + y = 2$$
- (b) Complete 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:
$$5 = 3(2) - 1$$
$$10 = 3(2^2) - 2$$
$$21 = 3(2^3) - 3$$
$$60 = 3(2^4) - 4$$
$$\dots\dots\dots$$

Answer :

(a) _____

(b) Conclusion : _____

(c) Conclusion : _____

3. (a) State whether each of the following statements is true or false.

(i) $2^3 = 6$ or 3.5

(ii) $(-4) \times (-5) = 20$ and $-4 > -2$

(b) Complete the premise in the following argument:

Premise 1 : If the determinant of a matrix = 0, then the matrix does not have an inverse.

Premise 2 : _____

Conclusion : Matrix A does not have an inverse.

(c) Write down two implications based on the following sentence.

$$A \leq B \text{ if and only if } A + B = A'$$

Answer :

a. (i) _____

(ii) _____

b. Premise 2 : _____

c. Implication 1 : _____

Implication 2 : _____

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

$$-2(3) = 6 \text{ or } -4 > -5$$

b. Write down two implications based on the following statement:

$$p^3 = 8 \text{ if and only if } p = 2$$

(c) Complete the premise in the following argument:

Premise 1 : _____

Premise 2 : _____ 3

Conclusion : x _____ 9

Answer :

a. _____

b. Implication 1 : _____

Implication 2 : _____

c. Premise 1 : _____

5. (a) State whether each of the following statement is true or false.

(i) $4^2 = 8$ or _____ = -2

(ii) $a \in \{a, b, c\}$ and $-3 > -7$

(b) Write down premise 1 to complete the following argument.

Premise 1 : _____

Premise 2 : $6 \times p$ _____ 42

Conclusion : p _____ 7

(c) Form a general conclusion by induction for the number sequence
11, 23, 43, 71, ... which follow the pattern

$$11 = 4(1^2) + 7$$

$$23 = 4(2^2) + 7$$

$$43 = 4(3^2) + 7$$

$$71 = 4(4^2) + 7$$

.....

.....

Answer :

(a) (i) _____

(ii) _____

(b) Premise 1 : _____

(c)

Conclusion: _____

6. (a) Determine whether each of the following sentences is a statement.

(i) 9 is a prime number.

(ii) Solve the equation $2x(x - 2) = 0$

(b) Fill in the suitable quantifier to make the following statement become true.

..... Prime number are odd numbers

(c) Complete the following argument.

Premise 1 : If p is a positive integer, then $4p$ is a multiple of 2.

Premise 2 : _____
Conclusion : $4p$ is a multiple of 2.

Answer :

- a. (i) _____
(ii) _____
- b. _____
- c. Premise 2 : _____

7. (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 following argument.
Premise 1 : If $3t = 0$, then $t = 0$.
Premise 2 : _____
Conclusion : $3t \neq 0$
- (c) State the converse of the following statement and hence, determine whether its converse is true or false.
 $x^3 = 64$ if and only if $x = 4$

Answer :

- a. (i) _____
(ii) _____
- b. Premise 2 : _____
- c. _____

8. (a) Is the sentence below a statement or non-statement?
3 and 4 are factors of 8

- (b) Write down two implications based on the following sentence:
 x is an even number if and only if x can be divided by 2

- (c) Make a general conclusion by induction for the following number pattern :

$$2 = (0)^2 + 2$$

$$3 = (1)^2 + 2$$

$$6 = (2)^2 + 2$$

$$11 = (3)^2 + 2$$

Answer :

- a. _____
- b. Implication 1 : _____
 Implication 2 : _____
- c. _____

9. (a) State whether each of the following statement is true or false

(i) $-2^2 = -4$ or $(-3)^3 = -9$

(ii) _____ and _____

- (b) Complete the following argument.

Premise 1 : _____

Premise 2 : $x^n + x$ is not a quadratic expressions.

Conclusion : $n \neq 2$.

- (c) Write down two implications based on the following sentence.

$$1 - m > 2 \text{ if and only if } m < -1$$

Answer :

- a. (i) _____
 (ii) _____
- b. Premise 1 : _____

- (c) Implication 1 : _____
 Implication 2 : _____
10. (a) State whether the following sentence is a statement or a non-statement.
 Give a reason for your answer.
 $2 + 7 = 1 + 6$
- (b) State whether each of the following statements is true or false.
 (i) $\{0\}$ is an empty set or $\{\}$ is an empty set.
 (ii) $\{\}$ is an empty set and $\{\}$ is also an empty set.
- (c) Complete the following argument.
 Premise 1 : if $y > 3$, then $5y > 15$.
 Premise 2 : $5y > 15$.
 Conclusion : _____

Answer :

- a. _____
- b. (i) _____
 (ii) _____
- (c) Conclusion : _____

MODULE 6

TOPIC : MATHEMATICAL REASONING

1. (a) (i) some 1m
 (ii) all 1m
 (b) If $x > 4$ then $x > 7$ 1m
 False. 1m
 (c) $P \Rightarrow Q \Rightarrow P$ 1m
2. (a) Non-statement 1m
 (b) 3 is a factor of 24 2m
 (c) $3(2^n) - n$ and $n = 1, 2, 3, \dots$ 2m
3. (a) (i) True 1m
 (ii) False 1m
 (b) The determinant of matrix $a = 0$ 1m
 (c) If $A \begin{bmatrix} a & b \\ c & d \end{bmatrix} B$ then $A \begin{bmatrix} a & b \\ c & d \end{bmatrix} B = A$ 1m
 If $A \begin{bmatrix} a & b \\ c & d \end{bmatrix} B = 0$ then $A \begin{bmatrix} a & b \\ c & d \end{bmatrix} B$ 1m

4. (a) True 1m
 (b) If $p^3 = 8$ then $p = 2$ 1m
 If $p = 2$ then $p^3 = 8$ 1m
 (c) If $x = 9$ then $x = 3$ 2m
5. (a) (i) True 1m
 (ii) False 1m
 (b) Premise 1 : If $p = 7$, then $6 \times p = 42$ 1m
 (c) $4n^2 + 7$, $n = 1, 2, 3, 4, \dots$ 2m
6. (a) (i) Statement. 1m
 (ii) Non-statement 1m
 a. Some 1m
 b. Premise 2 : p is a positive integer 2m
7. (a) (i) False 1m
 (ii) False 1m
 a. $t \neq 0$ 1m
 b. If $x = 3$, then $x^2 = 9$ 1m
 True 1m
8. (a) Statement 1m
 (b) If x is an even number then x can be divided by 2. 1m
 If x can be divided by 2 then x is an even number. 1m
 (c) $n^2 + 2$, $n = 0, 1, 2, \dots$ 2m
9. (a) (i) True 1m
 (ii) False 1m
 a. If $n = 2$, then $x^2 + x$ is a quadratic expressions. 1m
 b. If $1 - m > 2$ then $m < -1$ 1m
 If $m < -1$ then $1 - m > 2$ 1m
10. (a) It is a statement because it has a truth value which is false. 2m
 (b) (i) True 1m
 (ii) False 1m
 (c) $y > 3$ 1m