

CHAPTER 4: MATHEMATICAL REASONING

EXERCISE 1

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

$$-3 > -4 \text{ or } 2^3 = 6$$

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

‘x is a multiple of 3 if and only if it is divisible by 3’

(c) Complete the premise in the following argument.

Premise 1 : All integers less than zero are negative integers.

Premise 2 : _____

Conclusion : y is a negative number. [5 marks]

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

‘ 1 is a prime number.’

(b) write down the conclusion in the following argument .

Premise 1 : If the side of the cube is 4 cm, then its volume is 64cm^3

Premise 2 : The volume of cube p is not 64cm^3

Conclusion : _____

(c)

$$10^2 \times 10^3 = 10^{2+3}$$

$$10^4 \times 10^5 = 10^{4+5}$$

$$10^6 \times 10^7 = 10^{6+7}$$

Based on the above information, make a general conclusion by induction of $10^m \times 10^n$

General conclusion: _____

[5 marks]

- 3 (a) Form a true compound statement by combining the two statements given below.

(i) $5^2 = 10$

(ii) $\frac{1}{4} = 0.25$

- (b) Complete the premise in the following argument.

Premise 1 : If x is an angle in a semicircle, then $x = 90^\circ$

Premise 2 : _____

Conclusion : $x = 90^\circ$

- (c) Complete the following sentence using a suitable quantifier to make it a true statement.

‘_____ prime numbers are odd numbers.’

[5 marks]

- 4 (a) Based on the object and its given property, construct a **true** statement using an appropriate quantifier.

Object : Even numbers.

Property: Divisible by 4.

- (b) State whether the following statements is true or false.

(i) $3m + m = 4m$ and $x + y = xy$

(ii) $250 = 2.5 \times 10^2$ or 0.0340 has 4 significant figures.

- (c) Write down the conclusion in the following argument.

Premise 1 : If $m < 0$, then $3m < 2m$

Premise 2 : $3m > 2m$

Conclusion: _____

[5 marks]

5. (a) Determine the following mathematical statement is a statement or a non-statement. Give reason for your answer.

$$'2 - 3 = 3 - 2'$$

- (b) Complete the following statement using 'and' or 'or' to make it a true statement. '2 is multiple of 4..... $x + 2x = 3x$ '

- (c) Complete the following arguments.

Premise 1: _____

Premise 2: A rhombus is a quadrilateral.

Conclusion: A rhombus has 4 sides.

[5 marks]

CHAPTER 4: MATHEMATICAL REASONING

EXERCISE 2

1 (a) Write two implications from the following compound statement.

“ $x - g > y - g$ if and only if $x > y$.”

Implication 1:.....

Implication 2:.....

(b) Construct a true statement for the following sentences using the appropriate quantifier.

i).....multiple of 3 are divisible by 4.

ii).....triangles identical in forms and sizes considered congruent.

[5 marks]

2. (a) Complete the following arguments.

i) Premise 1: If $k > 3$, then $2 \times k > 6$.

Premise 2: $2 \times k < 6$.

Conclusion:.....

ii) Premise 1: If a number is a factor of 4, then the number is also a factor of 16.

Premise 2:.....

Conclusion: 2 is a factor of 16.

(b) Complete the following statement by using ‘and’ or ‘or’ to form a true statement.

“All prime numbers has only 2 factorsall prime numbers are odd.

[5 marks]

3. (a) Make a general conclusion by induction based on the numerical sequence below 0, 3, 8, 15 ...

$$0 = 1^2 - 1$$

$$3 = 2^2 - 1$$

$$8 = 3^2 - 1$$

$$15 = 4^2 - 1$$

Conclusion :.....

(b) Complete the following premise.

Premise 1:.....

Premise 2: Angle P is less than 90°

Conclusion: Angle P is an acute angle

[5 marks]

4. (a) Write two implications for the following compound statement.
“ $\tan \alpha = 1$ if and only if $\alpha = 45^\circ$ ”
Implication 1:.....
Implication 2:.....
- (b) If $a < 0$, then $-1 < a < 0$. Write the converse of the implication.
(c) State whether the converse is true or false.

[5 marks]

5. (a) Complete the conclusion based on the two given premises.
Premise 1: If n is an even integer, then $n - 1$ is an odd number.
Premise 2: $n - 1$ is not an odd number.
Conclusion:.....
- (b) Complete the following premise.
Premise 1:.....
Premise 2: ABC is an isosceles triangle.
Conclusion: ABC has two sides of equal length.
- (c) Determine whether “ $m^2 + 2m - 3 = (m + 3)(m - 1)$ ” is a statement or not.
Give reason for your answer.

[5 marks]

CHAPTER 4: MATHEMATICAL REASONING

DIAGNOSTIC TEST

1.(a) Determine whether each of the following is a statement or a non statement.

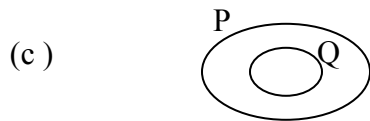
(i) $x + 3y$

(ii) $4^2 = 8$

(b) Fill in the blank with the symbol $>$ or $<$ to form a false statement.

(i) 2^3 3^2

(ii) -6 -4



Based on the above Venn diagram, complete the following statement using an appropriate quantifier so that the statement is true.

‘ elements of set Q are elements of set P’

(d) Write down the conclusion in the following argument.

Premise 1 : All prime numbers have only two factors.

Premise 2 : 5 is a prime number.

Conclusion :

[5 marks]

2. (a) Determine whether the following statement is true or false.

(i) $3^2 = 6$ or $\frac{2}{5} = 0.4$

(ii) $-3 \times -4 = 12$ and $-3 + -4 = 7$

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

$$mn = 0 \text{ if and only if } m = 0 \text{ or } n = 0$$

(c) Complete the following argument.

Premise 1: If the radius of a circle is 5 cm, then its circumference is 10π

Premise 2 :

Conclusion: the radius of circle P is not 5 cm.

[5 marks]

3. (a) Based on the object and its given property, construct a **true** statement using an appropriate quantifier.

Object: odd numbers

Property: prime numbers

- (b) Combine the two statements below to form a true statement.

Statement 1: $3 + (-2) = 5$

Statement 2: 16 is a perfect square

- (c) Complete the following argument.

Premise 1:

Premise 2: The sum of interior angles of polygon Q is 540°

Conclusion: Q is a pentagon.

[5 marks]

4. (a) Identify the antecedent and consequent in the following implication.
 ‘ If a triangle has two equal sides, then it is an isosceles triangle.’
 (b) State the converse of each of the following implication and determine if the converse is true or false.

(i) If $x < 4$, then $x < 6$

(ii) If $A \cap B = A$, then $A \subset B$

- (c) Make a general conclusion by induction based on the numerical sequence below.

2, 9, 16, 23,

$$2 = 2 + 7 (0)$$

$$9 = 2 + 7 (1)$$

$$16 = 2 + 7 (2)$$

$$23 = 2 + 7 (3)$$

.....

The numerical sequence can be represented by

- (d) Complete the following argument

Premise 1 :

Premise 2 : $M \cap N \neq M$

Conclusion: M is not a subset of N

[5 marks]

5. (a) Determine whether each of the following statements is true or false.
- (i) 17 is a prime number or an even number.
 - (ii) 5 and 8 are factor of 15
- (b) complete the following statement using an appropriate quantifier so that the statement is false.
- ‘ empty set do not have any elements’
- (c) Complete the following argument.
- Premise 1 :
- Premise 2 : x is a natural number.
- Conclusion: x is greater than zero.
- (d) Construct an implication in the form of ‘if and only if’ from the following pairs of implications.
- Implication 1 : If n^2 is an odd number, then n is an odd number.
- Implication 2 : If n is an odd number, then n^2 is an odd number.

[5 marks]