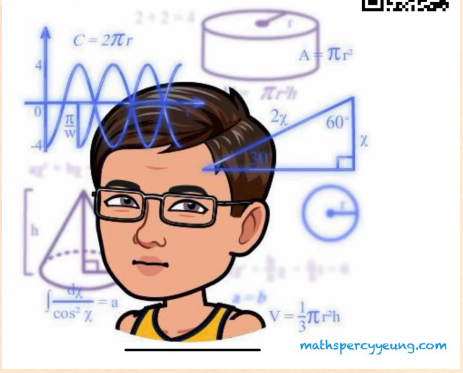


S1

Mathematics

Past Exam Paper (1314–2223)

Question Book

Ch3 Introduction to Algebra

UCCKE F1 Ch3 Introduction to Algebra

Ch3 Introduction to Algebra

[1314 S.1 1st Exam MC Q3]

1. Ronald tried to represent two word phrases by algebraic expressions as below.

	Word phrase	Algebraic expression
I	Subtract the product of x and y from the sum of a and b	$a+b-xy$
II	Divide the sum of p and q by the product of c and d	$\frac{cd}{p+q}$

He is not sure if these two word phrases are correctly represented. Which of the following is true?

A. Both I and II are correct.
B. Only I is correct.
C. Only II is correct.
D. Both I and II are incorrect.

[1314 S.1 1st Exam SQ Q4]

Represent the following word phrase by algebraic expressions.

(a) Multiply xy by 3.
(b) Divide s by 2 and then subtract $2t$ from the result. (2 marks)

[1314 S.1 1st Exam SQ Q5]

Simplify the following expressions.

(a) $5p+2r-3p+r$
(b) $2+24xy\div 3y+5$
(c) $y\times y\div(-y)$

(4 marks)

[1314 S.1 1st Exam SQ Q7]

If $a = 10$ and $b = -1$, find the values of the following algebraic expressions by the method of substitution.

(a) $3b^2$

(b) $(2+a)(b-5)$ (3 marks)

[1314 S.1 1st Exam Enhanced Question Q1]

The following table shows a series of figures. (5 marks)

			
1st figure	2nd figure	3rd figure	4th figure

(a) Draw the 4th figure in the table above.

(b) By considering the number of dots in the above figures as a sequence T(n), fill in the following blanks.

T(1) = ( )^2 + ( )

T(2) = ( )^2 + ( )

(c) Hence, find the general term of the sequence.

(d) Find the number of dots in the 9th figure.

(e) Consider the sequence 3, 7, 13, 21, …

Use the result of (c) to find the general term of this sequence.

[1415 S.1 1st Exam MC Q3]

Which of the following is a pair/are pairs of like terms?

I. $\frac{ab^2}{2}$, $3b^2a$

II. $-4x^2$, $-4x$

III. $2y$, $\frac{1}{2y}$

A. I only
B. III only
C. I and III only
D. II and III only

[1415 S.1 1st Exam SQ Q3]

Consider the formula $S = ut + \frac{1}{2}at^2$. Find the value of S when $a = -10$, $t = 4$ and $u = 5$.

(2 marks)

[1415 S.1 1st Exam SQ Q4]

Express the following word phrases by algebraic expressions.

(a) The sum of 4 and a to the power of 5. (1 mark)

(b) Divide x by the difference obtained when y is subtracted from 7. (1 mark)

[1415 S.1 1st Exam Enhanced Question Q1]

In figure 5, each of the following diagrams is formed by dots.

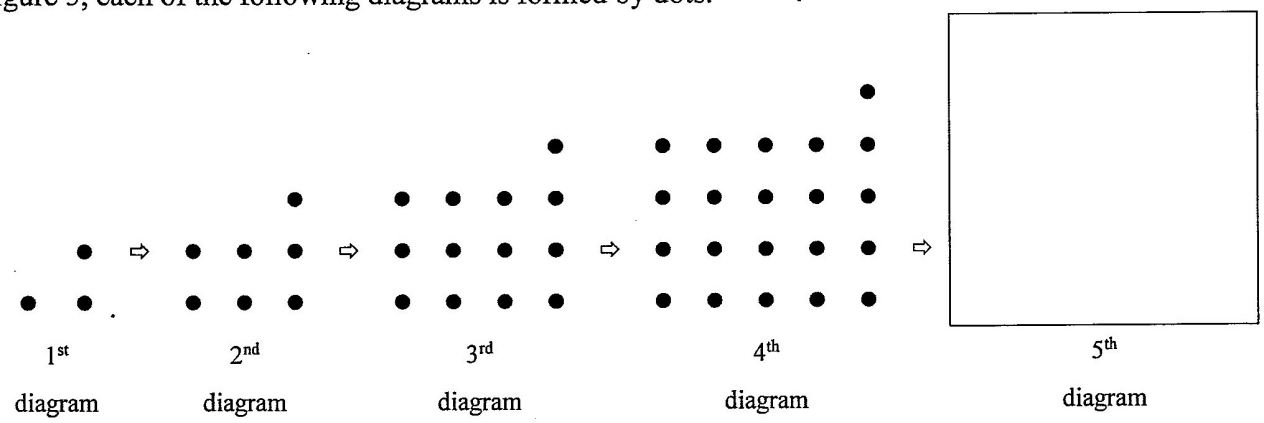


Figure 5

(a) The numbers of dots in the above diagrams form a sequence. Complete the table below and draw the 5th diagram in the space provided above.

Diagram	1st	2nd	3rd	4th	5th
Number of dots					

(2 marks)

(b) Find the general term (a_n) of the sequence of the number of dots in the n^{th} diagram.

(2 marks)

(c) Find the number of dots in the 10^{th} diagram.

(1 mark)

[1516 S.1 1st Exam MC Q3]

Today is Ronald and Gordon's birthday. Ronald is a years old and Gordon is two times as old as Ronald. Three years ago, the age of Gordon was

A. $(2a+3)$.
B. $(2a-3)$.
C. $2(a+3)$
D. $2(a-3)$.

[1516 S.1 1st Exam MC Q5]

Which of the following are pairs of unlike terms?

I. xy, $\frac{1}{xy}$

II. $-4abc$, $\frac{2abc}{3}$

III. $5m^2n^3$, $5m^3n^2$

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

[1617 S.1 1st Exam MC Q3]

Which of the following expression may represent the word phrase 'Divide the sum of 5 and x by 2'?

A. $5+\frac{x}{2}$
B. $\frac{5x}{2}$
C. $\frac{5+x}{2}$
D. $5x-2$

[1617 S.1 1st Exam MC Q4]

Which of the following is a pair of like terms?

I. $3x$, $3x^2$

II. $2a^2b$, $-5a^2b$

III. -7, 12

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

[1617 S.1 1st Exam MC Q5]

Eva's mother is m years old now. 5 years ago, Eva's age was $\frac{2}{5}$ of her mother's age. How old is Eva now?

A. $m-5$
B. $\frac{2}{5}m+5$
C. $\frac{2}{5}(m-5)$
D. $\frac{2}{5}(m-5)+5$

[1617 S.1 1st Exam SQ(B) Q8]

A sequence 2, 8, 14, 20, … is given.

(a) Write down the fifth term of the sequence. (1 mark)

(b) Hence, find the 118th term of the sequence. (2 marks)

[1617 S.1 1st Exam SQ(C) Q1]

In a test, there are 35 multiple choice questions. 2 marks are awarded for each correct answer. 2 marks are deducted for each wrong answer. 1 mark is deducted for each unattempted question. Jackson answers 30 questions and he is very sure that 20 questions are answered correctly.

(a) What is the Jackson's lowest possible score?

(b) He can get an 'A' if he scores more than 60 marks. Is it possible for him to get an 'A'? Explain your answer. (5 marks)

[1718 S.1 1st Exam MC Q3]

Which of the following algebraic expressions represents the word sentence:

'Multiply the sum of x and y by 3'?

A. $3xy$

B. $x + y \times 3$

C. $3 \times x + y$

D. $3(x + y)$

[1718 S.1 1st Exam FQ Q13]

Simplify $3x + 2y - 5y + x$. (1 mark)

[1718 S.1 1st Exam FQ Q14]

Simplify $5+7a-4a\div 2-12$. (2 marks)

[1718 S.1 1st Exam EQ Q21]

A quiz has 10 questions. For each correct answer, incorrect answer and unanswered question, +4 marks, –2 marks and –1 mark are given respectively. Karen answered x questions correctly and y incorrectly, and she did not answer the rest. Let M be the total score of her quiz.

(a) Find the number of unanswered questions in terms of x and y. (1 mark)

(b) Express M in terms of x and y. Simplify your answer. (2 marks)

(c) If $x=3, y=4$, find M. (2 marks)

(d) Can Karen get a total score of "38"? Explain your answer. (3 marks)

[1718 S.1 1st Exam EQ Q22]

On Monday, Ada had some candies and Betty had 6 more candies than Ada. On Tuesday, each of them ate 12 candies. The number of candies Ada had was two-third of Betty's.

(a) Let a be the number of candies Ada had on Monday, set up an equation to find a by filling suitable numbers into the boxes below. (1 mark)

$$a - \square = \frac{2}{3}(a + \square - \square)$$

(b) Hence, by solving the equation in (a), find a. (3 marks)

(c) On Wednesday, each of them ate y more candies. After that, the number of candies Betty had was two times that of Ada. Use the result in (b) to set up an equation in y and find the value of y. (3 marks)

[1718 S.1 1st Exam Bonus Question Q23]

(a) Find the general term a_n of the sequence: 2, 6, 12, 20, …. . (1 mark)

(b) (i) Hence, or otherwise, find the general term b_n of the sequence:
$-2, 6, -12, 20, \ldots$. (1 mark)

(ii) Find b_{100}. (1 mark)

[1819 S.1 1st Exam MC Q3]

Which of the following sentences can be used to describe the algebraic expression '$4p - 5$'?

A. Subtract 4 from the product of 5 and p.
B. Subtract 5 from the product of 4 and p.
C. Subtract the product of 4 and p from 5.
D. Subtract the product of 5 and p from 4.

[1819 S.1 1st Exam MC Q4]

Which of the following is a formula?

I. $x = \frac{yz}{10}$
II. $a = m^2 + n^2$
III. $p + r^2 - 2s$

A. I only
B. II only
C. I and II only
D. I, II and III

[1819 S.1 1st Exam MC Q5]

Which of the following is a linear equation in one unknown?

A. $3=5-x$

B. $3x=2y+1$

C. $x^2-1=0$

D. $2+\frac{2x}{3}$

[1819 S.1 1st Exam BQ Q12]

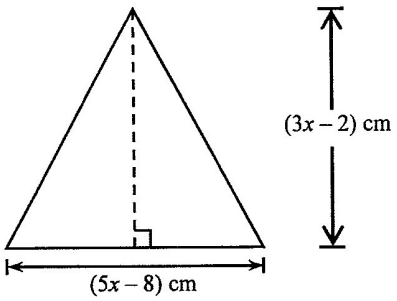
Simplify $-5m+2n+3+6n-4m$. (2 marks)

[1819 S.1 1st Exam BQ Q13]

Consider the formula $k=10h-5h^2$. If $h=-3$, find the value of k. (2 marks)

[1819 S.1 1st Exam IQ Q17]

In the figure, the area of the triangle is 60 cm^2.



(a) Set up an equation to find the value of x. (1 mark)

(b) Use the method of 'guess and check' to determine whether $x = 4$ is a solution of the equation obtained in (a). (2 marks)

[1819 S.1 1st Exam IQ Q18]

(a) Solve the equation $3(2y-1)+2(4-y)=5(y-3)$. (2 marks)

(b) By using the result in (a), solve the equation

$$3[2(-5x+10)-1]+2[4-(-5x+10)]=5[(-5x+10)-3].$$ (2 marks)

[1819 S.1 1st Exam AQ Q20]

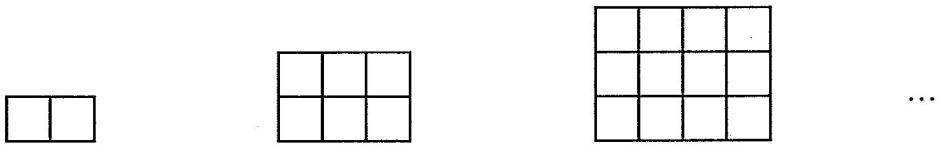
A company produces two sizes of carton lemon tea. The capacity of a large carton is 125 mL less than twice of the capacity of a small carton. When the company produces 500 small carton lemon tea and 400 large carton lemon tea, a total of 275 L of lemon tea is used.

(a) Set up an equation in x to find the capacity of a small carton. (2 marks)

(b) Mr. Chan claims that the capacity of a large carton is 1.5 times the capacity of a small carton. Do you agree? Explain your answer. (3 marks)

[1819 S.1 1st Exam AQ Q21]

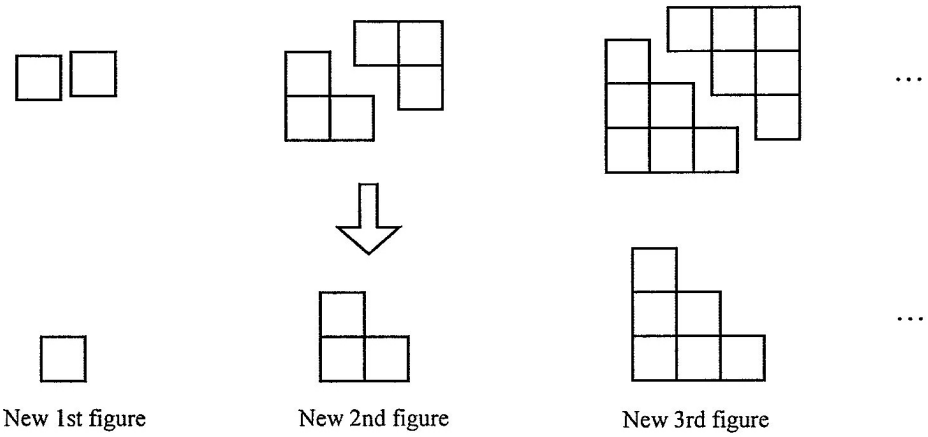
(a) Each of the following figures is formed by squares. The first figure has 2 squares. The second figure has 6 squares. The third figure has 12 squares and so on.



1st figure 2nd figure 3rd figure ...

Write down the number of squares in the nth figure. (1 mark)

(b) The figures in (a) are now cut into two equal halves as shown below and new figures are formed by taking only half of the previous figures respectively.



New 1st figure New 2nd figure New 3rd figure ...

By using the above information, explain why $1+2+3+...+n=\frac{n^2+n}{2}$. (2 marks)

[1920 S.1 UT MC Q2]

The expression for "subtract the quotient of a divided by b from c" is

A. $\frac{a}{b}-c$.

B. $\frac{b}{a}-c$.

C. $c-\frac{a}{b}$.

D. $c-\frac{b}{a}$.

[1920 S.1 UT MC Q4]

a, b and c are three negative numbers. Which of the following expressions is positive?

A. $(-a)\div(-b)$

B. $(-a)\div b$

C. $(-a)b$

D. $(-a)(b)\div(-c)$

[1920 S.1 UT MC Q5]

Which of the following are formulas?

I. $x+3=5$

II. Area of a triangle = Base × Height ÷ 2

III. $P=3(a-b)$

A. I and II

B. I and III

C. II and III

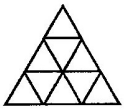
D. I, II and III

[1920 S.1 UT BQ Q13]

Simplify $3+8\times a-2a+3$. (2 marks)

[1920 S.1 UT AQ Q20]

The following figures are formed by small triangles of the same area. .

			
Figure	1st	2nd	3rd
Number of small triangles	1	4	9

(a) According to the above pattern, write down the number of small triangles in the 4^{th} and 5^{th} figures. (2 marks)

(b) Write down the general term for the number of small triangles in the n^{th} figure. (1 mark)

(c) Use the result of (b), or otherwise, find the number of small triangles in the 10^{th} figure. (2 marks)

[1920 S.1 UT AQ Q20]

(a) Simplify $2(4t+1)-(5t-3)$. (2 marks)

(b) Use the result of (a), solve $\frac{5t+2}{2}+\frac{2-3t}{7}=2(4t+1)-(5t-3)$. (3 marks)

[1920 S.1 Exam MC Q2]

Which of the following is equal to $2a$?

A. $a+a$

B. $a\times a$

C. a^2

D. $a+2$

[2021 S.1 ASUT MC Q1]

The nth term of a sequence is n^2+2. Find the sum of the first 3 terms.

A. 3.

B. 11.

C. 14.

D. 20.

[2021 S.1 ASUT MC Q2]
The expression for "subtract a from b, and then divide c by the difference" is

A. $\frac{a-b}{c}$.

B. $\frac{b-a}{c}$.

C. $\frac{c}{b-a}$.

D. $\frac{c}{a-b}$.

[2021 S.1 ASUT MC Q5]
Which of the following are formulas?

I. $x+4=9$

II. $P=\frac{1}{2}bh$

III. Area of a circle = Radius × Radius × π

A. I and II
B. I and III
C. II and III
D. I, II and III

[2021 S.1 ASUT MC Q6]

$\overbrace{a\times a\times\cdots\times a}^{m}+\overbrace{b+b+\cdots+b}^{n}=$

A. $am+bn$.
B. a^n+b^n.
C. a^m+bn.
D. $am+b^n$.

[2021 S.1 ASUT MC Q7]
The statement 'x is 7 less than y' cannot be represented as the formula

A. $x+7=y$.
B. $x=7-y$.
C. $x=y-7$.
D. $7=y-x$.

[2021 S.1 ASUT MC Q8]

The statement 'x is 7 less than y' cannot be represented as the formula

A. $x+7=y$.

B. $x=7-y$.

C. $x=y-7$.

D. $7=y-x$.

[2021 S.1 ASUT MC Q10]

After simplification, the algebraic expression $5x^2+2x+1-3x^2-x-1$ contains

A. 2 terms.

B. 3 terms.

C. 4 terms.

D. 5 terms.

[2021 S.1 ASUT BQ Q13]

Simplify $1+8a\div 2-3a-4$. (2 marks)

[2021 S.1 ASUT BQ Q15]

Consider the formula $D=b^2-4ac$, if $a=-1$, $b=-2$ and $c=3$. Find D. (3 marks)

[2021 S.1 ASUT IQ Q17]

The sum of the ages of Teresa and Ivan is 60. Six years ago, the age of Ivan is 2 times that of Teresa. Let x be the present age of Teresa.

(a) Write down the present age of Ivan in terms of x. (1 mark)

(b) Find the present age of Teresa and Ivan. (4 marks)

[2021 S.1 ASUT AQ Q20]

Let a_n be the n^{th} term of a sequence. If $a_5 = -3, a_7 = 1$ and $a_{n+2} = a_{n+1} - a_n$ for any positive integer n, find the 4^{th} term of the sequence. (3 marks)

[2021 S.1 Final Exam BQ Q1]

Consider the formula $X = a^2 - a$, find X when $a = -3$. (2 marks)

[2021 S.1 Final Exam MC Q2]

If '$4p - (5 + 2r)$' is represented by a word phrase, then we have

A. add $2r$ to 5, and then subtract $4p$.

B. $4p$ divide the sum of 5 and $2r$.

C. $4p$ minus the difference of 5 and $2r$.

D. subtract the sum of 5 and $2r$ from $4p$.

[2122 S.1 ASUT MC Q5]

52. Which of the following is NOT a formula?

I. $v = u + at$ II. $y + 6x^2$ III. $2a = 4$

A. I only

B. II only

C. I and III only

D. II and III only

[2122 S.1 ASUT MC Q7]

53. Represent 'divide the product of 7 and x by the sum of y and z' by an algebraic expression.

A. $\frac{y+z}{7x}$

B. $\frac{7x}{y+z}$

C. $\frac{yz}{7+x}$

D. $\frac{7+x}{yz}$

[2122 S.1 ASUT MC Q10]

54. The present age of Tracy is one-third the age of her mother. 4 years later, her age will be two-fifths the age of her mother. Let x be the present age of Tracy. Which of the following equations can be used to find the value of x?

A. $\frac{2}{5}(x+4) = 3x+4$

B. $x+4 = \frac{2}{5}(3x+4)$

C. $\frac{2}{5}(x+4) = 3(x+4)$

D. $x+4 = \frac{2}{5} \times 3(x+4)$

[2122 S.1 ASUT BQ Q14]

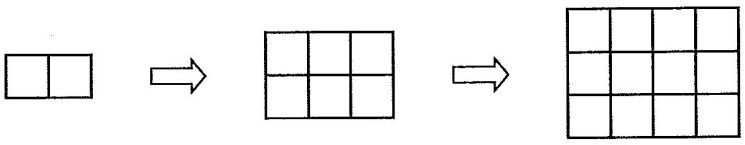
55. Simplify each of the following algebraic expressions.

(a) $-9x + 2 - 3x - 6$ (1 mark)

(b) $9m - 2m \times 5$ (2 marks)

[2122 S.1 ASUT AQ Q20]

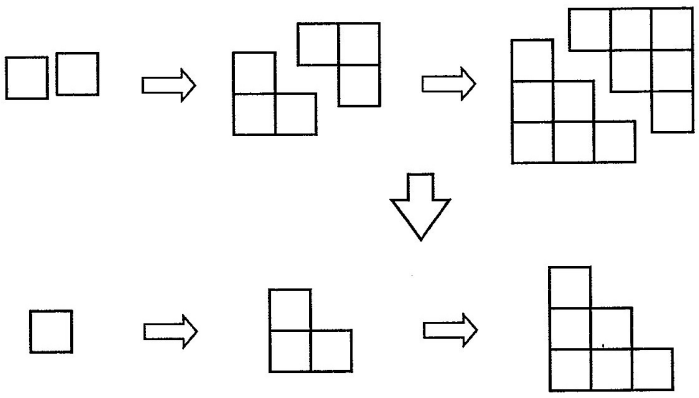
56. (a) The figures below are made up of identical small squares.



According to the above pattern, write down the number of small squares in the 5th figure.

(1 mark)

(b) Each of the figures in (a) is split into two parts as follows to form a new sequence of figures.



(i) According to the above pattern of the new sequence of figures, write down the number of small squares in the nth figure.

(ii) Write down the number of small squares in the 10th figure.

(2 marks)

(c) Mr. Leung claims that there is a figure consisting exactly 60 small squares. Do you agree? Explain your answer. (2 marks)

[2122 S.1 Final Exam MC Q8]

57. There are p students and q teachers at a school. A total of N RAT test kits arrived at the school. k of the test kits are distributed equally to all teachers, and the rest of them are distributed equally to all students. Given that a teacher received more test kits than a student, find an expression for the difference in the number of test kits received by a teacher and a student.

A. $\frac{k}{q} - \frac{N-k}{p}$

B. $\frac{k}{p} - \frac{N-k}{q}$

C. $\frac{N-k}{q} - \frac{k}{p}$

D. $\frac{N-k}{p} - \frac{k}{q}$

[2223 S.1 ASUT MC Q5]

58. Spencer is z years old now. The present age of Jim is 4 times that of Spencer.

What will be the age of Jim 7 years later?

A. $4(z-7)$ B. $4z-7$

C. $4(z+7)$ D. $4z+7$

[2223 S.1 ASUT MC Q6]

59. Which of the following word phrases can be used to represent the expression '$\frac{k^2}{h}+8$'?

A. Divide the square of h by k and then add 8 to the quotient.

B. Multiply k by the square of h and then add 8 to the product.

C. Divide the square of k by h and then add 8 to the quotient.

D. Multiply h by the square of k and then add 8 to the product.

[2223 S.1 ASUT MC Q7]

60. Consider the formula $N = a^2 - ab$. If $a = -1$ and $b = 3$, find N.

A. -4 B. -2

C. 2 D. 4

[2223 S.1 ASUT BQ Q13]

61. It is given that the general term of a sequence is $a_n = (-2)^n - n$.
Find the 4^{th} term of the sequence.

(2 marks)

[2223 S.1 ASUT IQ Q16]

62. Simplify each of the following.

(a) $-2m + 6 + m^2n - 4m + 8m^2n + 7$

(b) $7r - (8r - 2r) \div 3 \cdot s + 4rs$

(3 marks)

[2223 S.1 ASUT IQ Q18]

63. There are two pieces of wire of the same length. One piece of wire is bent into a rectangle while the other piece is bent into a square. The length of the rectangle is y cm and its width is 4 cm shorter than its length.

(a) Find the length of one piece of wire in terms of y.

(b) Find the area of the square in terms of y.

(4 marks)

[2223 S.1 ASUT AQ Q21]

64. Let a_n be the n^{th} term of a sequence.

Given that $a_1 = 3$, $a_2 = 5$ and $a_{n+2} = a_{n+1} + 2a_n$ for any positive integer n.

(a) Find a_4.

(2 marks)

Let b_n be the n^{th} term of another sequence.

Given that $b_n = \frac{1}{2}(a_n + a_{n+1})$ for any non-negative integer n.

(b) (i) Find b_1 and b_2.

(2 marks)

(ii) It is known that $a_5 = 43$. Robert claims that a_n must be greater than b_n for any positive integer n. Do you agree? Explain your answer by comparing the first 4 terms of the two sequences or by using other methods.

(2 marks)

[2223 S.1 Final Exam MC Q4]

4. $(6h - 8hk) - (8hk - 6h) =$

A. 0.

B. $12h$.

C. $-16hk$.

D. $12h - 16hk$.

[2223 S.1 Final Exam MC Q11]

The general term of a sequence is $a_n = \frac{8}{n^n - 2}$. Find the 4th term of the sequence.

A. $\frac{4}{127}$

B. $\frac{4}{7}$

C. $\frac{1}{32}$

D. $\frac{1}{2}$