# FUKIEN SECONDARY SCHOOL S5 First Term Uniform Test (2021-2022) Mathematics Compulsory Part (1 hour 15 minutes)

Date: 11<sup>th</sup> November 2021 Time: 8:30 a.m. - 9:45 a.m.

Name:\_\_\_\_\_ Class: \_\_\_\_\_ No.: \_\_\_\_\_

## **Instructions to students:**

- This paper consists of THREE parts, Section A, Section B and Multiple-choice Questions. Section A carries 37 marks, Section B carries 15 marks and Multiple-choice Questions carry 10 marks.
- 2. The maximum score of this paper is 62.
- Attempt ALL questions.
  Write your answers in the spaces provided in this Question / Answer Book.
- 4. Unless otherwise specified, show your workings clearly.
- 5. Unless otherwise specified, numerical answers should either be exact or correct to 3 significant figures.
- 6. The diagrams in this paper are not necessarily drawn to scale.

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Section A (37 marks)	
1. Simplify $\frac{3}{6x-5} + \frac{5}{7-10x}$ .	(3 marks)
2. Factorize (a) $x^2 - 2xy - 8y^2$	
(b) $x^2 - 2xy - 8y^2 - 3xz + 12yz$ .	(3 marks)

3. In a school, the ratio of the number of male students to the number of female students is 9 : 11. If 30 male students admitted to the school and 10 female students withdrawn from the school, then the ratio of the number of male students to the number of female students is 8 : 9. Find the new number of female students.

(4 marks)



**S5** Mathematics

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- 4. It is given that y varies directly as the square of x and inversely as the square root of u. When x = 15 and u = 9, y = 150.
  - (a) Express y in terms of x and u.
  - (b) If x = 15 and the value of *u* is decreased from 9 to 4, find the change in the value of *y*.

(5 marks)

5. Let  $T_n$  be the *n*th term of an arithmetic sequence. It is given that  $T_3 = 2$  and  $T_8 = -13$ . (a) Find  $T_1$ .

(b) Find the value of k such that  $T_1 + T_3 + T_5 + ... + T_{2k-1} = -1210$ . (6 marks)

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	integer $n$ , find $a_1$ .	(5 ma
	It is given that a varies as m and inversely as the square root of n. Find the	<b>n</b> or007
7.	It is given that $r$ varies as $m$ and inversely as the square root of $p$ . Find the change in $r$ when $m$ is increased by 10% and $p$ is decreased by 36%.	percen (4 ma
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- For any positive integer *n*, let  $A_n = \log_2(a \times \frac{1}{4^{n-1}})$ , where a > 0. It is given that 8.
  - $A_1 + A_2 + \ldots + A_{10} = 30.$
  - (a) Find *a*.

  - (b) Let  $B_n = \sqrt{2}^{A_n}$  for positive integer *n*. Find the least value of *k* such that  $B_1 + B_2 + ... + B_k > 127$ .

(7 marks)


## Section B (15 marks)

- 9. The painting cost (in \$) of a solid is a sum of two parts. One part is constant and the other part varies as the surface area (in cm<sup>2</sup>) of the solid. The painting cost for a solid with surface area  $200 \text{ cm}^2$  is \$300 while the painting cost for a solid with surface area  $250 \text{ cm}^2$  is \$360. Suppose the surface area of solid *A* is 605 cm<sup>2</sup>.
  - (a) Find the painting cost of solid *A*.

(4 marks)

(b) Solids *A* and *B* are similar solids. The volume of *A* is 33.1% more than that of solid *B*. Mary claims that the painting cost of solid *A* is at least 20% higher than that of solid *B*. Do you agree? Explain your answer. (4 marks)



### **S5** Mathematics

(a)

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10. In Figure 1,  $OA_1A_2$  is a right-angled isosceles triangle with  $A_1A_2 = OA_2 = 24$  cm. The second right-angled isosceles triangle  $OA_2A_3$  is formed by using  $OA_2$  as the hypotenuse. The process is continued to form an infinite number of right-angled isosceles triangles  $OA_3A_4$ ,  $OA_4A_5$ ,  $OA_5A_6$ , ...,  $OA_nA_{n+1}$ , ... such that the whole figure has a spiral pattern.



(b) An insect starts at  $A_1$  and crawls along the spiral path  $A_1A_2A_3$  ... as shown in Figure 2. Elon claims that the insect will not travel for more than 82 cm. Do you agree? Explain your answer. (3 marks)

### S5 Mathematics Multiple-choice Questions (10 marks)

Each question carries 2 marks. Write down the correct answers in the boxes.

15

11. If *a* varies directly as the square of *b* and inversely as the square root of *c*, which of the following must be constant?



In the figure, there is 1 dot in the first pattern. For any positive integer n, the (n + 1)th pattern is formed by adding 4 dots to the nth pattern. Find the number of dots in the 10th pattern.

A. 37

12.

- B. 41
- C. 45
- D. 49

13. Let  $T_n$  be the *n*th term of an arithmetic sequence. If  $T_3 = 17$  and  $T_6 = 29$ , find  $T_6 + T_7 + T_8 + \ldots + T_{12}$ .

- A. 96
- B. 287
- C. 307
- D. 372

14. If the sum of the first *n* terms of a sequence is  $3n^2 - n$ , which of the following is/are true?

- I. 10 is a term of the sequence.
- II. The 6th term of the sequence is 32.
- III. The sequence is an arithmetic sequence.
- A. I only
- B. II only
- C. I and III only
- D. II and III only

15. The general term of a geometric sequence is  $-3(2)^{2-n}$ . Find the sum to infinity of the sequence.

- A. 24
- B. 12
- C. -12
- D. -18