

南译在日中警核

Nanyang Girls' High School

# End-of-Year Examination 2023 Secondary 4

# **ADVANCED MATHEMATICS**

## Wednesday 11 October 2023

1 hour 1215 – 1315

#### **READ THESE INSTRUCTIONS FIRST**

- 1. Write your name, register number and class on all the work you hand in.
- 2. Write in dark blue or black ink.
- 3. You may use an HB pencil for any diagrams or graphs.
- 4. Do not use staples, paper clips, glue or correction tape/ fluid.
- 5. Write your answers and working on the separate writing paper provided, unless otherwise stated.
- 6. Answer **all** questions.
- 7. Omission of essential working will result in loss of marks.
- 8. The use of an approved scientific calculator is expected, where appropriate.
- 9. If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degree to one decimal place. For  $\pi$ , use either your calculator value or 3.142, unless the question requires the answer in terms of  $\pi$ .
- 10. At the end of the examination, fasten all your work securely together.
- 11. The number of marks is given in brackets [] at the end of each question or part question.

This document consists of **3** printed pages and **1** blank page.

Setter: A. Low

#### NANYANG GIRLS' HIGH SCHOOL

[Turn over

- 1 5 women, 4 men, 3 girls and 2 boys attended a party.
  - (a) 4 females and 2 males were chosen to play a game. Find the number of ways this can be done. [2]
  - (b) At the end of the party, a photo was taken of the 14 people such that the adults stood in a row at the back while the children sat in a row in the front.
    Find the number of ways the photo can be taken such that no two people of the same gender was next to each other in each row. [2]
- A triangle has sides of lengths 5 cm, 6 cm and 7 cm. Find the diameter of the inscribed circle giving your answer in exact form. [3]
- 3 (a) The fourth term of an arithmetic progression is 5. Given that the common difference is -3 and the sum of the first *n* terms is 28, find the value of *n*. [3]
  - (b) The first three terms of a geometric progression are 4, *u* and 2 where u < 0. Find the sum to infinity of the series, giving your answer in the form  $a+b\sqrt{2}$  where *a* and *b* are integers. [3]
- 4 Express  $\frac{8}{\sqrt{4-9x^2}}$  in ascending powers of *x* up to and including the  $x^4$  term and state the range of values of *x* for which the expansion is valid. [3]

5 It is given that 
$$3xy = e^{2y}$$
.

6

(a) Show that 
$$\frac{dy}{dx} = \frac{y}{x(2y-1)}$$
. [3]

- (b) Find the equation of the tangent to the curve at the point where y = 1. [3]
- (a) Find  $\int x \cos x dx$ . [2]
  - (b) Hence, using the substitution  $u = \sqrt{x}$ , find  $\int 3 \cos \sqrt{x} dx$ . [3]

- Find the volume generated when the area bounded by the curve  $y = 3\tan 2x$ , the line  $x = \frac{\pi}{8}$  and the *x*-axis, is rotated through one revolution about the *x*-axis. Give your answer in the form  $(a\pi + b\pi^2)$  cubic units where *a* and *b* are rational numbers. [4]
- 8 Four fair dice are rolled. Find the probability of rolling
  (a) four different numbers, [2]
  (b) two pairs of the same number (for example 1, 1, 2, 2 but not 1, 1, 1, 1.) [2]
- 9 In the diagram, *ABCD* is a parallelogram. *E* and *F* are points on *AB* and *CD* respectively such that AE = 2EB and FC = 3DF. *EF* intersects *AC* at *G*.



Find

(a) 
$$AG: GC$$
, [2]

(b) 
$$\frac{\text{Area of } AGFD}{\text{Area of } ABCD}$$
. [3]

#### **END OF PAPER**

### Answers

1. (a) 1050 ways  
(b) 34560 ways  
2. 
$$\frac{4\sqrt{6}}{3}$$
 cm  
3. (a)  $n = 8$   
(b)  $8 - 4\sqrt{2}$   
4.  $4 + \frac{9}{2}x^2 + \frac{243}{32}x^4 + \cdots, -\frac{2}{3} < x < \frac{2}{3}$   
5. (b)  $y = \frac{3}{e^2}x$   
6. (a)  $x \sin x + \cos x + c$ , where *c* is an arbitrary constant  
(b)  $6\sqrt{x} \sin \sqrt{x} + 6\cos \sqrt{x} + c$ , where *c* is an arbitrary constant  
7.  $\frac{9}{2}\pi - \frac{9}{8}\pi^2$  cubic units  
8. (a)  $\frac{5}{18}$   
(b)  $\frac{5}{72}$   
9. (a)  $8:9$   
(b)  $\frac{41}{136}$