

# 南华中学

## NAN HUA HIGH SCHOOL

### **END OF YEAR EXAMINATION 2022**

Subject	:	Mathematics (Part 1)
Level	:	Secondary Two Express
Date	:	11 October 2022
Duration	:	1 hour

### **READ THESE INSTRUCTIONS FIRST**

Write your name, index number and class on all the work you hand in.

Write in dark blue or black pen. You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue, correction fluid or correction tape.

Answer **all** questions.

If working is needed for any question, it must be shown with the answer. Omission of essential working will result in loss of marks.

The use of an approved scientific calculator is expected, where appropriate. 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 degrees to one decimal place.

For  $\pi$  , use either your calculator value or 3.142, unless the question requires the answer in terms of  $\pi$  .

The number of marks is given in brackets [] at the end of each question or part question.

The total number of marks for this paper is 40.

FOR MAP	RKER'S USE	ONLY
Question Number	Maximum Mark	Mark
1	6	
2	5	
3	3	
4	6	
5	6	
6	4	
7	6	
8	4	
Total Mark	40	

Answer **all** the questions.

1 (a) Expand and simplify 2(11x-3)-(3x-5)(7-x).

(b) Factorise completely (i)  $9x^2 - 100$ ,

(ii) 4wy - 10x + 8wx - 5y.

2 (a) Solve the inequality 
$$\frac{m+10}{4} \le \frac{2}{5}$$
.



3 The mass, *M* grams, of a metal ball is directly proportional to the cube of its radius, *R* centimeters. The mass of a metal ball is 264 g when the radius is 2 cm. Find the mass of the metal ball, in kilograms, when its radius is 6 cm.

*Answer* .....kg [3]

4 (a) Express  $\frac{x}{6x^2 - 7x - 3} + \frac{5}{3x + 1}$  as a single fraction in its simplest form.

**(b)** Solve the equation 
$$\frac{3}{2-5m} - \frac{10}{5m-2} = 9$$
.

- 5 A map has a scale of 1 cm to 0.5 km.
  - (a) Express the scale of the map in the form 1 : n, where n is an integer.

(b) The length of a path is 720 m. Find its corresponding length on the map.

*Answer* ..... cm [2]

(c) An advertisement on a new residential development makes the following claim:



epresented by  $0.22 \text{ cm}^2$  on the map. comment

Given that the plot of land is represented by  $0.22 \text{ cm}^2$  on the map, comment on whether the claim is correct. Explain your answer with appropriate working.

Answer

.....[3]

6 (a) Make *d* the subject of the formula  $c^2 = \frac{7d}{d+3c}$ .

*Answer* ..... [3]

(b) Find the value of d when c = -1.

Answer  $d = \dots$  [1]

7 20 boys took part in a survey. The number of coins each boy had in his wallet was recorded.

Number of coins	1	2	3	4	5	6
Number of boys	2	4	6	x	2y	1

(a) Show that x + 2y = 7.

[1]

[2]

(b) The mean of the distribution is 3.3. Show that 2x + 5y = 16.

(c) Hence, find the value of x and of y.

8 In the diagram, *PQR* is a straight line,  $\Delta PQS \equiv \Delta PTS$ , and triangle *PRS* is similar to triangle *PST*.



Given that PS = 8 cm, PT = 5.6 cm, angle  $PQS = 114^{\circ}$  and angle  $SPT = 27^{\circ}$ , calculate

(a) angle *PSR*,

(b) the length of *PR*.

**End of Part I** 

#### Answers

1. (a) 
$$3x^2 - 4x + 29$$
 (b)(i)  $(3x + 10)(3x - 10)$  (ii)  $(2x + y)(4w - 5)$   
2. (a)  $m \le -8\frac{2}{5}$  (or  $m \le -8.4$ )  
(b)  $-11 - 10 - 9 - 8 - 7$   
 $-8.4$   
(c)  $-9$   
3. 6 cm  
4. (a)  $\frac{11x - 15}{(3x + 1)(2x - 3)}$  (b)  $m = \frac{1}{9}$   
5. (a) 1 : 50000 (b) 1.44 cm  
(c) Actual land area of 0.055 km<sup>2</sup> = 0.055 ÷ 0.01 = 5.5 hectares  
Since the actual land area is less than 6 hectares, the claim in the  
advertisement is incorrect.  
6. (a)  $d = \frac{3c^3}{7 - c^2}$  (b)  $d = -\frac{1}{2}$ 

6. (a) 
$$d = \frac{3c^3}{7-c^2}$$
 (b)  $d = -\frac{1}{2}$ 

7. (c) 
$$x = 3, y = 2$$

8. (a) 
$$\angle PSR = 114^{\circ}$$
 (b)  $PR = 11.4 \text{ cm} (3 \text{ s.f.}) \text{ [or } 11\frac{3}{7} \text{ cm]}$ 



# 南华中学

## NAN HUA HIGH SCHOOL

### END OF YEAR EXAMINATION 2022

Subject	:	Mathematics (Part 2)
Level	:	Secondary Two Express
Date	:	11 October 2022
Duration	:	1 hour 30 minutes

### **READ THESE INSTRUCTIONS FIRST**

Write your name, index number and class on all the work you hand in.

Write in dark blue or black pen. You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue, correction fluid or correction tape.

Answer **all** questions.

If working is needed for any question, it must be shown with the answer.

Omission of essential working will result in loss of marks.

The use of an approved scientific calculator is expected, where appropriate.

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 degrees to one decimal place.

For  $\pi$ , use either your calculator value or 3.142, unless the question requires the answer in terms of  $\pi$ .

The number of marks is given in brackets [] at the end of each question or part question.

The total number of marks for this paper is 60.

FOR MARKER'S USE ONLY					
Question Number	Maximum Mark	Mark			
1	7				
2	5				
3	7				
4	4				
5	7				
6	6				
7	9				
8	5				
9	10				
Total Mark	60				

This paper consists of **13** printed pages.

Answer **all** the questions.

1 (a) The following table shows the currency exchange rates offered by a local moneychanger. [e.g. Selling rate of Euro is  $\notin 1 = S$ \$1.4224]

Currency	Unit	Sell	Buy
Euro (€)	1	1.4224	1.3889
Swedish Krona (kr)	100	13.7580	13.3695

Kathy returns from her holiday trip in Sweden with 3844 kr left unspent. Calculate the amount of Singapore dollars she will receive if she exchanges the unspent amount of 3844 kr at this moneychanger.

*Answer* S\$..... [2]

(b) A massage chair sold at a store is priced at \$3300.

Dan decides to buy it on a hire purchase scheme. After paying a down payment of 20%, the remaining amount will be paid in monthly instalments at a simple interest rate of 12% per annum.

If Dan pays his first monthly instalment in July 2022 and expects to make the last payment in February 2024, calculate his monthly instalment.

*Answer* \$..... [5]

- 2 It is given that y is inversely proportional to  $\sqrt{2x-1}$  and that y = 1 when x = 5.
  - (a) Express y in terms of x.

(b) Find the value of x when 
$$y = \frac{3}{5}$$

(c) For y to be defined, x > t. State the value of t.

*Answer* t = ..... [1]

- 3 Two types of rice, organic brown rice and jasmine rice, are sold at the supermarket. The cost of x kilograms of organic brown rice is \$8.40. With the same amount of money, one can get an additional 4 kilograms of jasmine rice.
  - (a) Write down an expression, in terms of x, for
    - (i) the cost of 1 kilogram of organic brown rice,

*Answer* \$..... [1]

(ii) the cost of 1 kilogram of jasmine rice.

*Answer* \$..... [1]

The cost of 1 kilogram of organic brown rice is \$2.80 more than the cost of 1 kilogram of jasmine rice.

(b) Write down an equation in terms of x to represent this information and show that it reduces to  $x^2 + 4x - 12 = 0$ .

[2]

(c) Solve the equation  $x^2 + 4x - 12 = 0$ .

*Answer* x = ..... or x = ..... [2]

(d) Hence, find the cost of 5 kilograms of jasmine rice.

*Answer* \$..... [1]

4 The stem-and-leaf diagram shows the ages of 30 visitors to a Travel Fair on a particular afternoon.

Stem	Lea	ıf					
1	2	6	7				
2	1	4	5	6	8	8	
3	0	2	3	4	5	k	9
4	3	3	3	5	7		
5	0	1	2	5	9		
6	1	1	4	8			

Key: 1|2 represents 12 years old

(a) Write down the age of the oldest person who visited the Travel Fair that afternoon.

Answer .....years old [1]

(b) State the modal age of the visitors.

Answer .....years old [1]

(c) Given that the median age is 37, find the value of k.

(d) Shaun wants to use a dot diagram to present this set of data.Do you think it is a good choice? Support your answer with an explanation.

Answer



*Answer* Angle *WYX* =.....[2]

A triangle *XZY* is placed next to triangle *WXY* as shown in the diagram below. XZ = 10.5 cm and YZ = 17.5 cm.



(c) By showing your calculations clearly, explain why *WXZ* is a straight line.

Answer

.....[3]

6 A solid cone has a base radius of 5 cm and a height of 8 cm.

Calculate

(a) its slant height,



(b) the total surface area of the cone,

(c) the volume of the cone.

7 The table below shows some values of x and their corresponding values of y, where  $y = 17 + 4x - 2x^2$  for  $-2 \le x \le 5$ .

x	-2	-1	0	1	2	3	4	5
У	1	11	17	19	р	11	1	-13

(a) Find the value of *p*.

Answer  $p = \dots$ [1]

(b) Using a scale of 2 cm to represent 1 unit on the x-axis and 2 cm to represent 5 units on the y-axis, draw the graph of  $y = 17 + 4x - 2x^2$  for  $-2 \le x \le 5$  on the grid provided on the next page.

[3]

- (c) State the
  - (i) equation of the line of symmetry of the graph,

(ii) coordinates of the turning point.

( , ) [1]

(d) Use your graph in (b) to find the value of y when x = -0.8.

Answer  $y = \dots$ [1]

(e) By drawing a suitable line on the same grid, use your graph to solve the equation  $17 + 4x - 2x^2 = 5$ .

Answer 
$$x = .....$$
 or  $x = .....$  [2]

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8 The line x - y = 3 and the curve  $x^2 - 2y^2 = 12 + 5xy$  intersect at two points. Find the coordinates of the points of intersection.

# Answer (,,),(,,) [5]

9 According to the United States Golf Association (USGA) Rules of Golf, the diameter of the ball shall not be less than 42.67 mm (1.680 inches).

The majority of manufacturers follow this guideline when producing golf balls.



(a) A golf ball has a volume of 42 cm<sup>3</sup>. Showing your working clearly, determine if this golf ball meets the USGA standards.

Answer

.....[2]

Esther has three golf balls, each of radius 2.14 cm. She wants to make a container for the three balls.

**Diagram I** shows two possible designs for the containers that she can make with clear plastic sheet.

The first design is a closed cylindrical container and the second one is a closed triangular container.

Assume that the 3 golf balls fit tightly in each container.

**Diagram I** 



cylindrical container



triangular container

The top view of the triangular container can be modelled by an equilateral triangle *ABC* with a circle, centre *O*, inscribed in it, as shown in **Diagram II**.



(b) By finding the length of BM, show that the length of BC is 7.4132 cm, correct to 5 significant figures.

Answer

(c) Esther claims that the amount of plastic sheet used to make one triangular container is enough for making two cylindrical containers. Showing your working clearly, determine whether Esther's claim is correct.

Answer

.....

......[6]

**End of Paper** 

#### Answers

1.	(a)	S\$513.92 (2 d.p.)	(b)	\$158.40			
2.	(a)	$y = \frac{3}{\sqrt{2x-1}}$	(b)	<i>x</i> = 13	(c)	$t = \frac{1}{2}$	
3.	(a)(i)	$\$\frac{8.4}{x}$ (ii)	$\$\frac{8.4}{x+4}$	- (c)	x = -6 or 2	(d)	\$7
4.	(a)	68 years old	(b)	43 years old	(c)	<i>k</i> = 5	
	(d)	Possible answers: Th many <b>different</b> value	e dot di es / a lar	agram is not a g ge range (from	good choice as 12 to 68).	this set of data	a has
5.	(a)	48 cm	(b)	73.7°			
6.	(a)	9.43 cm	(b)	227 cm <sup>2</sup>	(c)	209 cm <sup>3</sup>	
7.	(a)	<i>p</i> = 17					
	(b)	y 20			(c)	x = 1	
			2	4 x	(d)	(1, 19)	
	(e) (f)	When $x = -0.8$ , $y = 1$ Values of x are $-1.65$	2.5 (±0 5 or 3.65	.5) 5 (±0.05)			
0	$\left(2^{1}\right)$	1) and $(2, 1)$					

- 8.  $\left(2\frac{1}{2}, -\frac{1}{2}\right)$  and (2, -1)
- 9. (a) Since the diameter of the tennis ball (4.31cm) is more than 4.267 cm in diameter, it meets the USGA standards.
  - (c) Since the surface area of two cylindrical containers is 402 cm<sup>2</sup> which is more than 333cm<sup>2</sup>, the amount of plastic sheet needed to make the triangular container is not enough for making two cylindrical containers. Therefore, Esther's claim is incorrect.