

TANJONG KATONG SECONDARY SCHOOL

Preliminary Examination 2022 Secondary 4

CANDIDATE NAME		
CLASS	INDEX NUMBER	

MATHEMATICS

Paper 1

4048/01

Thursday 4 August 2022

2 hours

READ THESE INSTRUCTIONS FIRST

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

Write in dark blue or black pen.

You may use a pencil for any diagrams or graphs.

Do not use staples, paper clips, highlighters, glue or correction fluid/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 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 π , use either your calculator value or 3.142, unless the question requires the answer in terms of π .

The number of marks is given in brackets [] at the end of each question or part question. The total of the marks for this paper is 80.

Compound Interest

Total Amount =
$$P\left(1+\frac{r}{100}\right)^n$$

Mensuration

Curved surface area of a cone =
$$\pi rl$$

Curved surface area of a sphere = $4\pi r^2$
Volume of a cone = $\frac{1}{3} \pi r^2 h$
Volume of a sphere = $\frac{4}{3} \pi r^3$
Area of triangle $ABC = \frac{1}{2} ab \sin C$
Arc length = $r\theta$, where θ is in radians

Sector area =
$$\frac{1}{2} r^2 \theta$$
, where θ is in radians

Trigonometry

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$
$$a^2 = b^2 + c^2 - 2bc \cos A$$

Statistics

$$Mean = \frac{\sum fx}{\sum f}$$

Standard Deviation =
$$\sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$$

1	Calculate	$-2.3^3 + $	$1 - (-4.5)^2 - 7 \times 20 \times (-3)$, giving your answer correct to 4 decimal	places.
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Answer [1]

4 workers can pack 3 containers for shipping in 15 days.Find the number of workers needed to pack 10 containers of the same size in 20 days.

Answer [2]

3 *A*, *B*, *C* and *D* are points on a circle. *AC* is a diameter of the circle and angle $DBC = 68^{\circ}$.



Find angle ACD.

Answer	[2]

4 The graph shows the number of each type of drinks purchased in a food court.



Soda is Everyone's Favourite Drink

State a misleading feature of the graph and explain how this will affect the reader's interpretation of the graph.

_____[2]



The diagram shows a square and a figure that is made up of six smaller squares. The ratio of the perimeter of the square : perimeter of the figure is 6:7.

Find the ratio of the area of the square : area of the figure.

Answer : [2]

5

Three similar	unbiased six-side	d dice are thr	own at the same	time.
If each dice is	s numbered 1, 2, 3	6, 4, 5 and 6, f	find the probabil	ity that

(a) the total of the three numbers shown is 3,

6

7

Answer [1]

(b) the three dice show the same number,

Answer [1]

(c) the total of the three numbers shown is 4.

Answer [2]

(a) $2^{y} = 8^{12} + 8^{12}$ Find the value of y.

Answer y = _____ [1]

(b) Simplify
$$\frac{4a+4b}{3} \div \frac{8a^2-8b^2}{9}$$
.

Answer [2]

A pyramid has a volume of 76 cm ³ , correct to the nearest cubic centimetr

(a) Find the least possible volume of the pyramid.

8

Answer _____ cm³ [1]

(b) The base area of the pyramid is 26 cm², correct to the nearest square centimetre. Find the greatest possible height of the pyramid.

Answer _____ cm [2]

9 The square of the diameter of a container varies directly to the amount of paint needed to cover the outside of a container.
 When 37.5 ml of paint is used to cover the outside of the container, the diameter of the container is 25 cm. Calculate

(a) the diameter of a container when the amount of paint needed is 8.64 ml,

Answer _____ cm [2]

(b) the amount of paint needed for a container which has a radius of 20 cm.

Answer _____ ml [2]

10 Solve the equation
$$\frac{x}{3} = 5 - \frac{3x-2}{4}$$
.

Answer [3]

11 $\xi = \{ x: -1 \le x \le 7, x \in \Box \}$ $A = \{ x: -1 < x < 6 \}$ $B = \{ 2x: 0 < x \le 3 \}$

List the elements in

(a) A',

(b) $A \cup B$,

Answer [1]

Answer [1]

(c) $A' \cap B$.

[Turn over

- 12 A fruit store sells apples in packs of 3 at \$1.60 before GST. Lim has a \$10 note and wants to buy as many apples as possible.
 - (a) Find the amount of change he will receive if the GST is 7%.

Answer \$ [2]

Lim notices that the GST will increase to 9% in 2024. He commented that if he still uses a \$10 note to pay for his apples, the amount of change he receives will decrease by 2%.

(b) Do you agree with his comment? Justify your answer with calculation.

Answer

13 Bank SDB pays an interest of 1.5% per year for the amount of money in deposit accounts at the end of each year and a bonus interest of 10% of the initial principal amount at the end of 10 years. Luke opened an account with the bank and deposited \$10 000 into it. Find the amount of money Luke has in the account at the end of 12 years.

Answer \$	[4]	

- 14 In the United States, the distance between Disneyland and the Universal Studios is 55 km.
 - (a) On a map, the distance between these two theme parks is 11 cm. The scale of the map is 1 : n. Find the value n.

Answer n = [2]

(b) The area of the Disneyland Park is 0.65 km².
 Find the area of the theme park on another map of scale 1 : 20 000.

Answer _____ cm² [2]

15 The cumulative frequency graph represents the amount of savings 50 teenagers can save in a year.

Cumulative Frequency



16 Consider the following number pattern:

T_1	$3^4 - 16 = 65$
T_2	$4^4 - 16 = 240$
T_3	$5^4 - 16 = 609$
:	
T_n	

(a) Write down an expression for T_4 and evaluate it.

Answer [1]

(b) Find an expression, in terms of n, for T_n .

Answer [2]

(c) One term of the sequence is 83505. Find the value of n in this term.

Answer n = [2]

- 17 The Health Promotion Board recommends individuals who are seeking to prevent weight gain and obesity to achieve 150 minutes of moderate intensity physical activities, such as brisk walking, in a week. To achieve this, Peter, Matt and John brisk walk every weekday for the same duration and set a goal to achieve an average heart rate of 130 beats per minute (bpm) for each session.
 - (a) On Monday, during Peter's brisk walk, his health tracker showed that he has an average heart rate of 150 bpm for the first twenty minutes. To achieve his goal, what is the average minimum heart rate he must have for the rest of his walk?

Answer _____ bpm [2]

Moderate to Vigorous Physical Activities (MVPA) is attained when a person reaches at least 65% of his maximum heart rate during physical activities. The formula below is usually used to estimate a person's maximum heart rate:

220 – Your Age = Maximum Heart Rate

(b) Matt is 30 years old. Find the minimum heart rate he must reach during the brisk walk to attain MVPA.

Answer bpm [1]

John is 20 years old. During his walk, the heart rates he clocked were 120 bpm for the first 12.5 minutes, 130 bpm for the next 10 minutes at and 140 bpm for the last 7.5 minutes. He claimed that he has attained 30 minutes of MVPA. Do you agree? Justify your answers.

Answer

18 (a) Simplify 2(3-2x)-5(3x-2).

Answer [2]

(b) Factorise completely $k^3 - k$.

19 In the diagram, *AXMB* represent a cliff. *A* is a mark on the cliff when the sea level is at high tide and *B* is a mark on the cliff at low tide. Another mark *X* on the cliff is 2 m below the sea level at high tide. At low tide, the sea level is 4.2 m lower than at high tide.

14



(a) *M* is the mark on the cliff when the sea level is exactly halfway between high tide and low tide at a certain time of the day.Find the length *XM*.

Answer _____ m [1]

(b) From point C, the angle of elevation of X is 36° . Find angle XCM.

Answer [4]

(a)

(i) Express \overrightarrow{AC} as a column vector.

Answer [1]

(ii) Find $|\overrightarrow{AC}|$.

 $\overrightarrow{AB} = \begin{pmatrix} 7\\ 4 \end{pmatrix}, \ \overrightarrow{BC} = \begin{pmatrix} 3\\ -5 \end{pmatrix}.$

Answer [2]

(iii) D is a point (6,2) and E is (-8,k). If \overrightarrow{DE} is parallel to \overrightarrow{AB} , find the value of k.

Answer k = [2]

(**b**) The point *P* has coordinates
$$(1,7)$$
 and $\overrightarrow{PQ} = \begin{pmatrix} -3\\ 2 \end{pmatrix}$. Find the equation of the line *PQ*

Answer [2]

[Turn over



The diagram shows a rhombus *ABCD*. Point *E* is on *AC* and *BD*. *ABP* and *BDQ* are straight lines and $\angle ACP$ is a right angle. The measurements, in centimetres, of some lengths are shown on the diagram.



(b) Find the area of the rhombus *ABCD*.

Answer	cm ²	[2]
	 -	

(c) Given *QD* is 37.5 cm, calculate the total area of the figure *ABPCQD*.

Answer _____ cm² [3]

End of Paper

21

No.	Solution/Key Steps
1	7.8517
2	10
3	22°
	Title is misleading. It does not allow the reader to make his own judgement as to which is the
	favourite drink in the food court
	Or
	The vertical axis does not start from 0 which will mislead reader to think that soda is
	purchased more than 2 times than milk (or more than 1 time than tea)
	Nhia.
5	9:1
6(a)	(1) I I I I I I I I I I I I I I I I I I I
0(u)	$\left(\frac{1}{2}\right) = 1$
6(b)	$(1)^3$
	$\left(\frac{1}{6}\right) \times 6 = \frac{1}{36}$
6(c)	$(1)^3$ 1 (5)2
	$\left(\frac{1}{c}\right) \times 3 = \frac{1}{72}$
	(6) 12
7(0)	27
$\frac{7(a)}{(b)}$	3
	$\frac{3}{2(a-b)}$
	2(u-b)
8(a)	$75.5 \mathrm{cm}^3$
0(u)	
8(b)	9
9(a)	12
(b)	96
10	
10	$5\frac{1}{12}$
	13
11(a)	-1, 6, 7
(b)	0, 1, 2, 3, 4, 5, 6
(c)	6
12(a)	1.44
12(b)	11.1%.

Sec 4 Mid Year Exam 2022 Math Paper 1 Mark Scheme

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13	12986.41
14(a)	1: 500 000
14(b)	16.25 cm ²
15(ai)	\$440
(aii)	15
(b)	\$500
(c)	This change will cause the new cumulative frequency curve to be on the left of the original curve.
16(a)	64–16 = 1280
(b)	$T_n = (n+2)^4 - 16$
(c)	15 0019
17(a)	90
(b)	123.5
	alha
18(a)	16–19x
(b)	k(k+1)(k-1)
	live
19(a)	0.1
(b)	1.3°
20(. 1)	
20(a1)	$\overline{AC} = \begin{pmatrix} 10 \\ -1 \end{pmatrix},$
(ii)	10.0
(iii)	-6
(b)	$y = -\frac{2}{2}x + \frac{23}{2}$
	3 3
21(0)	0
$\frac{21(a)}{(b)}$	$\frac{0}{240 \text{ cm}^2}$
	510 cm ²
(C)	

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