

CREST SECONDARY SCHOOL SECONDARY FOUR PRELIMINARY EXAMINATION



4045/02

2 hours

Name:

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Class:

MATHEMATICS (SYLLABUS A)

Paper 2

Thursday 15 August 2024

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your class, index number and name 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 or correction fluid.

Section A Answer all the questions.

Section B Answer one question.

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

If working is needed for any question it must be shown in the space below the question. Omission of essential working will result in loss of marks. The total number of marks for this paper is 70.

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 π , use either your calculator value or 3.142.

For Exami	ner's use
	70
	70

This document consists of **19** printed pages and **1** blank page.

Mathematical Formulae

Compound Interest

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

Measurement

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

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

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

.

Statistic

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

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

Section A (62 marks) Answer **all** the questions in this section.

- 4 The height of Mount Everest is 8 848m. On a particular day, the temperature at Mount Everest base camp was 5° C and the temperature at the summit was -20° C.
 - (a) Find the difference in temperature between the base camp and summit within a day.

Answer°C [1]

(b) What is the rate of temperature change?

Answer°C/m [2]

5 Stacey operates a home-based bakery, specialising in madeleines. She recorded the number of madeleines sold each day in the month of January. The results are shown in the table.

Number of madeleines sold, x	Frequency
$0 \le x < 20$	2
$20 \le x < 30$	11
$30 \le x < 40$	9
$40 \le x < 50$	6
$50 \le x < 80$	3

(a) Calculate an estimate for the mean and the standard deviation.(i) Mean

(ii) Standard Deviation

Answer

Answer	Standard deviation =	[2]	

(b) Stacey forgot to include a corporate order in her table. The order was for 60 madeleines. She expected the estimated mean to increase after she updated the table to include this order. Explain whether Stacey is correct.

- 6 These are the first five terms of a sequence. 28 24 20 16 12
 - (a) Find the next two terms of the sequence.

(b) Write an expression, in terms of *n*, for the *n*th term of this sequence.

(c) Donovan says that – 42 is a term in this sequence. Is he correct? Show your working.

Answer

7 There are 12 pink, 7 purple and 1 white ball in a bag. 2 balls are drawn at random, without replacement.
Find the probability that

(a) the 2 pink balls are drawn,

(a) the 2 pink balls are drawn,

(b) exactly 1 purple ball is drawn,

(c) none of them is white.



7

AB is parallel to CD. E is on BC such that BE = 5 cm, CE = 2 cm, and DE = 3 cm.

(a) Name a pair of similar triangles and explain your reasons for the similarity.

Answer	Triangles and are similar because	
		[2]

(b) Find the length of *AD*.

8



A, B, C, D and E lie on a circle, centre O. Angle $AED = 123^{\circ}$.

Find

(a) Angle *ABD*

	Answer Angle ABD = Reason	
		[2]
(b)	Angle <i>CBD</i>	
	Answer Angle <i>CBD</i> = Reason	[2]
(c)	Angle CAD	[2]
	Answer Angle CAD = Reason	[2]
		[4]

10 The table below is for $y = 2^x$.

	x	- 1.5	- 1	- 0.5	0	0.5	1	1.5	2
	у	0.35		0.71	1	1.41	2	2.83	4
(a)	a) Complete the table.								[1]
(b)	Draw the graph of $y = 2^x$ for $-1.5 \le x \le 2$, on the graph provided behind.								[2]
(c)	Is it possible to find a value of x when $y = 0$? Explain your answer.								
	Answer								
		•••••			•••••				[1]
(d)	(d) Use your graph to find the value of x when $y = 3.5$.								

Answer $x = \dots$ [1]

(e) By drawing a suitable tangent, find the gradient of the curve when x = -0.5.



11 A rectangular plot of land measures (2x+5) m by (x-1) m. A path of 2 m wide runs around the perimeter of a garden.



The area of the garden is 110 m^2 .

(a) Write an equation, in terms of x, for the area of garden. Show that it reduces to $2x^2 - 9x - 115 = 0$.

Answer

(b) Solve the equation $2x^2 - 9x - 115 = 0$ and hence, find the length and breadth of the garden.

Answer

11

[Turn over

[4]

Length = m

Breadth = m

[3]



The diagram shows an upright conical container of radius 6 cm and height 10 cm, filled with water to a height of 3 cm.

(a) Find the radius of the water in the container.

12

(b) Find the surface area of container in contact with the water.

Answer cm² [3]

(c) The water in the conical container was poured into a square-based pyramid container with length 6 cm and height 12 cm.



Given that the water was filled to a certain height in the container, find the volume of squarebased pyramid, not filled by water.

13 The Central Provident Fund Board (CPFB) in Singapore manages a compulsory saving scheme for all employees to provide financial security to individuals in their retirement years. Both employer and employee contribute a portion of the employee's salary to this fund.

The table below shows the current CPF contribution rates for Singaporeans and Singapore Permanent Residents (SPRs) across the different age groups.

Employee's age (years)	Contribution rates from 1 January 2024 (monthly wages > \$750)				
	By employer (% of wage)	By employee (% of wage)	Total (% of wage)		
55 and below	17	20	37		
Above 55 to 60	15	16	31		
Above 60 to 65	11.5	10.5	22		
Above 65 to 70	9	7.5	16.5		
Above 70	7.5	5	12.5		

*Image obtained from Central Provident Fund Board (https://www.cpf.gov.sg/)

(a) Alex starts working at age 25 and earns a monthly wage of \$4,000.
 Calculate the total CPF contribution, made by both Alex and his employer, in the first year.

Answer \$ [2]

(b) He receives a 10% increment in his monthly wage every year. Considering the CPF contribution rate for his age group, calculate the total CPF savings after working for 3 full years.

Answer \$ [3]

(c) After 3 years of employment, Alex is keen to purchase a property and below are the prices.

3-room resale flat	3-bedder condominium	
\$350 000	\$1 500 000	

Given that Alex must have sufficient CPF savings to cover the 5% down payment for the property purchase, suggest which property would be a better choice for him.

Show your workings clearly.

[2]

Answer	
	•••
	•••
	•••
	•••
	•••

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Section B (8 marks) Answer **one** question from this section. Each question carries 8 marks.

14 The diagram shows a school field, *ABCD*, on horizontal ground. *A* is on a bearing of 55 ° from North, angle $ACB = 40^{\circ}$, AC = 80 m, AD = 55 m, and BC = 60 m.



(a) Find bearing of A from B.

(**b**) Find the length of *AB*.

Answer m [2]

(c) Calculate the area of the school field, *ABCD*. Round off to 3 significant figures.

(d) A lamppost of height 15 m stood at point *D*. Find the angle of elevation from point *A* to lamppost.



15 The box-and-whisker plots show the average daily water usage, in litres, of two households, *A* and *B*.

(a) Which household, *A* or *B*, has a higher range of water usage? Show your workings clearly.

(b) Use the diagram to estimate the median for household *B*.

(c) Use the diagram to estimate the interquartile range for household *B*.

Answer

(d)

(e) On average, Household *A* takes about 65 litres of water to wash one load of laundry in a washing machine. Calculate the percentage of daily water usage attributed to laundry.

END OF PAPER