Name: _____

Class : _____ Class No. _____

For Marker's Use Only					
1-17		(40)	**24-25**	(3)	(8)
18-19	(3)	(4)	**26-27**	(6)	(6)
20-21	(4)	(6)	**28-29**	(6)	(6)
22-23	(4)	(4)	**Total**		

Instructions for Candidates:

1. This paper consists of TWO sections, A and B.

2. Answer **ALL** questions in the spaces provided in this **Question-Answer Paper.**
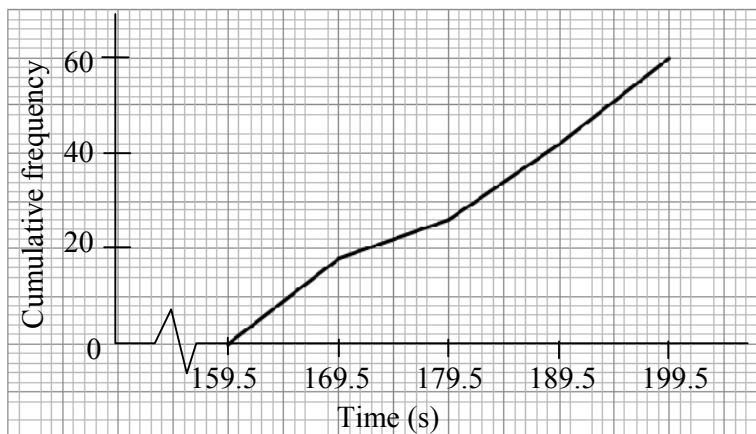
Section A (40%)

All rough work should be done on the rough work paper provided, but will not be marked.

	Answer	**Marks**
1. The table below shows the distribution of the numbers of siblings of a group of S3 students.	1. mean: _____ median: _____ mode(s): _____	3

Number of siblings	0	1	2	3
Number of students	6	7	7	6

Find the mean, the median and the mode(s) of the numbers of siblings of the group of S3 students.

2. The graph below shows the cumulative frequency polygon of the time taken for the runners to complete an 800 m race.

2._____   2

Find the 30th percentile of the time taken for this group of runners to complete the race.

Sub-total :   /5

3. Express the following numbers in scientific notation.

   (a) 14 700 000

   (b) 0.000 102 5

3.

(a)_____   1

(b)_____   1

4. Fill in each of the following blanks with the inequality sign ">" or "<" .

   (a) If $s > t$, then $2s - 3$ _____ $2t - 3$.

   (b) If $f > g$, then $\dfrac{2}{7} - \dfrac{f}{10}$ _____ $\dfrac{2}{7} - \dfrac{g}{10}$.

4.

(a)_____   1

(b)_____   1

5. Factorize $12x^2 - 27y^2$.

5._____   2

6. Factorize $-32x^2 + 16xy - 2y^2$.

6._____   3

7. Convert the decimal number $2^{11} + 2^8 + 2^5 + 7$ into a binary number.

7._____   2

8. Convert 1000101_2 into a hexadecimal number.

8._____   2

9. Peter deposits \$40 000 in a bank at an interest rate 5% per annum compounded quarterly. Find the compound interest received after 2 years. Give your answer correct to the nearest dollar.

9._____   2

10. The number of bacteria in a culture decreases by 20% per hour. If there are 38 000 bacteria in the culture, how many bacteria were there 4 hours ago? Give your answer correct to 3 significant figures.

10._____   2

11. Mr. Chan has to pay \$4680 of rates quarterly. If the rate percentage is 5%, what is the rateable value of the property?

11._____   2

12. The annual income of Tom is \$580 000 and he is eligible for a salaries tax allowance of \$379 000. With reference to the table below, how much salaries tax should he pay?

12._____   2

Net chargeable income	Tax rate
On the first \$50 000	2%
On the next \$50 000	8%
On the next \$50 000	10%
Remainder	20%

13. Which of the following **cannot** be the probability of an event?   13._____   2
     (You may choose more than one of the below.)

     A. $\dfrac{1}{\pi}$ B. $0.\dot{2}$ C. 0 D. -1 E. $\sqrt{3}$

14. A shuttle bus arrives every 10 minutes and it waits for 3 minutes   14._____   3
     at the bus stop. Peggy arrives at the bus stop at a random time.
     Find the probability that she has to wait for more than 3 minutes
     before getting on the bus.

15. In a game, there are 5 targets marked with scores -1, 0, 1, 2 and   15._____   3
     3 respectively. Each player has to throw 2 balls to hit the targets
     in order to get the scores as marked. John has played the game
     and all of his balls hit the target. If the probabilities of hitting
     any of the 5 targets are the same, find the probability that he
     gets a total score less than 4.

16. In the figure, *POQ* is a sector with radius 12 cm. If ΔPOQ is an   16._____   3
     equilateral triangle, find the area of the shaded region.
     (Give the answer correct to 3 significant figures.)
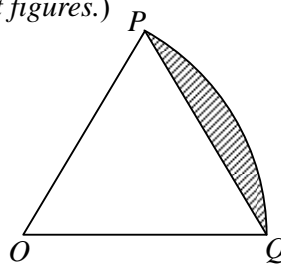
17. Factorize $3x^{n+1} + 5x^{n} - 12x^{n-1}$.   17._____   3

Section B   (60%)   **Sub-total :   /14**

All working must be clearly shown in the spaces provided.

18. Simplify $\dfrac{\left(x^{4}y^{-5}\right)^{2}}{\left(x^{-3}y^{2}\right)^{-1}}$ and express the answer with positive indices.   (3 marks)

19. Solve $\dfrac{6-x}{11} - \dfrac{1-x}{4} < 0$. Also, write down the greatest integer satisfying the inequality. (4 marks)

20. In a Science competition, 3 marks are given for each correct answer and 5 marks are deducted for each wrong answer. If Mandy has answered 14 questions and has obtained a positive score, at least how many questions has she answered correctly? (4 marks)

21. The length and width of a rectangle are x cm and y cm respectively. When the length and width of the rectangle are increased by 25% and p % respectively, the area of the rectangle is increased by 75%.
    (a) Express the new area of the rectangle in terms of x and y. (2 marks)
    (b) Find the value of p. (4 marks)

22. It is known that there are 8.25×10^{11} bacteria on a lawn with dimensions of 25 m $\times 150$ m.
    (a) Find the number of bacteria on the lawn per m^2.
    (b) If the weight of each bacterium is about 1.1×10^{-13} g, estimate the weight of the bacteria on the lawn per m^2.
    (*Express your answers in scientific notation.*) (4 marks)

23. An organization issues 100 000 lucky draw tickets. The prizes are as follows:

Prize item	Number of prizes	Prize
1st prize	1	$100 000
2nd prize	1	$50 000
3rd prize	8	$10 000
Consolation prize	10	$1 000

(a) Find the expected value of the prize of each of the lucky draw tickets.

(b) If Jacky buys a lucky draw ticket of $10, does he gain or suffer a loss on average? Explain your answer. (4 marks)

24. Simplify $\dfrac{8^{2n+1} - 8^{2n-1}}{6 \cdot 2^{6n} + 64^n}$. (3 marks)

25. The table below shows the results of David and John in the subjects Chinese, English, Mathematics and P.E. and the weight of each subject.

	Chinese	English	Mathematics	P.E.
David	82	84	95	63
John	x	90	64	88
Weight	4	4	3	1

(a) It is given that the weighted mean mark of David is higher than that of John by 5. Find the value of x.   (5 marks)

(b) Suppose the weight of P.E. is tripled. Using the result of (a), who has a higher weighted mean mark? Explain your answer.   (3 marks)

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26.　Carmen borrowed a loan \$200 000 from a bank for two years. Interest was calculated at the end of every year at an interest rate of 8% per annum. She planned to repay \$$x$ at the end of every year. It was assumed that the interest was calculated before Carmen made the repayment.

(a) Find, in terms of x, the amount she still owed the bank after the first repayment.

　　(*Express the answer as an expanded and simplified algebraic expression.*)　　　　(2 marks)

(b) Find, in terms of x, the amount she still owed the bank after the second repayment.

　　(*Express the answer as an expanded and simplified algebraic expression.*)　　　　(2 marks)

(c) The loan was fully paid after two repayments. Find the amount of each repayment.

　　Give the answer correct to the nearest dollar.　　　　　　　　　　　　　　　　(2 marks)

27. A circular tank of base radius 2 m is filled with water to a depth of 8 m. A rectangular prism of height 12 m is then lowered until it stands upright on the tank's as shown in the figure. If the base of the prism is a rectangle whose length and width are 1 m and 2 m respectively, find
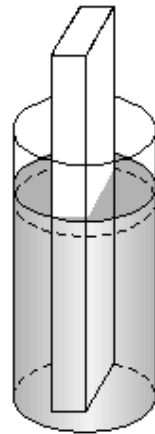
(a) the rise in water level, (3 marks)

(b) the total area of the region that the prism is in contact with water.

(*Give the answers correct to 3 significant figures.*) (3 marks)

28. (a)   Factorize $x^3 - 64$.   (1 mark)

  (b)   Factorize $x^2 - 24x + 80$.   (1 mark)

  (c)   Using (a) and (b), or otherwise, factorize $3x^3 + 2x^2 - 48x - 32$.   (4 marks)

29. In the figure, square *ABCD* is inscribed in a circular carpet with
    radius 2 m. A smaller circle is inscribed in the square *ABCD*.
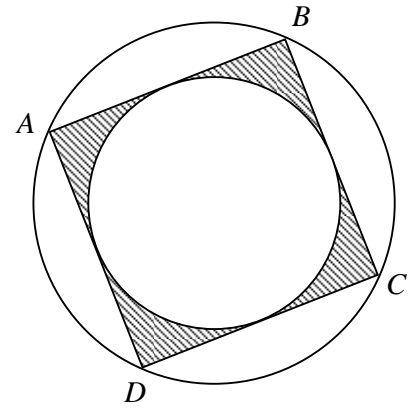
    (a) Find the length of the side of square *ABCD*.
         (*Leave your answer in surd form.*)   (2 marks)
    (b) A bug lands on the carpet at random. Find the probability that
         it lands on the shaded region. (*Give the answer correct to 3
         significant figures.*)   (4 marks)

* End of Paper *