

EXP

TAMPINES SECONDARY SCHOOL

SECONDARY FOUR EXPRESS

PRELIMINARY EXAMINATIONS 2026

NAME

CLASS

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REGISTER
NUMBER

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MATHEMATICS (EXPRESS)
PAPER 1**4052**
24 August 2026
2 hours 15 minutes

Candidates answer on the Question Paper.

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 an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** the 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 π , use either your calculator value or 3.142.

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 **90**.

For Examiner's Use**90**

Mathematical Formulae*Compound Interest*

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

Mensuration

$$\text{Curved surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a cone} = \frac{1}{3} \pi r^2 h$$

$$\text{Volume of a sphere} = \frac{4}{3} \pi r^3$$

$$\text{Area of a triangle } ABC = \frac{1}{2} ab \sin C$$

$$\text{Arc length} = r\theta, \text{ where } \theta \text{ is in radians}$$

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

Trigonometry

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

Statistics

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f}$$

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

Answer **all** the questions.

- 1 (a) Calculate $\frac{-(-12) + \sqrt{(-12)^2 - 4 \times 11 \times (-3)}}{2 \times 11}$.
Write your answer correct to 3 significant figures.

Answer: [1]

- (b) The number of people in a carnival is given to be 500, corrected to the nearest hundred. Write down the minimum number of people that could be at the carnival.

Answer [1]

- 2 (a) Express 360 as the product of its prime factors.

Answer [1]

- (b) The number $360h$ is a perfect square. Find the smallest positive integer value of h .

Answer [1]

- (c) The integer k is such that $200 < k < 420$. The highest common factor of 360 and k is 40. Find the smallest possible value of k .

Answer $k = \dots\dots\dots$ [2]

3 Simplify the following.

(a) (i) $\left(\frac{a^{-15}}{8b^{12}}\right)^{\frac{1}{3}}$

Answer [2]

(ii) $\frac{4x^2}{y} \div \frac{20x}{y^3}$

Answer [2]

(b) Given that $5^{x-4} \times 125^x = 1$, find the value of x .

Answer $x =$ [2]

- 4 (a) Singapore consumes 440 million gallons of water daily.
 Given that 1 gallon = 3.785 litres, express 440 million gallons in litres.
 Leave your answer in standard form.

Answer litres [1]

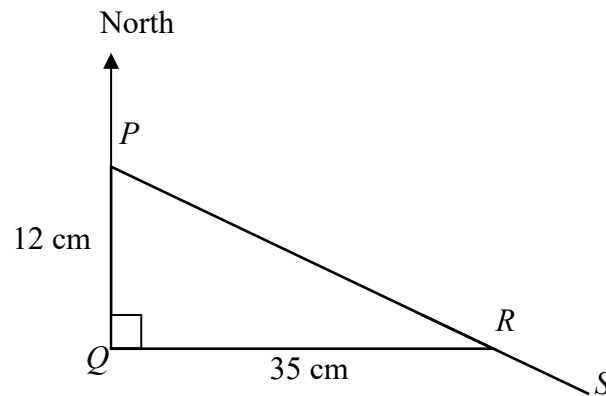
- (b) On a particular day in Singapore, it was estimated that the average water consumption is 142 litres per person. Using the daily water consumption from part (a), calculate the number of people in Singapore on that particular day.
 Give your answer in standard form correct to 3 significant figures.

Answer [2]

- 5 Write as a single fraction in its simplest form $\frac{4}{3-2a} - \frac{5}{a+3}$.

Answer [2]

- 6 In the diagram, PRS is a straight line. P is due north of Q .
 $PQ = 12$ cm, $QR = 35$ cm and angle PQR is 90° .



- (a) Find the value of $\cos \angle QRS$, leaving your answer as a fraction in its simplest form.

Answer [2]

- (b) Find the bearing of R from P .

Answer [2]

- 7 The area of a plot of land on a map is 575 cm^2 . The actual area of the plot of land is 23 km^2 . If the map is drawn to a scale of $1 : n$, find the value of n .

Answer $n = \dots\dots\dots$ [2]

- 8 The stem-and-leaf diagram shows the amount of time in minutes that 23 people spent on an online shopping platform.

7		5	6	8	9	9	9		
8		0	0	1	1	2	3	4	7
9		3	4	4	5	6	8		
10		0	1	2					

Key $7 | 5$ represents 75 minutes

- (a) Write down the median time.

Answer $\dots\dots\dots$ minutes [1]

- (b) An additional person's time spent on the online shopping platform was added to the above stem-and-leaf diagram, and the range increased to 34 minutes. Find the two possible times that this person spent on the online shopping platform.

Answer $\dots\dots\dots$ or $\dots\dots\dots$ minutes [2]

- 9 (a) The high-speed train travelling from Xi'an to Chengdu is 95 m/s.
Convert this speed into km/h.

Answerkm/h [1]

- (b) The distance from Xi'an to Chengdu is 658 km. By rounding the distance and the speed in **part (a)** to 1 significant figure, estimate the time taken for the high-speed train to travel from Xi'an to Chengdu.

Answer h [1]

- (c) Without doing any further calculation, explain why the actual time is shorter than the answer to **part (b)**.

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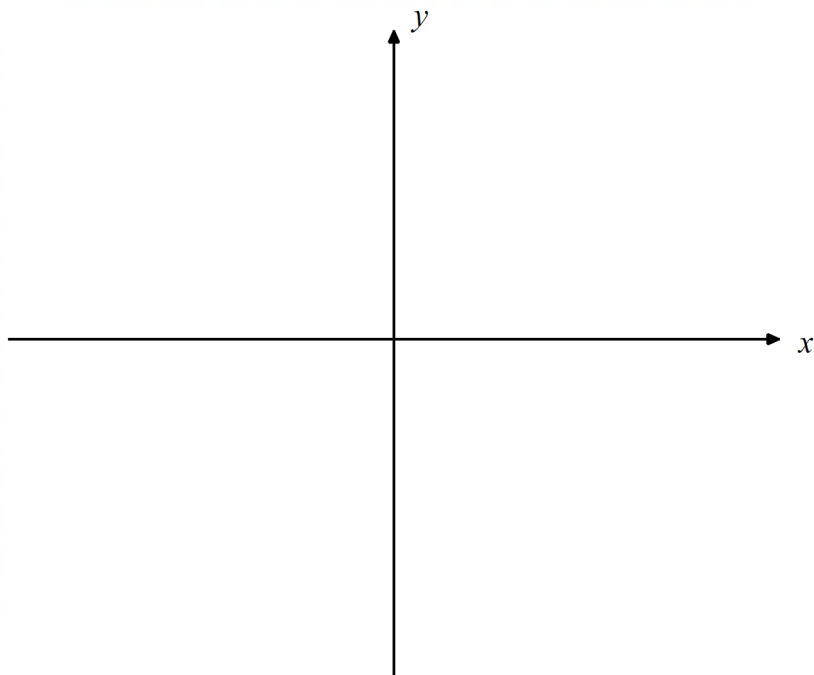
..... [1]

10 The expression $x^2 - 8x + 11$ is equivalent to $(x + a)^2 + b$.

(a) Find the value of a and of b .

Answer $a = \dots\dots\dots, b = \dots\dots\dots$ [2]

(b) Sketch the graph of $y = x^2 - 8x + 11$, indicating clearly the y -intercept and the turning point of the curve. [3]



- 11 The table below shows the time taken by 100 students to complete a hiking trail.

Time (t minutes)	$30 < t \leq 40$	$40 < t \leq 50$	$50 < t \leq 60$	$60 < t \leq 70$	$70 < t \leq 80$
Frequency	15	32	30	16	7

Calculate an estimate of the

- (a) mean time,

Answer minutes [1]

- (b) standard deviation of the above times.

Answer minutes [2]

- 12 P is directly proportional to the square of Q .

Aaron says: "If the value of Q is halved, the value of P will also be halved."

Determine if Aaron is correct. Explain your answer, with mathematical calculations.

Answer

.....

 [3]

- 13** The cash price of a smart phone is \$1475.
The hire-purchase price of the smart phone consists of a deposit and 12 equal monthly payment of \$113.
Given that the hire-purchase price is \$1651, calculate the deposit as a percentage of the cash price.

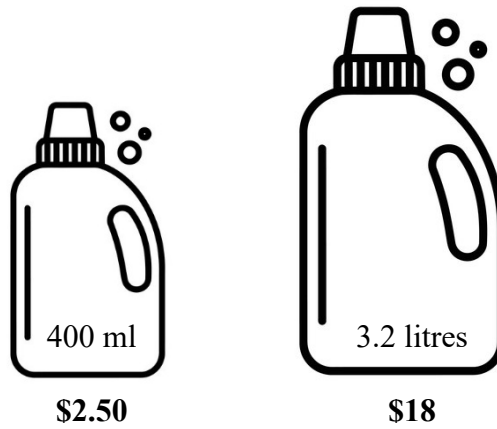
Answer% [3]

- 14** Five positive integers have a mean of 11, a median of 14 and a mode of 19. Find the 5 numbers.

Answer,,,, [2]

15 The diagram below shows two geometrically similar bottles.

- (a) The height of the 400 ml bottle is 6.5 cm.
Find the height of the 3.2 litre bottle.



Answer cm [2]

- (b) Explain which bottle is better value for money.

400 ml / 3.2 litre * bottle is better value for money

because

**circle your choice*

[1]

16 (a) Solve the following pair of simultaneous equations.

$$8y = -x + 32$$

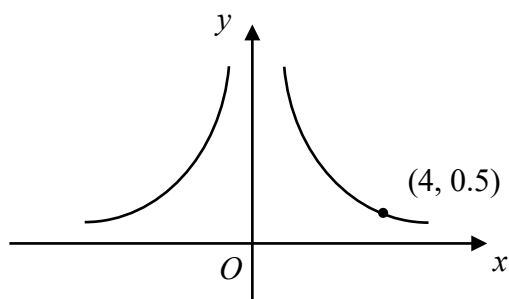
$$2y = x - 2$$

Answer $x = \dots\dots\dots, y = \dots\dots\dots$ [3]

- (b) Solve the inequalities $\frac{3}{4}x < \frac{1}{2}(x+1) \leq 5x-1$.

Answer [3]

- 17 The sketch shows the graph of $y = ax^n$, where $a > 0$ and n is an integer greater than -4 .



Find the value of n and of a .

Answer $n =$

$a =$ [3]

- 18 The table shows the CCA chosen by a group of 30 students.

	Uniform Group	Performing Arts
Boys	8	3
Girls	7	12

- (a) One of the students who is in the Uniform Group is chosen at random. Find the probability that this student is a boy.

Answer [1]

- (b) Two girls are chosen at random. Find the probability that both girls are in the Performing Arts CCA.

Answer [1]

- (c) Two students are chosen at random. Find the probability that at least one is from the Uniform Group CCA.

Answer [2]

19 $\xi = \{\text{integers } x : 1 < x \leq 17\}$

$X = \{x: 3 \leq x < 15\}$

$Y = \{\text{factors of } 20\}$

(a) List the elements in $X \cap Y$.

Answer [1]

(b) Find $n(X \cup Y)'$.

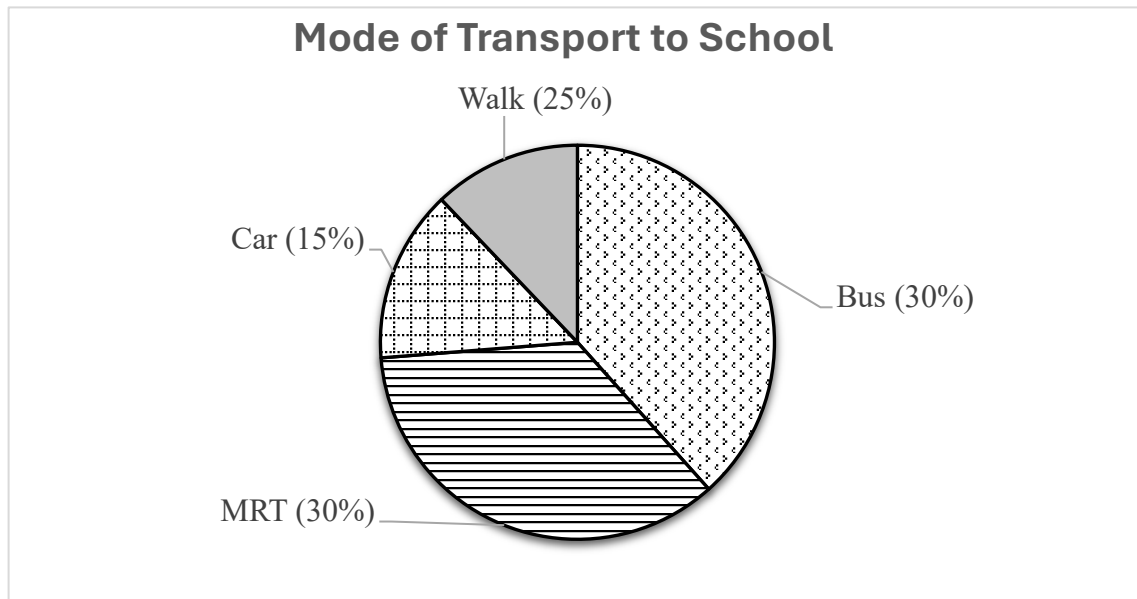
Answer [1]

20 A bank pays compound interest of 1.5% per annum.

Mr Lee deposited a sum of money in the bank for 3 years. After 3 years, there was \$10456.78 in his account. Find the amount he deposited in the bank at the start, giving your answer to the nearest dollar.

Answer \$..... [3]

- 21 In a recent survey, the following pie chart was used to report the modes of transport students take to a particular school.



State one aspect of the chart that may be misleading and explain how this may lead to a misinterpretation of the chart.

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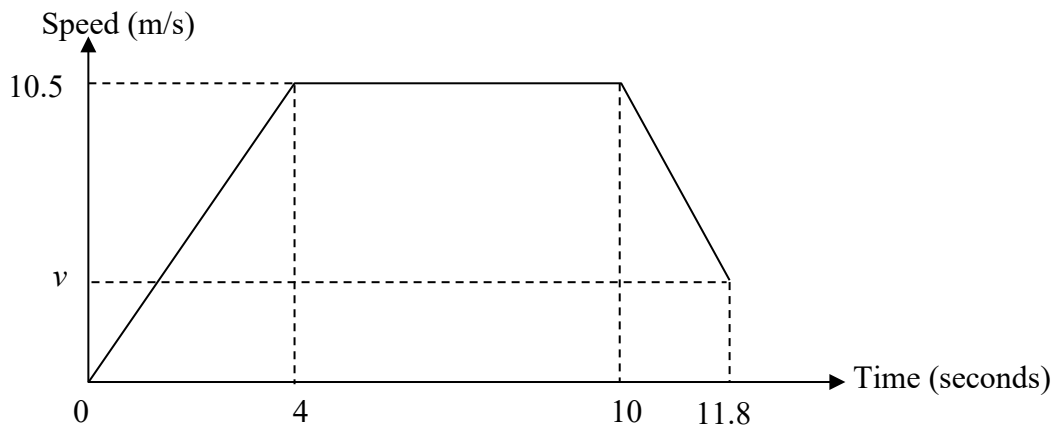
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[2]

- 22 An object's speed is shown in the speed-time graph below. For the first 4 seconds, the object accelerated to a speed of 10.5 m/s. It then maintained the same speed for the next 6 seconds and slowed down over the last 1.8 seconds.



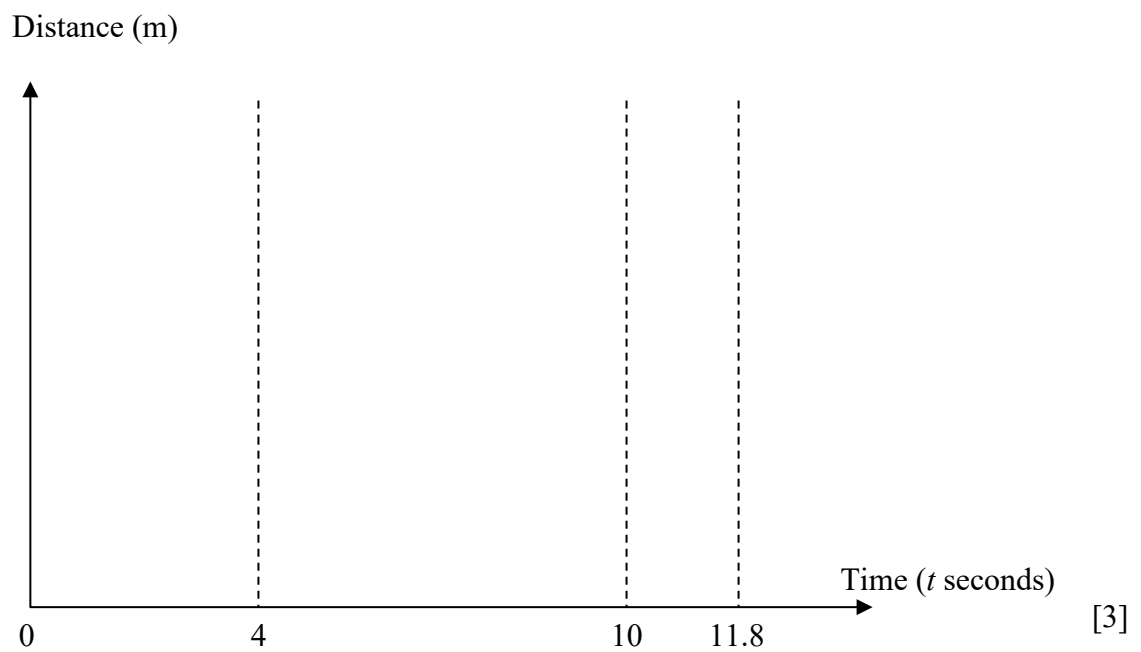
- (a) Find the object's acceleration in the first 3 seconds.

Answerm/s² [1]

- (b) The area under a speed-time graph represents the distance travelled by the object. The object travelled a distance of 16 m from 10 to 11.8 seconds. Calculate its speed, v m/s, at 11.8 seconds.

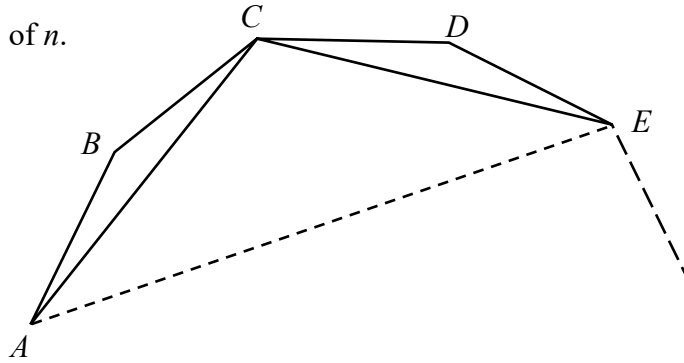
Answerm/s [2]

- (c) Use the grid below to sketch the distance-time graph of the object for the first 11.8 seconds.



- 23 In the figure below, $ABCDE$ is part of an n -sided regular polygon. The angle ABC is 150° .

- (a) Find the value of n .



Answer $n = \dots\dots\dots$ [1]

- (b) Prove that triangles ABC and CDE are congruent.

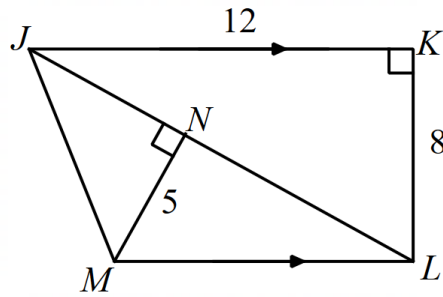
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 [2]

- (c) Hence, find angle CEA .

Answer Angle $CEA = \dots\dots\dots$ [2]

- 24 $JKLM$ is a trapezium and JNL is a straight line. JK is parallel to ML . $NM = 5$ m, $KL = 8$ m and $JK = 12$ m.



- (a) State, with clear reasons, a pair of similar triangles. [2]

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- (b) Find the length of NL .

Answer m [2]

- (c) Find the value of $\tan \angle JLM$.

Answer [1]

25 The first four terms in a sequence are given below.

$$T_1 = 2^2 + 1 = 5$$

$$T_2 = 3^2 + 4 = 13$$

$$T_3 = 4^2 + 7 = 23$$

$$T_4 = 5^2 + 10 = 35$$

(a) Find T_5 .

Answer $T_5 = \dots\dots\dots$ [1]

(b) Show that the n^{th} term of the sequence, T_n is given by $n^2 + 5n - 1$. [2]

(c) T_n and T_{n+1} are consecutive terms in the sequence. Find and simplify $T_{n+1} - T_n$.

Answer $\dots\dots\dots$ [2]

- (d) Hence, explain why the difference of two consecutive terms of the sequence is even for all values of n .

Answer

..... [1]

END OF PAPER

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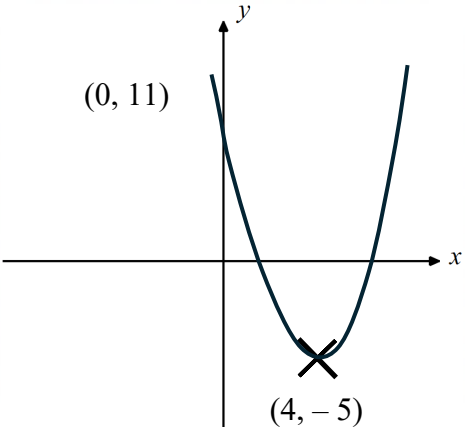
Answer Key

1(a)	1.30	13	20%
1(b)	450	14	The 5 numbers are 1, 2, 14, 19, 19
2(a)	$360 = 2^3 \times 3^2 \times 5$	15(a)	$h = 13$ cm
2(b)	$h = 10$	15(b)	Bottle B is better value for money
2(c)	280	16(a)	$x = 8, y = 3$
3(ai)	$\frac{1}{2a^5b^4}$	16(b)	$\frac{1}{3} \leq x < 2, x \geq \frac{1}{3}$
3(aii)	$\frac{xy^2}{5}$	17	$n = -2, a = 8$
3(b)	$x = 1$	18(a)	$\frac{8}{15}$
4(a)	1.6654×10^9	18(b)	$\frac{12}{19} \times \frac{11}{18} = \frac{22}{57}$
4(b)	Number of people $\approx 1.17 \times 10^7$	18(c)	$\frac{22}{29}$
5	$\frac{14a-3}{(3-2a)(a+3)}$	19(a)	$Y = \{2, 4, 5, 10\}$ $X \cap Y = \{4, 5, 10\}$
6(a)	$-\frac{35}{37}$	19(b)	$(X \cup Y)' = \{15, 16, 17\}$ $n(X \cup Y)' = 3$
6(b)	108.9°	20	$P \approx \$10000$
7	1: 20 000	22(a)	Acceleration at 3s = 2.625m/s^2
8(a)	83	22(b)	$v = 7\frac{5}{18}$ or 7.28
8(b)	109 min and 68 min	23(a)	$n = 12$
9(a)	342km/h	24(b)	$NL = 7.5\text{m}$
9(b)	2.33h or $2\frac{1}{3}$ h	24(c)	$\tan \angle JLM = \frac{8}{12} = \frac{2}{3}$
9(c)	Since distance (numerator) is rounded up and time (denominator) is rounded down, the actual time is shorter than the estimated time.	25(a)	$T_5 = 6^2 + 13 = 49$
10(a)	$a = -4, b = -5$	25(b)	$T_n = n^2 + 5n - 1$
11(a)	51.8	25(c)	$T_{n+1} - T_n = 2n + 6$
11(b)	11.2		
12	He is wrong as the value should be a quarter of its original.		

Tampines Secondary School
2026 Sec 4G3 Preliminary Exam Marking Scheme

No.	Mark Scheme	Marks
1(a)	$\frac{-(-12) + \sqrt{(-12)^2 - 4 \times 11 \times (-3)}}{2 \times 11} = 1.30$	B1
1(b)	450	B1
2(a)	$360 = 2^3 \times 3^2 \times 5$	B1
2(b)	$\therefore h = 2 \times 5 = 10$	B1
2(c)	$360 = 2^3 \times 3^2 \times 5$ $k = 2^3 \times 5 \times 7 = 280 \quad (7 \text{ is the next smallest prime after } 2, 3 \text{ and } 5)$ $\text{HCF} = 2^3 \times 5 = 40$	M1 (to identify 2^3 and 5 as part of k's prime factors) A1
3(ai)	$\left(\frac{a^{-15}}{8b^{12}} \right)^{\frac{1}{3}} = \frac{a^{-5}}{2b^4}$ $= \frac{1}{2a^5b^4}$	B1 positive index or any correct index law applied A1
3(aii)	$\frac{4x^2}{y} \div \frac{20x}{y^3} = \frac{4x^2}{y} \times \frac{y^3}{20x}$ $= \frac{xy^2}{5}$	M1 (any 1 correct simplification) A1
3(b)	$5^{x-4} \times 125^x = 1$ $5^{x-4} \times 5^{3x} = 5^0$ $x - 4 + 3x = 0$ $4x = 4$ $x = 1$	M1 (convert any term to same base) A1
4(a)	$440 \times 3.785 \times 10^6 = 1.6654 \times 10^9$	A1
4(b)	Number of people = $\frac{\text{Total daily water consumption in litre}}{\text{Average consumption per person in litres}}$ $= \frac{1.6654 \times 10^9}{142}$ $= 11\,728\,169$ $\approx 1.17 \times 10^7$	M1, A1

5	$\frac{4}{3-2a} - \frac{5}{a+3} = \frac{4(a+3) - 5(3-2a)}{(3-2a)(a+3)}$ $= \frac{4a+12-15+10a}{(3-2a)(a+3)}$ $= \frac{14a-3}{(3-2a)(a+3)}$	M1 common denominator A1
6(a)	$PR = \sqrt{12^2 + 35^2}$ $= 37 \text{ cm}$ $\cos \angle QRS = -\cos \angle PRQ$ $= -\frac{35}{37}$	M1 A1
6(b)	$\angle QPR = \tan^{-1} \frac{35}{12}$ $= 71.075^\circ$ $\text{Bearing} = 180^\circ - 71.075^\circ$ $\approx 108.9^\circ$	M1 A1
7	$575 \text{ cm}^2 : 23 \text{ km}^2$ $1 \text{ cm}^2 : \frac{23}{575} \text{ km}^2$ $1 \text{ cm}^2 : 0.04 \text{ km}^2$ $1 \text{ cm} : \sqrt{0.04} = 0.2 \text{ km}$ $1 \text{ cm} : 20\,000 \text{ cm}$ $\therefore 1 : 20\,000$	M1 A1
8(a)	83	B1
8(b)	109 min and 68 min	B2
9(a)	$0.095 \text{ km} \times 3600 = 342 \text{ km/h}$	B1
9(b)	$\frac{700}{300} = 2.33 \text{ h}$ or $2\frac{1}{3} \text{ h}$	B1 ecf
9(c)	Since distance (numerator) is rounded up and time (denominator) is rounded down, the actual time is shorter than the estimated time.	B1
10(a)	$x^2 - 8x + 16 - 16 + 11 = (x-4)^2 - 5$ $a = -4, b = -5$	B2

10(b)		B1 curve shape B1 y-intercept B1 min. point.
11(a)	$\text{Mean} = \frac{35 \times 15 + 45 \times 32 + 55 \times 30 + 65 \times 16 + 75 \times 7}{100}$ $= 51.8 \text{ min (3s.f.)}$	B1
11(b)	$\text{S.d.} = \sqrt{\frac{35^2 \times 15 + 45^2 \times 32 + 55^2 \times 30 + 65^2 \times 16 + 75^2 \times 7}{100}}$ $= 11.2 \text{ min (3s.f.)}$	M1 A1
12	$P = kQ^2$, where k is a constant.	M1
	$P_{\text{new}} = k \left(\frac{1}{2} Q \right)^2$ $= \frac{1}{4} kQ^2$	M1
	He is wrong as the value should be a quarter of its original.	A1
13	$\text{Deposit} = \$1651 - 12 \times \$113 = \$295$ deposit as a percentage of the cost price $\text{Percentage} = \frac{295}{1475} \times 100\%$ $= 20\%$	M1 M1 (ecf. Their deposit) A1
14	$\frac{x + y + 14 + 19 + 19}{5} = 11$ $x + y = 55 - 14 - 19 - 19$ $x + y = 3$ $x = 1, y = 2$ The 5 numbers are 1, 2, 14, 19, 19	M1 A1

15(a)	$\left(\frac{h}{6.5}\right)^3 = \frac{3200}{400} = \frac{8}{1}$	M1
	$\frac{h}{6.5} = \sqrt[3]{8}$ $h = 2 \times 6.5 = 13 \text{ cm}$	A1
15(b)	400 ml cost \$2.50 $\rightarrow \times 8 = 3200 \text{ ml cost } \$2.50 \times 8 = \$20$ 3200 ml cost \$18 Bottle B is better value for money because for the same volume of 3200 ml, bottle B cost \$2 less.	B1 (o.e.)
16(a)	$y = -\frac{1}{8}x + 4$ ---- (1) $2y = x - 2$ ---- (2) Substitute (1) into (2): $2\left(-\frac{1}{8}x + 4\right) = x - 2$ $-\frac{1}{4}x + 8 = x - 2$ $\frac{5}{4}x = 10$ $x = 8, y = 3$	M1 A2
16(b)	$\frac{3}{4}x < \frac{1}{2}(x+1) \leq 5x-1$ $\frac{3}{4}x < \frac{1}{2}(x+1)$ $\frac{1}{2}(x+1) \leq 5x-1$ $3x < 2(x+1)$ $x+1 \leq 10x-2$, $3x-2x < 2$ $1+2 \leq 10x-x$ $x < 2$ $x \geq \frac{1}{3}$ $\frac{1}{3} \leq x < 2$	M2 for each inequality solution A1
17	$n = -2$	B1
	Sub (4,0.5) into $y = ax^{-2}$ $\frac{1}{2} = a(4)^{-2}$ $\frac{1}{2} = \frac{a}{16}$ $a = 8$	M1 A1
18(a)	P (student in uniform group chosen is a boy) = $\frac{8}{15}$	B1
18(b)	P (two girls chosen are from the Performing Arts) = $\frac{12}{19} \times \frac{11}{18} = \frac{22}{57}$	B1

18(c)	P (2 students chosen, at least 1 is from the performing arts) $= 1 - \left(\frac{15}{30} \times \frac{14}{29} \right) = \frac{22}{29}$	M1 or attempt to calculate of 1 or more A1
19(a)	$\xi = \{\text{integers } x : 1 < x \leq 17\}$ $X = \{x: 3 \leq x < 15\}$ $Y = \{\text{factors of } 20\}$ $Y = \{2, 4, 5, 10\}$ $X \cap Y = \{4, 5, 10\}$	B1
19(b)	$(X \cup Y)' = \{15, 16, 17\}$ $n(X \cup Y)' = 3$	B1
20	$P \left(1 + \frac{1.5}{100} \right)^3 = 10456.78$ $P = \frac{10456.78}{\left(1 + \frac{1.5}{100} \right)^3}$ $P \approx \$10000$	M1 (Eqn) M1 A1
21	The pie chart has sectors which are not proportional to the data percentage. It makes the sector representing the MRT / Bus appear to be more than double the size of the sector representing those who travel by Car. OR The sector representing Walk seems to be smaller than or same size as that of Car though the percentage of students walk to school is higher.	B1 Aspect given B1 Other reasonable explanation given.
22(a)	Acceleration at 3s = $\frac{10.5}{4} = 2.625 \text{ m/s}^2$	M1, A1
22(b)	$\frac{1}{2} \times 1.8(v + 10.5) = 16$ $v + 10.5 = \frac{16 \times 2}{1.8}$ $v = 7 \frac{5}{18} \text{ or } 7.28$	M1 A1
22(c)	Distance travelled: 1 st 4 sec: $\frac{1}{2} \times 4 \times 10.5 = 21 \text{ m}$ Next 6 sec: $6 \times 10.5 = 63 \text{ m}$ Last 1.8 sec: 16 m	B3 for each part of graph correct shape and corresponding value

		(Award M1 if graph is entirely wrong, but calculation of either area in first 2 segments is correct)
23(a)	Size of one exterior angle $= 180^\circ - 150^\circ$ $= 30^\circ$ $n = 360^\circ \div 30^\circ$ $n = 12$	B1 o.e. for interior angles formula B1
23(b)	Since the figure is a regular polygon, $AB = BC = CD = DE$ (Sides of a regular polygon) $\text{Angle } ABC = \text{Angle } CDE$ (interior angles of a regular polygon) By SAS, triangles ABC and CDE are congruent.	M1 any 1 correct reason A1 for proof
23(c)	$\text{Angle } DCE = \text{Angle } BCA = (180^\circ - 150^\circ) \div 2 = 15^\circ$ $\text{Angle } ACE = 150^\circ - 30^\circ = 120^\circ$ $AC = CE$ hence triangle CEA is an isosceles triangle. $\text{Angle } CEA = (180^\circ - 120^\circ) \div 2 = 30^\circ$	M1 (any base angle of isosceles) A1
24(a)	$\angle KJL = \angle NLM$ (alternate angles, $JK \parallel ML$) $\angle JKL = \angle LNM = 90^\circ$ (given) ΔJKL is similar to ΔLNM	M1 (2 properties) M1

24(b)	$\frac{NL}{12} = \frac{5}{8}$ $NL = \frac{5}{8} \times 12 = 7.5\text{m}$	M1 A1
24(c)	$\tan \angle JLM = \frac{8}{12} = \frac{2}{3}$	B1
25(a)	$T_1 = 2^2 + 1 = 5$ $T_2 = 3^2 + 4 = 13$ $T_3 = 4^2 + 7 = 23$ $T_4 = 5^2 + 10 = 35$ $T_5 = 6^2 + 13 = 49$	B1
25(b)	$T_n = (n+1)^2 + 3n - 2$ $= n^2 + 2n + 1 + 3n - 2$ $= n^2 + 5n - 1$	B1
25(c)	$T_{n+1} - T_n$ $= (n+1)^2 + 5(n+1) - 1 - (n^2 + 5n - 1)$ $= n^2 + 2n + 1 + 5n + 5 - 1 - n^2 - 5n + 1$ $= 2n + 6$	B1 B1
25(d)	Since $T_{n+1} - T_n = 2n + 6 = 2(n+3)$, can be expressed as a multiple of 2, hence the expression will always be even.	B1