For Examiner's Use

1 Write the following numbers in order of size, starting with the largest.

$$112\% \ , \ (-1.2)^2, \ \sqrt{1.3} \ , \ 1.\dot{6}$$

Answer ..... , ... , ... , ... [1]

2 **(a)** Calculate $\dfrac{(-21)^3 \div [15-(\sqrt{2\times 11}+7.45^2)]}{\sqrt[3]{100}-2}$, leaving your answer to 1 significant figure.

Answer (a).....[2]

(b) A natural number n, rounded off to the nearest 1000, is 23 000.

Write down

(i) the smallest possible value of n,

(ii) the largest possible value of n.

Answer (b) (i) n = ...[1]

(ii) n =.....[1]

For Examiner's Use

3 Deborah made a loss of 15% when she sold her laptop for $1785.
If she wanted to make a profit of 25%, how much should she sell her laptop for?

Answer $.....[3]

For Examiner's Use

4 **(a)** Hannah cycles to school everyday. If she cycles at an average speed of 10 km/h, she will reach her school in 30 minutes.
On a certain day, she left her home for school at 7 am.
Calculate the average speed, in m/s, she needs to cycle at, if she is expected to reach her school at 7.25 am.

(b) Given that $\frac{2x-3y}{2}=\frac{x+3y}{3}$, find the ratio of $x:y$.

Answer (a).....m/s[3]

(b)..... : .....[3]

For Examiner's Use

5 **(a)** Given that the nth term of the sequence 1, 4, 9, 16, ... is n^2, state the nth term of the following sequence $1, \frac{1}{4}, \frac{1}{9}, \frac{1}{16}, \ldots$.

For Examiner's Use

Answer (a) .....[1]

(b) Consider the following pattern in the table.

Line 1	1	$= 1 = 1^2$
Line 2	$1 + 2 + 1$	$= 4 = 2^2$
Line 3	$1 + 2 + 3 + 2 + 1$	$= 9 = 3^2$
Line 4	$1 + 2 + 3 + 4 + 3 + 2 + 1$	$= 16 = 4^2$
Line 5		

(i) Write down Line 5 in the table above. [1]

(ii) Find the value of $1 + 2 + 3 + \ldots + 499 + 500 + 499 + \ldots + 3 + 2 + 1$.

(iii) Given that $1 + 2 + 3 + \ldots + (p-1) + p + (p-1) + \ldots + 3 + 2 + 1 = 81$, find the value of p.

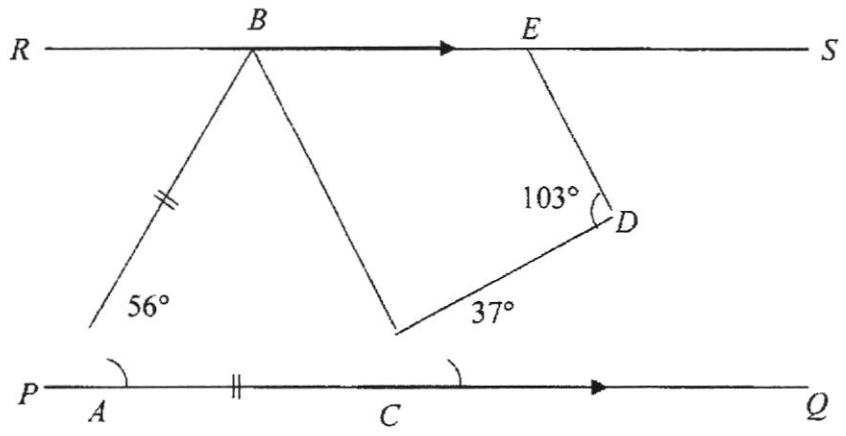
Answer (b) (ii) .....[1]

(iii) p = ...[1]

For Examiner's Use

6 **(a)** In the diagram (not drawn to scale), $AB = AC$ and RS is parallel to PQ.

$\angle BAC = 56°, \angle DCQ = 37°$ and $\angle CDE = 103°$.



For Examiner's Use

Find, stating your reason(s) clearly,

(i) $\angle BCD$,

(ii) $\angle DES$.

Answer (a) (i) .....° [2]

(ii) .....° [2]

(b) Explain whether BC is parallel to ED.

Answer (b).....

..... [2]

For Examiner's Use

7 **(a)** Simplify $\frac{5w^5}{3} \times \frac{1}{\sqrt[3]{216w^6}}$.

Answer .....[2]

(b) Factorise $5a^2 + 35ab - 3ab - 21b^2$ completely.

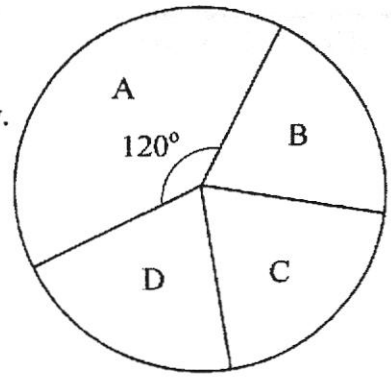
Answer .....[2]

For Examiner's Use

8 **(a)** The pie chart shows the distribution of mathematics test grades of a class.

(i) Given that there were 36 students in the class, how many students scored grade A?

(ii) 10 students scored grade B.
Penny says that this pie chart is drawn wrongly.
Explain with working how she came to the conclusion.



Answer (a) (i).....students[1]

(ii) .....

.....

..... [2]

For Examiner's Use

(b) The table shows the number of hours spent on Facebook by a group of students in a day.

For Examiner's Use

Number of hours	0	1	2	3	4	5	6
Number of students	4	x	7	6	5	4	2

(i) If the mode is 2, write down an inequality which must be satisfied by x.

(ii) If the mean number of hours spent by each student is 2.75, form an equation in x and solve it.

Answer (b) (i) ..... [1]

(ii) x = ... [3]

For Examiner's Use

9 In a triangle ABC, $\angle ABC = 50°$ and $BC = 7$ cm.

[Turn over

The line AB is given as shown below.

(a) Construct and label the triangle ABC in the answer space below. [2]

(b) A, B and C mark the position of three shops on a map.
A train station is to be built equidistant from the walking paths AB and AC and equidistant from A and C.

By constructing the appropriate bisectors, mark the location of the train station and label it with 'S'.
[3]

Answer (a) and (b)

1 **(a)** Solve the inequalities $-10 \leq 2x + 7 < 3$. [2]

(b) Express $\frac{2}{w} - \frac{w}{3} + 1$ as a single fraction. [2]

(c) The first 4 terms of a sequence are 8, 13, 18 and 23.

(i) Write down the 6th term. [1]

(ii) Find the nth term of this sequence. [1]

---

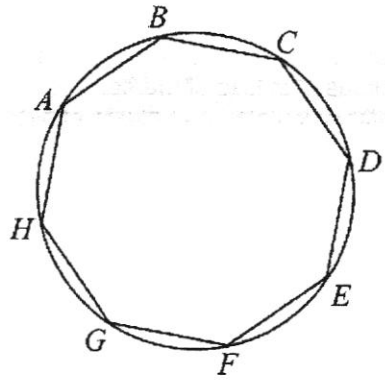
2 **(a)** An n-sided polygon has 3 interior angles of 163°, 137° and 100° respectively.

(i) State in terms of n, the number of remaining interior angles. [1]

The remaining interior angles are 160° each.

(ii) Find the value of n. [2]

(b) A one-dollar coin has a regular octagon $ABCDEFGH$ inscribed in a circle as shown.



(i) Find the reflex angle ABC. [2]

(ii) Stating your reasons clearly, find

(a) angle BAC,

(b) angle BAD. [3]

(iii) Find angle ADG. [1]

3 **(a)** Petrol costs $50x$ cents per litre.

Alex bought some petrol and it cost him $2y$ dollars.
Find an expression, in terms of x and y, for the number of litres of petrol Alex bought. [2]

(b) Two towns, A and B, are 198 km apart.

(i) Simon travelled by car from A to B at an average speed of 66 km/h.
How long did the journey take? [1]

(ii) He travelled back by car from B to A in 5 hours 30 minutes.
Find his average speed, in kilometres per hour, on his return journey. [1]

(iii) Simon left A at 0730. He stayed in B for $\frac{3}{4}$ of an hour.
At what time did he arrive back in A? [1]

(iv) The car travelled 13 km on each litre of petrol.
Find the least whole number of litres he needs to complete the journey from A to B and back again to A. [2]

---

4 **Answer the whole of this question on a sheet of graph paper.**

The values of x and y shown in the table below are related through a straight line.

x	-4	8	24
y	6	3	-1

(a) Using a scale of 2 cm to represent 4 units, draw a horizontal x-axis for $-4 \le x \le 24$.
Using a scale of 2 cm to represent 1 unit, draw a vertical y-axis for $-1 \le y \le 6$.
On your axes, plot the points given in the table and join them with a straight line. [3]

(b) Using your graph, find the

(i) value of y when $x = 2$, [1]

(ii) the x-intercept, [1]

(iii) gradient of the line. [2]

5 **(a)** Calculate the total surface area of a cuboid of dimensions 9 cm by 7 cm by 5 cm. [2]

(b) **(i)** Express 2016 as the product of its prime factors. [1]

(ii) Given that $\frac{2016}{k} = p^2$, where k and p are integers and p is as large as possible, find the values of k and of p. [2]

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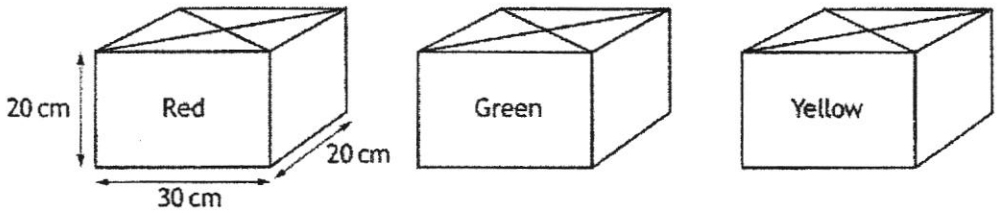
6 Gwen makes candles from blocks of coloured wax.
Each block of wax is a cuboid measuring 30 cm by 20 cm by 20 cm as shown.



Each candle contains the colours red, green and yellow in the ratio 1 : 2 : 3 respectively and has a volume of 729 cm^3.

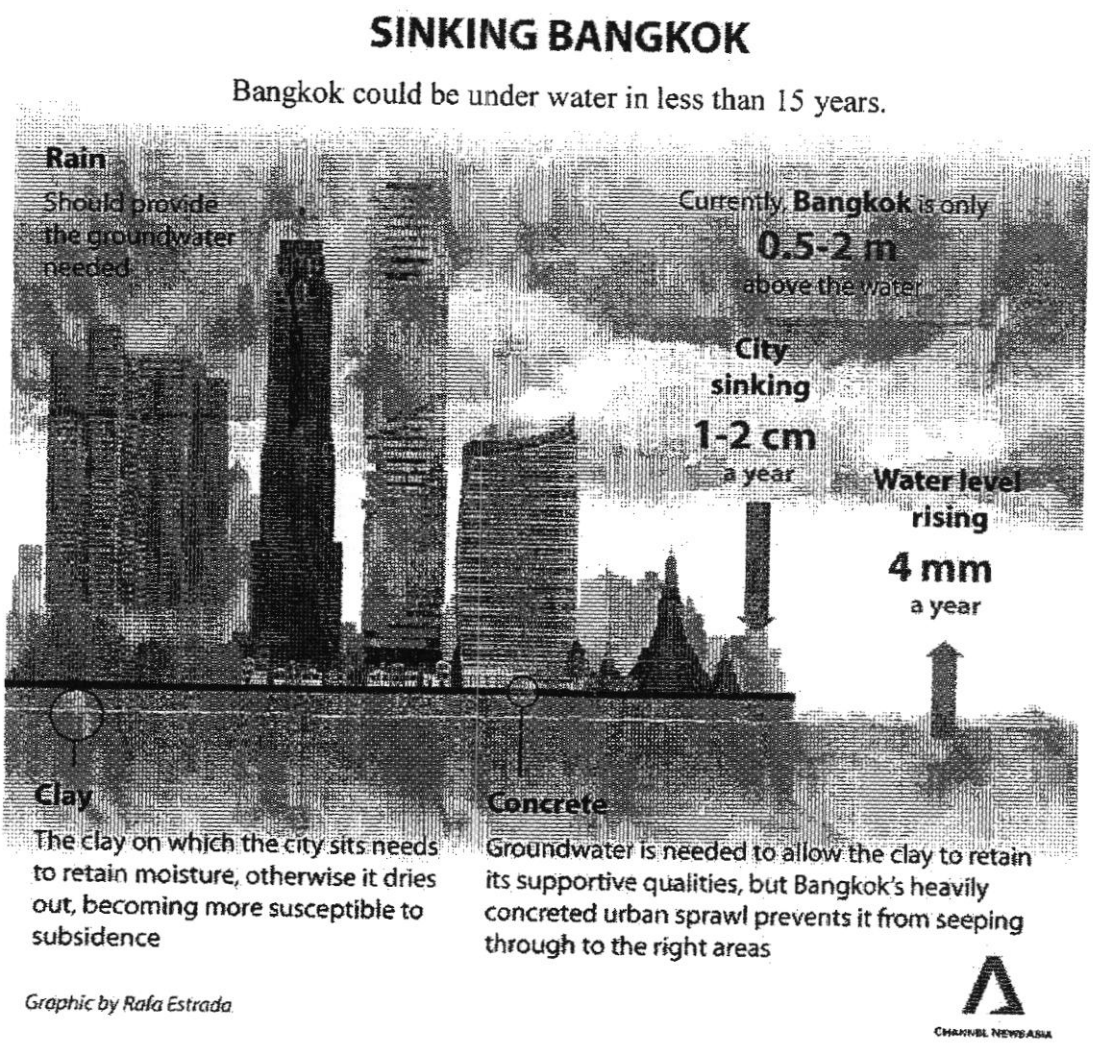
Gwen only buys 1 block of each colour.

(a) What is the maximum number of candles that she can make? [3]

Gwen sells all the candles made in **(a)** and makes a profit of 65%.

(b) Given that each block of wax costs $15.50, what is Gwen's selling price for each candle, leaving your answer to the nearest cent? [3]

7 It is reported that Bangkok city is sinking and it is accelerated with the rising water level.



Bangkok city sinks 1 to 2 cm every year, correct to the nearest cm.

(a) Find the greatest possible distance the city will sink. [1]

(b) The report claims that 'Bangkok could be under water in less than 15 years.' By showing your working clearly, verify if the claim is true or false. [2]

8 Orange juice is poured into the mold (Figure 1) and frozen to form a popsicle (Figure 2).
The uniform cross-section of the mold is made up of a trapezium ***WXYZ*** and a semi-circle with diameter ***XY***.
The perpendicular length between ***WZ*** and ***XY*** is 9 cm.
XY = 2 cm and ***WZ*** = 5 cm.

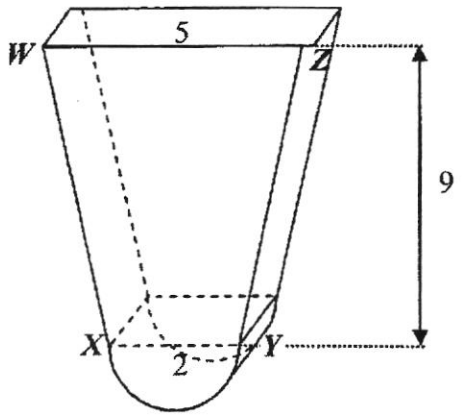


Figure 1

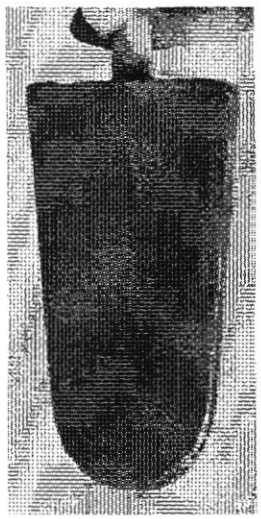


Figure 2

(a) Show that the cross-sectional area of the mold is 33.071 cm^2. [2]

(b) The uniform thickness of the mold is 1.2 cm, calculate the volume of the mold. [1]

Wendy buys orange juice to makes orange popsicles for a charity event.

The price of orange juice is given below.

Item	T&K Orange Juice (330 ml)	T&K Orange Juice (1 L)
Price (before discount)	\$1.20	\$2.70
Promotion	10% discount	Buy 2 at \$4.65

Wendy estimates that there will be 350 popsicles sold.
90% of the mold is filled as orange juice expands when frozen.

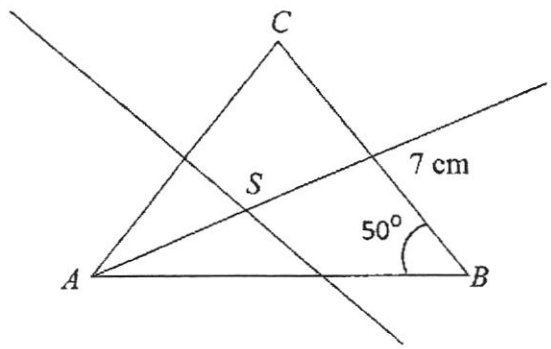
She must make sure that she charges the lowest amount to cover her costs and raise \$400.

(c) Suggest a sensible amount for her to charge for one popsicle. [4]

End of Paper

Secondary One End-of-Year Examination 2017
Marking Scheme

	Solution	Marks	Remarks
1.	$1.\dot{6}$, $(-1.2)^2$, $\sqrt{1.3}$, 112%	B1	
2. (a)	77.57509249 ≈ 80	B1 B1	 soi
2. (b) (i)	Smallest $n = 22500$	B1	
2. (b) (ii)	Largest $n = 23499$	B1	
3.	Cost price $= \frac{1785}{85} \times 100 = \$2100$ Selling price $= \frac{125}{100} \times 2100$ $= \$2625$	B1 M1 A1	$\frac{1785}{85}$ Cost price $\times \frac{125}{100}$
4. (a)	Distance $= \frac{1}{2} \times 10 = 5\text{km}$ Speed $= \frac{5000\text{m}}{25 \times 60\text{s}}$ $= 3\frac{1}{3}\text{m/s}$ or $3.\dot{3}\,\text{m/s}$	B1 M1 A1	5km or 5000m seen $\frac{\text{distance}}{\text{time}}$ A0 for 3.33
4. (b)	$3(2x-3y) = 2(x+3y)$ $6x-9y = 2x+6y$ $15y = 4x$ $x : y = 15 : 4$	M1 B1 A1	Getting rid of denominator Either $15y$ or $4x$ seen
5. (a)	$\frac{1}{n^2}$	B1	
5. (b)(i)	$1+2+3+4+5+4+3+2+1 = 25 = 5^2$	B1	
5. (b)(ii)	25 0000	B1	B0 if 500^2
5. (b) (iii)	$p = 9$	B1	
6. (a)(i)	$\angle ACB = \frac{180^\circ - 56^\circ}{2} = 62^\circ$ (Base $\angle$s of isos. Δ) $\angle BCD = 180^\circ - 62^\circ - 37^\circ = 81^\circ$ (adj. $\angle$s on a str. line)	B1 B1	Correct reasoning for (a) (i) and (ii)
6. (a)(ii)	Draw line XY parallel to RS and PQ $\angle XDC = 37^\circ$(alt. $\angle$s) $\angle XDE = 103^\circ - 37^\circ = 66^\circ$ $\angle DES = 66^\circ$(alt. $\angle$s)	M1 A1	Either alt/ int angles seen

6. (b)	BC is not parallel to ED because $\angle CBE = 62^\circ \neq \angle DES$, hence they are not equal corresponding angle	B1 B1 statement with reasons	$\angle CBE = 62^\circ$ Corresponding angles $\angle CBE \neq \angle DES$ Alternative: Use of interior angle to prove
7.(a)	$\frac{5w^5}{3} \times \frac{1}{\sqrt[3]{216w^6}}$ $= \frac{5w^5}{3} \times \frac{1}{6w^2}$ $= \frac{5w^3}{18}$	B1 B1	$6w^2$
7.(b)	$5a^2 + 35ab - 3ab - 21b^2$ $= 5a(a+7b) - 3b(a+7b)$ $= (5a-3b)(a+7b)$	B1 B1	Grouping method seen (either one of the factors)
8. (a) (i)	12 students	B1	
8. (a) (ii)	Angle of sector rep B $= \frac{10}{36} \times 360^\circ = 100^\circ$ The sector for students scoring B should be more than 90°. In the pie chart, it looked less than 90°.	B1 B1	Showing working
8.(b) (i)	$0 \leq x \leq 6$ or $0 \leq x < 7$	B1	
8. (b) (ii)	$\frac{x+14+18+20+20+12}{28+x} = 2.75$ $\frac{84+x}{28+x} = 2.75$ $84 + x = 77 + 2.75x$ $1.75x = 7$ $x = 4$	B1 M1 A1	Forming equation Attempt to group variable or constant
9. (a) & (b)		G2 B1 B1 B1	G1 arcs seen at C G1 info labelled Perpendicular Bisector Angle Bisector Correctly label the position S

Qn		Working/Answer	Mark
1	**a**	$-10 \le 2x+7 < 3$ $-17 \le 2x < -4$ $-8.5 \le x < -2$	 B1 $-17 \le 2x$ or $2x < -4$ B1
	b	$\frac{2}{w} - \frac{w}{3} + 1$ $= \frac{6}{3w} - \frac{w^2}{3w} + \frac{3w}{3w}$ $= \frac{6 - w^2 + 3w}{3w}$	 M1 Common denominator A1 isw
	ci	33	B1
	cii	$5n + 3$	B1 oe
			Total: 6 marks
2	**ai**	$n - 3$	B1
	aii	$(n-2)180 = 400 + (\text{their ai})160$ $n = 14$ or $\frac{360 - 17 - 80 - 43}{20} = 11$ $n = 14$	M1 A1 M1 Finding remaining ext. angle A1
	2bi	Reflex $\angle ABC = 360^\circ - 135^\circ$ $= 225^\circ$	B1 135 seen B1 soi
	2biia	$\angle BAD = \frac{180 - 135}{2}$ (base angle of isos triangle) $= 22.5$	 B1
	2biib	$\angle BAD = 180 - 135$ (int. angle) $= 45$	 B1 B1 for all reasons stated correctly
	2biii	$\angle ADG = 45$	B1
			Total: 9 marks

3	**a**	$\frac{200y}{50x}$ $=\frac{4y}{x}$	M1 $\frac{2y}{50x}$ A1
	bi	3 hours	B1 $\frac{198}{66}$
	bii	36 km/h	B1 $\frac{198}{5.5}$
	biii	1645 or 4:45 pm	B1 reject 04 45
	biv	$\frac{396}{13}$ $=31$	B1 30.46 B1
			Total: 7 marks
4	**a**	Straight line passes through plotted 3 "x" points correctly Labelling of axes and scale	G2 1 mark deducted for missing point G1
	bi	$y=4.5$	B1
	bii	20	B1 reject (20, 0)
	biii	$m=-\frac{5}{20}$ $=-0.25$	M1 A1 soi
			Total: 7 marks
5	**a**	$2(9\times7+7\times5+9\times5)$ $=286\ \text{cm}^2$	M1 Find area of min. of 2 sides A1
	bi	$2^5\times3^2\times7$	B1
	bii	$k=14$ $p=12$	B1 B1
			Total: 5 marks

6	**a**	Vol of yellow needed = 0.5 (729) = 364.5 Max no of candles = $\frac{12000}{364.5}$ = 32	B1 Finding amt. of yellow wax needed M1 Vol. of wax/Vol. of candle A1 reject 33
	b	Selling price = (15.50 × 3 × 165%)/(their a) = $2.40	B1Find cost of wax × 165% M1 / (their a) A1 reject 2.4, 2.39
			Total: 6 marks
7	**a**	2.5	B1
	b	Each year the city sinks by 2.5 + 0.4 = 2.9 No of years = $\frac{50}{2.9}$ = 17.2 The claim is not true as it will take more than 17 years for Bangkok city to sink.	B1 (their a) + 0.4 50/ their greatest sink B1 $\frac{50}{2.9}$ and conclusion
			Total: 3 marks
8	**a**	area= $0.5\pi(1)^2 + 0.5\,(5+2)9$ = 33.071 (shown)	B1 B1
	b	39.6849	B1 39.6852/39.7
	c	orange needed= 90%(their b) × 350 = 12500.7435 Cost = 6 × 4.65 + 2.40 × 90% = 30.06 Price of each pop = $\frac{400 + \textit{their cost}}{350}$ = 1.228 Wendy should charge 1.25, 1.30	B1 B1 B1 B1
			Total: 7 marks