Anglo-Chinese School
(Barker Road)

END-OF-YEAR EXAMINATION 2018

SECONDARY ONE
EXPRESS

MATHEMATICS 4048
PAPER ONE

1 hours 15 minutes .

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your 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.

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 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 your 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.

At the end of the examinations, fasten your work securely together.
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 50.

For Examiner's Use

Mathematical Formulae

Compound Interest

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

Mensuration

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

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

Answer **all** the questions

1 (a) Calculate $\dfrac{2.5 + \sqrt{9.67 - 3}}{4.5^2}$ and write down the first six digits on your calculator display.

Answer (a) _____ [1]

(b) Round off your answer in (a) to 4 significant figures.

Answer (b) _____ [1]

2 By rounding each number to 1 decimal place, estimate the value of $\dfrac{7.96 \times 10.04}{(4.33 - 2.29)^2}$.

Answer _____ [2]

3 Alex, Bernard and Casper shared $405 between them.
The ratio of money that Alex and Bernard received was 3 : 7, and the ratio of money that Bernard and Casper received was 2 : 1.
How much money did Alex receive?

Answer $ _____ [2]

4 A chemical is a solid at $-10°C$.
It melts into a liquid at a temperature of $62°C$.

    (a) Calculate the difference in temperature between the solid state and liquid state.

Answer   (a) _____ $°C$ [1]

    (b) If a chemist takes a total of 24 minutes to uniformly heat the chemical from solid to liquid state, find the time taken to heat the chemical from solid state to a temperature of $23°C$.

Answer   (b) _____ minutes   [2]

5 It is given that $E = \frac{1}{3}b^2h$.

    (a) Find E when $b = 9$ and $h = 5$.

Answer   (a) $E =$ _____   [1]

    (b) Express h in terms of E and b.

Answer   (b) $h =$ _____   [2]

6 (a) Simplify $5 - (x - 2)$.

Answer (a) _____ [1]

(b) Factorise completely $xy - 12 - 4x + 3y$.

Answer (b) _____ [2]

7 Two different sizes of boxes of washing powder are sold.
The mass and price of the washing powders are given below.

Small
1.6 kg
$7.50

Large
3 kg
$12.50

Show, with working, which size of the box of washing powder would be the best buy.

Answer _____ [3]

8

8 Solve $\dfrac{8}{5} = \dfrac{x}{x-1}$.

Answer _____ . [3]

9 Written as a product of its prime factors, $8800 = 2^x \times 5^y \times 11$.
   (a) Find the values of x and y.

Answer **(a)** $x =$ _____ [1]

$y =$ _____ [1]

(b) Find the smallest positive integer k such that $\sqrt{\dfrac{8800}{k}}$ is an

integer.

Answer **(b)** $k =$ _____ [1]

10 The first four terms of a sequence are 2, 5, 10 and 17.

(a) Write down the next two terms.

Answer (a) _____ [1]

(b) Find an expression, in terms of n, for the nth term of the sequence.

Answer (b) _____ [1]

(c) Explain, with working, why 525 is not a term in the sequence.

Answer (c) _____

_____ [2]

11 **(a)** Class *Y* had 11 out of 35 students scoring distinction for a
Mathematics test.
Class *Z* had 12 out of 38 scoring distinction for the same
test.
Which class had a higher percentage of students scoring
distinction?
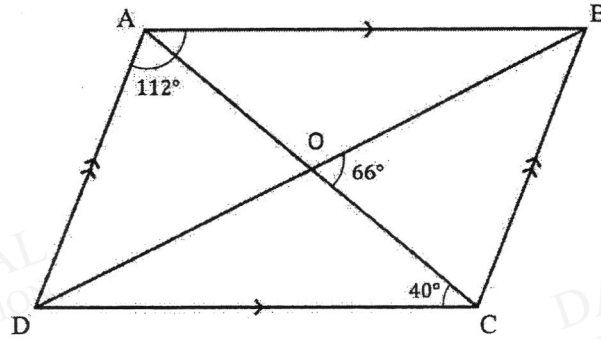Show your working clearly.

Answer (a) _____ [2]

(b) The cost price of a watch was $1200.
It was sold for a price of $960.
Find the percentage decrease in price.

Answer (b) _____ % [2]

12 The diagram shows a parallelogram *ABCD*.

Angle $DAB = 112°$, angle $ACD = 40°$ and angle $BOC = 66°$.

Giving your reasons, find

(a) angle *DAC*,

Answer   (a) _____ ° [2]

(b) angle *ADC*.

Answer   (b) _____ ° [2]

13   A shop sells spherical candles with diameter 4 cm.
The shopkeeper wants to pack the candles into boxes measuring
17 cm by 17 cm by 5 cm.

Candle

Box

5 cm

17 cm

4 cm

17 cm
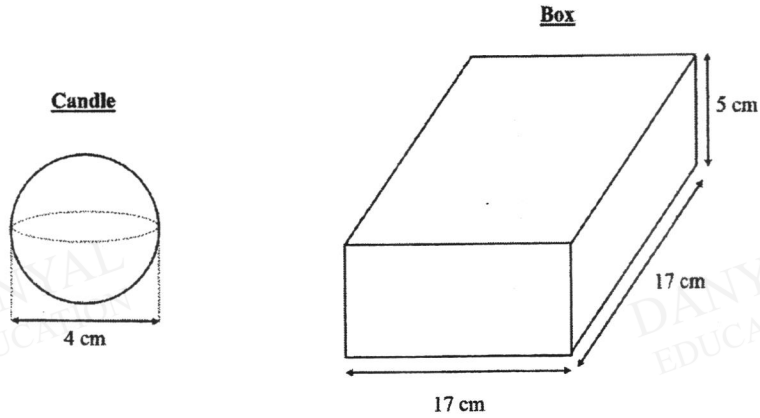
a)   Calculate the volume of each candle and the box.

Answer   (a)   Candle = _____ cm³   [1]

Box = _____ cm³   [1]

(b)   The shopkeeper claims that he can pack 43 candles into each box.
Do you agree with the shopkeeper's claim?
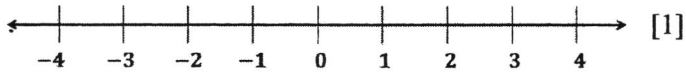You must show your calculations.

Answer   (b)   _____

_____   [2]

14 **(a)** **(i)** Solve $3x + 1 < 10$.

Answer (a) (i) _____ [1]

(ii) Illustrate the solution to $3x + 1 < 10$ on the number line below.

Answer:
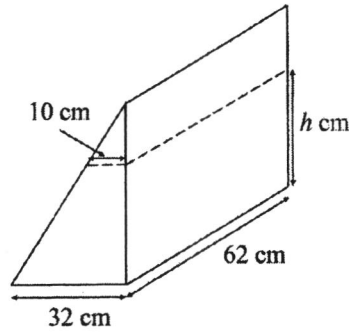

[1]

(b) **(i)** Solve $2x - 9 < 4x - 3 \le x + 13$.

Answer (b) (i) _____ [2]

(ii) Find the largest rational number that satisfies $2x - 9 < 4x - 3 \le x + 13$.

Answer (b) (ii) _____ [1]

14

15 An aquarium was built in the shape of a right triangular prism.
The dimensions of the aquarium are shown below.
Some water was poured into the aquarium, reaching up to a height of h cm.

(a) Given that it took a total of 10 minutes to fill the aquarium with $53l$ of water, find the rate of water flow in litres per hour.

Answer (a) _____ *l*/hr [1]

(b) Given that a total of $53l$ of water was poured into the aquarium, find h, the height of the water level.

Answer (b) $h =$ _____ cm [4]

End of Paper

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Additional Materials: Writing Paper

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This document consists of **6** printed pages.

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Answer **all** the questions

1   A red light flashes once every 28 seconds, a blue light flashes once every 45 seconds and a yellow light flashes once every 42 seconds.
    Given that all the lights flash together at 9.00 am, find the time that all three lights next flash together again.   [2]

---

2   *ABCD* is a parallelogram, with *BC* = 6.4 cm, *CD* = 12 cm and *AE* = 2.6 cm.
   Given that area of *ABCD* = 72.96 cm², find
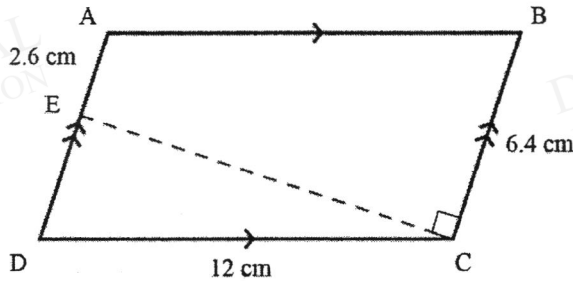
   (a)   the length of *CE*,   [2]

   (b)   the area of triangle *CED*.   [2]

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3   **(a)**   Dave invested a sum of money in a bank which pays a simple interest rate of 1.1% annually.
            The interest that Dave earned at the end of 6 years is $990.
            Find the amount of money that Dave invested.   [2]

   (b)   Max borrowed $30 000 from a bank that charges compound interest of 3.1% per annum.
            Calculate the interest that he has to pay at the end of 4 years.   [2]

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4   On a map, 3 cm is used to represent a road with actual length of 1.5 km.
   (a)   Find the map scale in the form 1 : *n*.   [1]

   (b)   If the actual length of a road is 8.5 km, find the length in cm on the map.   [1]

   (c)   If the area of a field on the map is 9.4 cm², find the actual area of the field in km².   [2]

18

5 (a) The exchange rate between Singapore dollars ($) and Euros (€) was $1 = €0.63.
A handbag costs €1250.
Calculate the price of the handbag in Singapore dollars, giving your answer to the nearest cent.   [2]

(b) The cash price of a television is $970.
The hire purchase plan consists of a deposit of $400 and a 2-year monthly instalment of $26.
(i) Find the total cost of the hire purchase plan.   [2]

(ii) Express the difference between the cash price and the hire purchase price as a percentage of the cash price.   [2]
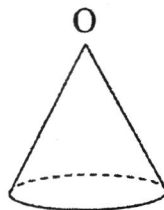
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6 (a) The ratio of an interior angle to an exterior angle of a regular polygon with n sides is 3 : 2.
Find the value of n.   [2]

(b) A 6-sided polygon has two interior angles of 102° and four interior angles of $2x°$ each.
Find the value of x.   [3]

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7 (a) AOB is a sector of a circle with centre O and radius 7 cm.
Length of minor arc $AB = 15.15$ cm.
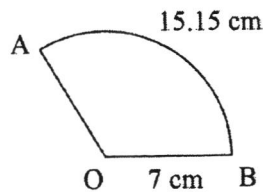
Find
(i) angle AOB,   [2]

**(ii)** the area of sector AOB.   [2]

(b)

Sector AOB is folded into a cone with vertex O, as shown above.
Find the radius of the cone.   [2]

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8 A plane was scheduled to fly from Singapore to London, with a transit stopover at Dubai. The plane took x hours to cover 5 800 km from Singapore to Dubai.

    (a) Find the speed, in terms of x and in km/h, of the plane from Singapore to Dubai.   **[1]**

After a transit of 5 hours, the plane flew the remaining 5 200 km from Dubai to London, taking $(x-2)$ hours.

    (b) Given that the average speed of the plane for the entire journey is 550 km/h, form an equation in terms of x and solve for x.   **[4]**

    (c) Hence, find the total time for the journey from Singapore to London, including transit.   **[1]**

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9 The diagram below shows a plastic model of a pyramid.
The pyramid has a square base of length 15 cm and perpendicular height of 22 cm.
To allow insertion of a stand, a cylindrical space of height 3 cm and diameter 2 cm is hollowed out.

22 cm

15 cm
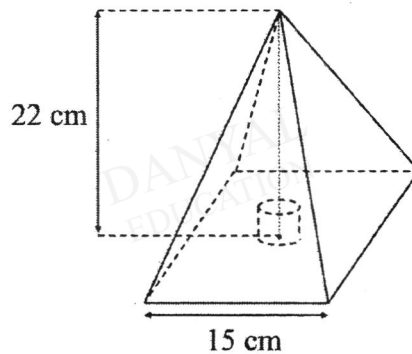
    (a) Given that plastic material costs \$0.05 /cm^3, find the cost of producing the model, giving your answer to the nearest dollar.   **[4]**

    (b) A cover sheet is designed to cover the four triangular faces of the model exactly. The cover sheet has an area of 696 cm^2. Find the slant height of the model pyramid.   **[3]**

20

10 Mr Wong made a 1.30 pm restaurant reservation at Orchard Road for his family lunch. He plans to arrive 15 minutes before the reservation timing, and leave at 4.00 pm. Parking rates for two different shopping malls in the area are shown below.

Ion Orchard	
Time	**Charges**
<u>8AM – 5.59PM</u>	
1st Hour	$2.56
Every subsequent 30 mins or part thereof	$1.88

Somerset 313	
Time	**Charges**
<u>11AM – 10.59PM</u>	
1st Hour	$3
Every subsequent 30 mins or part thereof	$1.28

(a) Explain, with working, which shopping mall should Mr Wong park at. [3]

(b) At the restaurant, Mr Wong and family ate a total of $135 worth of food.
When the bill arrived, it was $158.90.
Mr Wong claimed that with 17% Service Charge and GST, the bill that arrived was wrong.
His working is shown below.

> **Mr Wong's working**
> $$\text{Total} = \frac{117}{100} \times 135$$
> $$= \$157.95$$

Evaluate Mr Wong's working and explain, with working to support your answer, if Mr Wong's claim is accurate and why. [3]

End of Paper

1	(a)	0.25099			
	(b)	0.2510			
2		$$\frac{7.96 \times 10.04}{(4.33 - 2.29)^2}$$ $$= \frac{8.0 \times 10.0}{(4.3 - 2.3)^2}$$ $$= \frac{80}{4}$$ $$= 20$$			
3	(a)	$3:7$ $\qquad 2:1$ $6:14:7$ $\text{Alex received} = \frac{405}{6+14+7} \times 6$ $\qquad\qquad\quad = \$90$			
4	(a)	$\text{Difference} = 62 - (-10)$ $\qquad\qquad\quad = 72°C$			
	(b)	$\text{Rate} = \frac{72}{24}$ $\qquad\quad = 3°C/\min$ $\text{Time taken} = \frac{23 - (-10)}{3}$ $\qquad\qquad\quad = 11 \text{ minutes}$			
5	(a)	$E = \frac{1}{3}(9^2)5$ $\quad = 135$			
	(b)	$E = \frac{1}{3}(b^2)h$ $3E = (b^2)h$ $h = \frac{3E}{b^2}$			
6	(a)	$5 - (x - 2)$ $= 7 - x$			
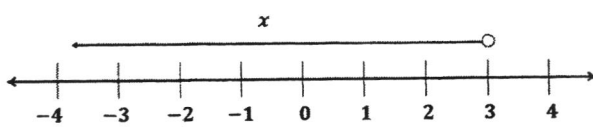
(b)	$xy-12.-4x+3y$ $= xy+3y-12-4x$ $= y(x+3)-4(3+x)$ $= (x+3)(y-4)$				
7	Small $= \dfrac{7.50}{1.6}$ $= \$4.6875/kg$ Large $= \dfrac{12.50}{3}$ $= \$4.1666/kg$ Large size washing powder is the best buy.				
8	$\dfrac{8}{5} = \dfrac{x}{x-1}$ $\dfrac{8(x-1)}{5(x-1)} = \dfrac{5 \times x}{5(x-1)}$ $8x-8 = 5x$ $3x = 8$ $x = \dfrac{8}{3}$ or $2\dfrac{2}{3}$				
9 (a)	$x = 5$ $y = 2$				
(b)	$k = 2 \times 11$ $= 22$				
10 (a)	$26, 37$				
(b)	$T_n = n^2$				
(c)	$n^2 + 1 = 525$ $n^2 = 524$ $n = 22.89$ 525 cannot be a term in the sequence as the n is not an integer.				
11 (a)	Class Y $= \dfrac{11}{35} \times 100\%$ $= 31.42\%$				
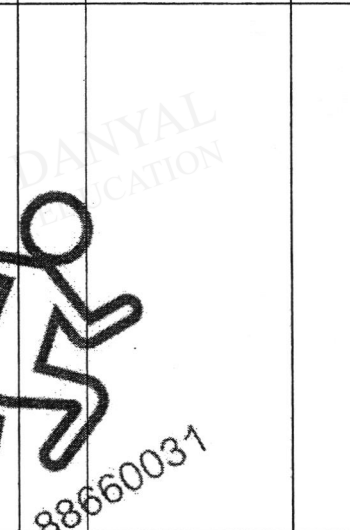
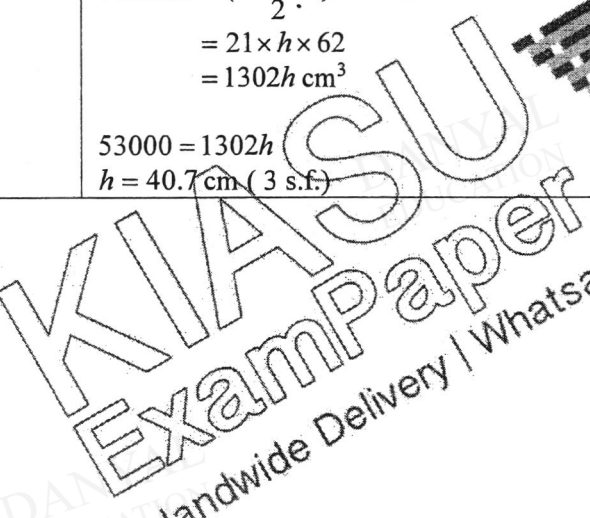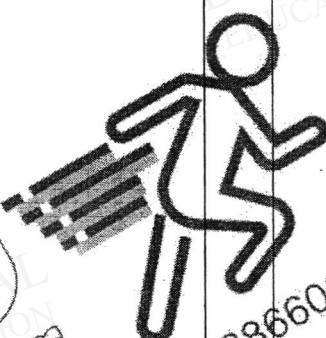|					
		Class Z $= \dfrac{12}{38} \times 100\%$ $= 31.57\%$ Class Z scored better.			
	(b)	Percentage decrease $= \dfrac{1200 - 960}{1200} \times 100\%$ $= 20\%$			
12	(a)	$\angle BAC = 40 \quad (alt.\angle s, AB \,//\, DC)$ $\angle DAC = 112 - 40$ $\qquad = 72°$			
	(b)	$\angle ADC = 180 - 72 - 40 \quad (\angle s \text{ sum of } \Delta)$ $\qquad = 68°$			
13	(a)	Volume of candle $= \dfrac{4}{3} \times \pi \times 2^3$ $= 33.5 \text{ cm}^3 \ (3 \text{ s.f.})$ Volume of box $= 17 \times 17 \times 5$ $= 1445 \text{ cm}^3$			
	(b)	Actual number of candles $= (17 \div 4) \times (17 \div 4) \times (5 \div 4)$ $\approx 4 \times 4 \times 1$ ≈ 16 Shopkeeper is wrong as he divided the total volume of the box by the volume of the candles. He did not take into account the dimensions of fitting in the candles.			
14	(a) (i)	$3x + 1 < 10$ $3x < 9$ $x < 3$			
	(ii)				
	(b) (i)	$2x - 9 < 4x - 3 \le x + 13$ $2x - 9 < 4x - 3 \quad \text{and} \quad 4x - 3 \le x + 13$			

	(ii)	$3x \leq 16$ $-2x < 6$ $x > -3$ $\qquad x \leq \dfrac{16}{3}$ $\qquad -3 < x \leq \dfrac{16}{3}$ $\dfrac{16}{3}$ or $5\dfrac{1}{3}$			
15	(a)	Rate $= 53 \div \dfrac{10}{60}$ $= 318 l / hr$			
	(b)	Let h be the height of water level. $53l = 53000 \text{ cm}^3$ Volume $= (\dfrac{10+32}{2 \cdot}) \times h \times 62$ $\qquad = 21 \times h \times 62$ $\qquad = 1302h \text{ cm}^3$ $53000 = 1302h$ $h = 40.7 \text{ cm} \ (3 \text{ s.f.})$			

1		$28 = 2^2 \times 7$ $45 = 3^2 \times 5$ $42 = 2 \times 3 \times 7$ $LCM = 2^2 \times 3^2 \times 5 \times 7$ $\qquad = 1260$ seconds $\qquad = 21$ minutes Time $= 0900 + 0021$ $\qquad = 0921$			
2	(a)	Length $= 72.96 \div 6.4$ $\qquad = 11.4$ cm			
	(b)	$ED = 6.4 - 2.6$ $\qquad = 3.8$ Area of $\triangle CED = \dfrac{1}{2} \times 3.8 \times 11.4$ $\qquad = 21.66$ cm²			
3	(a)	$\dfrac{P \times 1.1 \times 6}{100} = 990$ $6.6P = 99000$ $P = \$15000$			
	(b)	Total $= 30000(1 + \dfrac{3.1}{100})^4$ $\qquad = 33896.582$ Interest $= 33896.582 - 30000$ $\qquad = \$3896.58$			
4	(a)	3 cm : 1.5 km 3 : 150000 1 : 50000			
	(b)	Length on map $= \dfrac{850000}{50000}$ $\qquad = 17$ cm			
	(c)	1 cm : 0.5 km 1cm² : 0.25 km² 9.4 cm² : 2.35 km²			

5	(a)		Price $= \dfrac{1250}{0.63}$ $= 1984.126$ $= \$1984.13$			
	(b)	(i)	Hire purchase $= 400 + (24 \times 26)$ $= \$1024$			
		(ii)	Difference $= \dfrac{1024 - 970}{970} \times 100\%$ $= 5.567\%$ $= 5.57\%$ (3 s.f.)			
6	(a)		Size of exterior angle $= \dfrac{180}{5} \times 2$ $= 72°$ $n = \dfrac{360}{72}$ $= 5$			
	(b)		$(6 - 2) \times 180 = (2 \times 102) + (4 \times 2x)$ $720 = 204 + 8x$ $516 = 8x$ $x = 64.5$			
7	(a)	(i)	Circumference of circle $= \pi \times 14$ $= 43.9822$ $\dfrac{\angle AOB}{360} = \dfrac{15.15}{43.9822}$ $\dfrac{\angle AOB}{360} = 0.3444$ $\angle AOB = 124.0°$ (1 d.p.)			
		(ii)	Area of $AOB = \dfrac{124.004}{360} \times (\pi \times 7^2)$ $= 53.025 \text{ cm}^2$			
	(b)		Minor arc = circumference of circle Radius $= 15.15 \div 2 \div \pi$ $= 2.4111$ $= 2.41$ cm (3 s.f.)			

8	(a)	$\text{Speed} = \dfrac{5800}{x}\,\text{km/h}$			
	(b)	$\dfrac{5800 + 5200}{x + 5 + (x - 2)} = 550$			
		$\dfrac{11000}{2x + 3} = 550$			
		$11000 = 1100x + 1650$			
		$1100x = 9350$			
		$1100x = 9350$			
		$x = 8.5$			
	(c)	$\text{Total time taken} = 8.5 + (8.5 - 2) + 5$			
		$= 20\,\text{hrs}$			
9	(a)	$\text{Volume} = (\tfrac{1}{3} \times 15^2 \times 22) - (\pi \times 1^2 \times 3)$			
		$= 1640.57$			
		$\text{Cost} = 1640.57 \times 0.05$			
		$= 82.028$			
		$= \$82 \text{ (nearest dollar)}$			
	(b)	$\text{Each face} = 696 \div 4$			
		$= 174$			
		$\text{Slant height} = 174 \times 2 \div 1\mathcal{8}$			
		$= 23.2\,\text{cm}$			
10	(a)	$\text{Ion Orchard} = 2.56 + 1.88 \times 4$			

$= 10.08$

Somerset 313 $= 3 + 1.28 \times 4$
$\qquad = 8.12$

Mr Wong should park at Somerset 313.

(b) Actual bill:

With Service Charge $= \dfrac{110}{100} \times 135$
$\qquad\qquad\qquad = 148.50$

With GST $= \dfrac{107}{100} \times 148.50$
$\qquad\qquad = 158.895$
$\qquad\qquad \approx \$158.90$

Mr Wong's claim is wrong as he combined Service Charge and GST to get 17%, therefore the total cost would only be \$157.95. But 7% GST is applied on top of the 10% Service Charge, hence the bill of \$158.90 is correct.