Index Number	Class	Marks: Paper 1 / 40

Anglo-Chinese School (Barker Road)

MID-YEAR EXAMINATION 2017

SECONDARY ONE EXPRESS

MATHEMATICS 4048

2 HOURS 15 MINUTES

Additional Materials:
Writing paper (4 sheets)

READ THESE INSTRUCTIONS FIRST

Do not open this booklet until you are told to do so.

Write your class and candidate number on the cover sheet.
Hand up Paper One and Paper Two separately.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, 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.
Calculators should be used 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 the calculator value or 3.142, unless the question requires the answer in terms of π or otherwise stated.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total marks for Paper One and Two is **90**.

3 s.f.		Simplify fraction	
1 d.p.		Truncation error	

Mathematical Formulae

Compound Interest

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

Mensuration

Curved Surface area of 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 a triangle $= \frac{1}{2}ab\sin C$

Arc length $= r\theta$, where θ is in radians

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

Trigonometry

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

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

Statistics

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

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

PAPER ONE [40 marks]

Candidates answer on the Question paper.

Answer **all** questions.

For Examiner's Use

1 Calculate $\dfrac{\sqrt{81}\times\dfrac{2}{3}}{6.9-1.39^2}$.

(a) Write down the first five digits on your calculator display.

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

(b) Give your answer to **part (a)** correct to 2 significant figures.

Answer: (*b*) ..... [1]

2 **(a)** Express $19\frac{3}{7}$ % as a fraction in its simplest form.

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

(b) Express 0.8 hour as a percentage of 300 seconds.

Answer: (*b*) ..... % [2]

3 Given that p is real and $p \geq 4\frac{2}{3}$, write down the smallest value of p if

(a) p is a rational number,

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

(b) p is an integer.

Answer: (*b*) ..... [1]

For Examiner's Use

4 **(a)** By rounding each number to 1 significant figure, estimate the value of

$$\frac{5.43\times\sqrt{35.67}}{9.87\times(0.987)^2}.$$

Show your working clearly.

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

(b) A number y, when rounded off to 3 significant figures, is 81 300.
Write down
(i) the maximum integer value of y and,
(ii) the minimum integer value of y.

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

(ii) ..... [1]

5 Mickey changed S$737 into pounds (£) when the exchange rate was £1 = S$2.20.

(a) Calculate the amount in pounds (£) Mickey received.

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

He later changed all the pounds back into dollars when the exchange rate was £1 = S$2.15.

(b) Express the loss as a percentage of the original amount changed.

Answer: (*b*) ..... [2]

For Examiner's Use

6 Arrange the following numbers in descending order.

$$32.5\%, -3.\dot{2}, 0.3255, \sqrt[3]{-32768}$$

Answer: ..... [2]

For Examiner's Use

7 **(a)** Express 784 as the product of its prime factors.

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

(b) Using your answer to **part (a)**, explain why 784 is a perfect square.

Answer (b): .....

..... [1]

(c) m and n are both prime numbers.

Find the smallest values of m and n so that $784 \times \frac{m}{n}$ is a perfect cube.

Answer: (*c*) $m =$ ..... [1]

$n =$ ..... [1]

For Examiner's Use

8 Adeline, Brian and Carol shared a sum of money among themselves in the ratio of 4 : 7 : 9. Brian has \$42 more than Adeline.

(a) How much money did Carol have?

Answer: (*a*) \$ ..... [2]

(b) Brian received another \$14. Calculate the ratio of the new amount of money shared by Adeline, Brian and Carol.
Leave your answer in simplest form.

Answer: (*b*) ..... [2]

9 The length of each side of a square is increased by 10%.
Find the percentage increase in the area of the square.

Answer: ..... % [2]

For Examiner's Use

10 **(a)** Frank sold a painting for \$621 at a profit of 80% of the cost price. What was the cost price of the painting?

Answer: ..... [2]

(b) A tablet costs \$1280, excluding 7% Goods and Services Tax (GST). How much is the total cost of the tablet including the GST?

Answer: ..... [2]

11 The temperature at 08 00 h was -4° C and the temperature at 14 00 h was 14° C.

(a) Find the difference between the two temperatures.

Answer: (*a*) ..... $^{\circ}C$ [1]

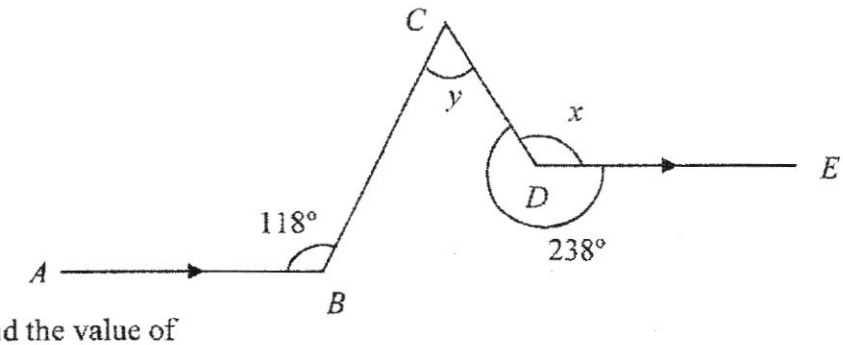
(b) Assuming that the temperature rises at a steady rate, find the time when the temperature was 9° C.

Answer: (*b*) ..... [2]

12 Given that AB is parallel to DE, $\angle ABC = 118^{\circ}$ and reflex $\angle CDE = 238^{\circ}$.

Use

Use



Find the value of

(a) x,

Answer: (a) $x =$ ..... ° [1]

(b) y.

Answer: (b) $y =$ ..... ° [1]

13 Map A is drawn to a scale of 1 : 500 000.

(a) Find the actual distance of an expressway, in kilometres, represented by 25 cm on the map.

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

(b) A reservoir of area 180 km^2 is represented by 28.8 cm^2 on map B. Calculate the map scale of map B in the form of 1 : n.

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

PAPER TWO [50 marks]

Write your answers and working on the writing papers provided.
At the end of the examination, fasten all your work in Paper Two securely together.
Attach the cover page on top of your answer script.
Answer **all** questions.

1 In 2014 School Budget in ACSBR, the Mathematics Department was allocated 712 000 dollars. In 2015, the budget allocated to the Mathematics Department was 5% higher than 2014.

(a) Calculate the budget allocated to the Mathematics Department in 2015. [2]

(b) Given the amount of money allocated to the Mathematics Department in 2014 was 10% more than the previous year 2013.
Find the percentage increase in budget from 2013 to 2015. [3]

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2 Three bells chime together every 15 seconds, 33 seconds and 48 seconds respectively.

(a) Given that they chime together at 00 45, when will they next chime together again? [2]

(b) How many time will they chime together from 00 46 to 22 46? [2]

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3 A man walks 1000 m at an average speed of 4 km/h and then runs 1.3 km in 5 minutes.
Calculate

(a) his running speed in kilometers per hour, [2]

(b) his average speed for the whole distance. [2]

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4 **(a)** A car uses 15.75 litres of fuel to travel a distance of 250 km.
Giving your answer in litres per 100 km, calculate the fuel consumption of the car. [2]

(b) Angie's car has a fuel consumption of 12 litres per 100 km.

(i) Calculate the distance, in km, she can travel on a full tank of 60 litres. [2]

(ii) Petrol costs $1.65 per litre.
Calculate how much, correct to the nearest cent, the petrol will cost Angie for a journey of 120 km. [2]

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5 The cash price of a new car is \$108 500.
Ben buys the car on hire purchase.
He pays a deposit of 20% of the cash price followed by 60 monthly instalments at \$1649.20 per month. Calculate

(a) the total amount that he will pay for the car, [2]

(b) the rate of simple interest per year that had been charged, leaving your answer correct to 1 decimal place. [3]

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6 Nelly deposits \$20 000 in a bank at an interest rate of 4% per annum.
If the interest is calculated on the basis of compound interest paid yearly, how much interest will she receive after 10 years? Leave your answer to the nearest cent. [3]

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7 The table below shows the rates of income tax for 2015.

	Chargeable Income	Rate (%)	Gross Tax Payable (\$)
On the first On the next	20 000 10 000	0 2%	0 200
On the first On the next	30 000 10 000	- 3.5%	200 350
On the first On the next	40 000 40 000	- 7%	550 2800
On the first On the next	80 000 40 000	- 11.5%	3350 4600

(a) Lucy's chargeable income for the year ended 2015 was \$98 000.
Calculate the amount of income tax she has to pay for 2015. [2]

(b) Lucy is given a pay raise in 2016 and the tax rate is the same as 2015. Calculate her chargeable income in 2016 if her income tax payable in 2016 is \$6570. [3]

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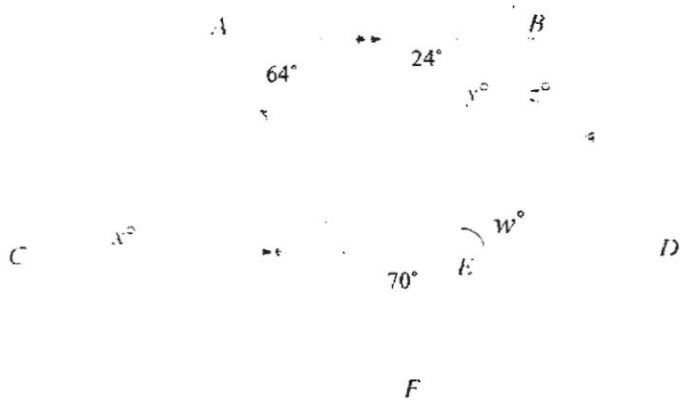
8 Given that AB is parallel to CD *and* AF is parallel to BD.
$\angle ABC = 24°$, $\angle BAF = 64°$ and $\angle CEF = 70°$



Stating your reasons clearly,
Calculate the values of

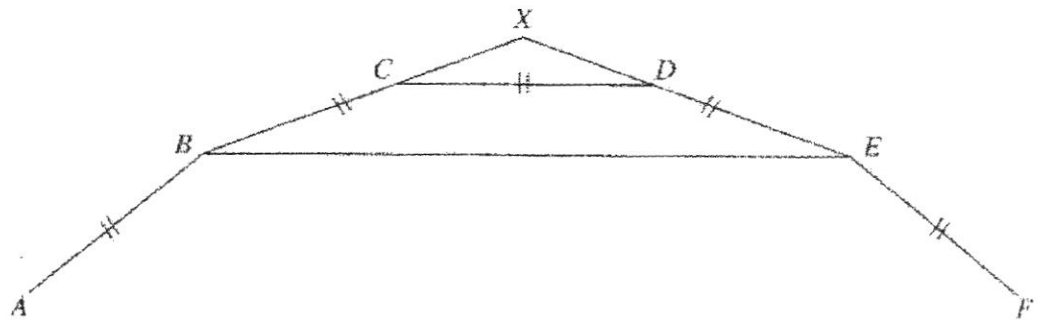
(a) $\angle w$, [2]

(b) $\angle x$, [2]

(c) $\angle y$, [2]

(d) $\angle z$. [2]

9



The diagram shows part of a regular polygon $ABCDEF$ …, where BCX and EDX are straight lines, and $\angle XCD = 20°$. Calculate

(a) $\angle CXD$, [1]

(b) the number of sides of this polygon, [2]

(c) the sum of all interior angles, [2]

(d) $\angle BEF$. [2]

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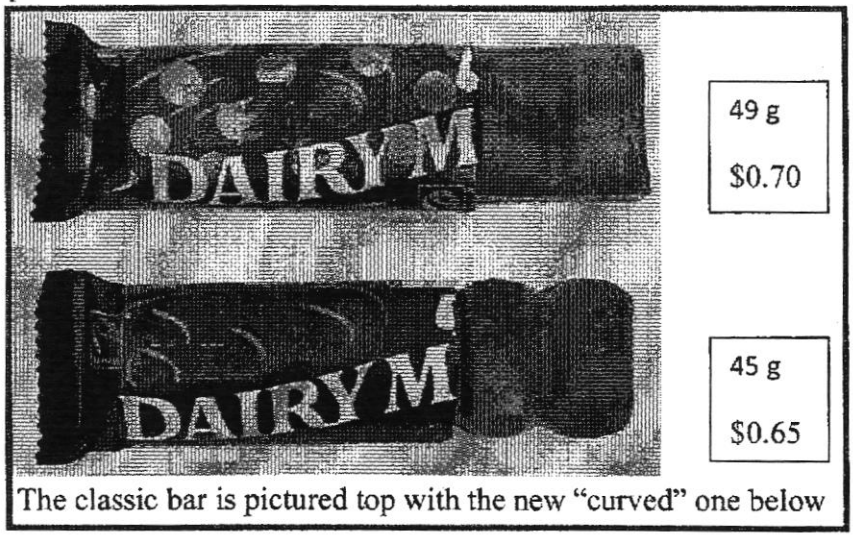
10 The classic bar has been shrunk from 49g to 45g as part of the re-launch as a new 'curved' shape. The "promotional" price for the new 'curved' shape bar is \$0.65, and the original price of the classic bar is \$0.70



The classic bar is pictured top with the new "curved" one below

Which bar gives the better value? **You must show all working clearly.**

[3]

End of Paper

ACS (Barker) Mid-Year Exam 2017 Marking Scheme
Mathematics – Sec 1 Express

Paper 1

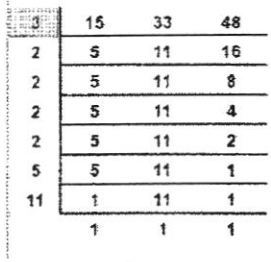
No	Essential Steps			
1(a)	$\dfrac{\sqrt{81}\times\dfrac{2}{3}}{6.9-1.39^2}=1.2077$			
1(b)	1.2			
2(a)	$19\dfrac{3}{7}\%=\dfrac{34}{175}$			
2(b)	$\dfrac{2880}{300}\times 100\%$ $=960\%$	0.8h = 48 min 300s = 5 min $\dfrac{48}{5}\times 100\%$ $=960\%$		
3(a)	$4\frac{2}{3}$ / 4.6 / $\frac{14}{3}$			
3(b)	5			
4(a)	$\dfrac{5\times\sqrt{40}}{10\times 1}$ $=3$			
4(b)	max y: 81 349 min y: 81 250			
5(a)	$\dfrac{737}{2.2}$ $=£335$			
5(b)	335×2.15 $=\$720.25$ $\dfrac{737-720.25}{737}\times 100\%$ $=2.27\%$			
6	$0.3255, 32.5\%, -3.\dot{2}, \sqrt[3]{-32768}$			
7(a)	$2^4\times 7^2$			
7(b)	The indices/powers/exponents for the prime factors 2 and 7 are both multiples of 2/ divisble by 2/ even			
7(c)	$m=7$ $n=2$			
8(a)	Amount received by Carol $=\dfrac{42}{3}\times 9=\$126$			

Paper 1

No	Essential Steps			
8(b)	\$14 → 1 unit 4 : 8 : 9			
9	Original length 100% → 1 Increased length 110% → 1.1 Original area → $1^2 = 1\text{unit}^2$ Increased area → $1.1^2 = 1.21\ \text{unit}^2$ Percentage increase in area $= \frac{1.21-1}{1} \times 100\%$ $= 21\%$			
10(a)	$\frac{100}{180} \times \$621$ $= \$345$			
10(b)	Total cost of tablet $= 1280 \times 1.07$ $= \$1369.60$			
11(a)	$14 - (-4)$ $= 18°\text{ C}$			
11(b)	13° C – 4 h 20 min / 1°C – 20 min / change of 3°C/h Time: 12 20 h			
12(a)	$x = 360° - 238°$ (∠s at a point) $= 122°$			
12(b)	$y = 180° - 62° - 58°$ (∠s sum of Δ) $= 60°$			
13(a)	1 : 500 000 1 cm : 5 km 25 cm : 125 km Actual distance = 125 km			
13(b)	$28.8\ \text{cm}^2 : 180\ \text{km}^2$ $1\ \text{cm}^2 : 6.25\ \text{km}^2$ 1 cm : 2.5 km 1 : 250 000	$28.8\ \text{cm}^2 : 180\ \text{km}^2$ 5.367 cm : 13.42 km 1 cm : 2.5 km 1 : 250 000		

ACS (Barker) Mid-Year Exam 2017 Marking Scheme
Mathematics – Sec 1 Express

Paper 2

No	Essential Steps		
1(a)	Budget allocated in 2015 $=\frac{105}{100}\times 712000$ $=747600$		
1(b)	Budget in 2013 $=\frac{100}{110}\times 712000=647272.73$ % increase $=\frac{747600-647272.7273}{647272.7273}\times 100\%$ $=15.5\%$ (3 s.f.)		
2(a)	 LCM $=2^4\times 3\times 5\times 11$ $=2640$ sec $=44$ min 00 45 + 00 44 = 01 29		
2(b)	$\frac{22\times 60}{44}$ $=30$		
3(a)	$1.3\div\frac{5}{60}$ $=15.6km/h$		
3(b)	Distance = 1+1.3 = 2.3 km Time for walk $=1\div 4$ $=0.25h$ Average speed $=\frac{2.3}{(0.25+\frac{5}{60})}$ = 6.9 km/h		
4(a)	$\frac{15.75}{250}\times 100$ $=6.3l$ Per 100 km		

4(b)(i)	$\frac{100}{12}\times 60$ $= 500km$		
4(b)(ii)	$\frac{12}{100}\times 120\times \$1.65$ $= \$23.76$		
5a	Deposit $= 0.2\times \$108500 = \$21700$ Total amount payable $= \$21700 + \$1649.20\times 60 = \$120652$		
5(b)	Amount of interest $\$120652 - \$108500 = \$12152$ $\frac{86800\times R\times 5}{100} = \$12152$ $R = 2.8\%$		-
6	Interest $= \$20\,000\times\left(1+\frac{4}{100}\right)^{10} - \$20000$ $= \$9604.89$		
7(a)	Tax on next \$18 000 $= \frac{11.5}{100}\times \$18000 = \$2070$ Total tax = \$3350 + \$2070 = \$5420		
7(b)	Tax on next \$$x$ amount = \$6570 − \$3350 = \$3220 \$$x$ income $= 3220\div\left(\frac{11.5}{100}\right)$ = \$28 000 Total Chargeable income = \$80 000 + \$ 28 000 = \$ 108 000		
8(a)	$\angle w = 70°$ (vert. opp. angle)		
8(b)	$\angle x = 24°$ (alt. angle, $AB//CD$)		
8(c)	$\angle y = 46°$ (ext. angle of triangle)		
8(d)	$\angle z = 46°$ (int. angle, $AF//BD$)		
9(a)	$(180° - 20° - 20°) = 140°$		
9(b)	$\frac{360°}{20°}$ = 18 sides		
9(c)	$16\times 180° = 2880°$		

9(d)	$\frac{(18-2)\times 180°}{18} = 160°$ $\angle BEF = 160° - 20° = 140°$		
10	Per 100g of classic bar $= \$0.70 \div 49 \times 100 = \$1.43$ Per 100g of new "curve" bar $= \$0.65 \div 45 \times 100 = \$1.44$ The old classic bar gives better value as the price per 100g is cheaper that the "curve" bar.		