Calculator Model:

Name:	Class	Class Register Number

中正中学

CHUNG CHENG HIGH SCHOOL (MAIN)

Parent's Signature

MID – YEAR EXAMINATION 2017
SECONDARY 1

Mathematics

3 May 2017

2 hours

Additional Materials: **Writing paper**

READ THESE INSTRUCTIONS FIRST

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

Write your name, class and index number on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use a pencil for any diagrams, graphs or rough working.
Do not use highlighters or correction fluid.

Answer **all** questions in Sections A and B.

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, unless the question requires the answer in terms of π.

At the end of the examination, fasten all your work securely together.
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 80.

Section A : Answer the questions in the space provided.

Section B : Answer the questions on the writing paper provided.

For Examiner's Use	
Section A	/ 40
Section B	/ 40
Total	/ 80

This document consists of **11** printed pages and **1** blank page.

Section A: Answer **all** the questions.

1   Round 0.999 to 2 significant figures.

Answer: .... [1]

2   **(a)**   Calculate $\dfrac{0.4215^3}{\sqrt[3]{645}-3.5}$. Truncate your answer to 6 decimal places.

(b)   Write your answer to part **(a)**, correct to 3 significant figures.

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

(b) .... [1]

3   Find $\sqrt[3]{1728}$ by using prime factorisation.

Answer: .... [3]

4 (a) Express 90 as a product of its prime factors, giving your answer in index notation.

   (b) Find the smallest possible value of n such that $90n$ is a perfect cube.

Answer: 90 =.................................. [1]

$n =$ .... [1]
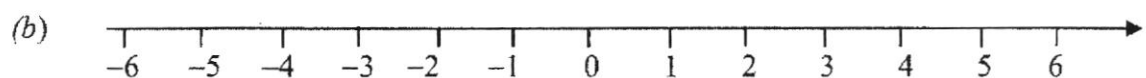
5 Consider the following numbers :
$$0, \sqrt{4}, \sqrt[3]{-27}, \frac{5}{\sqrt{3}}, 5, \frac{\pi}{4}.$$

   (a) Write down the

      (i)   irrational numbers,

      (ii) positive integers,

      (iii) prime numbers.

   (b) Represent all the numbers on the number line below.

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

(a)(ii).. [1]

(a)(iii).. [1]

(b)

[2]

6   **(a)**   Express 125 g as a percentage of 5 kg.

       (b)   Find the value of 4.5 % of $8.

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

(b) $ .... [2]

7   Evaluate, without the use of a calculator, $\left[8+(-4)^3\right]-\left[-2(12+3)\div 3\right]$, showing all your working clearly.

Answer: .... [3]

8   Simplify the following

(a) $x(2x+3)-7(3x-1)$,

(b) $5a \times (-2b) \times \sqrt[3]{-125a^3}$.

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

(b) .... [2]

9   Factorise the following expressions

(a) $15a^2b+6ac$,

(b) $(2v-w)(p+1)+2w(p+1)$.

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

(b) .... [2]

10 Given that $a = 3$, $b = -2$ and $c = \dfrac{1}{2}$, evaluate

(a) $2a - 3c$,

(b) $\dfrac{ab^2 - 3a}{c}$.

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

(b) .... [2]

11 A train 320 m long passes through a tunnel 5.2 km long.

The average speed of the train is 28 km/h.

(a) Convert 28 km/h into m/s.

(b) Calculate the time taken for the train to pass completely through the tunnel.
Give your answer in minutes.

Answer: (a) .... m/s [1]

(b) .... min [3]

7

12   A factory produces a type of baking powder made with baking soda, cream of tartar
      and cornstarch. The amount of baking soda, cream of tartar and cornstarch are in the
      ratio of 7 : 3 : 4 respectively.

      (a)   In a small bag of baking powder, there are 60g of cornstarch.
               What is the weight of the baking powder in the small bag?

      (b)   Bags of baking powder are filled at a rate of 180g per second.
               How many bags of baking powder weighing 1.5 kg each can be filled in
               3.5 hours?

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

                                 (b) .... bags [3]

                          End of Section A

Section B: Answer **all** the questions.

13 **(a)** Write down an algebraic expression for each of the following statements.

      (i) Subtract $5x + 3$ from $3x^2 + 5$. [2]

  (b) Simplify the following.

      (i) $2y - 3[x + 4(x - y)]$, [2]

      (ii) $\dfrac{3n - m}{4} + \dfrac{2n - m}{5}$. [3]

  (c) If $a : b = 5 : 4$ and $b : c = 4.2 : 0.65$, find $a : c$. [2]

14 Joey paid \$28.80 for a pair of shoes after a discount of 25% from a departmental store. What is the original price of the shoes? [2]

15 Marcus wants to change 600 Singapore Dollars (S\$) to Thai Baht (THB).
The exchange rate is S\$1 = 24.72 THB.

  (a) Find the amount of Thai Baht (THB) Marcus will receive if he changes 600 Singapore Dollars (S\$). [1]

  (b) The money changer is only able to change amounts in multiples of 1000 THB. The money changer decides to **round up** the amount in **(a)** to the nearest 1000 THB.

    Find the amount in S\$ that Marcus needs to top up for the extra amount, giving your answer to the nearest cent. [3]

16 One pen costs x cents. An eraser costs 30 cents less than a pen and a ruler costs two-third of a pen.

Find a simplified expression for

(i) the cost of an eraser in cent, [1]

(ii) the total cost of an examination goodie pack consisting of 3 pens, 1 eraser and 2 rulers in cent. [2]

17 Solve the equations:

(a) $1 + \dfrac{1}{2}x = \dfrac{1}{5}x$, [2]

(b) $2(5y+3) = 2y+14$. [2]

18 Susan cycles from home to a coffeeshop to purchase dinner before continuing the journey to her grandmother's place.

Susan cycled at a speed of 4 m/s to the coffeeshop for 3 minutes, took another 10 minutes to buy dinner and continued the rest of the journey to her grandmother's house at a speed of 6 m/s. Given that the total distance travelled is 4500 m,

(a) find the distance between Susan's house and the coffeeshop. [1]

(b) Find the average speed for the whole journey in m/s. [3]

19 (a) Mr Lee was paid a monthly basic salary of $3 850 since January 2015.
At the end of 2015, he was given a bonus of 13.5% of the value of sales that he
has made during the year. If the total value of his sales in 2015 was
$300 000, calculate Mr Lee's total income in 2015. [2]

(b) Mr Lee has to pay income tax in January 2016 for the annual income earned in
2015. The relief amount that will not be subjected to income tax is shown in
the table below.

Type of relief	Amount
Personal relief	$1000
Child relief	$5000 each child
CPF	$17 340
Voluntary donation	Three times the amount donated

Mr Lee has only one child and he has been making voluntary donation of $50
every month to an approved organization. The gross tax payable for the first
$40 000 is $550 and the tax rate for the rest is 7%. Calculate his income tax
payable for 2015 using the information given above. [3]

(c) In January 2016, Mr Lee's basic monthly basic salary was cut by $200.

(i) Calculate the percentage decrease in the basic monthly salary from 2015
to 2016, giving your answer to three significant figures. [2]

(ii) In 2016, he was paid a bonus of 15.5% of the value of his sales that he
has made during the year. Given that his bonus in 2016 is $33 790,
calculate the total value of his sales in 2016. [2]

20 Kale ordered one set meal at $55.60 and an ice cream for $12.90 at a restaurant. Below shows Kale's bill before payment.

1 set meal	$55.60
Ice cream	$12.90
SUBTOTAL	$68.50
10% Service Charge	$6.85
7% Goods and Services Tax (GST)	$5.27

Currently, the restaurant is offering two discount packages that Kale can choose from.

Discount Package I:

Enjoys 10% off the subtotal of the bill, which is thereafter subjected to 10% Service Charge first and then 7% GST.

Discount Package II:

There is no service charge and the subtotal is subjected to 7% GST.

Explain, showing all necessary working, which discount package is a better option for Kale.   [5]

~ End of Paper ~

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Section B	/ **40**
Total	/ **80**

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Section A: Answer all the questions.

1 Round 0.999 to 2 significant figures.

Answer: 1.0 [1]

---

2 **(a)** Calculate $\dfrac{0.4215^3}{\sqrt[3]{645}-3.5}$. Truncate your answer to 6 decimal places.

(b) Write your answer to part (a), correct to 3 significant figures.

(a) $\dfrac{0.4215^3}{\sqrt[3]{645}-3.5} = 0.014568$ (truncated to 6 d.p.)

(b) $\dfrac{0.4215^3}{\sqrt[3]{645}-3.5} = 0.014568$

$\phantom{\dfrac{0.4215^3}{\sqrt[3]{645}-3.5}} = 0.0146$ (to 3 s.f.)

Answer : (a) 0.014568 [1]

(b) 0.0146 [1]

---

3 Find $\sqrt[3]{1728}$ by using prime factorisation.

2	1728
2	864
2	432
2	216
2	108
2	54
3	27
3	9
3	3
	1

$1728 = 2^6 \times 3^3$

$\sqrt[3]{1728} = \sqrt[3]{2^6 \times 3^3}$

$\phantom{\sqrt[3]{1728}} = 2^2 \times 3$

$\phantom{\sqrt[3]{1728}} = 12$

Answer: 12 [3]

---

4 **(a)** Express 90 as a product of its prime factors, giving your answer index notation.

(b) Find the smallest possible value of n such that $90n$ is a perfect cube.

2	90
3	45
3	15
5	5
	1

$90 = 2 \times 3^2 \times 5$

$90n = 2^3 \times 3^3 \times 5^3$

$n = 2^2 \times 3 \times 5^2$

$n = 300$

Answer: $90 = 2 \times 3^2 \times 5$ [1]

$n = $ 300 [1]

5   Consider the following numbers :

$$0, \sqrt{4}, \sqrt[3]{-27}, \frac{5}{\sqrt{3}}, 5, \frac{\pi}{4}$$

(a) Write down the
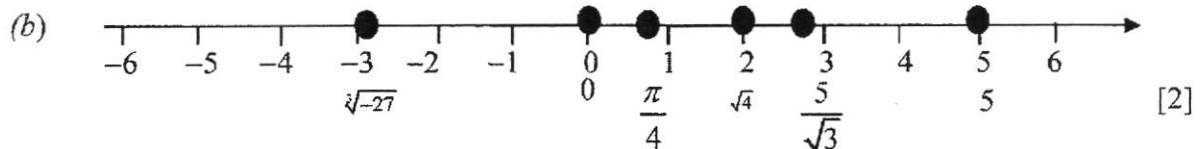
(i) irrational numbers,

(ii) positive integers,

(iii) prime numbers.

(b) Represent **all** the numbers on the number line below.

Answer: (a)(i) $\frac{5}{\sqrt{3}}, \frac{\pi}{4}$ [1]

(a)(ii) $\sqrt{4}, 5$ [1]
(a)(iii) $\sqrt{4}, 5$ [1]

(b)

[2]

6   (a)   Express 125 g as a percentage of 5 kg.
     (b)   Find the value of 4.5% of $8.

(a) $\dfrac{125}{5000} \times 100\% = 2.5\%$

(b) $\dfrac{4.5}{100} \times \$8 = \$0.36$

Answer : (a) 2.5 % [2]

(b) \$0.36 [2]

7 Evaluate, without the use of a calculator, $\left[8+(-4)^3\right]-\left[-2(12+3)\div 3\right]$, showing all your workings clearly.

$$\left[8+(-4)^3\right]-\left[-2(12+3)\div 3\right]=[8+(-64)]-[-2(15)\div 3]$$
$$=[8-64]-[-30\div 3]$$
$$=-56-(-10)$$
$$=-56+10$$
$$=-46$$

Answer : –46 [3]

8 Simplify
   (a) $x(2x+3)-7(3x-1)$,
   (b) $5a\times(-2b)\times\sqrt[3]{-125a^3}$.

(a) $x(2x+3)-7(3x-1)=2x^2+3x-21x+7$
$$=2x^2-18x+7$$

(b) $5a\times(-2b)\times\sqrt[3]{-125a^3}=5a\times(-2b)\times(-5a)$
$$=50a^2b$$

Answer : (a) $2x^2-18x+7$ [2]

(b) $50a^2b$ [2]

9 Factorise the following expressions
   (a) $15a^2b+6ac$,
   (b) $(2v-w)(p+1)+2w(p+1)$.

(a) $15a^2b+6ac=3a(5ab+2c)$

(b) $(2v-w)(p+1)+2w(p+1)=(p+1)(2v-w+2w)$
$$=(p+1)(2v+w)$$

Answer : (a) $3a(5ab+2c)$ [1]

(b) $(p+1)(2v+w)$ [2]

10 Given that $a = 3$, $b = -2$ and $c = \dfrac{1}{2}$, evaluate

    (a) $2a - 3c$,

    (b) $\dfrac{ab^2 - 3a}{c}$.

$(a)\ 2a - 3c = 2(3) - 3(\dfrac{1}{2})$

$= 6 - \dfrac{3}{2}$

$= 4\dfrac{1}{2} \ or\ 4.5$

$(b)\ \dfrac{ab^2 - 3a}{c} = \dfrac{3(-2)^2 - 3(3)}{\dfrac{1}{2}}$

$= \dfrac{12 - 9}{\dfrac{1}{2}}$

$= 3 \times 2$

$= 6$

Answer :   *(a)* $4\dfrac{1}{2} \ or\ 4.5$ [2]

                     (b)   6   [2]

---

11   A train 320 m long passes through a tunnel 5.2 km long.
The average speed of the train is 28 km/h.
    (a)   Convert 28 km/h into m/s.
    (b)   Calculate the time taken for the train to pass completely through the tunnel.
         Give your answer in minutes.

$a)\dfrac{28km}{1h} = \dfrac{28 \times 1000m}{1 \times 3600s}$

$= \dfrac{28000m}{3600s}$

$= 7\dfrac{7}{9} m/s$

b) Total length of the tunnel and train = 5.2km + 0.32 km
                                = 5.52 km

Time taken $= \dfrac{5.52}{28}$

$= \dfrac{69}{350} h$

Time taken in minutes $= 11.8$ min (3 s.f) or $11\dfrac{29}{35}$ min

Answer: (a) $7\dfrac{7}{9}$ m/s [1]

(b)11.8 or $11\dfrac{29}{35}$ min [3]

---

12 A factory produces a type of baking powder made with with baking soda, cream of tartar and cornstarch. The amount of baking soda, cream of tartar and cornstarch are in the ratio of $7 : 3 : 4$ respectively.

(a) In a small bag of baking powder, there are 60g of cornstarch.
What is the weight of the baking powder in the small bag?

(b) Bags of baking powder are filled at a rate of 180g per second.
How many bags of baking powder weighing 1.5 kg each can be filled in 3.5 hours?

(a) Weight of baking powder in the small bag $= \dfrac{60}{4} \times 14$

$= 210\text{g}$

(b) 3.5 hours $= 12600$sec

Number of bags of 1.5 kg each that can be filled in 3.5 hours $= \dfrac{0.18 \times 12600}{1.5}$

$= 1512$

Answer: (a) 210 g [2]

(b) 1512 bags [3]

End of Section A

Section B: Answer all the questions.

13 **(a)** Write down an algebraic expression for each of the following statements.

   (i)   Subtract $5x+3$ from $3x^2+5$.   [2]

   $$3x^2 + 5 - (5x+3) = 3x^2 + 5 - 5x - 3$$
   $$= 3x^2 - 5x + 2$$

   (b) Simplify the following:

   (i)   Simplify $2y - 3[x + 4(x-y)]$.   [2]

   $$2y - 3[x + 4(x-y)] = 2y - 3[x + 4x - 4y]$$
   $$= 2y - 3[5x - 4y]$$
   $$= 2y - 15x + 12y$$
   $$= -15x + 14y$$

   (ii) $\dfrac{3n-m}{4} + \dfrac{2n-m}{5}$.   [3]

   $$\frac{3n-m}{4} + \frac{2n-m}{5} = \frac{5(3n-m)}{20} + \frac{4(2n-m)}{20}$$
   $$= \frac{15n - 5m + 8n - 4m}{20}$$
   $$= \frac{23n - 9m}{20}$$

   (c) If $a:b = 5:4$ and $b:c = 4.2:0.65$, find $a:c$.   [2]

   $b:c = 4.2:0.65$
   $\quad = 420:65$

   $a:b = 5:4 \quad b:c = 420:65$
   $a:b = 525:420 \quad b:c = 420:65$
   $a:c = 525:65$
   $\quad = 105:13$

14 Joey paid $28.80 for a pair of shoes from a departmental store. If the store made a   [2]
loss of 25%, what is the original price of the shoes?

Original price of shoes $= \dfrac{100}{75} \times \$28.80$

$\qquad\qquad\qquad\qquad = \$38.40$

15 Marcus wants to change 600 Singapore Dollars (S$) to Thai Baht (THB).
The exchange rate is S$1 = 24.72 THB.

(a) Find the amount of Thai Baht Marcus will receive if he uses S$600.   [1]

S$600 $= 600 \times 24.72$

$\qquad\quad = 14832$ THB

(b) The money changer is only able to change amounts in multiples of 1000 THB.   [3]
The money changer decides to **round up** the amount in (a) to the nearest 1000
THB.
Find the amount in S$ that Marcus needs to top up for the extra amount,
giving your answer to the nearest cent.

Amount that Marcus needs to top up in Thai Baht $= 15000 - 14832$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad = 168$ THB

168 THB $=$ S$ 6.7971

Amount of S$ that Marcus needs to top up $=$ S$6.80 (rounded to nearest cents)

16 One pen costs x cents. An eraser costs 30 cents less than a pen and a ruler costs
two-third of a pen.
Find a simplified expression for

(a) the cost of an eraser in cents,   [1]

Cost of an eraser $= (x-30)$ cents

(b) the total cost of an examination goodie pack consisting of 3 pens, 1 eraser and [2] 2 rulers in cents.

Total cost of examination goodie pack $= 3x + (x-30) + 2(\frac{2}{3}x)$

$$= 3x + x - 30 + \frac{4}{3}x$$

$$= (\frac{16}{3}x - 30) \text{ cents}$$

17 Solve the equations:

(a) $1 + \frac{1}{2}x = \frac{1}{5}x$ [2]

$1 + \frac{1}{2}x = \frac{1}{5}x$

$\frac{1}{2}x - \frac{1}{5}x = -1$

$\frac{5}{10}x - \frac{2}{10}x = -1$

$\frac{3}{10}x = -1$

$3x = -10$

$x = -3\frac{1}{3}$

(b) $2(5y+3) = 2y+14$. [2]

$2(5y+3) = 2y+14$

$10y+6 = 2y+14$

$8y = 8$

$y = 1$

18 Susan cycles from home to a coffeeshop to purchase dinner before continuing the journey to her grandmother's place.

Susan cycled at a speed of 4 m/s to the coffeeshop for 3 minutes, took another 10 minutes to buy dinner and continued the rest of the journey to her grandmother's house at a speed of 6 m/s. Given that the total distance travelled is 4500 m,

(a) find the distance between Susan's house and the coffeeshop. [1]

Distance between coffeeshop and Susan house $= 4 \times 180$

$$= 720 \text{ m}$$

(b) Find the average speed for the whole journey in m/s.　　　　[3]

Time taken to travel from Susan to Grandma's house $= \dfrac{4500 - 720}{6}$

$$= 630 \text{ s}$$

Average speed for the whole journey $= \dfrac{4500}{180 + 630 + 600}$

$$= 3.19 \text{ (3 s.f) or } 3\dfrac{9}{47} \text{ m/s}$$

19 (a) Mr Lee was paid a monthly basic salary of $3 850 since January 2015.　　[2]
At the end of 2015, he was given a bonus of 13.5% of the value of sales that
he has made during the year. If the total value of his sales in 2015 was
$300 000, calculate Mr Lee's total income in 2015.

Mr Lee's total income in 2015 $= (3850 \times 12) + \left(\dfrac{13.5}{100} \times 300000 \right)$

$$= \$86700$$

(b) Mr Lee has to pay income tax in January 2016 for the annual income earned in　[3]
2015. The relief amount that will not be subjected to income tax is shown in
the table below.

Type of relief	Amount
Personal relief	$1000
Child relief	$5000 each child
CPF	$17 340
Voluntary donation	Three times the amount donated

Mr Lee has only one child he has been making voluntary donation of $50
every month to an approved organization. The gross tax payable for the first

$40 000 is $550 and the tax rate for the rest is 7%. Calculate his income tax payable for 2015 using the information given above.

Amount of relief $= \$1000 + \$5000 + \$17340 + 3(50 \times 12)$

$$= \$25140$$

Amount taxable $= \$86700 - \$25140$

$$= \$61\ 560$$

Amount of tax payable $= 550 + \dfrac{7}{100}(61560 - 40000)$

$$\approx 550 + 1509.20$$

$$= \$2059.20$$

(c) In January 2016, Mr Lee's basic monthly basic salary was cut by $200.

(i) Calculate the percentage decrease in the basic monthly salary from 2015 **[2]** to 2016, giving your answer to three significant figures.

Percentage decrease $= \dfrac{200}{3850} \times 100\%$

$$= 5.1948\%$$

$$= 5.19\% \ (3\text{s.f.})$$

(ii) In 2016, he was paid a bonus of 15.5% of the value of his sales that he **[2]** has made during the year. Given that his bonus in 2016 is $33 790, calculate the total value of his sales in 2016.

Total value of sales $= \dfrac{\$33790}{15.5} \times 100$

$$= \$218000$$

20 Kale ordered one set meals at $55.60 and an ice cream for $12.90 at a restaurant.   [5]
Below shows Kale's bill before payment.

1 set meal	$55.60
Ice cream	$12.90
SUBTOTAL	$68.50
10% Service Charge	$6.85
7% Goods and Services Tax (GST)	$5.27

Currently, the restaurant is offering two discount packages that Kale can choose from.

Discount Package I:

Enjoys 10% off the subtotal of the bill, which is thereafter subjected to 10% Service Charge first and then 7% GST.

Discount Package II:

10% Service Charge is waived, which is thereafter subjected to 7% GST.

Explain, showing all necessary working, which discount package is a better option for Kale.

Discount Package I:

Bill subjected to Service Charge and GST = $90\% \times \$68.50$

$$= \$61.65.$$

Total amount paid in Discount Package I = $(110\% \times \$61.65) \times 1.07$

$$= \$72.56$$

Discount Package II:

Bill subjected to GST = $68.50

Total amount paid in Discount Package II = $\$68.50 \times 1.07$

$$= \$73.30$$

Since amount paid in Package II is more than amount paid in Package I, therefore Package I is a better option for Kale.

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