Candidate Name .....

Class	Register No.

TANJONG KATONG GIRLS' SCHOOL

MID YEAR EXAMINATION 2016
SECONDARY ONE

4048 **MATHEMATICS**

Tuesday **3 May 2016** **1 h 15 min**

INSTRUCTIONS TO CANDIDATES

Write your name, class and register 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 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 **allowed**.
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.

The number of marks is given in brackets [ ] at the end of each question or part question.

The total marks for this paper is **50**.

For Examiners Use	
Total	50
Parents' Signature	

Setter : Ms Murniati
Marker(s) : Ms Murniati, Mrs Wong Lai Ying & Ms Noorhuda

This Question Paper consists of 10 printed pages, including this page.

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1. Correct

(i) S$29.03 to 1 significant figure,

(ii) 1.0203 to 2 significant figures.

Answer: (i) S$..... [1]

(ii) ..... [1]

2. Factorise each of the following expressions completely.

(a) $4x^2 + x$

(b) $2(a+2b) - y(a+2b)$

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

(b) ..... [1]

3. Subtract $(5+10x)$ from $5-11x+3x^2-2x^3$.

Answer: ..... [2]

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4. (a) (i) Solve the inequality $2 \geq -3x$.

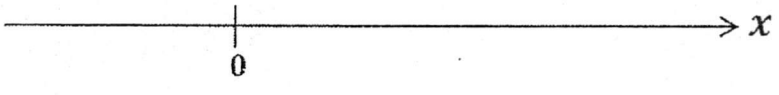
(ii) If x is an integer that satisfies the inequality $2 \geq -3x$, represent the solution of x on the number line below.

(b) Write down the least value of x if

(i) x is a prime number,

(ii) x is a rational number.

(a)
(ii)



[1]

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

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

(ii) ..... [1]

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5. Consider the sequence $-62, -58, -54, -50, \ldots$

(a) Write down the next two terms of the sequence.

(b) Write down an expression, in terms of n, for the n^{th} term of the sequence.

(c) Using your answer in part (a), find the 100^{th} term of the sequence.

(d) **(i)** Form an inequality, in terms of a, for which the a^{th} term is the first positive term of the sequence.

(ii) Hence, solve the inequality and determine the value of a.

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

(b) ..... [2]

(c) ..... [1]

(d)(i) ..... [1]

(ii) $a =$ ..... [2]

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6. (a) Solve the following equations.

(i) $2x+7-3(x+5)=4$

(ii) $\dfrac{3}{2y}=\dfrac{5}{7-4y}$

(b) Express the following as a single fraction in its simplest form.

$$1-\frac{5-2x}{3}$$

Answer: (a)(i) $x=$ ..... [3]

(ii) $y=$ ..... [3]

(b) ..... [3]

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7. **(a)** **(i)** Express 144 as a product of prime factors.

(ii) Find the smallest integer q for which $\sqrt[3]{144q}$ is an integer.

(b) The number 315 , written as the product of prime factors, is

$$315 = 3^2 \times 5 \times 7$$

Hence, find

(i) the smallest integer m such that $315m$ is a perfect square.

(ii) the smallest whole number that is divisible by both 144 and 315, leaving your answers in **index notation.**

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

(ii) q = ... [1]

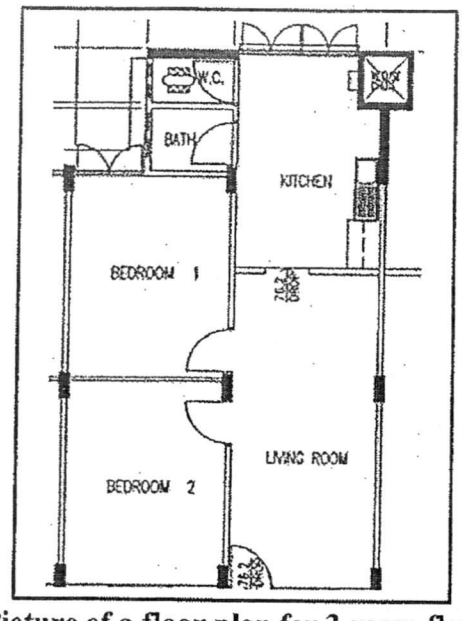
(b)(i) m = ... [1]

(ii) ..... [2]

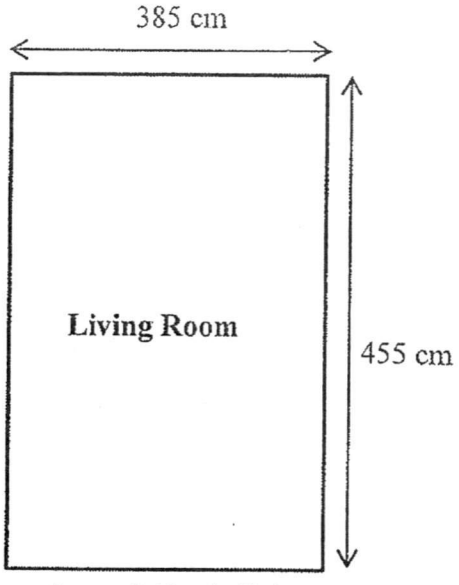
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8. The floor plan illustrated in the pictures below shows Alan's floor plan of a 3-room flat. The dimensions of her living room are 455 cm by 385 cm.

Alan is deciding on a suitable **square tile** that can be used to tile the floor of her living room completely, assuming that the tiles cannot be cut.



Picture of a floor plan for 3-room flat



Dimensions of Alan's living room

(a) Find the dimension of the largest square tile that can fit Alan's living room.

(b) Using the information below, find the total cost incurred to tile Alan's living room.

Standard cost of tiling are as follows	
Each square tile	: S$2.80 per tile
Labour cost to lay tiles	: S$60 per 100 tiles (Non-negotiable)

Answer: (a) .....cm by.....cm [3]

(b) S$..... [3]

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9. Using the INSERT provided, answer the following questions.

The graph shows the cost, $\$y$, of hiring **Electrician *A***, over a period of x hours spent on the job. The equation $y = mx + c$ represents the graph of **Electrician *A***.

(a) Using the graph provided for $0 \leq x \leq 4$, find

(i) the cost of hiring **Electrician *A*** for 2 hours,

(ii) the value of m and c,

(b) A house owner was puzzled that the graph shows that she has to pay $\$c$ for zero hours worked. Provide a possible explanation for this amount $\$c$.

The table below shows the cost of hiring **Electrician *B***.

Number of hours, x hours	0	2	4
Cost of hiring, $\$y$	0	50	100

(c) (i) On the same axes provided, draw the graph to represent the cost incurred for hiring **Electrician *B***. [2]

(ii) Write down the equation of the graph representing the cost of hiring **Electrician *B***.

(d) Determine which electrician to hire if a house owner requires 2.5 hours of electrical work. Show your working clearly on the graph insert. Provide a reason to justify your answer.

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

(ii) $m =$ ....., $c =$ ..... [2]

(b) .....

..... [1]

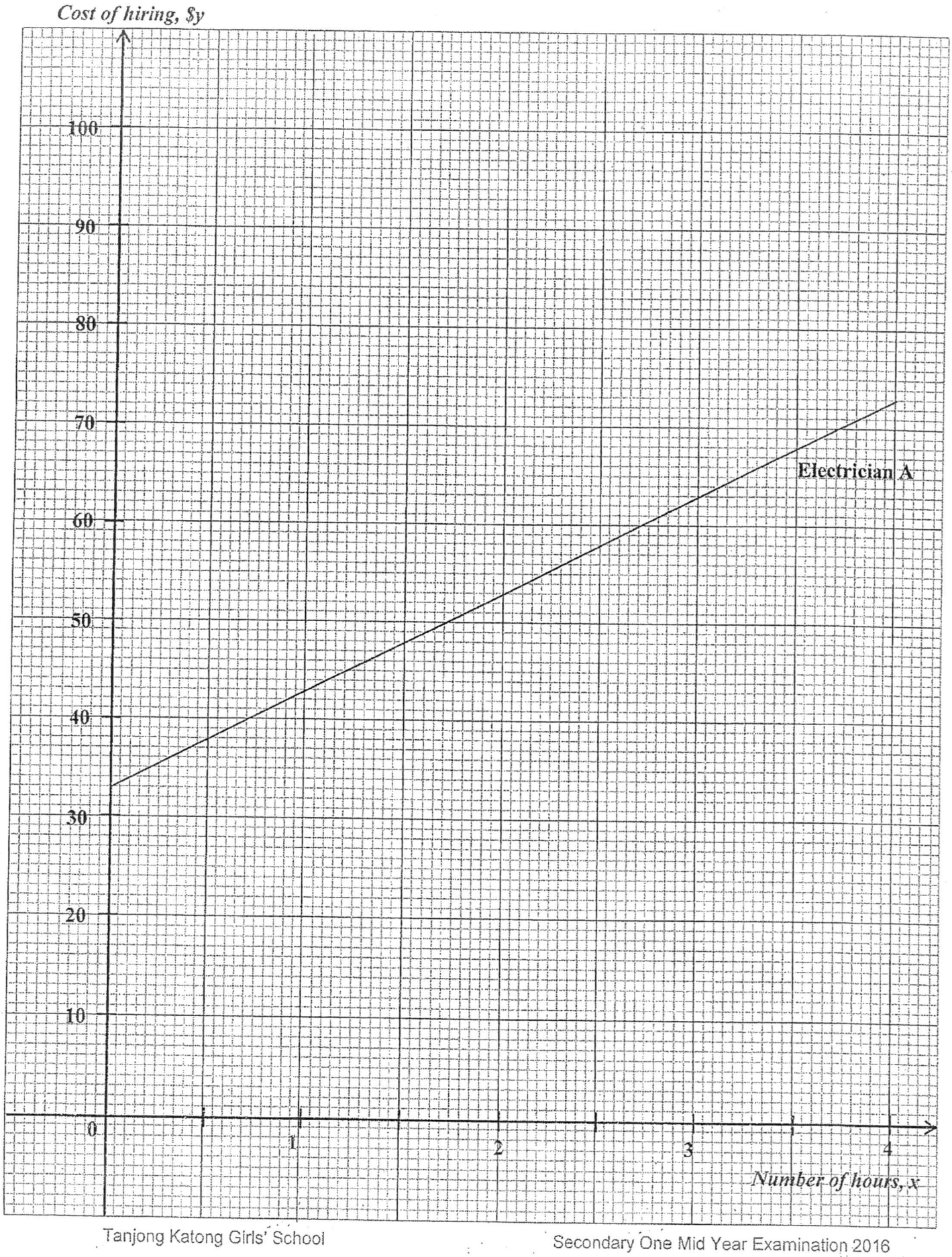
(c)(ii) ..... [1]

(d) Electrician..... because .....

..... [2]

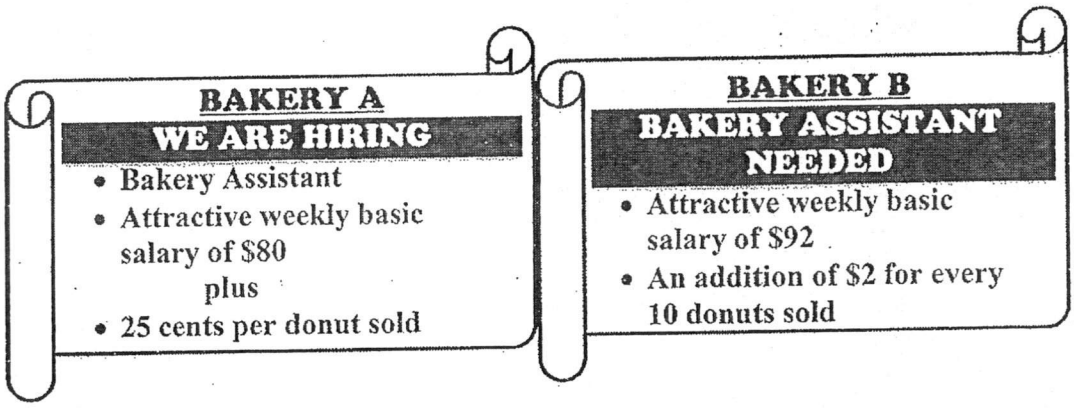
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INSERT:



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10.



Nadia claims her weekly salary would be the same if she sells n number of donuts as a bakery assistant in either bakery. By **forming an algebraic equation**, find n.

Answer: $n =$ ..... [4]

~ End of Paper ~

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Class	Register No.

Candidate Name **SOLUTION**.

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1. Correct

(i) S$29.03 to 1 significant figure,

(ii) 1.0203 to 2 significant figures.

Answer: (i) **S$30** [1]

(ii) **1.0** [1]

2. Factorise each of the following expressions completely.

(a) $4x^2 + x$

(b) $2(a+2b) - y(a+2b)$

Answer: (a) $x(4x+1)$ [1]

(b) $(2-y)(a+2b)$ [1]

3. Subtract $(5+10x)$ from $5-11x+3x^2-2x^3$

$$5-11x+3x^2-2x^3-(5+10x)$$
$$=5-11x+3x^2-2x^3-5-10x \qquad \textbf{Expand } -(5+10x)=-5-10x$$
$$=-2x^3+3x^2-21x$$

Answer: ..... [2]

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4. **(a)** **(i)** Solve the inequality $2 \geq -3x$.

(ii) If x is an integer that satisfies the inequality $2 \geq -3x$, represent the solution of x on the number line.

(b) Write down the least value of x if

(i) x is a prime number

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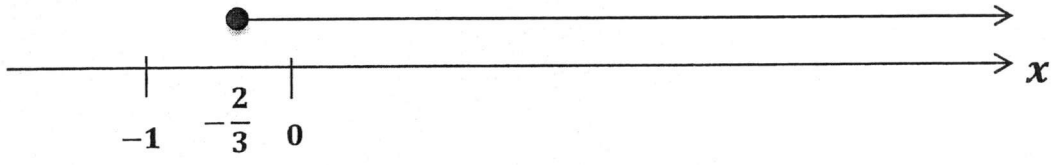
(a)

(i)

$$2 \geq -3x$$

$$-\frac{2}{3} \leq x \text{ or } x \geq -\frac{2}{3}$$

(ii)



Drawing of the correct arrow with shaded circle.

Students need to mark out $-\frac{2}{3}$

Answer: (a)(i) $x \geq -\frac{2}{3}$ [1]

(b)(i) 2 [1]

(ii) $-\frac{2}{3}$ [1]

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5. Consider the sequence $-62, -58, -54, -50, \ldots$

(a) Write down the next two terms of the sequence.

(b) Write down an expression, in terms of n, for the n^{th} term of the sequence.

(c) Using your answer in part (b), find the 100^{th} term of the sequence,

(d) **(i)** Form an inequality, in terms of a, for which the a^{th} term is the first positive term of the sequence.

(ii) Hence, solve the inequality and determine the value of a.

(b)

$$\begin{aligned} \text{nth term} &= -62 + 4(n-1) \\ &= -62 + 4n - 4 \\ &= 4n - 66 \end{aligned}$$

Using formula to find nth term

(c)

$$\begin{aligned} 100\text{th term} &= 4(100) - 66 \\ &= 334 \end{aligned}$$

(d)(i)

$$4a - 66 > 0$$

Form inequality

(ii)

$$\begin{aligned} 4a - 66 &> 0 \\ 4a &> 66 \\ a &> 16.5 \end{aligned}$$

Hence, value of $a = 17$

Solve inequality

Answer: (a) $\underline{-46}$, $\underline{-42}$ [1]

(b) ..... [2]

(c) ..... [1]

(d)(i) ..... [1]

(ii) $a =$ ..... [2]

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6. **(a)** Solve the following equations.

(i) $2x+[7-3(x+5)]=4$

(ii) $\frac{3}{2y}=\frac{5}{7-4y}$

(b) Express the following as a single fraction in its simplest form.

$$1-\frac{5-2x}{3}$$

(a)(i)

$2x+[7-3(x+5)]=4$ — **Expand correctly** $-3(x+5)=-3x-15$

$2x+[7-3x-15]=4$

$2x+[-8-3x]=4$ — **Simplify to** $7-3x-15=-8-3x$

$2x-8-3x=4$

$-x=12$

$x=-12$

(a)(ii)

$\frac{3}{2y}=\frac{5}{7-4y}$

$3(7-4y)=5(2y)$ — **Change to same denominator or cross-multiply**

$21-12y=10y$ — **Expand correctly** $3(7-4y)=21-12y$

$22y=21$

$y=\frac{21}{22}$

(b)

$1-\frac{5-2x}{3}$

$=\frac{3}{3}-\frac{(5-2x)}{3}$ — **Change to same denominator using LCM of 3**

$=\frac{3-5+2x}{3}$ — **Expand and simplify** $-(5-2x)=-5+2x$

$=\frac{2x-2}{3}$

Answer: (a)(i) $x=$ ..... [3]

(ii) $y=$ ..... [3]

(b) ..... [3]

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7. **(a)** **(i)** Express 144 as a product of prime factors.

(ii) Find the smallest integer q for which $\sqrt[3]{144q}$ is an integer.

(b) The number 315 , written as the product of prime factors, is

$$315 = 3^2 \times 5 \times 7$$

Hence, find

(i) the smallest integer m such that $315m$ is a perfect square.

(ii) the smallest whole number that is divisible by both 144 and 315, leaving your answers in **index notation**.

(a)(i)

$$144 = 2^4 \times 3^2$$

(a)(ii)

$$q = 2^2 \times 3$$
$$= 12$$

(b)(i)

$$m = 5 \times 7$$
$$= 35$$

(b)(ii)

LCM of 144 and $315 = 2^4 \times 3^2 \times 5 \times 7$

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

(ii) ..... [1]

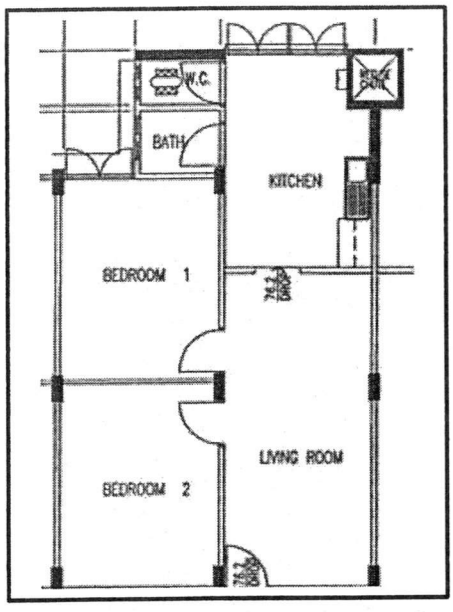
(b)(i) ..... [1]

(ii) ..... [2]

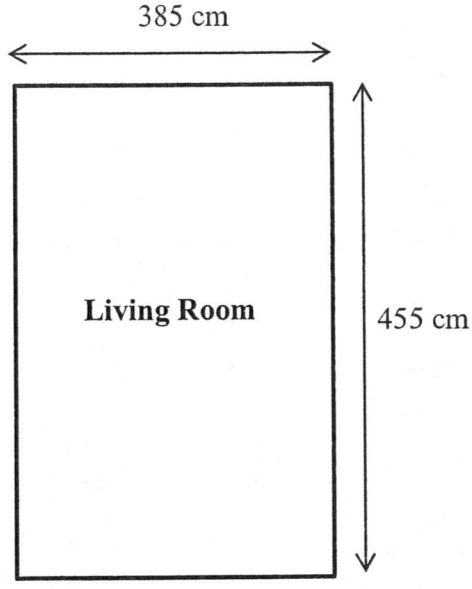
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Alan is deciding on a suitable **square tile** that can be used to tile the floor of her living room completely, assuming that the tiles cannot be cut.



Picture of a floor plan for 3-room flat



Dimensions of Alan's living room

(a) Find the dimension of the largest square tile that can fit Alan's living room.

(b) Using the information below, find the total cost incurred to tile Alan's living room.

Standard cost of tiling are as follows	
Each square tile	: S$2.80 per tile
Labour cost to lay tiles	: S$60 per 100 tiles (Non-negotiable)

(a)

$385 = 5 \times 7 \times 11$

$455 = 5 \times 7 \times 13$

Find HCF correctly

$HCF = 5 \times 7$

$= 35$

Dimension of tile = 35cm by 35cm

(b) $\text{No of tiles needed} = \frac{385}{35} \times \frac{455}{35}$

Find number of tiles

$= 143$

Find total cost

$\text{Total cost} = (143 \times 2.80) + (60 \times 2)$

$= \$520.40$

Answer: (a) .....cm by.....cm [3]

(b) S$..... [3]

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9. Using the INSERT provided, answer the following questions.

The graph shows the cost, $\$Y$, of hiring **Electrician *A***, over a period of x hours spent on the job.

The equation $Y = mX + c$ represents the graph of **Electrician *A***.

(a) Using the graph provided for $0 \leq x \leq 4$, find

(i) the cost of hiring **Electrician *A*** for 2 hours,

(ii) the value of m and c,

(iii) A house owner was puzzled that the graph shows that she has to pay $\$c$ for zero hours worked.

Provide a possible explanation for this amount $\$c$.

The table below shows the cost of hiring **Electrician *B***.

Number of hours, x hours	0	2	4
Cost of hiring, $\$Y$	0	50	100

(b) **(i)** On the same axes provided, draw the graph to represent the cost incurred for hiring **Electrician *B***. [2]

(ii) Write down the equation of the graph representing the cost of hiring **Electrician *B***.

(c) Determine which electrician to hire if a house owner requires 1.5 hours of electrical work. Show your working clearly on the graph insert.
Provide a reason to justify your answers.

Answer: (a)(i) $53 [1]

(ii) $m = 10$, $c = 33$ [2]

(iii) This could be to cover transport charges/labour cost/material and tools required/commitment cost incurred by the electrician to travel to the house owner's place **(Accept any plausible response)** [1]

(b) (ii) $y = 25x$ [1]

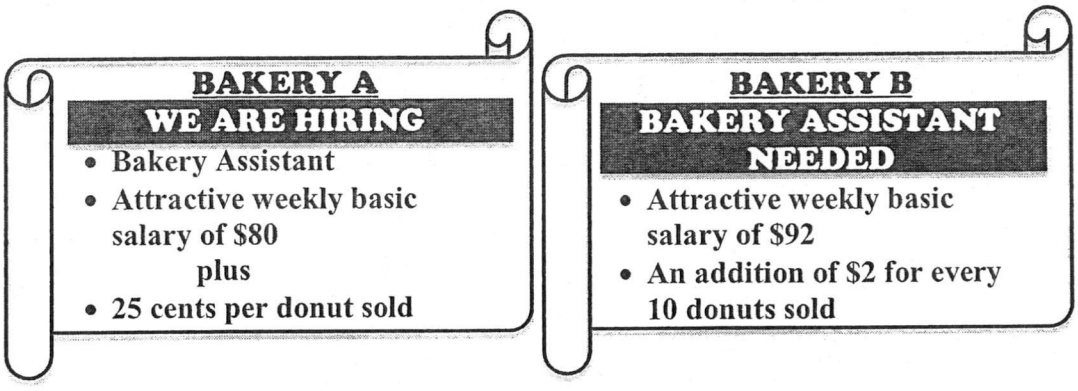
(c) Electrician **A** **[A1]** because it is cheaper by $4.50 **[B1]** to hire Electrician A compared to Electrician B. **(provide quantitative data to justify their choice)** [2]

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10.



Nadia claims her weekly salary would be the same if she sells n number of donuts as a bakery assistant in either bakery. By **forming an algebraic equation**, find n. [4]

$$80+\frac{25n}{100}=92+\frac{2n}{10}$$ **Form an expression for Bakery A**
Form an expression for Bakery B
Express as an equation

$$\frac{5n}{100}=12$$

$$5n=1200$$

$$n=240$$ **Expand and simplify and to solve for x**

Answer: $n=$ ..... [4]

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