Candidate Name _____ Class _____ Reg Number _____

TANJONG KATONG SECONDARY SCHOOL
2011 YEAR END EXAMINATION
SECONDARY ONE

MATHEMATICS
PAPER 1 2011

For Examiner's Use

Answer **all** questions.

For Examiner's Use

1 (a) Find the fraction which is exactly halfway between $\frac{1}{8}$ and $\frac{4}{8}$.

(b) Express the fraction $1\frac{3}{8}$ as a percentage.

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

(b)..... % [1]

2 An integer is estimated as 3000 when it is rounded off to one, two or three significant figures. Find the

(a) maximum possible value of the integer,
(b) minimum possible value of the integer.

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

(b)..... [1]

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For Examiner's Use

3 A stack of two-dollar notes, worth \$6000 is 12 cm thick. Find the thickness of a two-dollar note

(a) in centimetres, giving your answer as a decimal.
(b) in metres, giving your answer in standard form.

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

(b).....*m* [2]

4 **(a)** Find the smallest possible value of w if it leaves a remainder of one when divided by 2, 3 or 5.

(b) Expressed as the product of prime factors,
$18 = 2 \times 3^2$ and $45 = 3^2 \times 5$.
Use the results to find
(i) the smallest integer, k, such that $18k$ is a perfect cube,
(ii) the highest common factor of 18 and 45.

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

(b)(i)..... [2]

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

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For Examiner's Use

5 (a) Expand and simplify $2b(a+b) - a(a-b)$.

(b) Express $\frac{3f-g}{f+2g} - 1$ as a single fraction in its simplest form.

For Examiner Use

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

(b)..... [3]

6 (a) Factorise completely $3a(x-y)-(y-x)$.

(b) Solve the equation $\frac{a}{a+3} = 1\frac{1}{4}$.

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

(b)..... [2]

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For Examiner's Use

7 **(a)** Given that $x : y = 5 : 6$ and $y : w = 8 : 11$, find $x : y : w$.

(b) Vinegar and water are mixed in the ratio 1 : 4 by volume. If the volume of the solution is 900 cm^3,

(i) find the volume of vinegar in the solution,

(ii) how much vinegar must be added to the solution so that the ratio of vinegar to water in the solution becomes 1 : 3 by volume ?

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

(b)(i)..... cm^3 **[1]**

(b)(ii)..... cm^3 **[2]**

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For Examiner's Use

8 **(a)** Find the smallest integer y that satisfies the inequality $6y > -54$.

(b)(i) Solve $\frac{1}{5}x - \frac{2}{3}x > -7$.

(ii) Hence, find the largest possible value of x if x is a prime number.

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

(b)(i)..... [2]

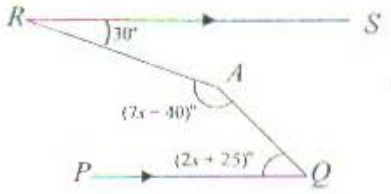
(b)(ii)..... [1]

4/5

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For examiner's Use

9 In the figure, $RS//PQ$, $\angle SRA = 30°$, $\angle RAQ = (7x - 40)°$ and $\angle AQP = (2x + 25)°$. Find the value of x.



For Examiner Use

Answer ..... [4]

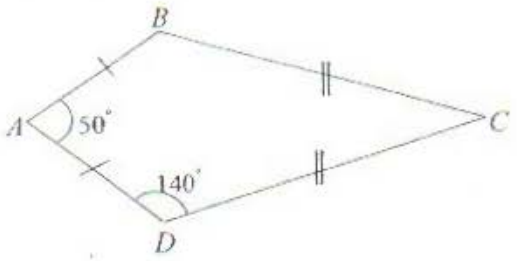
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For Examiner's Use

10 In the diagram, $ABCD$ is a quadrilateral in which $AB = AD$, $BC = CD$, $\angle BAD = 50°$ and $\angle ADC = 140°$.

(a) Find $\angle BCD$.

(b) What is the special name given to quadrilateral $ABCD$?



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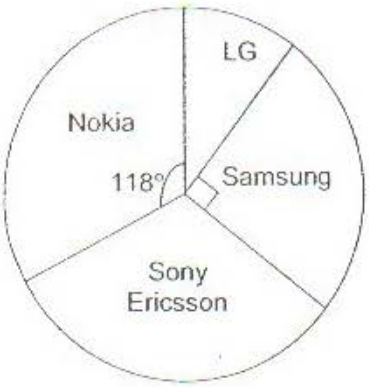
Answer **(a)**..... [2]

(b)..... [1]

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For Examiner's Use

11 The following pie chart shows the brand of mobile phones owned by a group of teenagers.



(a) Write down the fraction of teenagers who own a Samsung mobile phone.

(b) The number of teenagers who own a Sony Ericsson mobile phone is three times more than the number of teenagers who own a LG phone. Calculate the angle of the sector which represents the number of teenagers who own a Sony Ericsson mobile phone.

(c) Calculate the total number of teenagers in the group if the number of teenagers who own a Nokia mobile phone is 24 more than those who own a Sony Ericsson mobile phone.

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

(b)..... [3]

(c)..... [2]

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For Examiner's Use

12 Construct a quadrilateral $PQRS$ where $PQ = 6.5$ cm, $QR = 4.8$ cm, $RS = 8.5$ cm, $\angle PQR = 75°$ and $\angle QRS = 98°$.
On the same diagram, construct

(a)(i) the perpendicular bisector of PS,

(ii) the angle bisector of $\angle PSR$.

(b) Mark the point X where these two bisectors meet. Measure the length of PX.



Answer **(b)** $PX =$.....*cm* **[5]**

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Candidate Name _____ Class _____ Reg Number _____

TANJONG KATONG SECONDARY SCHOOL
2011 YEAR END EXAMINATION
SECONDARY ONE

MATHEMATICS
PAPER 1 2011

For Examiner's Use

Answer **all** questions.

For Examiner's Use

1 **(a)** Find the fraction which is exactly halfway between $\frac{1}{8}$ and $\frac{4}{8}$.

(b) Express the fraction $1\frac{3}{8}$ as a percentage.

(a) Required fraction $= \frac{2+3}{8} \times \frac{1}{2}$ or $\frac{1+4}{8} \times \frac{1}{2}$ M1

$= \frac{5}{16}$ A1

(b) $\frac{11}{8} \times 100\% = 137.5\%$ *or* $137\frac{1}{2}\%$ A1

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

(b).....% **[1]**

2 An integer is estimated as 3000 when it is rounded off to one, two or three significant figures. Find the
(a) maximum possible value of the integer,
(b) minimum possible value of the integer.

(a) maximum possible value = 3004 B1
(b) minimum possible value = 2995 B1

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

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

3 A stack of two-dollar notes, worth $6000 is 12 cm thick. Find the thickness of a two-dollar note
(a) in centimetres, giving your answer as a decimal.
(b) in metres, giving your answer in standard form.

(a) Thickness of one piece of two-dollar note $= \frac{12}{3000}$

$= 0.004$ cm A1

(b) 0.004 cm $= 0.00004$ m M1

$= 4 \times 10^{-5}$ m A1

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

(b).....*m* **[2]**

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For Examiner's Use

4 **(a)** Find the smallest possible value of w if it leaves a remainder of 1 when divided by 2, 3 or 5.

(b) Expressed as the product of prime factors,
$18 = 2 \times 3^2$ and $45 = 3^2 \times 5$.
Use the results to find
(i) the smallest integer, k, such that $18k$ is a perfect cube,
(ii) The highest common factor of 18 and 45.

(a) LCM of 2,3,5 is 30 M1
$w = 30 + 1$
$= 31$ A1

(b)(i) $18k = 2 \times 3^2 \times 2^2 \times 3$ M1
$k = 12$ A1

(b)(ii) HCF of 18 and 45 = 9 A1

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

(b)(i)..... **[2]**

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

For Examiner's Use

5 **(a)** Expand and simplify $2b(a + b) - a(a - b)$.

(b) Express $\frac{3f - g}{f + 2g} - 1$ as a single fraction in its simplest form.

(a) $2b(a + b) - a(a - b) = 2ab + 2b^2 - a^2 + ab$ M1
$= 3ab + 2b^2 - a^2$ A1

(b) $\frac{3f - g}{f + 2g} - 1 = \frac{3f - g - (f + 2g)}{f + 2g}$ M1 – single fraction
$= \frac{3f - g - f - 2g}{f + 2g}$ M1- expand correctly
$= \frac{2f - 3g}{f + 2g}$ A1

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

(b)..... **[3]**

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For Examiner's Use

6 **(a)** Factorise completely $3a(x-y)-(y-x)$.

(b) Solve the equation $\frac{a}{a+3}=1\frac{1}{4}$.

a) $3a(x-y)-(y-x) = 3a(x-y)+(x-y)$ M1 (changing terms in 2nd bracket)

$= (x-y)(3a+1)$ A1

(b) $\frac{a}{a+3}=1\frac{1}{4}$

$\frac{a}{a+3}=\frac{5}{4}$

$4a = 5(a+3)$ M1 – cross multiply

$a = -15$ A1

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

(b)..... [2]

7 **(a)** Given that $x : y = 5 : 6$ and $y : w = 8 : 11$, find $x : y : w$.

(b) Vinegar and water are mixed in the ratio 1 : 4 by volume. If the volume of the solution is 900 cm^3,

(i) find the volume of vinegar in the solution,

(ii) how much vinegar must be added to the solution so that the ratio of vinegar to water in the solution becomes 1 : 3 by volume ?

(a) $x : y = 5 : 6$ $y : w = 8\times3 : 11\times3$ **M1** (multiply ratio with LCM of original values of y)

$= 5\times4 : 6\times4$ $= 24 : 33$

$= 20 : 24$

$x : y : w = 20 : 24 : 33$ A1

(b) (i)Vol of vinegar $= 900\times\frac{1}{5}$

$= 180\ cm^3$ A1

(b)(ii) Let $x\ cm^3$ be the vol of vinegar added.

Vol of water = 720 cm^3

$\frac{180+x}{720}=\frac{1}{3}$ M1

$540 + 3x = 720$

$x = 60\ cm^3$ A1

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

(b)(i)..... cm^3 [1]

(b)(i)..... cm^3 [2]

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For Examiner's Use

8 **(a)** Find the smallest integer y that satisfies the inequality $6y > -54$.

(b)(i) Solve $\frac{1}{5}x - \frac{2}{3}x > -7$.

(ii) Hence, find the largest possible value of x if x is a prime number.

(a) $6y > -54$

$y > -9$ M1

$y_{smallest} = -8$ A1

(b)(i) $\frac{1}{5}x - \frac{2}{3}x > -7$

$\frac{x(3) - 2x(5)}{15} > -7$

$7x < 105$ M1----changing sign

$x < 15$ A1

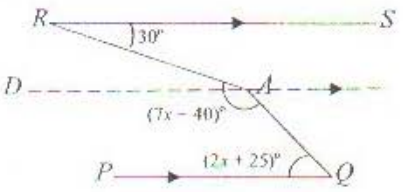
(ii) largest possible value of $x = 13$ A1

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

(b)(i)..... **[2]**

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

9 In the figure, $RS//PQ$, $\angle SRA = 30°$, $\angle RAQ = (7x - 40)°$ and $\angle AQP = (2x + 25)°$. Find the value of x.



$\angle RAD = 30°(alt\angle s, RS // PQ)$ M1 (use of alt. angles)

$\angle DAQ = (7x - 40)° - 30°$ M1

$= (7x - 70)°$

$\angle DAQ + \angle AQP = 180°(\text{int}\angle s, DA // PQ)$ M1 (use of int. angles) or(use of adj. angles on a str. line)

$(7x - 70)° + (2x + 25)° = 180°$

$(9x - 45)° = 180°$

$9x° = 225°$

$x = 25$ A1

Answer ..... **[4]**

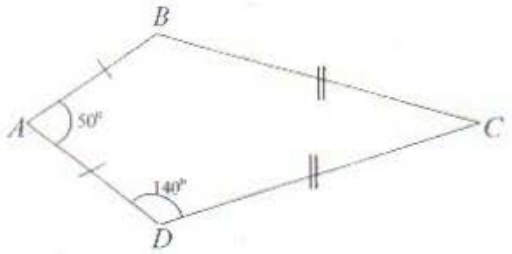
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For Examiner's Use

10 In the diagram, $ABCD$ is a quadrilateral in which $AB = AD$, $BC = CD$, $\angle BAD = 50°$ and $\angle ADC = 140°$

(a) Find $\angle BCD$.

(b) What is the special name given to quadrilateral $ABCD$?



$\angle ADB = \frac{180° - 50°}{2}$ (*base* $\angle$*s isos* Δ)

$= 65°$

$\angle CDB = 140° - 65°$

$= 75°$

$\angle BCD = 180° - 75° - 75°$ ($\angle$*s sum of* Δ) M1

$= 30°$ A1

Or $50° + 140° + 140° + \angle BCD = 360°$

(sum of int angles of a quad) M1

$\angle BCD = 30°$ A1

Quad $ABCD$ is a kite. A1

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

(b)..... [1]

11 The following pie chart shows the brand of mobile phones owned by a group of teenagers.



(a) Write down the fraction of teenagers who own a Samsung mobile phone.

(b) If the number of teenagers who own a Sony Ericsson mobile phone is three times more than the number of teenagers who own a LG phone. Calculate the angle of the sector which represents the number of teenagers who own a Sony Ericsson mobile phone.

(c) Calculate the total number of teenagers in the group if the number of teenagers who own a Nokia mobile phone is 24 more than those who own a Sony Ericsson mobile phone.

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(a) fraction of teenagers who own a Samsung phone $= \frac{1}{4}$ A1

(b) $3x + x = 360° - 90° - 118°$ M1

$x = \frac{152}{4}$

$x = 38°$ A1

angle of sector (Sony Ericsson) $= 114°$ A1

(c) Difference $= (118 - 114)°$

$= 4°$

Total number of teenagers $= \frac{24}{4} \times 360$ M1

$= 2160$ A1

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

(b)..... **[3]**

(c)..... **[2]**

For Examiner Use

12 Construct a quadrilateral $PQRS$ where $PQ = 6.5$ cm, $QR = 4.8$ cm, $RS = 8.5$ cm, $\angle PQR = 75°$ and $\angle QRS = 98°$. **[5]**

On the same diagram, construct

(a)(i) the perpendicular bisector of PS.

(ii) the angle bisector of $\angle PSR$.

(b) Mark the point X where these two bisectors meet. Measure the length of PX.

Construct

(a) QR ---------- 1m

(b) RS --------- 1m

(c) Line bisector --------- 1m

(d) Angle bisector ------- 1m

(e) Length PX -------- 1m

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Candidate Name _____ Class _____ Reg Number _____

TANJONG KATONG SECONDARY SCHOOL
2011 YEAR END EXAMINATION
SECONDARY ONE

MATHEMATICS
PAPER 2

Friday **7 Oct 2011** **1 hour 15 minutes**
0750 – 0905

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number on the cover page.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** the questions.
All answers are to be written on the writing paper provided.
If working is needed for any question it must be shown with the answer.
Omission of essential working will result in loss of marks.
You are expected to use a scientific calculator to evaluate explicit numerical expressions.
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 number of marks for this paper is 50.

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Answer **all** questions

1 A football club paid \$25 million for a player. A newspaper reported that the club would have to sell 635 382 tickets to recoup their investment.

(i) Write down 635 382 correct to two significant figures. [1]

(ii) Use your answer to (i) and the information above to **estimate** the cost of a ticket, correct to the nearest dollar. [2]

2 The cost of an advertisement in a magazine is obtained by adding together a fixed charge of 80 cents and an additional charge of 35 cents per word.

(i) Calculate the total cost of an advertisement containing 11 words. [1]

(ii) The total cost of an advertisement containing x number of words is T cents. Write down a formula for T in terms of x. [1]

(iii) Donex company is intending to print an advertisement in the magazine. With a budget of only \$8.00 available, what is the greatest number of words that Donex can use for their advertisement? [2]

3 (a) Solve the equation $\frac{3q-1}{4} - 3 = \frac{5-q}{2}$. [3]

(b) Factorise completely $4bx - 6a + 12ax - 2b$. [4]

4 Chandra left home at 08 30 and headed for school. After cycling for x minutes at a speed of 30 km/h, he experienced a flat tyre. He spent 30 minutes to change the tyre and then continued the second part of the journey for $(x + 10)$ minutes at a speed of 24 km/h.

(i) Find, in terms of x,

(a) the distance travelled in the first part of his journey. [1]

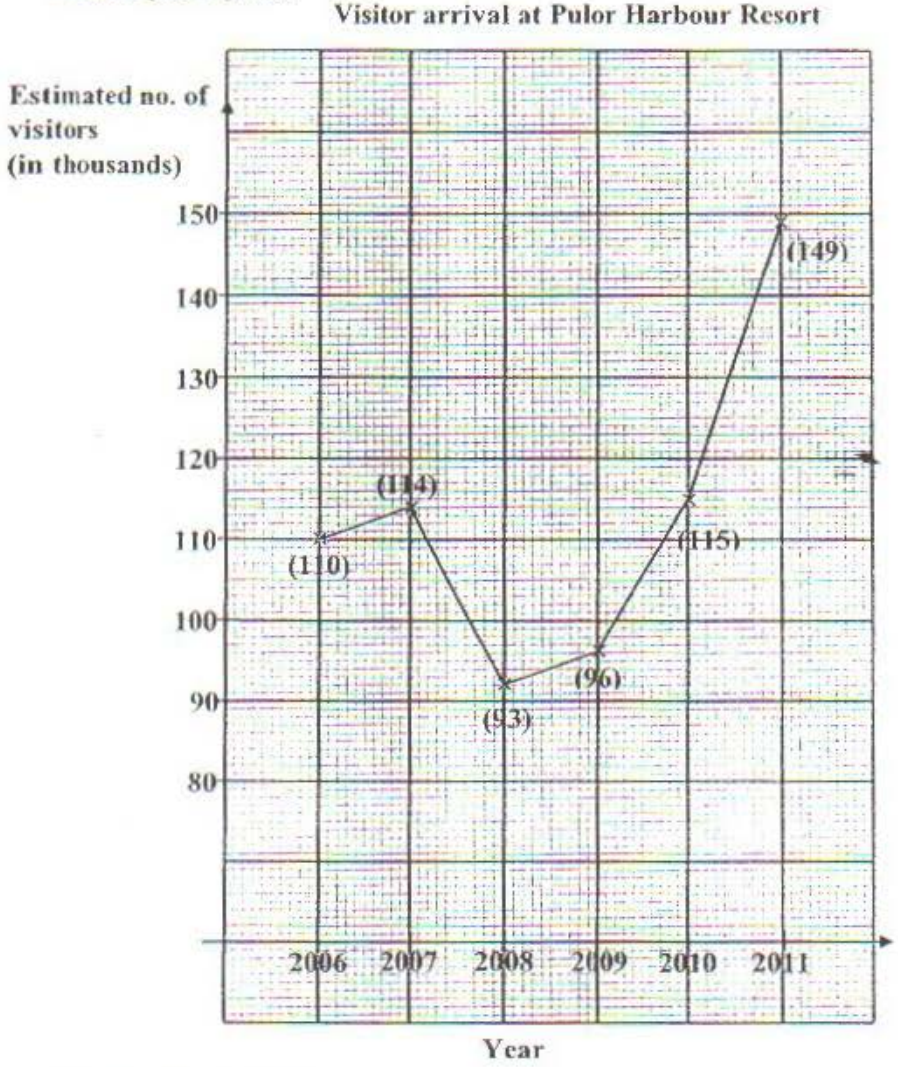
(b) the distance travelled in the second part of his journey. [1]

(ii) Given that the distance from his home to school is 17.5 km, form an equation in terms of x and solve it. [3]

(iii) What time did Chandra finally arrive in school? [1]

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5 The line graph below shows the estimated number of visitors to Pulor Harbour Resort over the past 6 years.



(a) Describe the graph. [1]

(b) Suggest a possible reason why there was a sharp drop in the number of visitors in 2008. [1]

(c) On average, guests stay for 2 days in the resort and spend $85 on each day. Calculate the income collected in 2009 correct to the nearest million. [2]

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6 The table below shows Mr Tan's water bill charges for the past 2 years.



Year	Charges	
	Fixed	Cost / cubic metre (Cu M)
2010	\$10 / month	80 cents
2011	36 cents / day	80 cents

(i) Calculate the total amount he paid in fixed charges for 2010. [1]

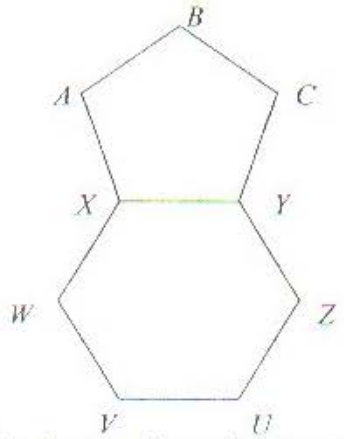
(ii) Calculate the total amount he paid in fixed charges for the 365 days of 2011 and the percentage increase from 2010 to 2011. [3]

(iii) For 2011, Mr Tan paid \$419.40 in all for his water bill. How many Cu M of water did he use? [2]

(iv) There was a leaky tap in Mr Tan's house that he did not fix. Water dripped from it at a rate of 0.6 Cu M per day. Calculate the amount of money he could have saved in a week. [2]

7 (a) In a heptagon, the exterior angles are $(86-x)°, x°, 4x°, (2x+15)°, (x-4)°, (120-2x)°$ and $28°$. Calculate the value of x and hence determine the value of the largest interior angle in the heptagon. [3]

(b)



The diagram above shows a regular pentagon $XYCBA$ and a regular hexagon $XYZUVW$ which share a common side XY. Giving your reasons, calculate

(i) $\angle XYC$. [1]

(ii) $\angle XYZ$. [1]

(iii) $\angle YCZ$. [3]

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8 A series of diagrams consisting of black and white triangles is shown below. The black triangles line the outer perimeter of each figure. All the other small triangles are white.



Fig. 1 Fig. 2 Fig. 3 Fig. 4

The table below shows the number of small triangles

Figure	1	2	3	4	5	...	n
No. of black triangles	3	6	9	12	c	...	x
No. of white triangles	1	3	7	13	d	...	y
Total number of triangles	4	9	16	25	e	...	z

(a) By considering the number patterns in the table or otherwise,

(i) state the value of c, d and of e. [3]

(ii) find expressions in terms of n for each of x and z. [2]

(b) Hence or otherwise, write down the relationship between x, y and z in the form of an equation. [1]

(c) How many white triangles are there in figure 73? [2]

(d) Is it possible for any figure to have a total number of 1849 triangles? Explain with reason. [2]

End of Paper

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2011 Yr End Sec1 Maths P2

Q1 i 640, 000

ii Cost of a ticket

$$= \frac{\$25000000}{640000}$$

$$= \$39.0625$$

$$\approx \$39$$

Q2 i Total cost = 80c + 35c(11)

= \$4.65 or 465c

ii $T = 80 + 35c$

iii $800 \geq 80 + 35x$

$35x \leq 720$

$x \leq 20.5$

OR

$800 - 80 = 720$

$720 \div 35 = 20R4$

Q3 a $\frac{3q-1}{4} - 3 = \frac{5-q}{2}$

$\frac{3q-1-12}{4} = \frac{5-q}{2}$

$6q - 26 = 20 - 4q$

$10q = 46$

$q = 4\frac{3}{5} or \frac{23}{5}$

b $4bx - 6a + 12ax - 2b$

$= 4bx + 12ax - 6a - 2b$

$= 4x(b + 3a) - 2(3a + b)$

$= (4x - 2)(3a + b)$

$= 2(2x - 1)(3a + b)$

Q4 ia Distance travelled $= \frac{x}{60} \times 30$

$= \frac{x}{2} km$

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b Distance travelled $= \frac{(x+10)}{60} \times 24$

$= \frac{2x+20}{5} km$

ii $\frac{x}{2} + \frac{2x+20}{5} = 17.5$

$\frac{5x+4x+40}{10} = 17.5$

$9x + 40 = 175$

$9x = 135$

$x = 15$

iii Total time taken = 15 + 30 + 25

= 70min or 1hr 10min

Time that Chandra finally arrives in school is 9.40am or 0940

Q5 a Highest visitor arrival in 2011

Lowest visitor arrival in 2008

Upward trend in visitor arrival from 2008 to 2011

b Financial crisis, natural disaster or other logical answer

c Income collected in 2009

$= 96000 \times \$85 \times 2$

$= \$16320000$

$\approx \$16mil$

Q6 i Total amount paid in 2010 = \$120

ii Total amount paid in 2011 = $365 \times 36c$

= \$131.40

$\%\ \text{increase} = \frac{\$131.40 - \$120}{120} \times 100\%$

$= 9.5\%$

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iii Amount of water used $= \dfrac{\$419.40 - \$131.40}{0.8}$

$= \dfrac{288}{0.8}$

$= 360$ CuM

iv Amount of money he could have saved $= 0.6 \times 7 \times 80c$

$= \$3.36$

Q7 a Total exterior angles $= 360°$

$x + 4x + 86 - x + 2x + 15 + x - 4 + 120 - 2x + 28 = 360$

$5x + 245 = 360$

$5x = 115$

$x = 23$

Largest interior angle $= 180° - 19°$

$= 161°$

bi $\angle XYC = \dfrac{3 \times 180°}{5}$

$= 108°$

ii $\angle XYZ = \dfrac{4 \times 180°}{6}$

$= 120°$

iii $\angle CYZ = 360° - 108° - 120°$ (angles at a pt)

$= 132°$

Since CY = YZ

$\therefore \angle YCZ = \dfrac{180° - 132°}{2}$ (base angles of isos triangle)

$= 24°$

Q8 ai c = 15

d = 21

e = 36

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$= 24°$

Q8 ai c = 15

d = 21

e = 36

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ii $x = 3n$

$z = (n+1)^2$

b $x + y = z$

c When $n = 73$,

$W_n = (74)^2 - 3(73)$

$= 5257$

d Yes

$\sqrt{1849} = 43$ (whole number) or 43^{rd} pattern

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