

Class Register No.

Candidate's Name :

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TANJONG KATONG GIRLS' SCHOOL

PRELIMINARY EXAMINATION 2013 SECONDARY FOUR

4016/01

**MATHEMATICS
Paper 1**

Monday

2 September 2013

2hr

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number in the spaces at the top of this page and the cover page for LOT 2.

Write your working and answers in dark blue or black pen in the spaces provided on the Question Paper.

You may use a 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.

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.

LOT	Marks
1	
2	
Total	
Parent's Signature	

The total marks for this paper is 80.

This Question Paper consists of 16 printed pages, including this page.

Mathematical Formulae

Compound interest

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

Mensuration

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

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

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

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

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

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

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

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 questions.

1 Express 695.9448 correct to

- (a) 2 decimal places,
- (b) 2 significant figures.

Answer (a) [1]

(b) [1]

2. Simplify the following, leaving your answers in positive index form.

(a) $\sqrt{9c^6} \div \frac{c^2}{b}$

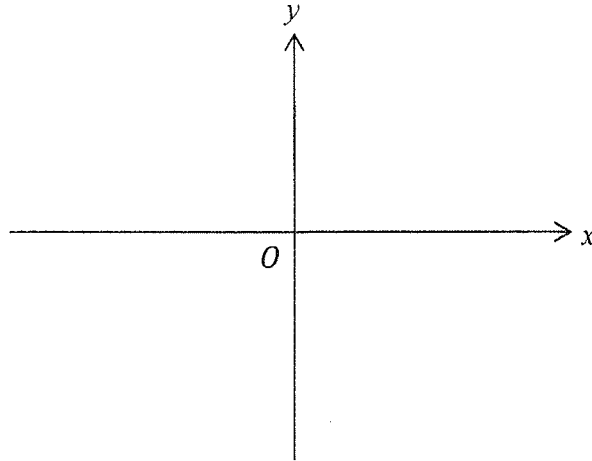
Answer (a) [1]

(b) $\left(\frac{h}{g^{-3}}\right)^{\frac{2}{3}} \times \frac{1}{h}$

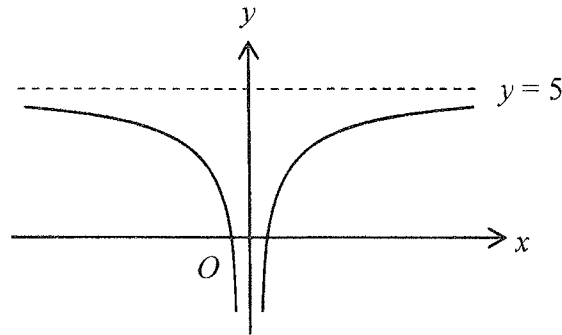
Answer (b) [1]

- 3 (a) Sketch the graph of $y = \frac{1}{x^2}$ [1]

Answer (a)



- (b) The sketch shows the graph of a function. Write a possible equation for the graph.



Answer (b) [1]

- 4 The HCF and LCM of two numbers, m and n , are 63 and $2 \times 3^2 \times 7^2$ respectively. Given that m is an even number and $m < n$, find the values of m and n .

Answer $m =$

$n =$ [2]

- 5 The scale of a map is 5cm : 6 km.
 (a) Write this scale in the form 1 : n .

Answer (a) 1 : [1]

- (b) A reservoir has an area of 50cm² on the map. Calculate the actual area of the reservoir in square kilometres.

Answer (b) km² [2]

- 6 (a) Write down the n th term for the sequence 1, 3, 5, 7, 9, 11, ...

Answer (a) [1]

- (b) Complete the following table by filling in the blanks, leaving your answers in terms of k and/or n .

Term	Sequence	Sum
1	1	1
2	1 + 3	4
3	1 + 3 + 5	9
⋮	⋮	⋮
_____	1 + 3 + 5 + ... + k	_____
⋮	⋮	⋮
n	1 + 3 + 5 + ... + _____	n^2

[2]

- 7 (a) Express $\frac{4x}{7} - (x - 4)$ as a single fraction.

Answer (a) [1]

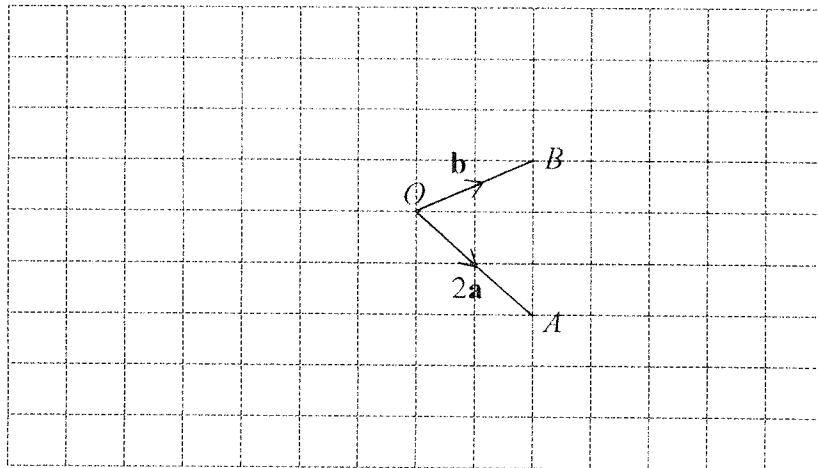
- (b) Factorise fully $2pr + 4rt - p^2 - 2pt$.

Answer (b) [2]

- 8 On the grid in the answer space, $\vec{OA} = 2\mathbf{a}$ and $\vec{OB} = \mathbf{b}$.

- (a) Draw and label clearly on the grid below, the vector \vec{OC} where $\vec{OC} = \mathbf{a} - 3\mathbf{b}$.
 (b) $OADB$ is a trapezium. Given that $\vec{AD} = 2\vec{OB}$, mark out D on the grid.

Answers (a) and (b)



[2]

- (c) Express \vec{BD} in terms of \mathbf{a} and/or \mathbf{b} .

Answer (c) [1]

9 (a) If $1\frac{2}{5}:2a = 7:5$, find a .

Answer (a) $a = \dots\dots\dots$ [2]

(b) Given that $0 \leq x \leq 5$ and $-1 \leq y \leq 3$, find the greatest value of $x^2 - 4xy + 4y^2$.

Answer (b) $\dots\dots\dots$ [2]

10 Solve the simultaneous equations

$$\frac{p}{3} - \frac{q}{5} = 4$$

$$5p + 2q = 50.$$

Answer $p = \dots\dots\dots$

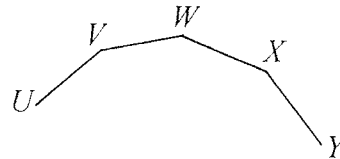
$q = \dots\dots\dots$ [3]

- 11 The cash price for a car was \$150 000. Sally paid a downpayment of \$90 000 and paid the remaining amount by monthly instalments for 5 years. Given that a simple interest of $x\%$ per annum was charged and that his monthly instalment was \$ 1 090, find the value of x .

Answer $x =$ [3]

- 12 (a) $UVWXY$ is part of a regular polygon which has interior angles of 150° .

- (i) Find the number of sides of the polygon.



Answer (a)(i) [1]

- (ii) Calculate $\angle WVY$.

Answer (a)(ii) $^\circ$ [1]

- (b) Explain briefly why the interior angle of a regular polygon cannot be 100° .

.....
.....
..... [1]

- 13 (a) It is known that d is directly proportional to the square root of v . Given that $d = \frac{1}{3}$ when $v = 4$, find the value of v when $d = 1$.

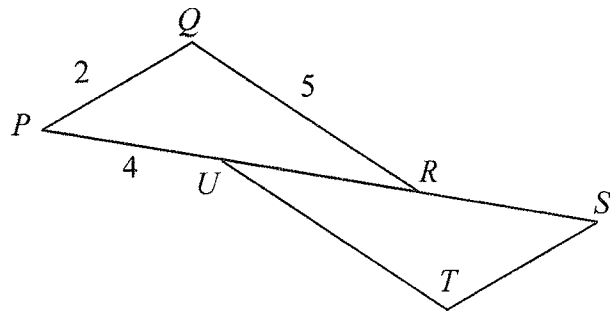
Answer (a) $v = \dots\dots\dots$ [1]

- (b) y is inversely proportional to x^n and y is $\frac{1}{8}$ of its original value when x is increased by 100%. Calculate the value of n .

Answer (b) $n = \dots\dots\dots$ [2]

- 14 In the diagram, triangle PQR and triangle STU are congruent.
It is given that $PURS$ is a straight line, $PQ = 2$ cm, $QR = 5$ cm and $PU = 4$ cm.

- (a) Find RS .



Answer (a) $\dots\dots\dots$ cm [1]

- (b) Show that QR is parallel to UT .

.....
.....
..... [2]

15 A survey was taken to find out the time taken in minutes, for 30 students to travel to school.

The results are displayed in the stem-and-leaf diagram below.

Stem	Leaf									
1	5	5	8							
2	0	0	0	5	5	8	9			
3	0	3	4	4	4	7	7	7	8	
4	0	2	2	2	2					
5	0	3	3	5	5	9				

Key: 1|5 represents 15 minutes

(a) For the distribution above, write down

(i) the modal time,

Answer (a)(i) min [1]

(ii) the median time taken.

Answer (a)(ii) min [1]

(b) The same data was represented on a pie chart.

(i) Calculate the angle of the sector representing 10 students who take more than k minutes to travel to school.

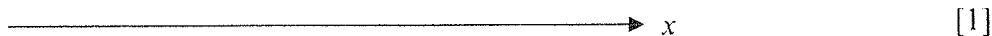
Answer (b)(i) ° [1]

(i) Find a possible value of k .

Answer (b)(ii) $k = \dots \dots \dots [1]$

16 Solve the inequalities $7x + 10 < 3x \leq \frac{1}{4}(x - 11)$. Represent your solution on the number line below.

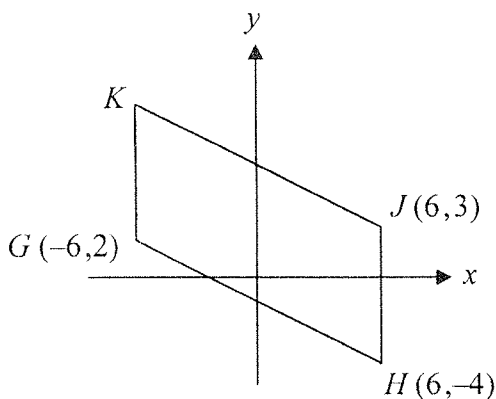
Answer [3]



17 The diagram shows a parallelogram $GHJK$.

G is $(-6, 2)$, H is $(6, -4)$ and J is $(6, 3)$.

(a) Find the equation of GH .



Answer (a) [2]

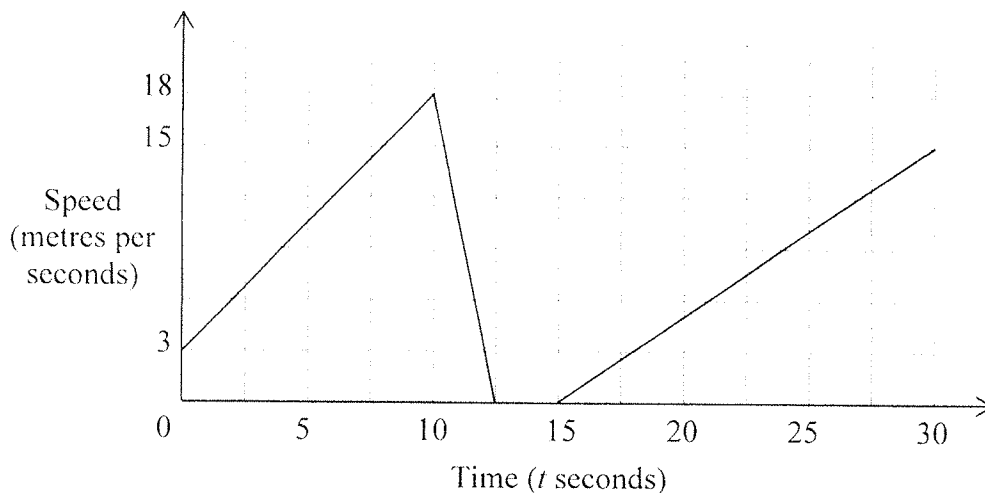
(b) State the coordinates of K .

Answer (b) [1]

(c) Calculate the area of the parallelogram.

Answer (c) units² [2]

18 The diagram below shows the speed-time graph of a truck for the first 30 seconds of its journey.



- (a) Find
(i) the speed of the truck when $t = 7s$,

Answer (a)(i) m/s [1]

- (ii) the retardation when $t = 11s$.

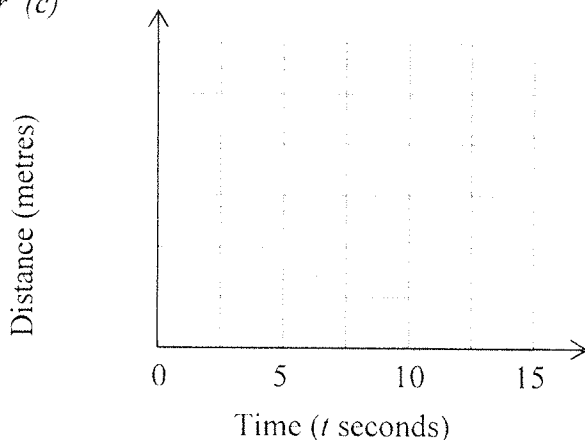
Answer (a)(ii) m/s^2 [1]

- (b) Describe what might have happened to the truck between $t = 12.5s$ and $t = 15s$.

..... [1]

- (c) On the grid in the answer space, sketch the distance-time graph for the same journey for 0 to 15 seconds.

Answer (c)



[2]

19 The diagram is a scale drawing showing the positions of two buildings, *S* and *T*, facing the sea.

S is due west of *T*. A bus interchange *B* is 500 m away from *S* and 750 m away from *T*.

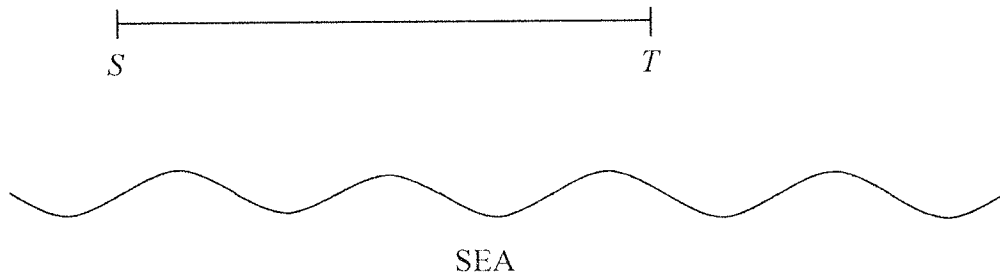
(a) Construct and label the position of the bus interchange *B* [1]

A convenience store *C* is equidistant from both buildings. It is on a bearing of 60° from *B*.

(b) Using ruler and compasses only, construct and label the position of the convenience store *C*. [2]

(c) Measure and estimate the distance in metres between the convenience store and the bus interchange.

Scale : 1 cm represent 100 m



Answer (c) m [1]

(d) Complete the following sentence.

Point *D* lies on the angle bisector of $\angle CST$ and is equidistant from

..... [1]

- 20 (a) Express $-x^2 + \frac{2}{3}x - 2\frac{1}{9}$ in the form of $a(x-b)^2 + c$, where a , b and c are constants.

Answer (a) [2]

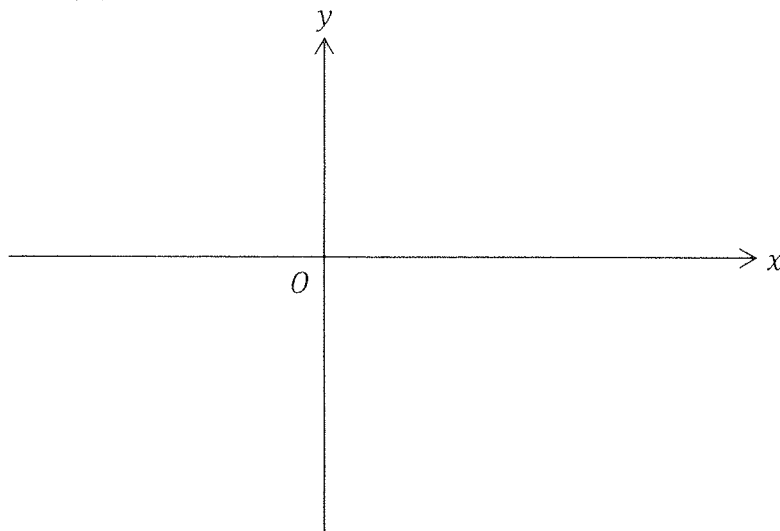
- (b) (i) Hence, state the turning point of another curve $y = -x^2 + \frac{2}{3}x - 3\frac{1}{9}$ and the equation of the line of symmetry.

Answer (b)(i) [1]

..... [1]

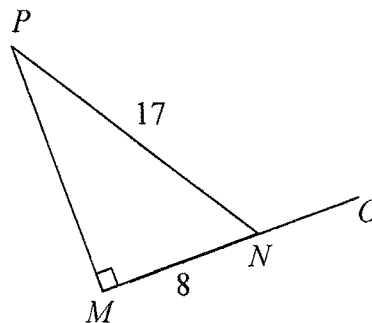
- (ii) Sketch the curve $y = -x^2 + \frac{2}{3}x - 3\frac{1}{9}$. [2]

Answer (b)(ii)



21 In the diagram, MNO is a straight line.
 $PN = 17$ cm, $MN = 8$ cm and $\angle PMN = 90^\circ$.

- (a) Without using calculator, find
 (i) $\tan \angle MPN$,



Answer (a)(i) [1]

- (ii) $\sin\left(\frac{\pi}{2} - \angle PNM\right)$, and

Answer (a)(ii) [1]

- (b) (i) Find $\angle ONP$.

Answer (b)(i) ° [2]

- (ii) Given that $\angle PON = 43^\circ$, find the distance between O and P .

Answer (b)(ii) cm [2]

22 The diameters of two spherical dust particles, A and B , are 2.5 micrometres (μm) and 10 μm respectively.

(a) Find the volume of one particle of A in m^3 and give your answer in standard form.

Answer (a) m^3 [2]

(b) The mass of 1 million particles of A is 15 micrograms (μg).

(i) Given that both particles have the same density, find the mass of 1 million particles of B in micrograms.

Answer (b)(i) μg [2]

(ii) Find the density of particle A in g/cm^3 .

$$\left[\text{Density} = \frac{\text{Mass}}{\text{Volume}} \right]$$

Answer (b)(ii) g/cm^3 [2]

End of paper 1

2013 TKGS SEC 4 MA PRELIM PAPER 1 ANSWER KEY

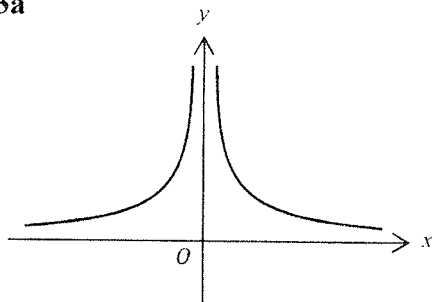
- 1a** 695.94
b 700

- 13a** 36
b 3

- 2a** $3bc$
b $\frac{g^2}{h^3}$

- 14a** 4
b $\angle QRP = \angle TUS$ (congruent triangles) and UR is the common side. So, QR is parallel to UT .

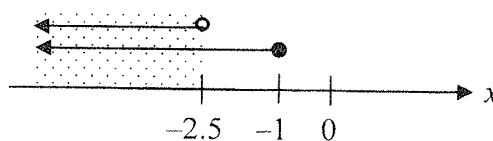
3a



- b** $y = -\frac{k}{x^2} + 5$;
[k can be any positive number]

- 15ai** 42
ii 35.5
bi 120
ii 40 or 41

- 16** $x < -2.5$



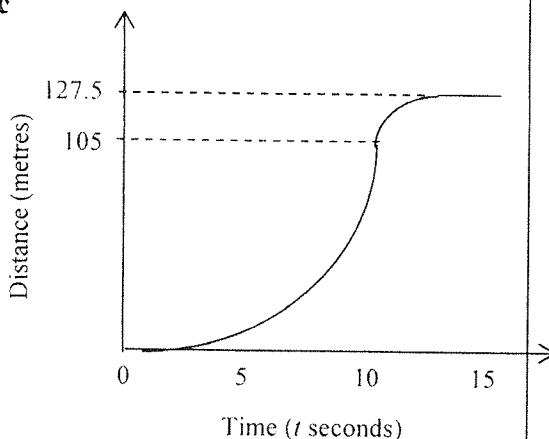
- 4** $m = 126, n = 441$

- 17a** $y = -\frac{1}{2}x - 1$
b $(-6, 9)$
c 84

- 5a** 120 000
b 72

- 18ai** 13.5
ii 7.2
b It came to a stop.
c

- 6a** $2n - 1$
b $\frac{k+1}{2}$; $\left(\frac{k+1}{2}\right)^2$; $2n - 1$



- 7a** $\frac{28 - 3x}{7}$
b $(2r - p)(p + 2t)$

- 8c** $2a + b$

- 9a** $\frac{1}{2}$
b 49

- 19c** 250 to 260
d CS and ST

- 10** $p = 10.8$; $q = -2$

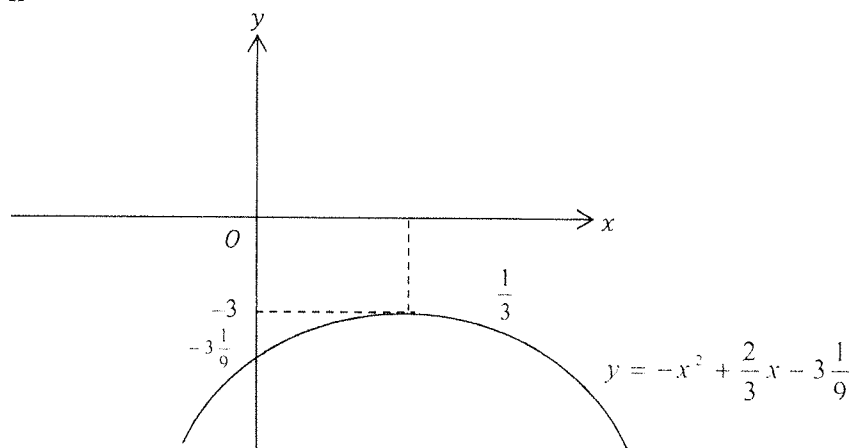
- 11** 1.8

- 12ai** 12
ii 30
b $n = \frac{360^\circ}{180^\circ - \text{interior } \angle}$ OR $n = \frac{360^\circ}{\text{exterior } \angle}$
When the interior angle is 100° , n cannot be an integer.

20a $-\left(x - \frac{1}{3}\right)^2 - 2$

bi $\left(\frac{1}{3}, -3\right); x = \frac{1}{3}$

ii



21ai $\frac{8}{15}$

ii $\frac{8}{17}$

bi 118.1

ii 22.0

22a 8.18×10^{-18}

bi 960

ii 1.83



TANJONG KATONG GIRLS' SCHOOL

PRELIMINARY EXAMINATION 2013 SECONDARY FOUR

4016/2

MATHEMATICS Paper 2

Wednesday

18 September 2013

2hr 30 min

Additional Materials: Writing paper
Graph paper

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number in the spaces 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 or graphs.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.

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Calculators should be used where appropriate.

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

LOT	Marks
1	
2	
Total	
Parent's Signature	

The total marks for this paper is 100.

Setter(s) : Mrs K Taufiq

Marker(s) : Miss Koo CC / Ms Noorhuda / Mrs K Taufiq / Mrs D Ang / Ms Loh SL

This Question Paper consists of 13 printed pages, including this page.

Mathematical Formulae

Compound interest

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

Mensuration

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

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

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

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

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

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

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

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** questions.

- 1 In 2012, Victor earned a gross annual income of \$106 875, out of which the amounts that **will not be subjected to income tax** are shown in the following table.

Personal Relief	\$3 000
Wife Relief	\$2 000
Child Relief	\$4 000 per child
Central Provident Fund (CPF) contributions	\$23 000
Donations	\$1 130

- (a) For the remaining income, the gross tax payable for the first \$40 000 is \$550 and exceeding which, the rate is 11.5%. Given that he and his wife have 3 children, find his income tax payable. [4]
- (b) In 2012, his annual gross income included the 13th month bonus and a 1.25 month special bonus, find his monthly salary. [2]
- (c) Victor put aside \$10 000 in a savings fund that pays compounded interest half yearly at an interest rate of $x\%$ per annum. He will receive an amount of \$14 516 when the fund matures in 15 years. Calculate the value of x . [2]

2 Chef Emmanuel chops 50 tomatoes in x minutes. His apprentice, Timothy took 10 minutes longer to chop 20 tomatoes.

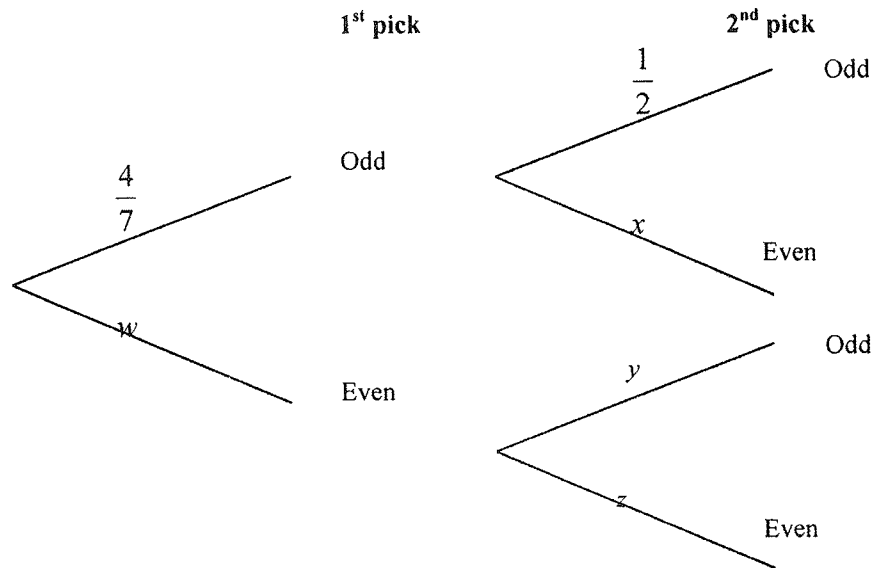
(a) Given that they chop a total of 95 tomatoes in 30 minutes, form an equation in x and show that it reduces to $19x^2 - 230x - 3000 = 0$. [3]

(b) Solve the equation $19x^2 - 230x - 3000 = 0$. [2]

(c) Hence, find the difference in the number of tomatoes cut by each of them in 30 minutes. [1]

(d) By showing the necessary calculations, complete the statement:
"Apprentice Timothy's rate of cutting tomatoes is _____ % that of Chef Emmanuel's rate ." [1]

- 3 (a) In a box, there are 7 numbered balls each having a non-repeating integer from 1 to 7 printed on it. Two balls are picked one at a time **without replacement** and their sum is recorded.

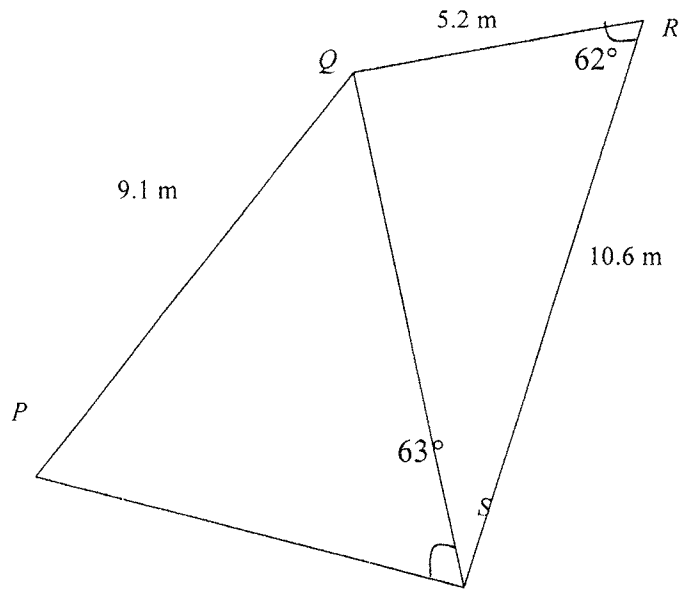


- (i) Write down the values of w , x , y and z . [2]
- (ii) Find the probability that both balls picked
- (a) are odd, [1]
- (b) have an even sum. [2]
- (iii) If the two balls had been drawn **with replacement**, find the probability that both balls picked have an odd sum. [2]

- (b) It is given that ξ is the universal set of all quadrilaterals, P is the set of parallelograms, R is the set of rhombuses and T is the set of rectangles.

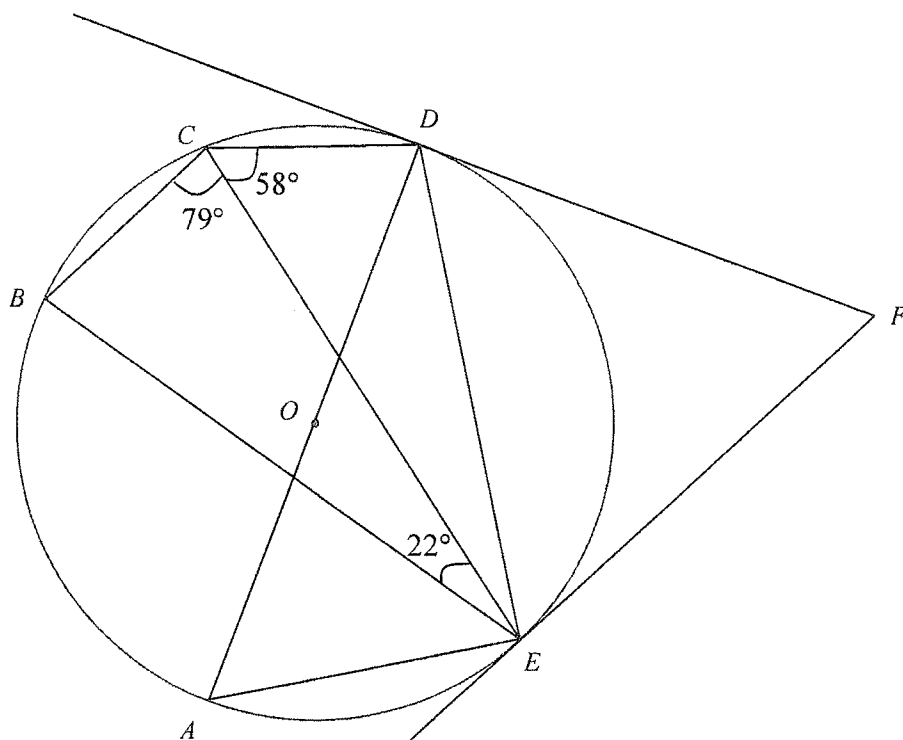
- (i) Draw a Venn diagram to represent the relationship of all the sets. [2]
- (ii) Express, in set notation, the region in which the set of squares would lie. [1]

- 4 The diagram shows the top down view of a crocodile exhibit in the zoo where PQ , QR , RS , QS and PS are bridges for visitors to walk along while observing the reptiles in the waters below them. It is given that $QR = 5.2$ m, $RS = 10.6$ m, $PQ = 9.1$ m, $\angle QRS = 62^\circ$ and $\angle QSP = 63^\circ$.



- (a) Calculate the length of the bridge QS . [2]
- (b) Given that S is due east of P , find the bearing of P from Q . [3]
- (c) The area of the crocodile exhibit is represented in a map drawn to a scale of 1 : 200.
Find, in square centimetres, the area representing the exhibit on the map. [3]
- (d) A visitor walks from P to S . Calculate the greatest angle of depression of the crocodile spotted directly 6.2 m below Q when viewed from any point along the bridge PS . [2]

- 5 The points A, B, C, D, E lie on a circle with centre, O . AD is the diameter of the circle and tangents at D and E meet at F . It is given that $\angle ECB = 79^\circ$, $\angle ECD = 58^\circ$ and $\angle CEB = 22^\circ$.



- (a) Calculate, giving your reasons clearly,
- (i) $\angle COB$, [1]
 - (ii) $\angle CED$, [2]
 - (iii) $\angle ADE$, [2]
 - (iv) $\angle DFE$. [2]
- (b) Given that X is a point on chord DE such that OXF is a straight line, prove that $\triangle OXD$ is similar to $\triangle AED$. [3]

6 Answer the whole of this question on a sheet of graph paper.

The variables x and y are connected by the equation $y = \frac{x(6-x^2)}{5}$.

Some corresponding values of x and y are given in the following table.

x	0	1	1.5	2	3	3.5	4
y	0	1	p	0.8	-1.8	-4.375	-8

(a) Find the value of p .

[1]

(b) Using a scale of 4 cm to represent 1 unit, draw the x -axis for $0 \leq x \leq 4$.

Using a scale of 2 cm to represent 2 units, draw the y -axis for $-14 \leq y \leq 2$.

On your axes, plot the points given in the table and join them with a smooth curve.

[3]

(c) Using your graph,

(i) write down a non-zero integral value of k for which the equation $\frac{x(6-x^2)}{5} = k$ has exactly two solutions for $0 \leq x \leq 4$,

[1]

(ii) draw a tangent to find the gradient of the curve when $x = 2.5$.

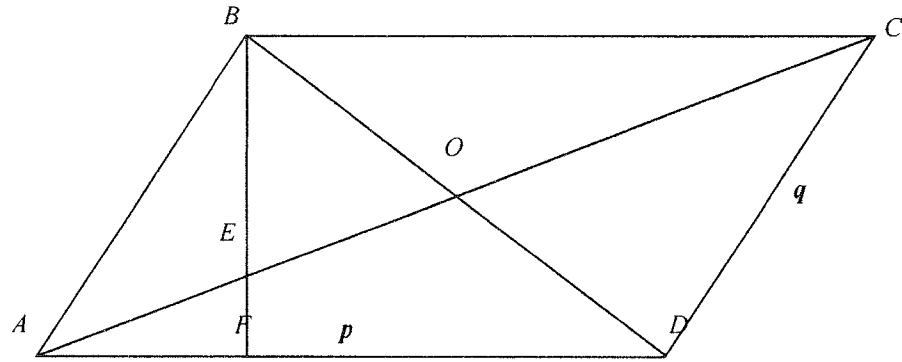
[2]

(d) (i) On the same axes, draw $y = -2x$.

[1]

(ii) Hence, find the range of values of x that satisfy the inequality $16x \geq x^3$.

[2]

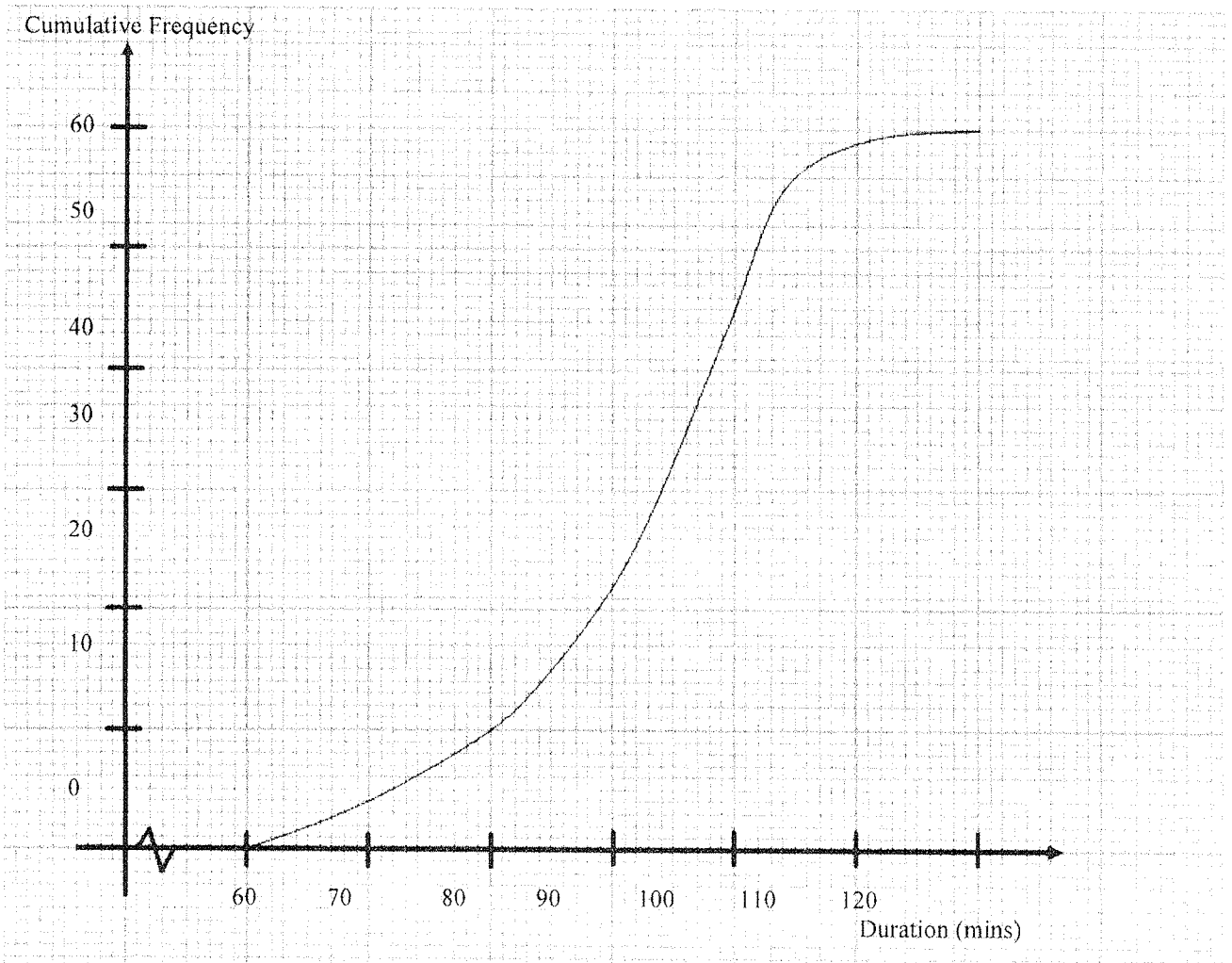


$ABCD$ is a parallelogram whose diagonals BD and AC intersect at O .

F is a point on AD such that $2AF = FD$. E is a point on AC such that $AE : AC = 1 : 4$.

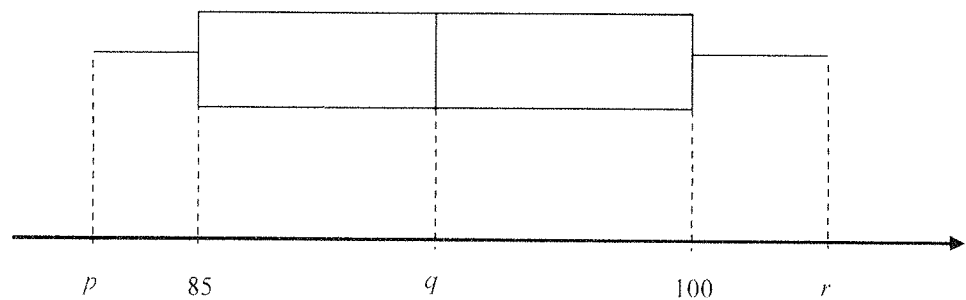
- (a) If O is the origin of a Cartesian plane, A is the point $(-4, -2)$ and B is the point $(-2, 2)$,
- (i) express \overrightarrow{AB} as a column vector, [1]
 - (ii) find $|\overrightarrow{AB}|$. [1]
- (b) Given that $\overrightarrow{AD} = \mathbf{p}$ and $\overrightarrow{DC} = \mathbf{q}$, express, as simply as possible, the following vectors in terms of \mathbf{p} and/or \mathbf{q} .
- (i)
 - (a) \overrightarrow{AE} [1]
 - (b) \overrightarrow{EF} [2]
 - (ii) Prove that B , E and F are collinear. [2]
 - (iii) Find the value of
 - (a) $\frac{\text{area of } \triangle AEF}{\text{area of } \triangle CEB}$, [1]
 - (b) $\frac{\text{area of } \triangle BAE}{\text{area of } \triangle BAC}$, [1]
 - (c) $\frac{\text{area of } \triangle AEF}{\text{area of } ABCD}$. [2]

- 8 The cumulative frequency graph below shows the duration (in minutes) 60 visitors spent at the Egyptian Mummy Exhibit at the Museum on a particular day when it was ongoing in the month of January.



- (a) (i) State the values of p , q , and r in the box and whisker diagram used to represent the information above.

[1]



- (ii) Find the interquartile range.
 (iii) Write down the 70th percentile.

[1]

[1]

- (b) Use the graph to find the values of s and t for the frequency table below.

Duration (mins)	No. of visitors
$60 < x \leq 70$	4
$70 < x \leq 80$	s
$80 < x \leq 90$	12
$90 < x \leq 100$	t
$100 < x \leq 110$	14
$110 < x \leq 120$	1

[2]

- (c) Using the frequency table above, calculate

(i) the mean duration, and

[2]

(ii) the standard deviation.

[2]

- (d) The Museum had another Dinosaur Exhibit in the month of February and carried out a similar survey with another 60 visitors. The findings are as follows:

Mean duration	95 minutes
Standard deviation	8.21 minutes

In your opinion, which exhibit is more interesting? Explain your answer.

[2]

- (a) (i) Simplify

$$\frac{6}{1-4x^2} + \frac{2}{2x-1} \quad [2]$$

- (ii) Given that
- $\frac{1}{f} = \frac{1}{u} + \frac{1}{t^2}$
- , make
- t
- the subject and hence find the values of
- t
- when

$$f = \frac{1}{2} \text{ and } u = 500\% \text{ of } 1 \text{ unit.} \quad [3]$$

- (b) The table below shows the number of cups of hot chocolate, milk tea and juice blend sold by three outlets owned by LovelyBeans on a typical day during lunch hour.

	Hot Chocolate	Milk Tea	Juice Blend
Outlet 1	32	21	58
Outlet 2	51	35	27
Outlet 3	42	56	22
Total	125	112	107

- (i) The usual prices of a cup of hot chocolate, milk tea and juice blend are \$3.50, \$2.80 and \$3.20 respectively. Form a 3×1 matrix M to represent this information.
Use matrix multiplication to calculate the amount of money collected for each outlet and state the outlet with the most profit on a typical day. [3]
- (ii) On World Health Day, the prices of the three types of drinks are reduced by 10% for hot chocolate, 20% for milk tea and 15% for juice blend. Using the matrix $N = \begin{pmatrix} 0.9 & 0 & 0 \\ 0 & 0.8 & 0 \\ 0 & 0 & 0.85 \end{pmatrix}$, calculate NM and explain what it represents. [2]
- (iii) Find the total amount of money earned during lunch hour on World Health Day, represented by TNM where T is a row matrix. (Assume that the number of cups sold is the same as that of a typical day.) [2]

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Figure 1 shows a diagram where $ABDE$ is a rectangle and O is the midpoint of AE . A semicircle of radius 14 cm is drawn with AE as the diameter. The semicircle cuts BD at P and Q such that

$$\angle POA = \frac{\pi}{9} \text{ rad} .$$

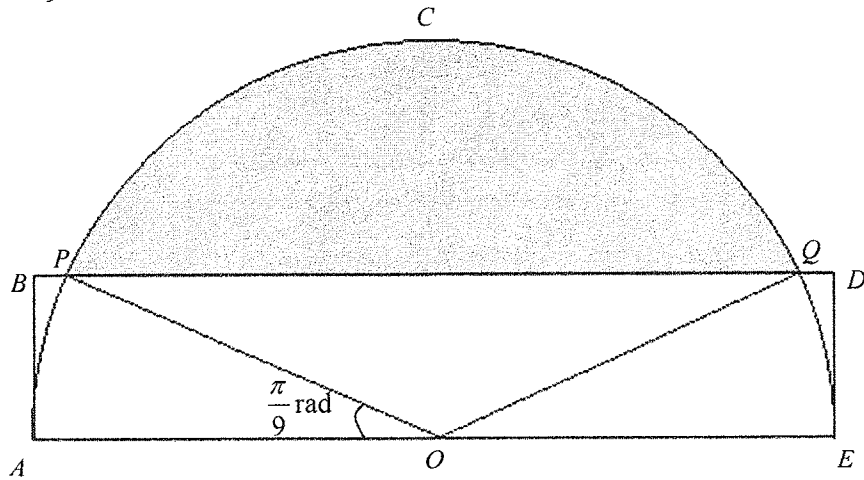


Figure 1

- (a) Find $\angle POQ$ in radians. Hence, calculate the area of the shaded segment PCQ . [3]

Figure 2 shows an inverted square-based pyramid of perpendicular height 35 cm. A solid, of which PCQ is the cross section, is mounted on it.

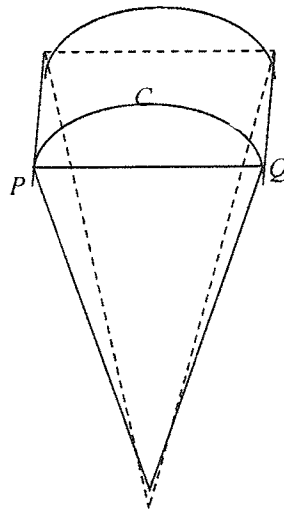


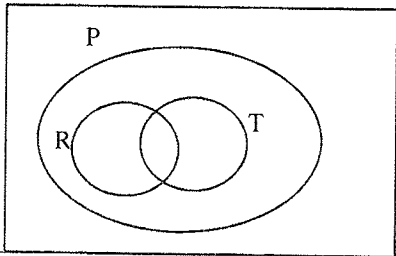
Figure 2

It is given further that $PQ = 26.3$ cm.

- (b) Find the volume of the figure. [2]
 (c) Find the length of the arc PCQ . [2]
 (d) Hence, calculate the total surface area of the figure. [4]

End of Paper 2

TKGS SEC 4MA P2 PRELIM EXAM 2013 SUGGESTED ANSWER KEY

1	a	\$3510.68	5	ai	44°
	b	\$7500		aii	21°
	c	2.50 (3sf)		aiii	32°
				aiv	64°
2	a	$19x^2 - 230x - 3000 = 0$ (shown)			
	b	$x = 20$ or $-7\frac{17}{19}$ (rej)	6	a	$p = 1.125$
	c	55 mins		ci	$k = 1$
	d	$26\frac{2}{3}$		cii	-2.5 (Accept -2.45 to -2.65)
				ciii	$0 \leq x \leq 4$
3	ai	$w = \frac{3}{7}, x = \frac{1}{2}, y = \frac{2}{3}, z = \frac{1}{3}$			
	aiia	$\frac{2}{7}$			
	aiib	$\frac{3}{7}$			
	aiii	$\frac{24}{49}$	7	ai	$\binom{2}{4}$
	bi	ξ 		aii	4.47 units (3sf)
	bii	$R \cap T$		bia	$\frac{1}{4}(p + q)$
				bib	$\frac{1}{12}(p - 3q)$
4	a	9.36 m (3sf)		bii	Since $\overrightarrow{BE} = 3\overrightarrow{EF}$, (or $BE \parallel EF$) and E is a common point, B, E and F are collinear.
	b	203.6°		biiia	$\frac{1}{9}$
	c	14.3 cm^2 (3sf)		biiib	$\frac{1}{4}$
	d	36.6°		biiic	$\frac{1}{24}$

			10	a	176 cm^2 (3sf)
8	ai	$p = 60, q = 94, r = 120$		b	12700 cm^3 (3sf)
	aii	15		c	34.2 cm (3sf)
	aiii	99 mins		d	3220 cm^2 (3sf)
	b	$s = 6, t = 23$			
	ci	$91\frac{2}{3}$ mins (Accept 91.7 mins)			
	cii	11.8 mins (3sf)			
	d	The Dinosaur Exhibit was more interesting because visitors stayed longer as its mean of 95 mins is greater, compared to the mean of $91\frac{2}{3}$ mins for the Egyptian Mummy Exhibit. The length of stay at the Dinosaur Exhibit was more consistent than in the Egyptian Mummy Exhibit as its standard deviation of 8.21 mins is smaller than 11.8 mins.			
9	ai	$\frac{4(1-x)}{(102x)(1+2x)}$			
	aii	$t = \pm \sqrt{\frac{fu}{u-f}}$ $t = \pm 0.745$ (3sf)			
	bi	$M = \begin{pmatrix} 3.50 \\ 2.80 \\ 3.20 \end{pmatrix}, \begin{pmatrix} 356.40 \\ 362.90 \\ 374.20 \end{pmatrix},$ Outlet 3			
	bii	$\begin{pmatrix} 3.15 \\ 2.24 \\ 2.72 \end{pmatrix}$ It represents the discounted price of each of the three types of drinks.			
	biii	$T = (125 \ 112 \ 107)$ Total amt is \$935.67.			