

Class	Index Number	Name
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SINGAPORE CHINESE GIRLS' SCHOOL

Preliminary Examination 2013

MATHEMATICS
Paper 1

4016/01

Tuesday

30 July 2013

2 hours

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your class, index number and name on all the work you hand in.

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** 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 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 of the marks for this paper is 80.

MATHEMATICAL FORMULAE

Compound Interest

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

Mensuration

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

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

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

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

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

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

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

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** the questions.

- 1 (a) Express 1.5 as a fraction of $3\frac{4}{7}$.
- (b) Express $\frac{45}{18}$ as a percentage.

Answer (a) [1]

(b) % [1]

- 2 Evaluate $\frac{4.016^2}{7^3 - \sqrt{2013}}$, giving your answer correct to 4 significant figures.

Answer [1]

- 3 (a) Given that $9\% : x = \frac{1}{8} : \frac{8}{9}$, find the value of x .
- (b) The marked price of a watch is \$8000. If the watch is sold at the marked price, the retailer gains a profit of 60%. Find the retailer's profit if he sells it at a discount of 20% of the marked price.

Answer (a) $x =$ [1]

(b) \$ [2]

4 Written as the product of its prime factors, $126 = 2 \times 3^2 \times 7$.

- (a) Express 180 as the product of its prime factors.
- (b) Find the greatest integer that will divide both 126 and 180 exactly.
- (c) Lollipops are sold in packs of 126.
Gummies are sold in packs of 180.
Clara buys the same number of lollipops as gummies.
Find the least number of packs of lollipops that she could have bought.

Answer (a) $180 = \dots\dots\dots$ [1]

(b) $\dots\dots\dots$ [1]

(c) $\dots\dots\dots$ [1]

5 (a) Simplify $\left(\frac{p^8}{16q^2}\right)^{-\frac{3}{4}}$.

(b) Given $243^{q+2} = 3^{2468} \div 81^{617}$, find q .

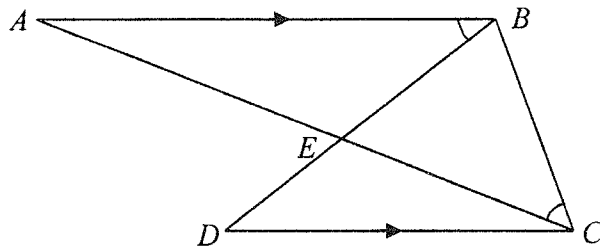
Answer (a) $\dots\dots\dots$ [1]

(b) $q = \dots\dots\dots$ [2]

- 6 On a certain day, the highest temperature recorded was $x^{\circ}\text{C}$ and the lowest temperature recorded was $-y^{\circ}\text{C}$. Given that x and y are positive integers and the difference between the two temperatures is $z^{\circ}\text{C}$, express y in terms of x and z .

Answer [1]

- 7 In the diagram, not drawn to scale, AC and BD intersect at E . AB is parallel to DC and angle $ABD = \text{angle } ACB$.



- (a) Show that triangle AEB is similar to triangle ABC .

Answer (a)

 [2]

It is given that angle $EDC = 44^{\circ}$ and angle $BAC = 24^{\circ}$.

- (b) Find
 (i) angle AED ,
 (ii) reflex angle BCD .

Answer (b)(i) $^{\circ}$ [1]

(ii) $^{\circ}$ [1]

- (c) Explain why triangle BCD is isosceles.

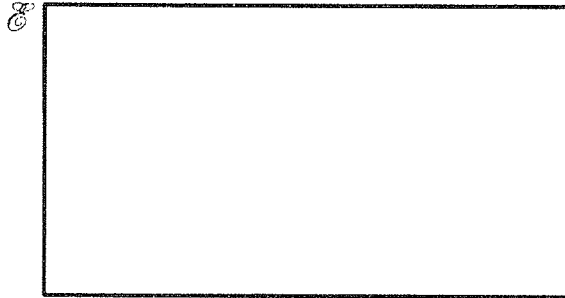
Answer (c)

 [1]

- 8 (a) $\mathcal{E} = \{x : x \text{ is a quadrilateral}\}$
 $L = \{x : x \text{ is a quadrilateral whose diagonals bisect each other}\}$
 $M = \{x : x \text{ is a quadrilateral with four right angles}\}$

(i) Illustrate the above information in the Venn diagram in the answer space.

Answer (a)(i)



[1]

(ii) Given that $N = \{x : x \text{ is a quadrilateral whose diagonals bisect each other at right angles}\}$, name the quadrilateral in the set $M \cap N$.

Answer (a)(ii)

[1]

(b)(i) Solve $x+1 \leq 12-x < 2x+3$.

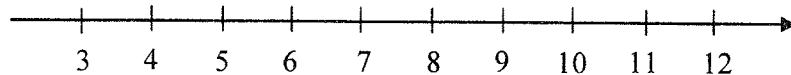
Answer (b)(i)

[2]

- (ii) $\mathcal{E} = \{x : x \text{ is a real number}\}$
 $A = \{x : 4 < x \leq 10\}$
 $B = \{x : x+1 \leq 12-x < 2x+3\}$

(a) Illustrate the solution set of $A \cap B'$ on the number line given in the answer space.

Answer (ii)(a)



[1]

(b) List all the prime numbers in the set $A \cup B$.

Answer (b)

[1]

- 9 (a) m hamsters will consume $5n$ grams of sunflower seeds. Assuming that each hamster consumes the same amount of sunflower seeds, find the number of hamsters, in terms of m and n , which can be fed with 2.3 kilograms of sunflower seeds.
- (b) Find the value of k such that $9x^2 + 54x + k$ is a perfect square.

Answer (a) [1]

(b) [1]

- 10 The sides of a triangle, correct to the nearest centimetre, are 8 centimetres, 10 centimetres and 13 centimetres. Find the least possible perimeter of the triangle.

Answer cm [1]

11 (a) Solve $\frac{5}{2}(y-1) - \frac{2}{5}(5-3y) = 21$.

(b) Simplify $\frac{128-18x^2}{6x^2-28x+32}$.

Answer (a) $y =$ [1]

(b) [3]

12 It is estimated that there are 36 billion white blood cells in 5 litres of human blood.

- (a) 36 billion can be expressed as k trillion. Find the value of k .
- (b) In human blood, the ratio of red blood cells to white blood cells is 1500 : 1. Find the number of red blood cells in 1 litre of human blood. Leave your answer in standard form.

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

(b) $\dots\dots\dots$ [1]

13 A man jogs 3.75 kilometres at an average speed of 9 kilometres per hour for the first part of the journey and then walks 70 metres in 50 seconds for the second part of the journey. Calculate

- (a) the time, in minutes, he takes for the first part of the journey,
- (b) his speed in kilometres per hour for the second part of the journey,
- (c) the average speed for the whole journey.

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

(b) $\dots\dots\dots$ km/h [1]

(c) $\dots\dots\dots$ km/h [1]

14 The force of attraction between two particles is inversely proportional to the square of the distance between them. Find the percentage increase in the force between the particles when the distance between them decreases by 25%.

Answer $\dots\dots\dots$ % [2]

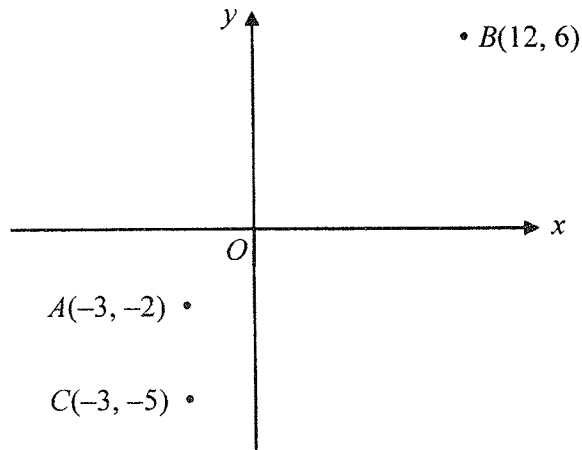
15 An area of 16 cm^2 on a map represents 25 km^2 on the ground.

- (a) Express the scale of the map in the form $1 : n$.
- (b) A river is represented by a length of 1.8 cm on the map. Find the actual distance, in metres, of the river.

Answer (a) 1 : [1]

(b) m [1]

16 The diagram shows three points $A(-3, -2)$, $B(12, 6)$ and $C(-3, -5)$.



Find

- (a) $\cos \hat{BAC}$,
- (b) the length of BC ,
- (c) the perpendicular distance from A to BC ,
- (d) the equation of the line passing through A and parallel to BC .

(a) $\cos \hat{BAC} = \dots\dots\dots$ [1]

(b) units [1]

(c) units [1]

(d) [2]

17 A confectionary sells small, medium and large butter and sudgee cakes.

The table shows the number of each type of cake sold in a particular week.

	Butter	Sugee
Small	34	22
Medium	81	71
Large	56	42

This information can be represented by the matrix $C = \begin{pmatrix} 34 & 22 \\ 81 & 71 \\ 56 & 42 \end{pmatrix}$.

The selling price of each small, medium and large cake is \$10, \$15 and \$18 respectively. This information can be represented by the matrix $P = (10 \ 15 \ 18)$.

- (a)(i) Evaluate PC .
- (ii) Explain what your answer to (a)(i) represents.

Answer (a)(i) [1]

(ii)

 [1]

- (b) Using matrix multiplication, calculate the total amount of money collected from the sales of the cakes.

Answer (b) \$ [1]

- 18 (a) The graph of $y = 4 - 64x^2$ intersects the y -axis at A and the x -axis at B and C . Write down the coordinates of A , B and C .

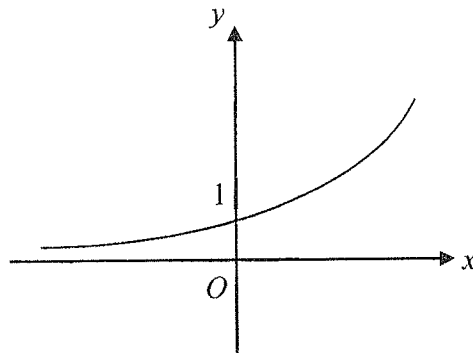
Answer A is (..... ,)

B is (..... ,)

C is (..... ,) [2]

- (b) Write down a possible equation for this graph.

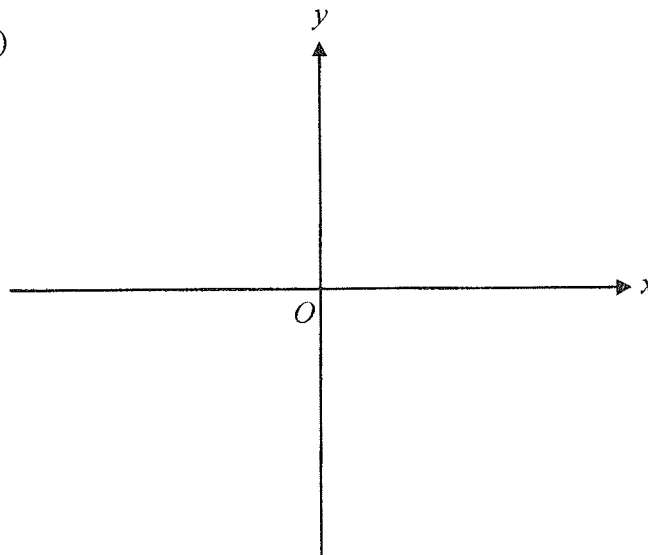
Answer (b)



Answer [1]

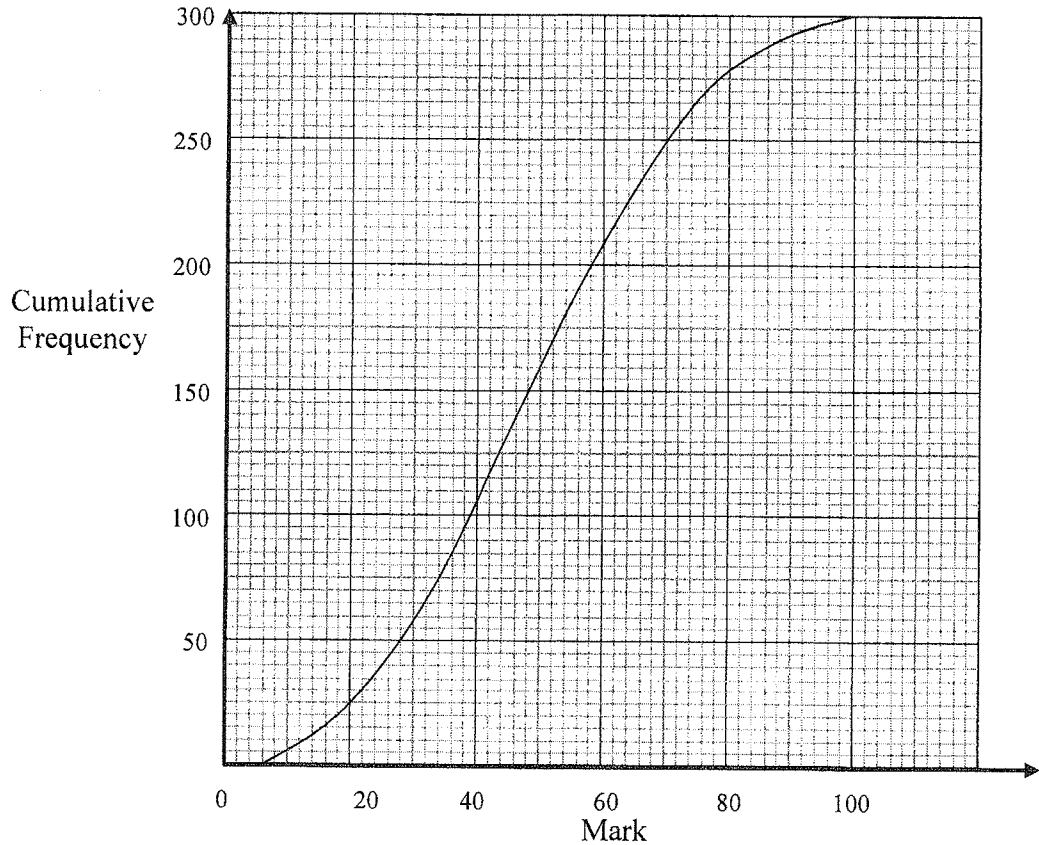
- (c) Sketch the graph of $y = \left(x + \frac{3}{4}\right)^2 + \frac{1}{2}$.

Answer (c)



[2]

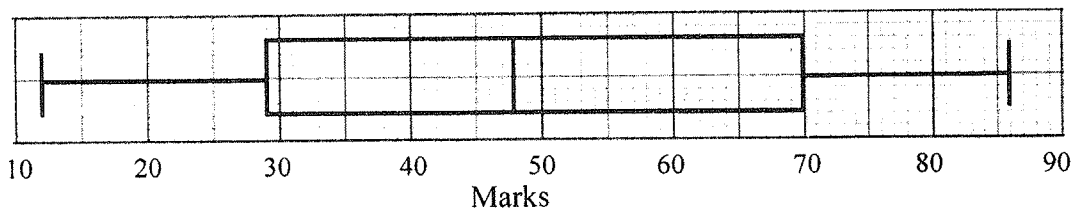
- 19 (a) The cumulative frequency curve shows the marks scored by 300 students in a Physics test. The maximum mark for the test is 100 marks.



- (i) Use the graph to find the
 - (a) median mark,
 - (b) interquartile range.
- (ii) Given that 10% of the students were awarded Grade *A*, use the graph to find the minimum mark required to score Grade *A*.
- (iii) Two students are chosen at random. Find the probability that one scores less than 22 marks and the other scores more than or equal to 84 marks.

Answer (a)(i) [1]
 (ii) [1]
 (ii) [1]
 (iii) [2]

- (b) The same group of 300 students sat for a Chemistry test. The results of the Chemistry test are represented by the box-and-whisker plot as shown.



Comment on the students' performance in the Physics and Chemistry tests.

Answer (b)

.....

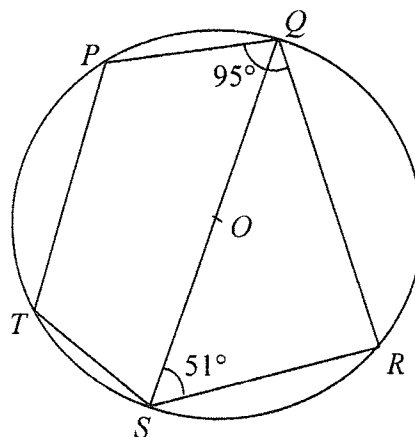
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..... [1]

- 20 In the diagram, the points P, Q, R, S and T lie on a circle with centre O . QOS is a straight line, angle $QSR = 51^\circ$ and angle $PQR = 95^\circ$.

- (a) Show that angle $SQR = 39^\circ$.
- (b) Stating your reasons clearly, calculate
- (i) angle RTS ,
- (ii) angle RSP ,
- (iii) angle POR .



Answer (a)

.....

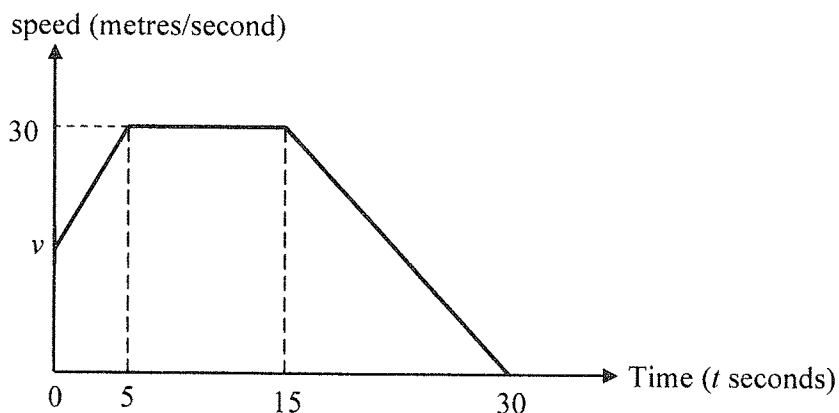
..... [1]

Answer (b)(i) angle $RTS = \dots\dots\dots^\circ$ [1]

(ii) angle $RSP = \dots\dots\dots^\circ$ [1]

(iii) angle $POR = \dots\dots\dots^\circ$ [1]

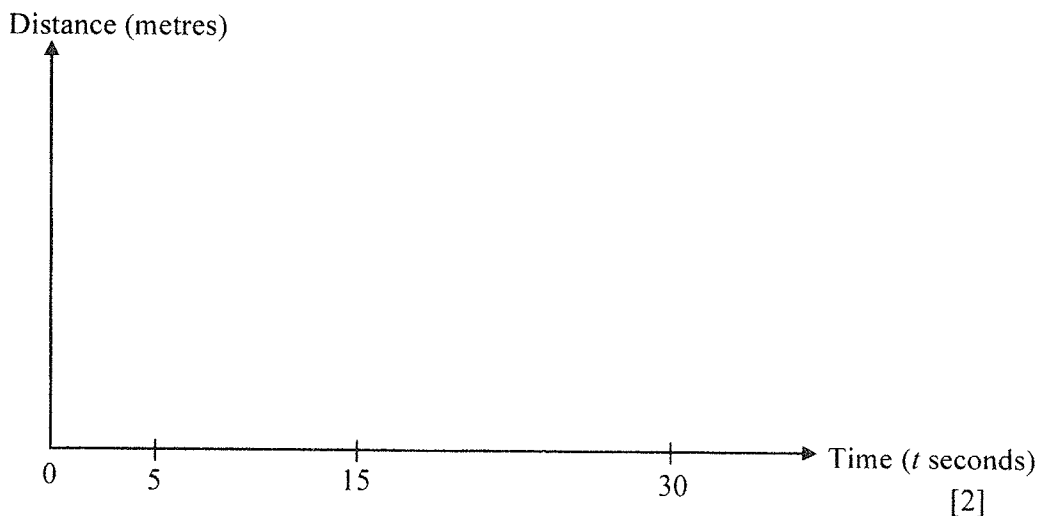
- 21 The diagram shows the speed–time graph of a particle for the first 30 seconds of motion. The particle started moving with an initial speed of v metres per second. The distance travelled in the last 15 seconds is twice the distance travelled in the first 5 seconds.



- (a) Calculate the initial speed, v m/s, of the particle.
- (b) Find the deceleration of the particle during the last 15 seconds.
- (c) Find the speed of the particle when $t = 23$.

Answer (a) $v = \dots\dots\dots$ m/s [2]
 (b) $\dots\dots\dots$ m/s² [1]
 (c) $\dots\dots\dots$ m/s [2]

- (d) On the grid in the answer space, draw the distance–time graph of the particle from $t = 0$ to $t = 30$.



22 **Figure I** shows a regular octagon with sides 6 cm.

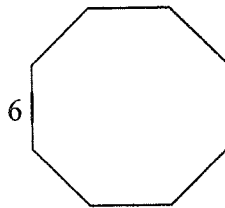


Figure I

- (a) Show that the area of the octagon in **Figure I**, correct to the nearest whole number, is 174 cm^2 .

Answer (a)

.....

.....

..... [2]

Figure II shows a right solid pyramid of height of 20 cm.

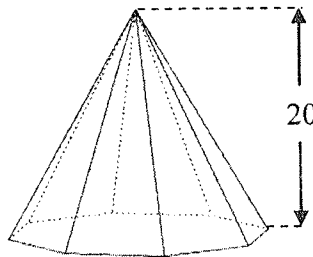


Figure II

The base of the pyramid is a regular octagon of sides 6 cm.

- (b) Find the volume of the pyramid.
- (c) Calculate the cost of painting the pyramid if it requires 3 cents to paint an area of 8 cm^2 .

Answer (b) cm^3 [1]

(c) \$ [3]

23 The line PQ is drawn in the answer space below.

- (a) Construct and label triangle PQR where $PR = 10$ cm and the bearing of R from Q is 346° . [1]
- (b) Construct the perpendicular bisector of PR . [1]
- (c) Construct the bisector of angle QPR . [1]

The point X , inside triangle PQR , is equidistant from P and R and nearer to PQ than to PR .

- (d) Indicate and label a possible position of point X in the answer space below. [1]

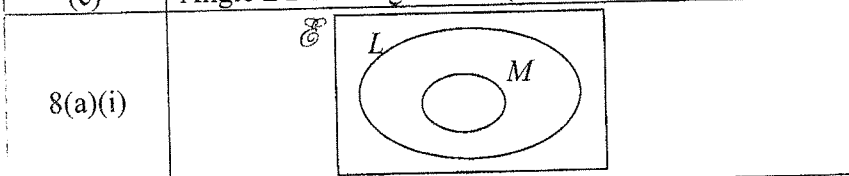


Answer Key for SCGS 4016/1

Qn	
1(a)	$\frac{21}{50}$
(b)	250%
2	0.05410
3(a)	0.64 or $\frac{16}{25}$
(b)	Cost price = $\frac{100}{160} \times 8000$ Profit = \$1400
4(a)	$180 = 2^2 \times 3^2 \times 5$
(b)	18
(c)	10
5(a)	$\frac{8q^{\frac{3}{2}}}{p^6}$
(b)	$3^{5q+10} = 3^0$ $q = -2$
6	$y = z - x$

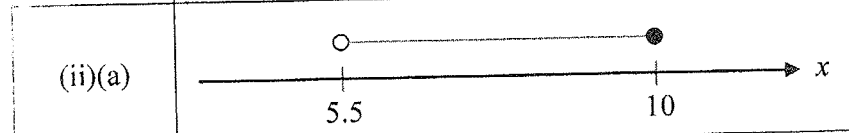
12(a)	0.036 or $\frac{9}{250}$
(b)	1.08×10^{13}
13(a)	25 min
(b)	$5\frac{1}{25}$ or 5.04 km/h
(c)	$8\frac{676}{775}$ or 8.87 km/h
14	$77\frac{7}{9}$ or 77.8 %
15(a)	1 : 125 000
(b)	2250 m
16(a)	$-\frac{8}{17}$
(b)	18.6 units
(c)	2.42 units
(d)	$y = \frac{11}{15}x + \frac{1}{5}$

7 (b)(i)	68°	17(a)(i)	(2563 2041)
(ii)	292°	(ii)	The total amount of money collected
(c)	Angle $DBC =$ angle DCB (base angles of isos triangle) from the sales of butter and sugce cakes respectively		



(ii) Square

(b)(i) $3 < x \leq 5\frac{1}{2}$



(ii)(b) 5, 7

9(a) $\frac{460m}{n}$

(b) $k = 81$

10 29.5 cm

11(a) $y = 6\frac{33}{37}$

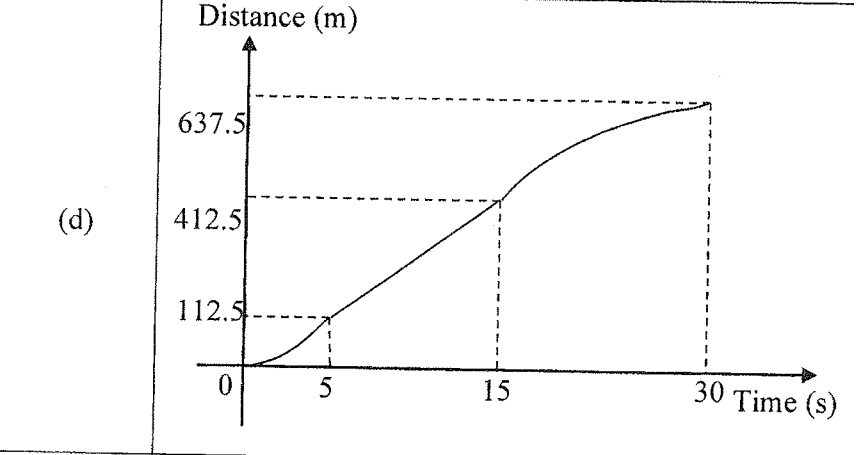
11(b) $\frac{3x+8}{2-x}$

(b)	\$4604
18(a)	$A(0, 4), B\left(\frac{1}{4}, 0\right), C\left(-\frac{1}{4}, 0\right)$
(b)	$y = a^x, a > 1$
(c)	
19(a)(i)(a)	48
(b)	30
(ii)	76

(iii)	$\frac{3}{299}$
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20(a)	Angle $SRQ = 90^\circ$ (angle in semicircle) Angle $SQR = 180^\circ - 90^\circ - 51^\circ$ (angle sum of triangle) $= 39^\circ$
(b)(i)	39° (angles in same segment)
(ii)	85° (opp. angles of cyclic quad)
(iii)	170° (angle at centre = twice angle at circumference, angles at a point)

21(a)	$v = 15 \text{ m/s}$
(b)	2 m/s^2
(c)	Speed $= 14 \text{ m/s}$



22,

(b)	Volume $= 1160 \text{ cm}^3$
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(c)	Total surface area $= 684.3 \text{ cm}^2$	Total cost $= \$257-$
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SINGAPORE CHINESE GIRLS' SCHOOL

Preliminary Examination 2013

MATHEMATICS

4016/02

PAPER 2

Wednesday

31 July 2013

2 hours 30 minutes

Additional materials: Answer Paper
Graph paper (1 sheet)

READ THESE INSTRUCTIONS FIRST

Write your index number, class and name on all the work you hand in.

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** 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 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 100.

The Question Paper consists of 11 printed pages and 1 blank page.

Mathematical Formulae*Compound interest*

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

Mensuration

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

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

- 1 (a) Solve the equation $m(m+3) = m$. [2]
- (b) The angles of a pentagon are y° , $2y^\circ$, $(y+35)^\circ$, $(2y-70)^\circ$ and $(3y-10)^\circ$.
Find the size of the smallest angle. [2]
- (c) Given that $p = \frac{q(r^2+s)}{r^2-s}$, express r in terms of p , q and s . [3]
- (d) Express $\frac{8}{x^2-9} - \frac{1}{(x+3)^2}$ as a single fraction in its simplest form. [3]
-
- 2 (a) In 2000, two Singaporean men, Amos and Ben, started a business with a Malaysian partner, Chandra. Amos invested S\$20 000, Ben invested S\$50 000 and Chandra invested RM 75 000. It was agreed that the profit would be shared in the same ratio as the sum of money they have invested.
- (i) Chandra changed RM 75 000 into Singapore dollars at an exchange rate of S\$1 = RM 1.5. Calculate Chandra's share of investment as a percentage of the total investment. [2]
- (ii) In 2003, Ben's share of profit was S\$14 000 more than Amos' share. Calculate the total profit in 2003. [1]
- (iii) The total profit made in 2003 was 10% more than that in 2002. If the total profit made in 2002 was 15% less than that in 2001, calculate the total profit in 2001. [2]
- (iv) In 2003, Chandra sold his share of the business for S\$45 000. He converted this sum to Malaysian Ringgit at an exchange rate of S\$1 = RM x , making a profit of 35% of his initial investment of RM 75 000. Calculate the value of x . [2]
- (b) On 1 January 2001, Amos placed \$100 000 in a fixed deposit account earning 2.5% interest per annum compounded half-yearly while Ben placed the same amount in a fixed deposit account earning simple interest 3.5% per annum. On 1 January 2004, they withdrew all their money. Calculate the difference in total interest earned by them. [3]
-

- 3 A taxi driver bought some litres of petrol for \$20.
He paid \$ x for each litre of petrol.

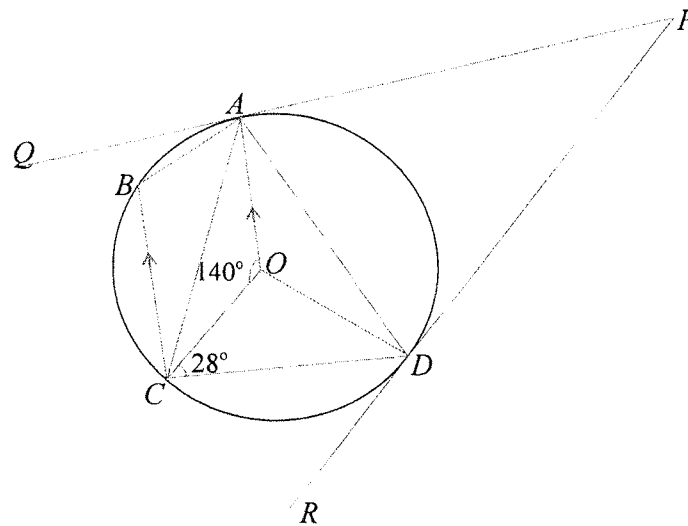
(a) Write down an expression, in terms of x , for the number of litres of petrol he bought. [1]

Three weeks later, the price of petrol decreased by 10 cents for each litre.
With the lower petrol price, the taxi driver was able to buy 0.4 litres more petrol using the same amount of money.

(b) Use the above information to write down an equation in x , and show that it simplifies to $10x^2 - x - 50 = 0$. [3]

(c) Solve the equation $10x^2 - x - 50 = 0$, giving your answers correct to three decimal places. [3]

(d) Find, correct to the nearest whole number, the number of litres of petrol he bought with the lower petrol price. [1]

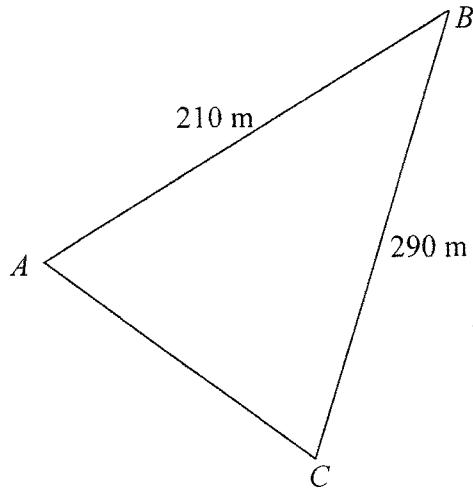


In the diagram, O is the centre of the circle. PQ and PR are tangents to the circle at A and D respectively. Angle $AOC = 140^\circ$, angle $DCO = 28^\circ$ and OA is parallel to CB .

- (a) Show that CA bisects angle BCO , stating your reasons clearly. [2]
- (b) Calculate
- (i) angle BAC , [2]
 - (ii) angle OAD , [1]
 - (iii) angle PDA , [1]
 - (iv) angle APD . [1]
- (c) Given that the radius of the circle is 5 cm, find the area enclosed by the tangents AP and DP and minor arc AD . [3]
-

6

North
↑



In the diagram, A , B and C represents points on a horizontal triangular field where military outposts are stationed. A soldier marches from A on a bearing of 065° to B which is 210 m away. He then marches from B with a bearing of 212° towards C which is 290 m away.

- (a) Calculate
- (i) area of triangle ABC , [1]
 - (ii) AC , [2]
 - (iii) angle BAC . [2]
- (b) BP represents a vertical tower. The angle of depression of C from the top of the tower is 35° . Find
- (i) the height of the tower, [2]
 - (ii) the greatest angle of elevation of the top of the tower from a point on AC . [3]

- 7 A right cone-shaped wooden block has a radius of 24 cm and height of 36 cm. A cylindrical block of height 12 cm was removed from the cone as shown in Figure 1.

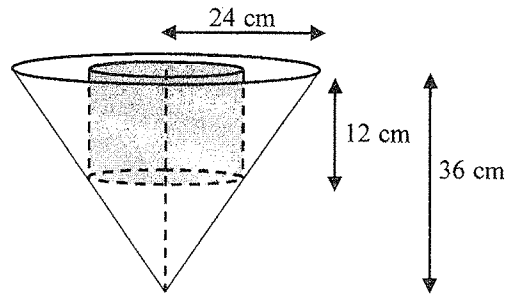


Figure 1

- (a) Show that the radius of the cylindrical block is 16 cm. [1]
- (b) Find the volume of the remaining wooden block, leaving your answer in terms of π . [2]

A geometrically similar right cone-shaped wooden block with a cylindrical hollow was constructed as shown in Figure 2.

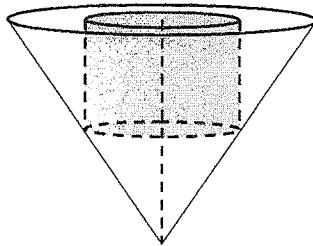


Figure 1

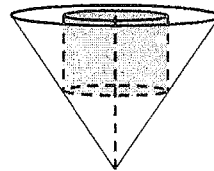


Figure 2

- (c) Given that the volume of the cylindrical hollow shown in Figure 2 was $20\frac{1}{4}\pi \text{ cm}^3$, find the height of the cylindrical hollow in Figure 2. [2]
- (d) Calculate the total surface area of the wooden block shown in Figure 2. [4]

8 (a) It is given that $\vec{AB} = \begin{pmatrix} -8 \\ 6 \end{pmatrix}$.

(i) Find the coordinates of the point A if B is the point $(-1, 9)$. [1]

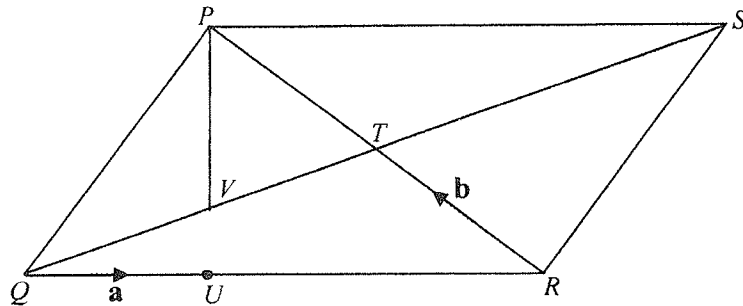
(ii) \vec{AB} is parallel to \vec{CD} and $\vec{CD} = \begin{pmatrix} 6 \\ a \end{pmatrix}$.

(a) Find the value of a . [2]

(b) Hence, find the value of $|\vec{CD}|$. [1]

(b) In the diagram, $PQRS$ is a parallelogram. The diagonals PR and QS intersect at T . U is a point on QR such that $QR = 3QU$. V is the midpoint of QT .

$\vec{QU} = \mathbf{a}$ and $\vec{RT} = \mathbf{b}$.



(i) Express as simply as possible in terms of \mathbf{a} and/or \mathbf{b}

(a) \vec{QP} , [1]

(b) \vec{QV} , [1]

(c) \vec{PV} . [1]

(ii) Show that PV produced passes through U . [2]

(iii) Find the numerical value of $\frac{\text{area of triangle } QUV}{\text{area of quadrilateral } PQRS}$. [1]

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

The variables x and y are connected by the equation $y = \frac{x^2}{3} + \frac{2}{x} - 1$.

The table below shows some values of x and the corresponding values of y .

x	0.5	0.6	0.8	1.0	1.5	2.0	2.5	3.0
y	3.08	2.45	k	1.33	1.08	1.33	1.88	2.67

- (a) Find the value of k . [1]
- (b) Using a scale of 4 cm to represent 1 unit on each axis, draw the graph of $y = \frac{x^2}{3} + \frac{2}{x} - 1$ for $0.5 \leq x \leq 3$. [3]
- (c) Use your graph to find the range of values of p for which the equation $\frac{x^2}{3} + \frac{2}{x} - 1 = p$ has exactly two solutions for $0.5 \leq x \leq 3$. [1]
- (d) Use your graph to find the values of x in the range $0.5 \leq x \leq 3$ for which $2x^2 + \frac{12}{x} - 15 = 0$. [2]
- (e) (i) On the same axes, draw the line $y = 3 - x$ for $0.5 \leq x \leq 3$. [1]
- (ii) The x -coordinate of the intersection of this line with the curve is a solution of the equation $x^3 + Ax^2 + Bx + 6 = 0$.
Find the value of A and of B . [2]
- (f) By drawing a tangent, find the x -coordinate of the point P at which the gradient of the curve $y = \frac{x^2}{3} + \frac{2}{x} - 1$ at P is $-\frac{1}{2}$. [2]
-

- 10 (a) The lifetimes of 25 Type *A* and Type *B* projector bulbs were measured. The results are shown below.

Type *A*

Lifetime (x hours)	Number of bulbs
$0 < x \leq 100$	1
$100 < x \leq 200$	5
$200 < x \leq 300$	8
$300 < x \leq 400$	7
$400 < x \leq 500$	4

Type *B*

<p>Mean lifetime = 282 hours</p> <p>Standard Deviation = 210 hours</p>
--

- (i) For Type *A* projector bulbs, calculate
- (a) the mean lifetime, [1]
- (b) the standard deviation. [2]
- (ii) Compare and comment on the lifetimes of Type *A* and Type *B* projector bulbs. [1]
- (iii) Two Type *A* projector bulbs were chosen at random.
Find the probability that both projector bulbs have lifetimes more than 300 hours. [2]
- (b) A pack of 12 cards are numbered from 5 to 16. One card is drawn at random.
- (i) Write down the probability that the number on the card drawn is **not** a prime number. [1]
- The card is replaced and two cards are drawn at random one after another.
Find, in its simplest form, the probability that
- (ii) sum of the numbers on both cards is greater than 29, [2]
- (iii) product of the numbers on both cards is odd. [2]

End of Paper

SCGS Prelim 2013 (4016/2)

Question	Answer	Question	Answer
1(a)	$m = 0$ or $m = -2$	6(a)(i)	16600 m^2
(b)	Smallest angle = 60°	(ii)	161 m
(c)	$r = \pm \sqrt{\frac{(p+q)s}{p-q}}$	(iii)	78.1°
(d)	$\frac{7x+27}{(x+3)^2(x-3)}$	(b)(i)	203 m
		(ii)	44.7°
2(a)	$41\frac{2}{3}\%$	7(a)	$r = 16 \text{ cm}$ (shown)
(b)	S\$56 000	(b)	$3840\pi \text{ cm}^3$
(c)	S\$59 893.05	(c)	$H = 2.25 \text{ cm}$
(d)	$x = 2.25$	(d)	221 cm^2
(e)	\$2761.68		
3(a)	$\frac{20}{x}$ litres	8(a)(i)	(7, 3)
(b)	$10x^2 - x - 50 = 0$ (shown)	(ii)	$k = -\frac{4}{3}, a = -4.5$
(c)	$x = 2.287$ or $x = -2.187$	(a)	
(d)	9	(b)	7.5 units
		(b)(i)	
		(a)	$3\mathbf{a} + 2\mathbf{b}$
		(b)	$\frac{1}{2}(3\mathbf{a} + \mathbf{b})$
		(c)	$-\frac{3}{2}(\mathbf{a} + \mathbf{b})$
		(ii)	PV produced passes through U (shown)

		(iii)	$\frac{1}{24}$
4(a)	$L_5 = 25$ $F_6 = 26$ $T_7 = 13$	9(a)	$k = 1.71$
(b)	Not a perfect square	(b)	curve drawn
(c)	$T_R = 2R - 1$	(c)	$1.08 < p \leq 2.67$ $\pm 0.1 \quad \pm 0.1$
(d)	$L_{R-1} = (R - 1)^2$	(d)	$x = 0.88 (\pm 0.5)$ or $2.2 (\pm 0.5)$
(e)	$F_R = L_{R-1} + 1$	(e)(i)	line drawn
(f)	73	(ii)	$A = 3$ and $B = -12$
(g)	499	(f)	tangent drawn $x = 1.25 (\pm 0.1)$
5(a)	$\angle OCA = \angle ACB$	10(a)	
(b)(i)	50°	(i)(a)	Mean = 282 hours
(ii)	42°	(b)	Standard Deviation ≈ 109 hours
(iii)	48°	(ii)	Type A and B projector bulbs have the same mean lifetimes. However, Type A projector bulbs has a smaller standard deviation, indicating that their lifetime is more consistent than that of Type B.
(iv)	84°		OR There is a wider spread of lifetime for Type B than that of Type A.
(c)	6.82 cm^2	(iii)	$\frac{11}{60}$
		(b)(i)	$\frac{2}{3}$
		(ii)	$\frac{1}{33}$
		(iii)	$\frac{5}{22}$