Name:_____ ( )	Class:_____

SERVE·LEAD·EXCEL

80

GREENDALE SECONDARY SCHOOL
Mid-Year Examination 2014

MATHEMATICS 4042/01

Paper 1 14 May 2014

Secondary Three Normal Academic 2 hours

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your index number and name on all the work you hand in.
Write in dark or blue pen.
You may use a soft 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 may 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 required the answer in terms of π.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 80.

Question	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13
Strand	N	N	N	N	S	S	G	M	N	N	M	A	N
Marks													

Question	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22			
Strand	M	N	N	A	A	A	M	G	G			
Marks												

This document consists of 17 printed pages; including this cover page.

For Examine Use Only

Mathematical Formulae

Compound interest

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

Mensuration

Curve surface area of a cone $= \pi rl$

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

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

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

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

Arc length $= r\theta$, where θ 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

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

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

For Examiner's Use Only

Answer all the questions.

1. (a) Express 30% as a fraction in its lowest terms.

(b) Express $\frac{1}{25}$ as a decimal.

Answer (a) _____ [1]

(b) _____ [1]

2. Evaluate, using a calculator

(a) $\frac{7-\sqrt{35}}{4}$,

(b) $\frac{573.2\times 21.3^2}{967-231}$.

Give your answers correct to 3 significant figures.

Answer (a) _____ [1]

(b) _____ [1]

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3. By writing each number correct to 1 significant figure, **estimate** the value of

$$\frac{48.4 \times 0.36}{11.3}.$$

You need to show your working.

Answer _____ [2]

4. The ratio of boys and girls in a class of students is 3 : 5 .
The total number of children in the class is 48.
(a) How many boys are there?
(b) When some boys join the class, the ratio of boys & girls became 4 : 5 .
How many boys joined the class?

Answer (a) _____ boys [1]

(b) _____ boys [2]

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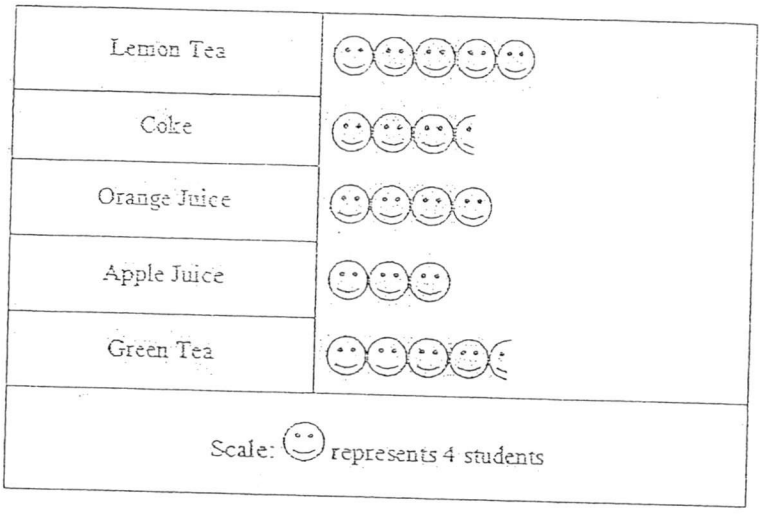
5. The pictogram shows the results of a survey carried out on a group of students on their favourite drink from the school canteen.



(a) How many students took part in the survey?

(b) How many more students like green tea than apple juice?

Answer (a) _____ students [1]

(b) _____ students [1]

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6. The stem-and-leaf diagram shows the amount of money that people spent on lunch from a survey.

Stem	Leaf						
3	2	5	6	6			
4	3	3					
5	1	4	8	9			
6	0	0	2	2	4	4	8
7	0	1					
8	1						

Key: 3 | 2 means \$3.20

Find

(a) the greatest amount of money spent on lunch,

(b) the number of people surveyed,

(c) the percentage of people who spent less than \$4 on lunch.

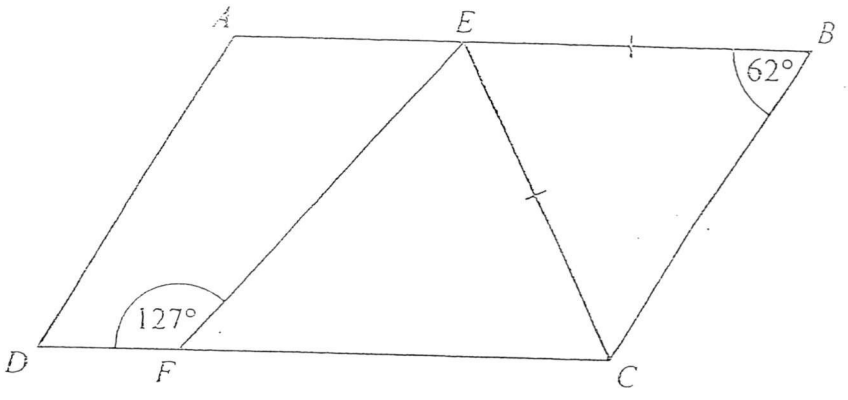
Answer (a) \$_____ [1]

(b) _____people [1]

(c) _____ %[2]

For Examiner's Use Only

7. The diagram shows a parallelogram $ABCD$.



$EB = EC$, $\angle EBC = 62^0$, $\angle DFE = 127^0$.

Find

(a) $\angle AEF$,

(b) $\angle FEC$,

(c) reflex $\angle BCF$.

State the reasons for your answers.

Answer (a) _____ ^{0} [1]

(b) _____ ^{0} [2]

(c) _____ ^{0} [3]

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8. A boy runs 4 km in 20 minutes.
He then walks a further 10 km at an average speed of 6 km/h.

Calculate

(a) his average running speed, giving your answer in kilometres per hour,

(b) the number of minutes he was walking,

(c) his average speed for the whole journey

Answer (a) _____ km/h [1]

(b) _____ minutes [1]

(c) _____ km/h [2]

9. In 2013 there were 36 600 000 cars in Japan.

(a) Write 36 600 000 in standard form.

(b) It is estimated that on average each car travelled 21 000 km in 2013.
Calculate the total distance travelled by cars in Japan in 2013.
Write your answer in standard form.

Answer (a) _____ cars [1]

(b) _____ km [2]

For Examiner's Use Only

10. John bought a sofa set under a hire purchase scheme with a monthly payment of $135 for 12 months with no down payment.

If the cash price of the sofa set is $950, find how much more John has to pay for the sofa under the hire purchase scheme?

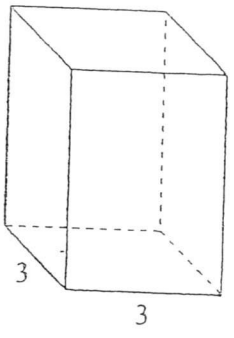
Answer $ _____ [2]

11. A cuboid with a square base has a volume of 45 cm^3.

The length of the side of square is 3 cm. Find

(a) the height of the cuboid,

(b) the total surface area of the cuboid.



Answer (a) _____ cm [1]

(b) _____ cm^2 [2]

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12. (a) Given that $25^m = 5$, write down the value of m.

(b) Express $\sqrt[2]{n^6}$ in index notation.

(c) Evaluate 3^{-2}.

Answer (a) _____ [1]

(b) _____ [1]

(c) _____ [1]

13. (a) Dave bought some stamps for collection. He bought them for \$48 and sold them some years later for \$90.
Find the profit as a percentage of the original price.

(b) John also bought a camera for \$280.
When he sold the camera, he made a loss of 40%.
How much did he sell it for?

Answer (a) _____ % [2]

(b) \$_____ [2]

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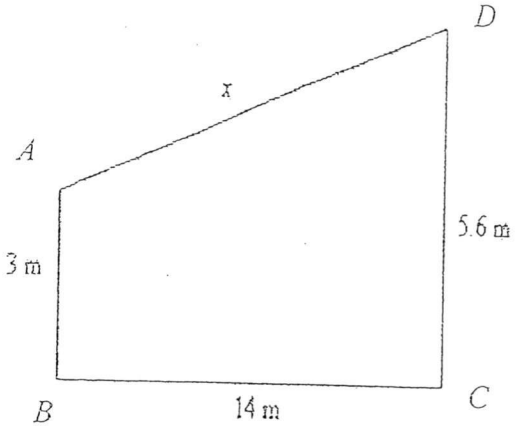
14. Two vertical posts AB and CD are 14 m apart.
Given that $AB = 3$ m, and $DC = 5.6$ m, calculate

(a) the value of x,
(b) the perimeter of the figure $ABCD$,



Answer (a) _____ [2]

(b) _____ m [1]

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15. Jane travelled from Singapore to India.

She exchanged S$700 into rupees when the exchange rate was S$1 = 44 rupees.

(a) Find the amount, in rupees, that Jane received.

(b) While in India, she spent 18 200 rupees. On her return, she exchanged the remaining rupees into dollars when the exchange rate was S$1 = 45 rupees. How many dollars did she receive?

Answer (a) _____ rupees [1]

(b) S$ _____ [2]

16. (a) Peter invested $300 in a bank for 2 years at 5% per year simple interest. Find the total amount that Peter will have in his account at the end of the second year.

(b) A bank pays 6% compound interest per year. Joyce invested $500. How much interest will Joyce earn at the end of the third year?

Answer (a) $ _____ [2]

(b) $ _____ [2]

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17. y is directly proportional to x^2.

Given that $y = 27$ when $x = 9$, find

(a) an expression for y in terms of x,

(b) the value of x when $y = \frac{1}{12}$.

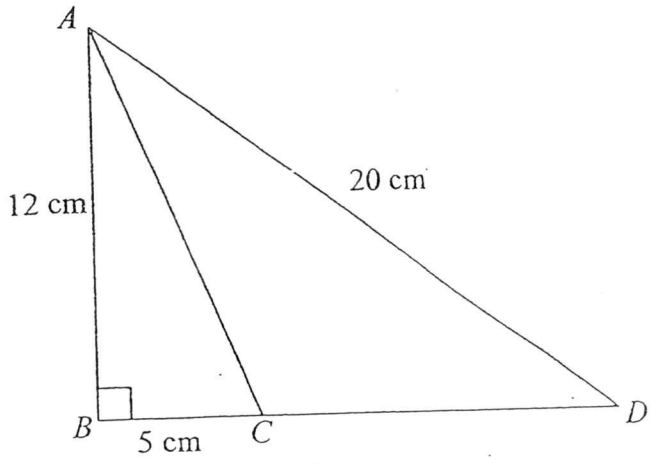
Answer (a) _____ [2]

(b) _____ [1]

For Examiner's Use Only

18. In the diagram shown, BCD is a straight line.

$\angle ABC = 90°$, $AB = 12$ cm, $BC = 5$cm and $AD = 20$ cm.



Find

(a) CD

(b) $\tan \angle ACB$,

(c) $\sin \angle BAD$.

(d) $\angle BAD$.

Answer (a) _____ cm [3]

(b) _____ [1]

(c) _____ [1]

(d) _____ ^{0} [1]

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19. Solve the following equations.

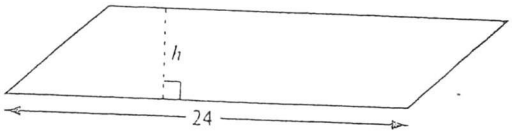
(a) $x(x-2)=0$,

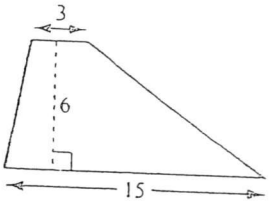
(b) $2x^2+x-3=0$.

Answer (a) _____ [2]

(b) _____ [3]

20.





Given that the area of the parallelogram is 3 times the area of the trapezium, calculate the height of the parallelogram.

Answer _____ cm [3]

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21. P and Q are 2 points whose coordinates are $(0, 1)$ and $(6, 4)$ respectively.

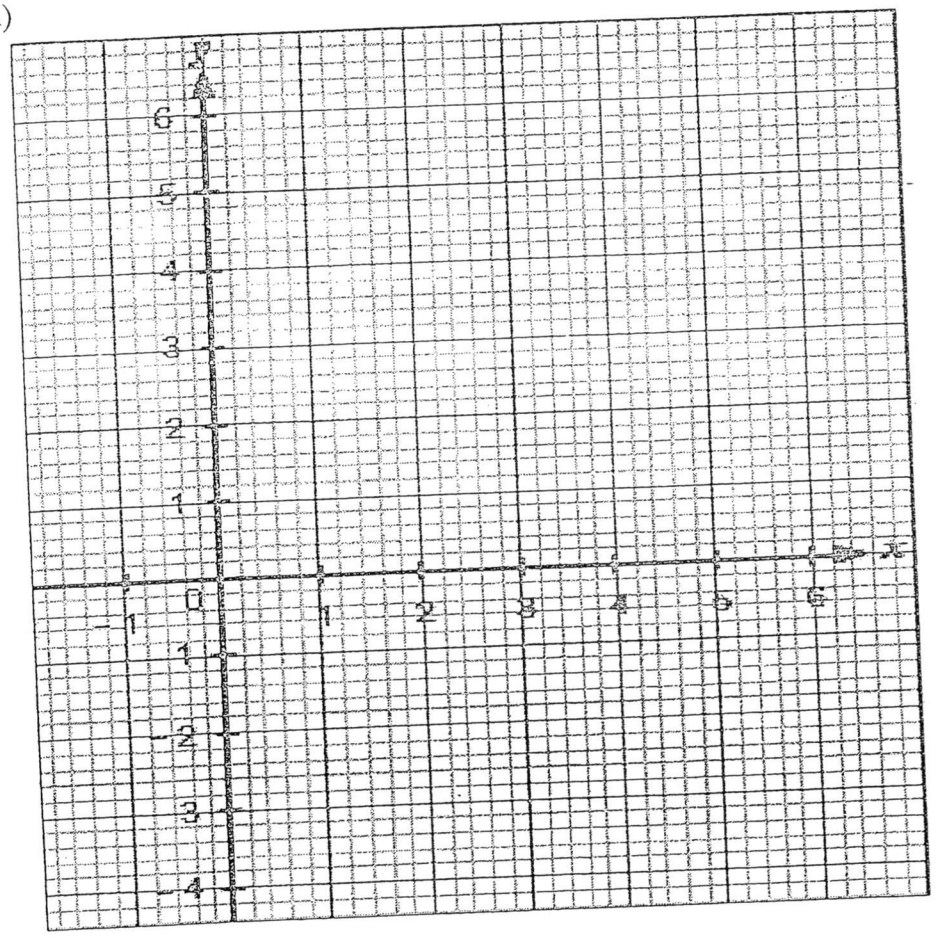
(a) Mark and label these 2 points clearly on the grid provided below and draw a line joining P and Q.

(b) Calculate the gradient of line PQ.

(c) Hence, or otherwise, write down the equation of the line PQ.

(d) Draw a line $y = 3$ on the same diagram and write down the coordinates of intersection between $y = 3$ and line PQ.

(a) [3]



Answer (b) _____ [2]

(c) _____ [1]

(d) _____ [2]

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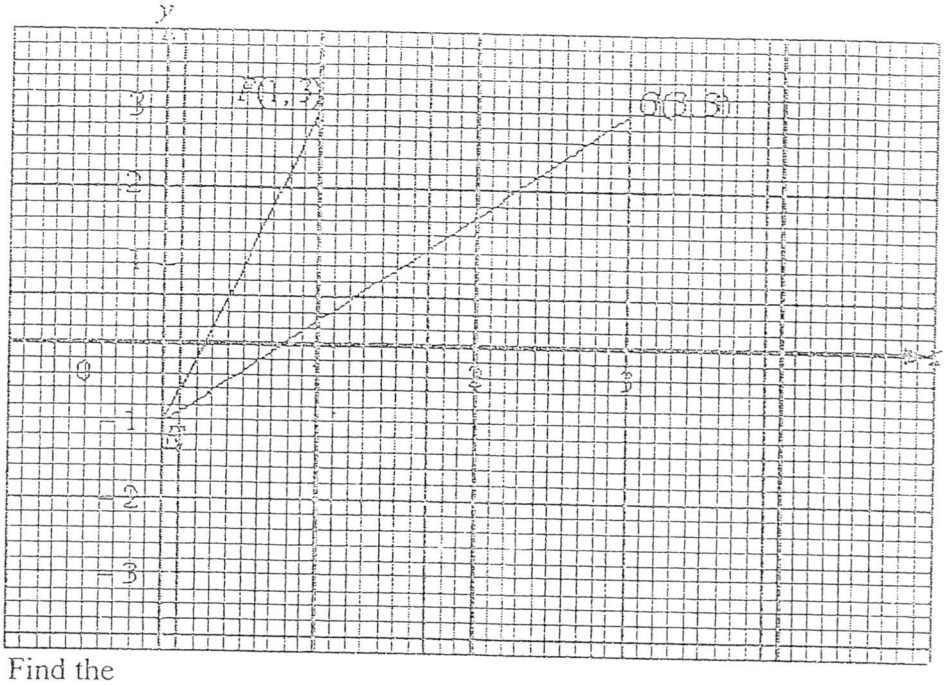
22. The graph below shows triangle EFG.



Find the

(a) length of EG,

(b) area of ΔEFG.

(c) Given that $EFGH$ is a parallelogram, state the co-ordinates of H.

Answer (a) _____ units[2]

(b) _____ units^2 [2]

(c) (,) [1]

End – of - Paper

Name:_____ ( )	Class:_____

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GREENDALE SECONDARY SCHOOL
Mid-Year Examination 2014

MATHEMATICS **4042/02**

Paper 2 8 May 2014

Secondary Three Normal Academic **2 hours**

Candidates answer on the Writing Paper.

READ THESE INSTRUCTIONS FIRST

Write your index number and name on all the work you hand in.
Write in dark or blue pen.
You may use a soft pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A
Answer all questions.

Section B
Answer two questions.

If working is needed for any question it must be shown with the answer.
Omission of essential working may 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 required 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 60.

This document consists of 6 printed pages, including this cover page.

Mathematical Formulae

Compound interest

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

Mensuration

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

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

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

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

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

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

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

Trigonometry

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

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

Statistics

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f}$$

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

Section A
Answer all the questions.

1. Factorise completely

   (a) $3x^2y - 6xy^2$, [2]

   (b) $4x^2 - 9y^2$. [2]

2. Solve

   (a) $\frac{x+2}{3} = 2$, [2]

   (b) $\frac{x+1}{3} + \frac{x+3}{2} = 1$. [4]

3. (a) Express $\frac{x+2}{3} - \frac{2x+1}{4}$ as a single fraction. [3]

   (b) Solve the simultaneous equations. [3]

   $x + 3y = 4$,

   $x = 3 - y$.

4. (a) Find the lowest common multiple of 40 and 56. [2]

   (b) Shop A sells balloons in packets of 40.
   Shop B sells balloons in packets of 56.
   Peter would like to buy the same number of balloons from Shop A and Shop B. What is the smallest number of packets of balloons that he could buy from Shop A and Shop B. [2]

5. Given that A is the point $(2, 9)$ and B is the point $(4, 4)$, calculate the

   (a) gradient of AB, [2]

   (b) equation of AB, [2]

   (c) length of AB. [2]

6. A bank charges 4% per year simple interest for a loan of \$120 000. If the loan is for 3 years, find

(a) the interest payable, [2]

(b) the total amount to be repaid, [1]

(c) the amount of each monthly payment if the total amount loaned is to be repaid in 36 equal instalments. [1]

7. (a) Given that $a^k = a^3 \div \sqrt{a}$, write down the value of k. [1]

(b) Simplify [1]

(i) $x^2 \times x^5$, [1]

(ii) x^0, [1]

(iii) $\frac{x^5}{x^7}$, [2]

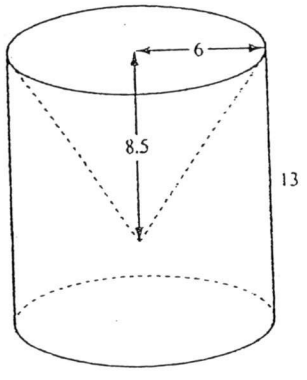
(iv) $2b^2 \times (4b)^2$.

8. (a) Express $x^2 + 6x - 12$ in the form $(x+a)^2 + b$, find the value of a and b. [2]

(b) Hence, or otherwise, solve $x^2 + 6x - 12 = 0$. [2]

Give your answer correct to 2 decimal places.

9. The diagram shows a container used to contain water.



Calculate [1]

(a) volume of cylinder. [1]

(b) volume of cone.

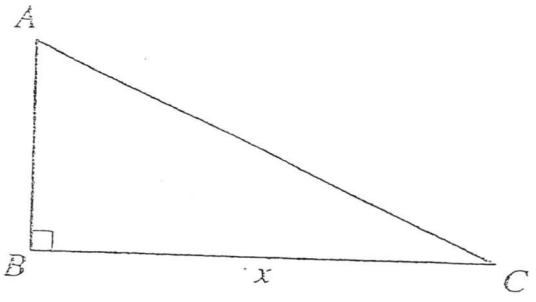
(c) Given that the container is formed by removing a cone from the cylinder, [2]

find the remaining volume.

Section B

Answer any two questions. Each question carries 8 marks.

10. The diagram shows a right-angled triangle ABC with $\angle ABC = 90^0$.



The length of the BC is x centimetres.

(a) Given that AB is 7 cm shorter than BC, write down the length of AB in terms of x. [1]

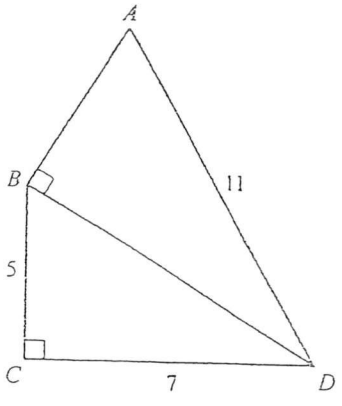
(b) Given that AC is 1 cm longer than BC, write down the length of AC in terms of x. [1]

(c) Using (a) and (b), write down an equation in x & show that it simplifies to $x^2 - 16x + 48 = 0$. [3]

(d) Solve the equation $x^2 - 16x + 48 = 0$. [2]

(e) Hence, find the length of AC. [1]

11.



In the figure, $BC = 5$ cm, $CD = 7$ cm and $AD = 11$ cm. $\angle ABD = \angle BCD = 90^0$.
Calculate

(a) BD, [1]
(b) AB, [1]
(c) $\angle BAD$, [2]
(d) the area of $\triangle ABD$, [1]
(e) the perpendicular distance from C to BD. [3]

12. **Answer the whole of this question on a single sheet of graph paper.**

x	-3	0	3	5
y	6	3	0	-2

(a) Using a scale of 1 cm to 1 unit, draw a horizontal x-axis for $-3 \le x \le 5$.

Using a scale of 1 cm to 1 unit, draw a vertical y-axis for $-2 \le y \le 6$.

Plot the graph for the table of values for $-3 \le x \le 5$. [3]

(b) Find the gradient of the line. [1]

(c) Show that the equation of the line is $y = -x + 3$. [1]

(d) On your diagram, draw the graph of $y = x + 5$. [2]

(e) Use your diagram to solve the simultaneous equations [1]

$$y = -x + 3 \quad ,$$
$$y = x + 5 \quad .$$

End – of - Paper

Secondary 3 Normal Academic MYE 2014 (Paper 1)

Marking Scheme

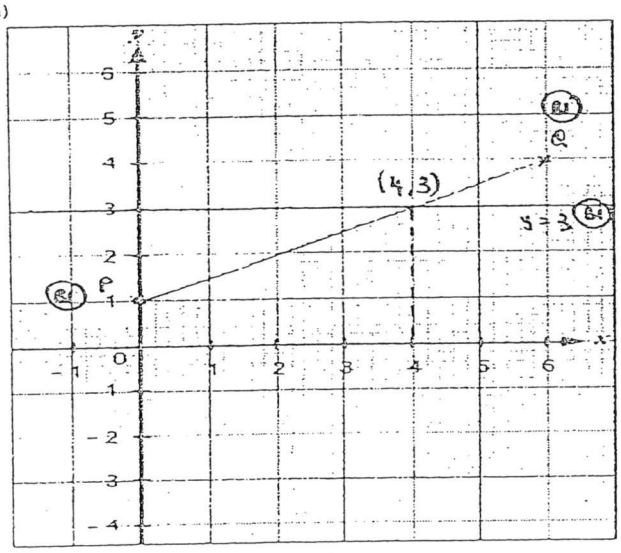
1(a)	$30\% = \frac{3}{10}$	B1
1(b)	$\frac{1}{25} = 0.04$	B1
2(a)	$\frac{7-\sqrt{35}}{4} \approx 0.271 (3sf)$	B1
2(b)	$\frac{573.2 \times 21.3^2}{967-231} \approx 353 (3sf)$	B1
3	$\frac{48.4 \times 0.36}{11.3}$ $\approx \frac{50 \times 0.4}{10}$ $= 2$	M1 A1
4(a)	$Boys : Girls$ 3 : 5 $No\ of\ boys = \frac{3}{8} \times 48 = 18\ boys$	B1
4(b)	$Boys : Girls$ 4 : 5 $3\ units \rightarrow 18\ boys$ $1\ unit \rightarrow 6\ boys$	M1 A1
5(a)	$No\ of\ students = 20 \times 4$ $\therefore \quad = 80\ students$	B1
5(b)	$No\ of\ students = 6\ students$	B1
6(a)	$Greatest\ amt = \$8.10$	B1
6(b)	$No\ of\ people surveyed = 20$	B1
6(c)	$\%\ of\ people\ spent\ less\ than\ \$4 = \frac{4}{20} \times 100\%$ $= 20\%$	M1 A1
7(a)	$\angle AEF = 180^0 - 127^0$ $53^0 (\text{int} \angle s)$	A1

7(b)	$\angle BEC = 180^0 - 62^0 - 62^0$ $= 56^0 (\angle s \text{ sum of } \Delta)$ $\angle FEC = 180^0 - 56^0 - 53^0$ $= 71^0 (\angle s \text{ on str line})$	M1 A1
7(c)	$\angle ECF = 56^0 (alt.\angle)$ $\angle BCE = 62^0 (base \angle s \text{ of } isos\Delta)$ $reflex\angle BCF = 360^0 - 56^0 - 62^0$ $= 242^0 (\angle s \text{ on str. line})$ **Alternative** $\angle BCF = 180^0 - 62^0$ $= 118^0 (\text{int } \angle s)$ $reflex\angle BCF = 360^0 - 118^0$ $= 242^0 (\angle s \text{ at a pt})$	M1 M1 A1
8(a)	$Avg \text{ running speed} = 4 \div \frac{1}{3}$ $= 12 \, km/h$	A1
8(b)	$Time = \frac{10}{6} = 1\frac{2}{3} hr$ $= 100 \text{ mins}$	A1
8(c)	$Avg \text{ speed} = \frac{10+4}{\left(\frac{1}{3}+1\frac{2}{3}\right)} = \frac{14}{2}$ $= 7 \, km/h$	M1 A1
9(a)	$36600000 = 3.66 \times 10^7$	B1
9(b)	$1 \, car \rightarrow 21000 \, km = 2.1 \times 10^4$ $total \text{ distance} = 3.66 \times 10^7 \times 2.1 \times 10^4$ $= 7.686 \times 10^{11} \, km$	 M1 A1
10	$Total \text{ instalment} = \$135 \times 12 = \$1620$ $Amt \text{ more} = \$1620 - \$950 = \$670$	M1 A1
11(a)	$Vol = 45$ $3 \times 3 \times h = 45$ $h = 5 \, cm$	 A1

11(b)	$\text{total SA of cuboid} = 2(3\times3)+4(3\times5)$ $=18+60$ $=78\ cm^2$	M1 A1
12(a)	$25^m = 5$ $5^{2m} = 5^1$ $2m = 1$ $m = \frac{1}{2}$	 A1
12(b)	$\sqrt[2]{n^6} = n^3$	A1
12(c)	$3^{-2} = \frac{1}{9}$	A1
13(a)	$\text{Increase in value} = \$90 - \$48 = \$42$ $\%\ increase = \frac{42}{48}\times100\%$ $=87\frac{1}{2}\%$ *Alternative* $\frac{90}{48}\times100\% = 187.5\%$ $profit(\%) = 187.5\% - 100\% = 87.5\%$	M1 A1
13(b)	$\text{Selling price} = 60\%\times\$280$ $=\$168$ *Alternative* $\text{Amt of loss} = 40\%\times\$280 = \$112$ $\text{selling price}(\$) = \$280 - \$112 = \$168$	M1 A1
14(a)	$x^2 = 14^2 + 2.6^2$ $x^2 = 202.76$ $x \approx 14.2\ m\ (3sf)$	M1 A1
14(b)	$\text{Perimeter of } ABCD = 3+14+5.6+14.23938201$ $\approx 36.8\ m$	 B1
15(a)	$\$1 = 44 rupees$ $\$700 = 44\times700$ $=30800\ rupees$	 A1

15(b)	$\text{Remaining rupees} = 30800 - 18200$ $= 12600 \text{ rupees}$ $\$1 = 45 \text{ rupees}$ $\$x = 12600 \text{ rupees}$ $x = \$280$	M1 A1
16(a)	$I = \frac{PRT}{100} = \frac{(300)(5)(2)}{100} = \$30$ $\text{total amt} = \$300 + \$30$ $= \$330$	M1 A1
16(b)	$A = P\left(1 + \frac{R}{100}\right)^n$ $= 500\left(1 + \frac{6}{100}\right)^3$ $= \$595.508$ $\text{Interest} = \$595.508 - \$500$ $= \$95.51$	 M1 A1
17(a)	$y = kx^2$ $27 = k(9)^2$ $k = \frac{1}{3}$ $y = \frac{1}{3}x^2$	 M1 A1
17(b)	$\text{when } y = \frac{1}{4}$ $\frac{1}{12} = \frac{1}{3}x^2$ $\frac{1}{4} = x^2$ $x = \frac{1}{2}$	 A1
18(a)	$20^2 = 12^2 + BD^2$ $BD^2 = 256$ $BD = 16$ $CD = 16 - 5 = 11 \text{ cm}$	M1 M1 A1
18(b)	$\tan ACB = \frac{12}{5}$	B1
18(c)	$\sin BAD = \frac{16}{20} = \frac{4}{5}$	B1

18(d)	$\angle BAD = \sin^{-1}\left(\frac{4}{5}\right)$ $\approx 53.1^0\ (1dp)$ *Alternative* $\cos\angle BAD = \frac{12}{20} \approx 53.1^0 (1dp)$ $\tan\angle BAD = \frac{16}{12} \approx 53.1^0 (1dp)$	B1
19(a)	$x(x-2)=0$ $x=0 \quad x=2$	B1 / B1
19(b)	$2x^2+x-3=0$ $(x-1)(2x+3)=0$ $x-1=0 \quad 2x+3=0$ $x=1, \quad x=-\frac{3}{2}$ *Alternative* $a=2, b=1, c=-3$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\frac{-1\pm\sqrt{1^2-4(2)(-3)}}{2(2)}$ $x=1, x=-1.5$	M1 A1 / A1
20	*Area of //– gram = 3 (Area of trapezium)* $24\times h = 3\left[\frac{1}{2}(6)(15+3)\right]$ $24h=3(54)$ $h=6\frac{3}{4}$	M1 M1 A1

21(a)	(a)  [3]	B1 (for correct P) B1 (for correct Q) B1 (for line joining P & Q) B1 (for correct $y = 3$ drawn)
21(b)	$gradient = \dfrac{y_2 - y_1}{x_2 - x_1}$ $= \dfrac{4-1}{6-0}$ $= \dfrac{1}{2}$	M1 A1
21(c)	$y = \dfrac{1}{2}x + 1$	B1
21(d)	Line of $y = 3$ on graph above $Intersection = (4, 3)$	A1
22(a)	$E(0, -1)$ $length\ of\ EG = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(3-0)^2 + (3+1)^2}$ $= \sqrt{25}$ $= 5\ units$ ***Alternative*** $length\ of\ EG = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(0-3)^2 + (-1-3)^2}$ $= \sqrt{25}$ $= 5\ units$	M1 A1
22(b)	$Area\ of\ \Delta EFG = \dfrac{1}{2}(2)(4)$ $= 4\ units^2$	M1 A1
22(c)	$H(2, -1)$	B1

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Marking Scheme (Paper 2)

1(a)	$3x^2y - 6xy^2$ $= 3xy(x - 2y)$	B1 / B1
1(b)	$4x^2 - 9y^2$ $= (2x)^2 - (3y)^2$ $= (2x + 3y)(2x - 3y)$	M1 A1
2(a)	$\frac{x+2}{3} = 2$ $x + 2 = 6$ $x = 4$	M1 A1
2(b)	$\frac{x+1}{3} + \frac{x+3}{2} = 1$ $\frac{2(x+1) + 3(x+3)}{6} = 1$ $2x + 2 + 3x + 9 = 6$ $5x + 11 = 6$ $5x = -5$ $x = -1$	M1 M1 M1 A1
3(a)	$\frac{x+2}{3} - \frac{2x+1}{4}$ $= \frac{4(x+2) - 3(2x+1)}{12}$ $= \frac{4x + 8 - 6x - 3}{12}$ $= \frac{5 - 2x}{12}$	M1 M1 A1
3(b)	$x + 3y = 4 \quad eq(1)$ $x = 3 - y \quad eq(2)$ $Sub\ (2)\ into\ (1)$ $3 - y + 3y = 4$ $2y = 1$ $y = \frac{1}{2}$ $x = 2\frac{1}{2}$	A1 A1

4(a)	$LCM = 2^3 \times 5 \times 7$ $= 280$	M1 A1
4(bi)	$No\ of\ packets(Shop\ A) = \frac{280}{40} = 7$ $No\ of\ packets(Shop\ B) = \frac{280}{56} = 5$	A1 A1
5(a)	$gradient = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{4-9}{4-2}$ $= -\frac{5}{2}$ $= -2\frac{1}{2}$	 M1 A1
5(b)	$y = -\frac{5}{2}x + c$ $At\ pt\ (4, 4)$ $4 = -\frac{5}{2}(4) + c$ $4 = -10 + c$ $c = 14$ $y = -\frac{5}{2}x + 14$	M1 A1
5(c)	$length\ AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(4-2)^2 + (4-9)^2}$ $= \sqrt{29}$ $\approx 5.39 units$	 M1 A1
6(a)	$I = \frac{PRT}{100}$ $= \frac{120000 \times 4 \times 3}{100}$ $= \$14400$	 M1 A1
6(b)	$Total\ amount\ to\ be\ repaid = \$120000 + \$14400$ $= \$134400$	B1
6(c)	$Amt\ of\ monthly\ instalment = \frac{\$134400}{36} = \$3733.33(2dp)$	B1

7(a)	$a^k = a^3 \div \sqrt{a}$ $a^k = a^3 \div a^{\frac{1}{2}}$ $a^k = a^{2\frac{1}{2}}$ $k = 2\frac{1}{2}$	A1
7(bi)	$x^2 \times x^5 = x^7$	B1
7(bii)	$x^0 = 1$	B1
7(biii)	$\frac{x^5}{x^7} = x^{-2}$ $= \frac{1}{x^2}$	B1
7(biv)	$2b^2 \times (4b)^2$ $= 2b^2 \times 16b^2$ $= 32b^4$	M1 A1
8(a)	$x^2 + 6x - 12 = (x+a)^2 + b$ $x^2 + 6x - 12 = x^2 + 2ax + a^2 + b$ *Compare* x: $6 = 2a$ $a = 3$ *Compare constant*: $-12 = a^2 + b$ $-12 = 3^2 + b$ $b = -21$	B1 B1
8(b)	$x^2 + 6x - 12 = 0$ $(x+3)^2 - 21 = 0$ $(x+3)^2 = 21$ $(x+3) = \pm\sqrt{21}$ $x+3 = \sqrt{21}$ $\quad x+3 = -\sqrt{21}$ $x = \sqrt{21} - 3$ $\quad x = -\sqrt{21} - 3$ $x \approx 1.58 (2dp)$ $\quad x \approx -7.58 (2dp)$	A1 / A1

	Alternative $a=1 \quad b=6 \quad c=-12$ $x = \dfrac{-6 \pm \sqrt{6^2 - 4(1)(-12)}}{2(1)}$ $x \approx 1.58 \quad x \approx -7.58$	
9(a)	$Vol\ of\ cylinder = \pi r^2 h$ $= \pi(6)^2(13)$ $\approx 1470\ cm^3 (3sf)$ *Alternative* $Vol\ of\ cylinder = \pi r^2 h$ $= (3.142)(6)^2(13)$ $= 1470.456\ cm^3$	A1
9(b)	$Vol\ of\ cone = \dfrac{1}{3}\pi r^2 h$ $= \dfrac{1}{3}\pi(6)^2(8.5)$ $\approx 320\ cm^3 (3sf)$ *Alternative* $Vol\ of\ cone = \dfrac{1}{3}\pi r^2 h$ $= \dfrac{1}{3}(3.142)(6)^2(8.5)$ $= 320.484\ cm^3 (3sf)$	A1
9(c)	$Vol\ of\ remaining\ solid = \pi(6)^2(13) - \dfrac{1}{3}\pi(6)^2(8.5)$ $= 1150 cm^3 (3sf)$ *Alternative* $Vol\ of\ remaining\ solid = 1470.456 - 320.484$ $= 1149.972\ cm^3$	M1 A1
	Section B	
10(a)	$AB = (x-7) cm$	B1
10(b)	$AC = (x+1) cm$	B1
10(c)	Pythagoras Theroem $(x+1)^2 = x^2 + (x-7)^2$ $x^2 + 2x + 1 = x^2 + x^2 - 14x + 49$ $x^2 + 2x + 1 = 2x^2 - 14x + 49$ $x^2 - 16x + 48 = 0$ *(shown)*	M1 M1 A1

10(d)	$x^2 - 16x + 48 = 0$ $a = 1, \quad b = -16, \quad c = 48$ $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \dfrac{-(-16) \pm \sqrt{(-16)^2 - 4(1)(48)}}{2(1)}$ $x = 12, \qquad x = 4 \ (reject)$	B1 / B1
10(e)	$AC = x + 1$ $= 12 + 1$ $= 13 \ cm$	B1
11(a)	Pythagoras Theorem $BD^2 = 5^2 + 7^2$ $BD^2 = 74$ $BD \approx 8.60 \ units$	A1
11(b)	$11^2 = AB^2 + 74$ $AB^2 = 47$ $AB \approx 6.86 \ units$	A1
11(c)	$\sin BAC = \dfrac{\sqrt{74}}{11}$ $\angle ACB = \sin^{-1}\left(\dfrac{\sqrt{74}}{11}\right)$ $\approx 51.4^0 (1dp)$	M1 A1
11(d)	$Area \ of \ \Delta ABD = \dfrac{1}{2}\left(\sqrt{47}\right)\left(\sqrt{74}\right)$ $\approx 29.5 \ cm^2 (3sf)$	A1
11(e)	$Area \ of \ \Delta BCD = \dfrac{1}{2}(5)(7) = 17.5 \ cm^2$ $17.5 = \dfrac{1}{2}\left(\sqrt{74}\right)(h)$ $h \approx 4.07 \ cm (3sf)$	M1 A1
12	On graph paper	Markings on graph attached.