1MA0

Edexcel GCSE

Mathematics (Linear) – 1MA0
Paper 2H (Calculator)

Higher Tier

Practice Paper 2B (Set N)

Time: 1 hour

Materials required for examination	Items included with question papers
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser. Tracing paper may be used.	Nil

Instructions

In the boxes above, write your centre number, candidate number, your surname, initials and signature.
Check that you have the correct question paper.
Answer ALL the questions. Write your answers in the spaces provided in this question paper.
You must NOT write on the formulae page.
Anything you write on the formulae page will gain NO credit.
If you need more space to complete your answer to any question, use additional answer sheets.

Information

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2).**
There are 13 questions in this question paper. The total mark for this paper is 58.
Calculators may be used.
If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

Advice

Show all stages in any calculations.
Work steadily through the paper. Do not spend too long on one question.
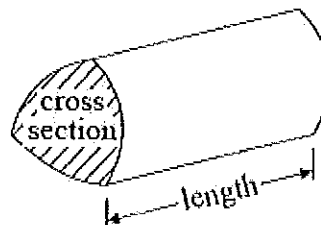If you cannot answer a question, leave it and attempt the next one.
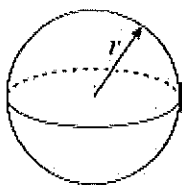Return at the end to those you have left out.

Formulae: Higher Tier

You must not write on this formulae page.
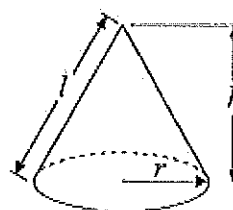**Anything you write on this formulae page will gain NO credit.**

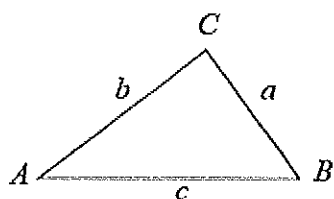**Volume of prism** = area of cross section × length

Volume of sphere $\frac{4}{3}\pi r^3$
Surface area of sphere = $4\pi r^2$

Volume of cone $\frac{1}{3}\pi r^2 h$
Curved surface area of cone = $\pi r l$

In any triangle ABC

The Quadratic Equation
The solutions of $ax2 + bx + c = 0$
where $a \neq 0$, are given by

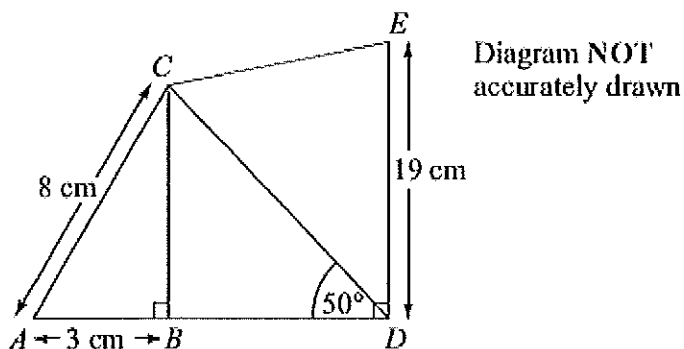$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

Sine Rule $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

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

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

2

Answer ALL THIRTEEN questions.
Write your answers in the spaces provided.
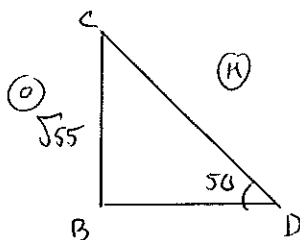You must write down all stages in your working.

1.

Diagram NOT
accurately drawn

$AC = 8$ cm.
$AB = 3$ cm.
$DE = 19$ cm.
Angle ABC = angle CBD = angle BDE = 90°.
Angle $BDC = 50°$.

(a) Calculate the length of CD.
    Give your answer correct to 3 significant figures.

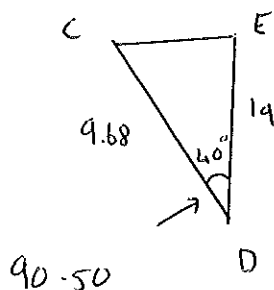① Need CB : Pythagoras

$CB = \sqrt{8^2 - 3^2}$

$= \sqrt{55}$

$\sin(50) = \dfrac{\sqrt{55}}{CD}$

$CD = \dfrac{\sqrt{55}}{\sin(50)} = 9.68115...$

$= 9.68 \ (3sf)$

.... cm
(4)

(b) Calculate the length of CE.
    Give your answer correct to 3 significant figures.

$90 - 50$

cosine rule:

$CE^2 = 9.68^2 + 19^2 - 2(9.68)(19)(\cos(40))$

$CE^2 = 172.909...$

$CE = \sqrt{172.909...} = 13.149...$

.... cm
(3)

$= 13.1 \ (3sf)$ (Total 7 marks)
[Full marks on this question was achieved by 9.9% of students]

2. Steve measured the length and the width of a rectangle.
He measured the length to be 645 mm correct to the nearest 5 mm.
He measured the width to be 400 mm correct to the nearest 5 mm.

Calculate the lower bound for the area of this rectangle.
Give your answer correct to 3 significant figures.

$$\text{Area} = b \times h$$

$$\text{Lower bound} = 642.5 \times 397.5$$

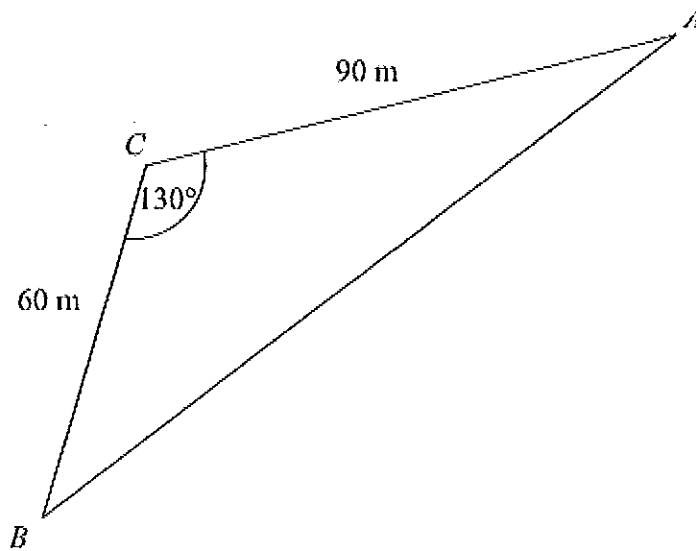$$= 255,393.75$$

$$= 255\,000 \text{ mm}^2 \quad (3sf)$$

.... mm²

(Total 3 marks)

[Full marks on this question was achieved by 9.3% of students]

3. Here is a triangle *ABC*.

Diagram **NOT** accurately drawn

90 m

C

130°

60 m

B

A

AC = 90 m.
BC = 60 m.
Angle *ACB* = 130°.

Calculate the perimeter of the triangle.
Give your answer correct to one decimal place.

Need AB: Cosine rule!

$$AB^2 = 60^2 + 90^2 - 2(60)(90)(\cos(130))$$

$$AB^2 = 18,642.106,,.$$
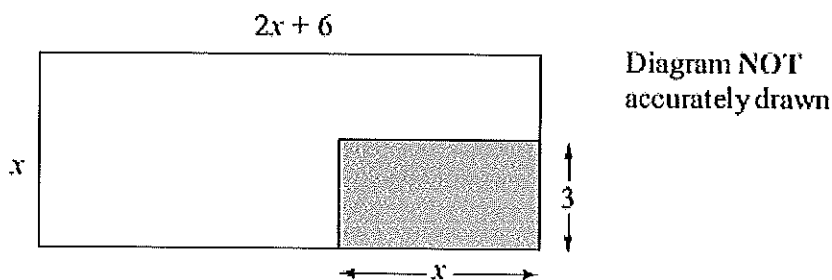
$$AB = \sqrt{18642.106..}$$

$$= 136.5360...$$

$$= 136.5 m \quad (1dp)$$

.... m

(Total 4 marks)

[Full marks on this question was achieved by 9.1% of students]

5

4. The diagram below shows a large rectangle of length $(2x + 6)$ cm and width x cm.
    A smaller rectangle of length x cm and width 3 cm is cut out and removed.

$$2x + 6$$

Diagram NOT
accurately drawn

x

$\updownarrow$
3
$\updownarrow$

$\longleftarrow x \longrightarrow$

The area of the shape that is left is 100 cm^2.

(a) Show that $\quad\quad\quad\quad\quad 2x^2 + 3x - 100 = 0$

Area of big rectangle $= x(2x+6) = 2x^2 + 6x$

Area of small rectangle $= 3x$

Big area $-$ small area $= 100$

$\rightarrow \quad 2x^2 + 6x - 3x = 100$

$\rightarrow \quad 2x^2 + 3x = 100$

$2x^2 + 3x - 100 = 0$

(3)

(b) Calculate the length of the smaller rectangle.
     Give your answer correct to 3 significant figures.

$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$a = 2$
$b = 3$
$c = -100$

$x = \dfrac{-3 \pm \sqrt{3^2 - 4(2)(-100)}}{2 \times 2}$

$x = \dfrac{-3 \pm \sqrt{809}}{4}$

$x = \dfrac{-3 + \sqrt{809}}{4}$

$= 6.3607.. = 6.36 \ (3sf)$

$\boxed{0r}$

$x = \dfrac{-3 - \sqrt{809}}{4} = -7.8607...$

.... cm

x must be positive, $\quad$ (4)

so $x = 6.36$ cm $\quad$ **(Total 7 marks)**

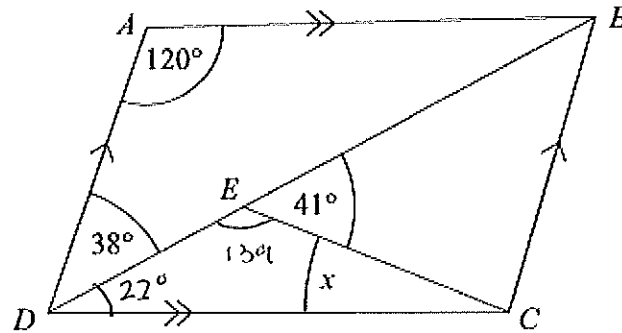*[Full marks on this question was achieved by 9.0% of students]*

6

*5.

Diagram **NOT** accurately drawn

ABCD is a parallelogram.

Angle *ADB* = 38°.
Angle *BEC* = 41°.
Angle *DAB* = 120°.

Calculate the size of angle *x*.
You must give reasons for your answer.

E D C = 60·38 = 22°   (allied angles add to 180°)

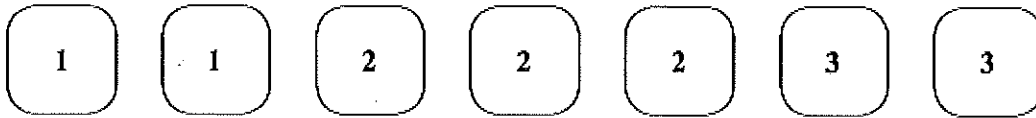DEC = 180 - 41 = 139°   (angles on a straight line add to 180°)

x = 180 - 139 - 22 = 19°

(angles in a triangle add to 180°)

<div align="right">

(Total 4 marks)

[Full marks on this question was achieved by 8.3% of students]

</div>

7

6. Here are seven tiles.

$$\boxed{1} \; \boxed{1} \; \boxed{2} \; \boxed{2} \; \boxed{2} \; \boxed{3} \; \boxed{3}$$
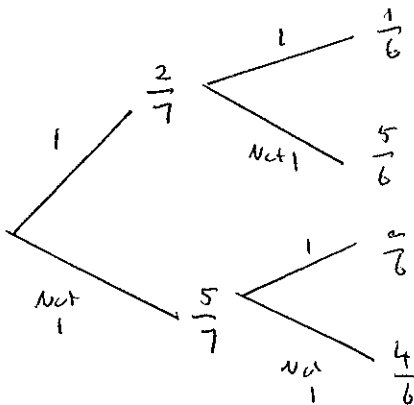
Jim takes at random a tile.
He does **not** replace the tile.

Jim then takes at random a second tile.

(a) Calculate the probability that both the tiles Jim takes have the number 1 on them.

$$P(1,1) = \frac{2}{7} \times \frac{1}{6} = \frac{2}{42}$$

$$= \frac{1}{21}$$

....
(2)

(b) Calculate the probability that the number on the second tile Jim takes is greater than the number on the first tile he takes.

Different ways

$$(1,2) = \frac{2}{7} \times \frac{3}{6} = \frac{6}{42}$$

$$(1,3) = \frac{2}{7} \times \frac{2}{6} = \frac{4}{42}$$

$$(2,3) = \frac{3}{7} \times \frac{2}{6} = \frac{6}{42}$$

Total $\quad \dfrac{16}{42} = \dfrac{7}{21}$

................$\dfrac{7}{21}$................
(3)

(Total 5 marks)

[Full marks on this question was achieved by 6.9% of students]

8

7.   (a) Max wants to take a random sample of students from his year group.

(i) Explain what is meant by a random sample.

Each member of his Year group must
have an equal chance of being selected

(ii) Describe a method Max could use to take his random sample.

Put all the names of his year group into
a hat and select them fairly

(Total 2 marks)

[Full marks on this question was achieved by 6.5% of students]

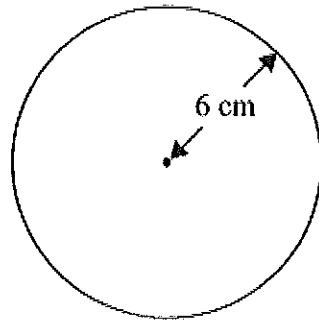8. The diagram shows a CD.
The CD is a circle of radius 6 cm.

Diagram NOT
accurately drawn

6 cm

$diameter = 6 \times 2$
$= 12$

(a) Work out the circumference of the CD.

$C = \pi d$
$= \pi \times 12$
$= 37.6991... \ cm$

.... cm
(2)

CDs of this size are cut from rectangular sheets of plastic.
Each sheet is 1 metre long and 50 cm wide.

(b) Work out the greatest number of CDs that can be cut from one rectangular sheet.

50cm
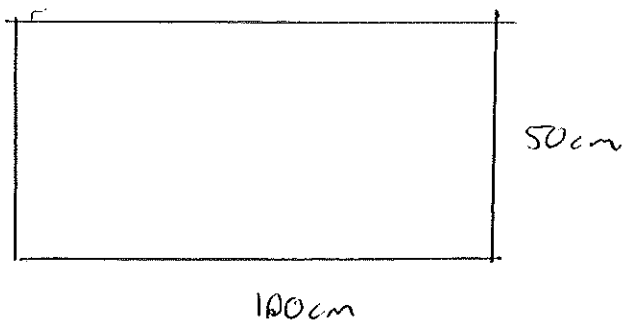
∴ Total number
$= 8 \times 4$
$= 32 \ CDs$

100cm

Greatest number across $= 100 \div 12 = 8.3 = 8$
Greatest number up $= 50 \div 12 = 4.16 = 4$

....
(2)

(Total 4 marks)

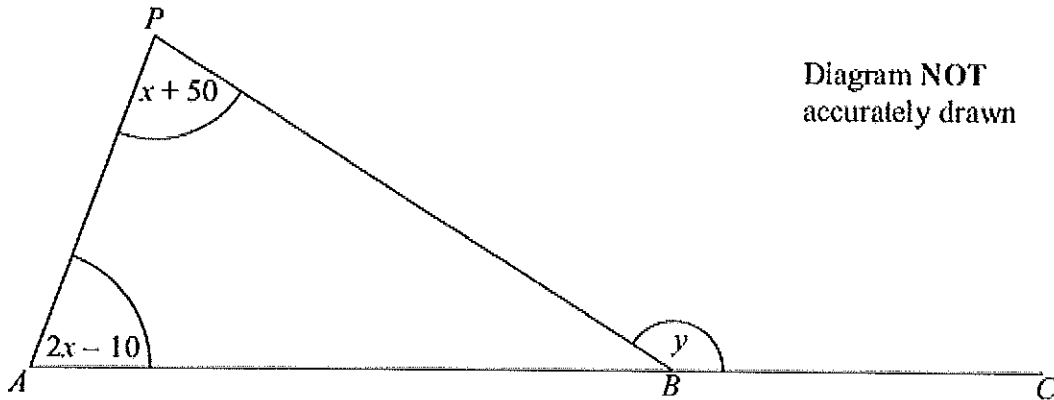[Full marks on this question was achieved by 5.2% of students]

10

9.

Diagram NOT
accurately drawn

All angles are measured in degrees.

ABC is a straight line.
Angle $APB = x + 50$
Angle $PAB = x - 10$
Angle $PBC = y$

(a) Show that $y = 3x + 40$
Give reasons for each stage of your working.

Exterior angle of triangle = sum of two interiors

$$y = x + 50 + 2x - 10$$

$$\rightarrow y = 3x + 40$$

(3)

(b) Given that $y = 145$

(i) work out the value of x,

$$145 = 3x + 40$$

$$-40 \begin{cases} 105 = 3x \\ \div 3 \end{cases} \quad 35 = x$$

$x = $ ....35........

(ii) work out the size of the largest angle in triangle ABP.

$2x - 10 \rightarrow 2(35) - 10 = 60^6$

$x + 50 \rightarrow 35 + 50 = 85^6$

........85........ °

(4)

(Total 7 marks)

[*Full marks on this question was achieved by 4.3% of students*]

11

10. Rob is learning about the planets.

Rob makes a model of the Sun.
He also makes a model of the planet Jupiter.

Rob is going to hang the two models in the school hall.

Rob wants a distance of 16 m between the two models.
The real distance between the planet Jupiter and the Sun is 8×10^8 km.

Work out the scale Rob should use.
Give your answer in the form 1 : n

8×10^8 km

$= 800\ 000\ 000$ km

$= 80\ 000\ 000\ 000$ m

$\div 16 \left(\begin{array}{l} 16 : 80\ 000\ 000\ 000 \\ 1 : 5\ 000\ 000\ 000 \end{array} \right) \div 16$

or $1 : 5 \times 10^9$

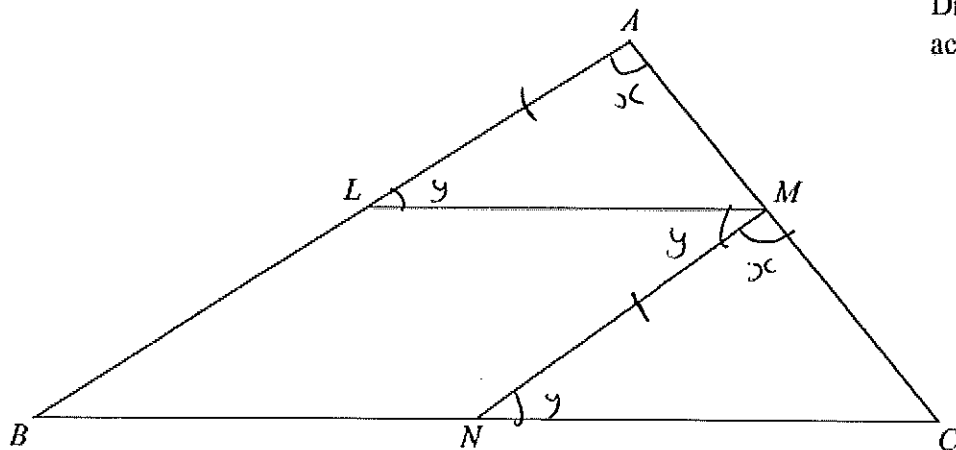...

(Total 3 marks)

[Full marks on this question was achieved by 3.5% of students]

11.

Diagram **NOT** accurately drawn

The diagram shows a triangle *ABC*.

LMNB is a parallelogram where
  L is the midpoint of *AB*,
  M is the midpoint of *AC*,
and *N* is the midpoint of *BC*.

Prove that triangle *ALM* and triangle *MNC* are congruent.
You must give reasons for each stage of your proof.

$CMN = MAL = x$ (corresponding angles are equal)

$ALM = LMN = MNC = y$ (alternate angles are equal)

~~$AML = MCN = 180 - x - y$ (angles in a triangle add to $180°$)~~

← Don't need !

Side (MN) = side (AL) as shape is a parallelogram

∴ we have ASA, which means the triangles are congruent !.

(Total 3 marks)

[Full marks on this question was achieved by 2.8% of students]
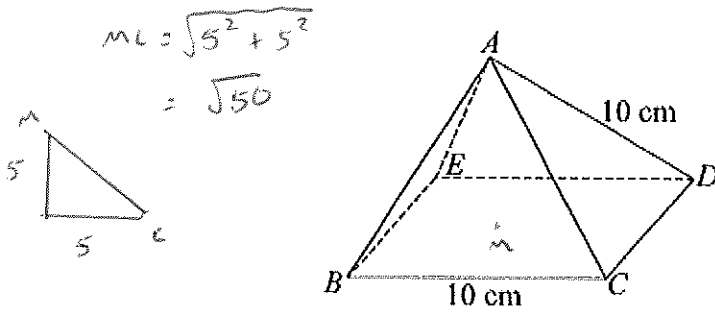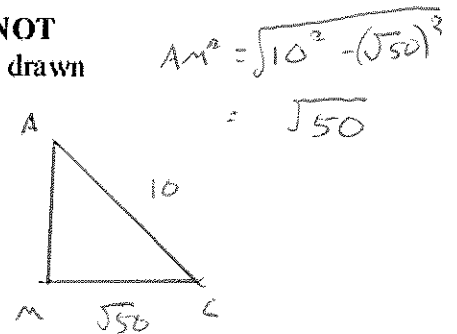
13

13. The diagram shows a pyramid.

$MC = \sqrt{5^2 + 5^2}$

$= \sqrt{50}$

Diagram **NOT** accurately drawn

$AM^2 = \sqrt{10^2 - (\sqrt{50})^2}$

$= \sqrt{50}$

BCDE is a square with sides of length 10 cm.
The other faces of the pyramid are equilateral triangles with sides of length 10 cm.

(a) Calculate the volume of the pyramid.
Give your answer correct to 3 significant figures.

see triangles above for height!

Volume of Pyramid = $\dfrac{\text{Area of Face} \times \text{Height}}{3}$

Think of a cone!

$= \dfrac{10 \times 10 \times \sqrt{50}}{3}$

$= \dfrac{100\sqrt{50}}{3}$ $= 235.702...$

$= 236$ (3sf)

.... cm³
(4)

(b) Find the size of angle *DAB*.

$DAB = CAE$

$CAE = 2 \times CAM$

must be 45° as isosceles

$\therefore DAB = 2 \times 45$
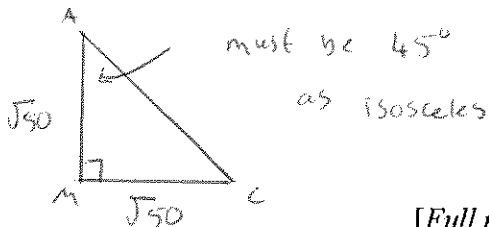
.... 90 .... °
(2)

(Total 6 marks)

[Full marks on this question was achieved by 0.6% of students]

TOTAL FOR PAPER = 58 MARKS
END

15

22. The average fuel consumption (c) of a car, in kilometres per litre, is given by the formula

$$c = \frac{d}{f}$$

where d is the distance travelled, in kilometres, and f is the fuel used, in litres.

    $d = 163$ correct to 3 significant figures.
    $f = 45.3$ correct to 3 significant figures.

By considering bounds, work out the value of c to a suitable degree of accuracy.
You must show **all** of your working **and** give a reason for your final answer.

Smallest = $\dfrac{\text{smallest } d}{\text{biggest } f}$ = $\dfrac{162.5}{45.35}$ = $3.5832...$

Biggest = $\dfrac{\text{biggest } d}{\text{smallest } f}$ = $\dfrac{163.5}{45.25}$ = $3.61325...$

Both answers are 3.6 to 1 decimal place, so this is a suitable degree of accuracy

$c =$ ....

(Total 5 marks)

[Full marks on this question was achieved by 1.4% of students]

14

Practice Paper 2B (Set N)

Question	Date of original linear paper	Original question number
1	June 2011	25
2	November 2011	25
3	March 2012	20
4	June 2011	23
5	November 2012	6
6	November 2012	21
7	June 2012	23
8	November 2011	8
9	November 2011	6
10	November 2012	19
11	November 2011	22
12	March 2012	22
13	November 2012	23