Centre Number						Candidate Number				
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Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
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TOTAL	

Free-Standing Mathematics Qualification
Advanced Level
June 2012

Using and Applying Statistics

6990/2

Unit 10

Monday 14 May 2012 1.30 pm to 3.00 pm

For this paper you must have:
- a clean copy of the Data Sheet (enclosed)
- the booklet of formulae and statistical tables (enclosed)
- a calculator
- a protractor
- a ruler.

Time allowed
- 1 hour 30 minutes

Instructions
- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Write the question part reference (eg (a), (b)(i) etc) in the left-hand margin.
- You must answer each question in the space provided for that question. If you require extra space, use an AQA supplementary answer book; do **not** use the space provided for a different question.
- Do not write outside the box around each page.
- Show all necessary working; otherwise marks for method may be lost.
- Do all rough work in this book. Cross through any work that you do not want to be marked.
- The **final** answer to questions requiring the use of tables or calculators should normally be given to three significant figures.
- You may **not** refer to the copy of the Data Sheet that was available prior to this examination. A clean copy is enclosed for your use.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You may use either a scientific calculator or a graphics calculator.

Advice
- You do not necessarily need to use all the space provided.

Section A

Answer **all** questions.

Answer each question in the space provided for that question.

Use **Household waste** *on pages 2 and 3 of the Data Sheet.*

1 Use the data in **Table 1**, printed on the Data Sheet, when answering question **1**.

(a) Which region has the highest **Household recycling rate** and the lowest **Residual household waste** in England for 2007/2008? *(1 mark)*

(b) (i) The graph opposite shows a bar chart for the years 2003/2004 for the **Household recycling rate** for England, Wales, Scotland and Northern Ireland.

Complete the bar chart by choosing the appropriate scale, labelling the vertical axis and identifying the countries. *(3 marks)*

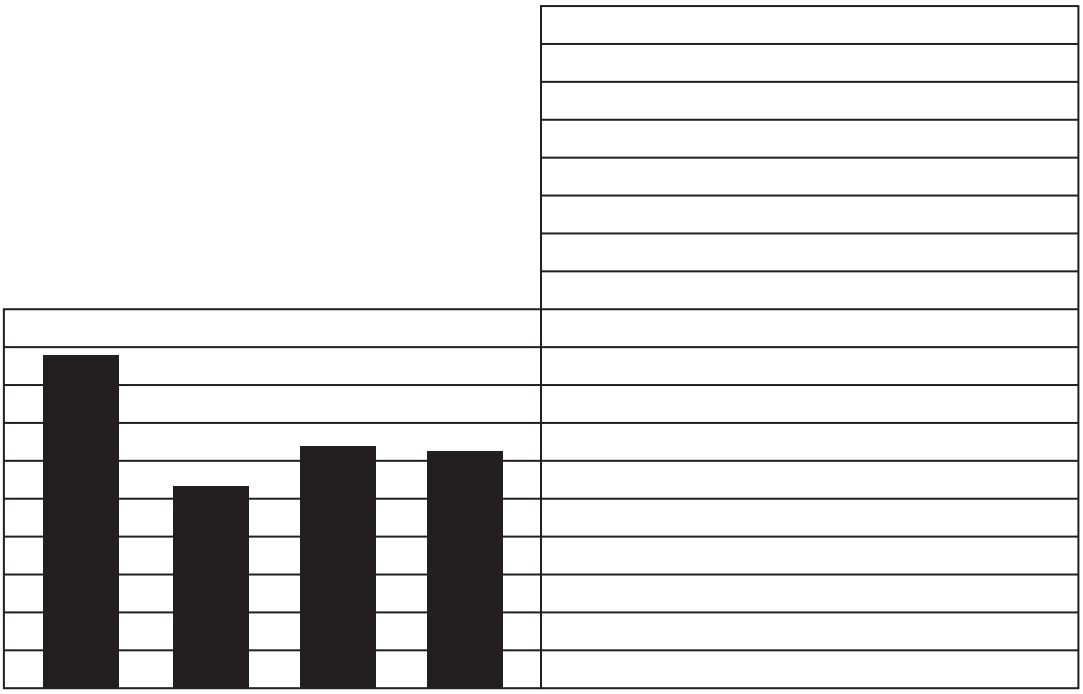
(ii) Draw a similar bar chart for the four countries for 2007/2008 using the grid opposite. *(3 marks)*

(c) Which country has made the biggest improvement in its recycling rate during the period 2003/2004 to 2007/2008? *(1 mark)*

QUESTION PART REFERENCE	**Answer space for question 1**

QUESTION PART REFERENCE

Answer space for question 1



2003/2004 **2007/2008**

2 Use the data in **Table 2**, printed on the Data Sheet, when answering question **2**.

(a) (i) Which type of household waste contributed the greatest weight to the total amount of recycled waste in 2007/2008? *(1 mark)*

(ii) In England, which region had the lowest amount of recycled waste per household in 2007/2008? *(1 mark)*

(b) Northern Ireland had the highest weight of recycling per household per year in 2007/2008. A pie chart would be an appropriate diagram to represent the types of recycled materials.

For Northern Ireland, what would be the angle for **Paper and card**?
(Do **not** draw the pie chart.) *(2 marks)*

(c) Scotland and Wales had very similar total weights of recycling per household per year in 2007/2008. However, the weight of which type of recycled household waste was five times greater in Wales than in Scotland? *(2 marks)*

QUESTION PART REFERENCE

Answer space for question 2

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Section B

Answer **all** questions.

Answer each question in the space provided for that question.

Use **Football statistics** *on page 4 of the Data Sheet.*

3 Part of the final Premier League table for the 2009/2010 season is reproduced below. Use **only** this part of the table for this question.

Position	Team	Played	Won	Drawn	Lost	Goals scored for	Goals scored against	+/−	Points gained
2	Manchester Utd	38	27	4	7	86	28	58	**85**
4	Tottenham	38	21	7	10	67	41	26	**70**
6	Aston Villa	38	17	13	8	52	39	13	**64**
8	Everton	38	16	13	9	60	49	11	**61**
10	Blackburn	38	13	11	14	41	55	−14	**50**
12	Fulham	38	12	10	16	39	46	−7	**46**
14	Bolton	38	10	9	19	42	67	−25	**39**
16	Wigan	38	9	9	20	37	79	−42	**36**
18	Burnley	38	8	6	24	42	82	−40	**30**
20	Portsmouth	38	7	7	24	34	66	−32	**28**

Tim, who loves football, believes that there may be a relationship between the number of **goals scored for** and the **points gained**.

(a) For the above table of data, use **goals scored for** (x) and the **points gained** (y) to plot a scatter graph on the grid opposite. *(2 marks)*

(b) Use your calculator to find for the above table of data:

(i) the mean **goals scored for**, $\overline{x}$; *(1 mark)*

(ii) the mean **points gained**, $\overline{y}$; *(1 mark)*

(iii) the product moment correlation coefficient, r. *(1 mark)*

(iv) Interpret your value of r in the context of this question. *(1 mark)*

(c) (i) Calculate the equation of the line of best fit of y on x in the form $y = ax + b$, giving the values of a and b correct to three significant figures. *(2 marks)*

(ii) Interpret the value of a in the context of this question. *(2 marks)*

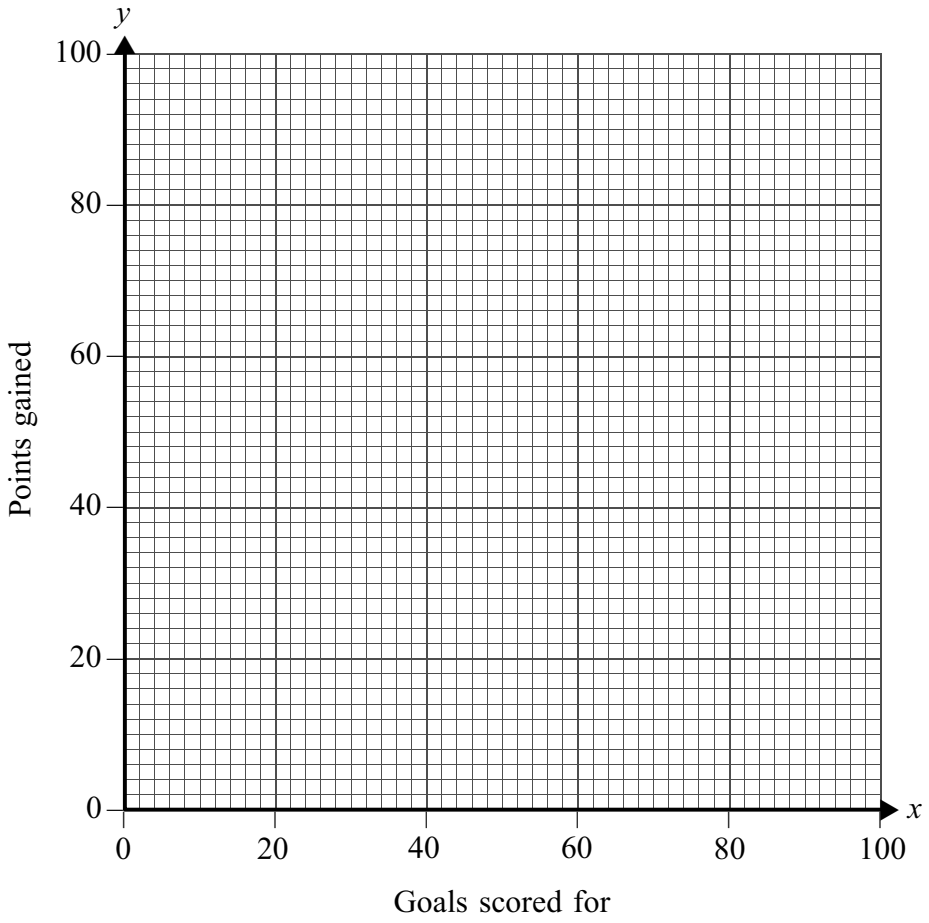
(iii) Plot the line of best fit on your scatter graph. *(3 marks)*

(d) For the 2009/2010 season, Birmingham gained 50 points but scored only 38 goals.
Using your graph or equation, estimate how many points you would have expected Birmingham to gain from having scored 38 goals.
Comment on your result, giving a possible reason why the values are different.

(2 marks)

QUESTION PART REFERENCE

Answer space for question 3



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Section C

Answer **all** questions.

Answer each question in the space provided for that question.

Use **Divorce** *on page 5 of the Data Sheet.*

4 (a) The percentage cumulative frequency curve for the age of husbands divorcing in 2008 is shown on the grid below.

Draw the percentage cumulative frequency curve for the age of wives divorcing in 2008 on the same grid.
Assume that the maximum age for wives divorcing is 70 years. *(3 marks)*

(b) Use the curves to estimate the median age of divorcing for both husbands and wives. *(2 marks)*

(c) The interquartile range for the age of divorcing for husbands is estimated to be 13 years. Estimate the interquartile range for the age of divorcing for wives. *(2 marks)*

(d) Use your answers from part **(b)** and part **(c)** to compare the gender and age of people divorcing in 2008. *(2 marks)*

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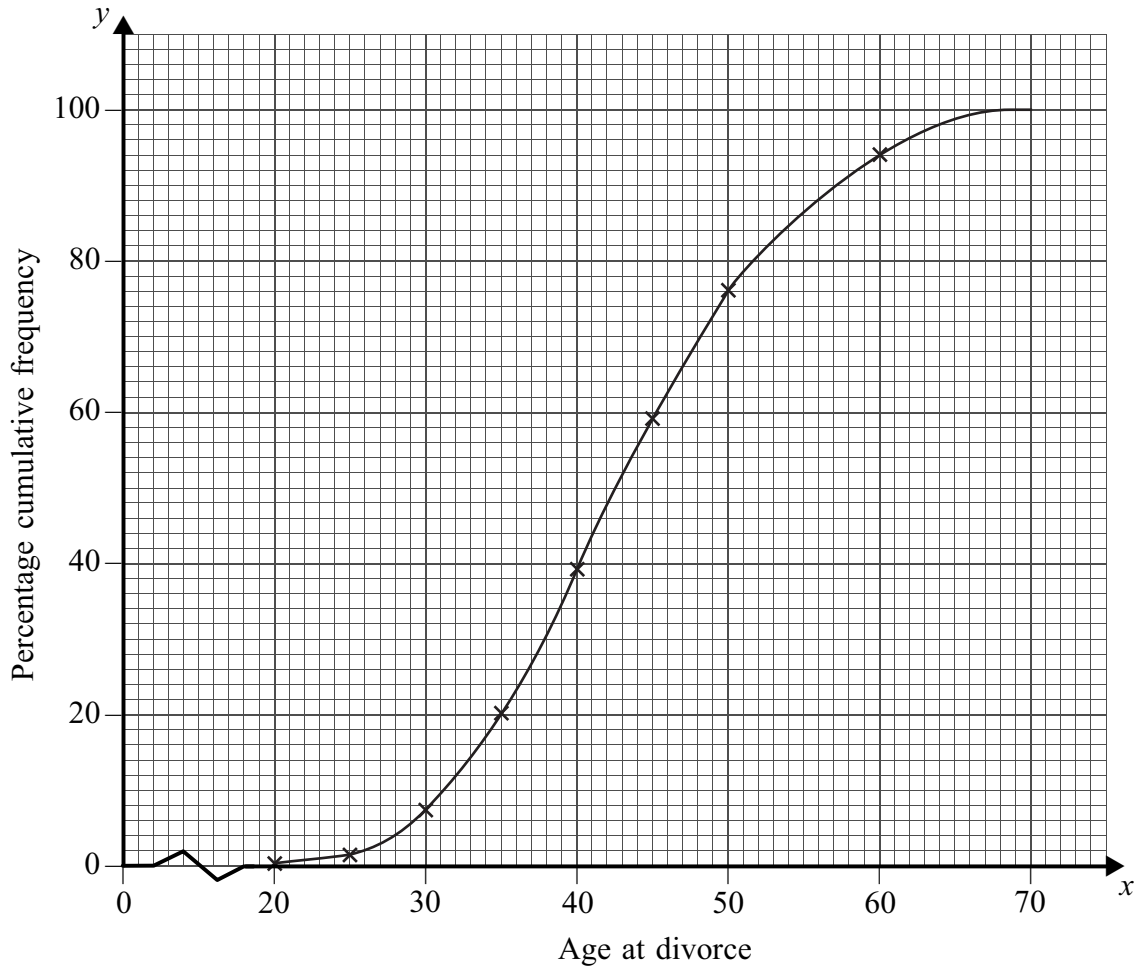
Answer space for question 4



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5 An extract from the Data Sheet table showing the total numbers of divorces is shown below.

Divorces (Numbers): 2002–2008

Year	2002	2003	2004	2005	2006	2007	2008
All ages	147 735	153 176	153 034	141 415	132 224	128 232	121 779

(a) (i) Calculate the percentage change from 2004 to 2005. *(2 marks)*

(ii) The percentage change from 2001 to 2002 was approximately +2.72 %. Calculate the number of divorces in 2001. Show your method clearly. *(3 marks)*

(b) (i) On the grid opposite, draw a graph for the period 2002–2008, plotting the years on the horizontal axis and the numbers of divorces on the vertical axis. *(3 marks)*

(ii) Describe the trend. *(2 marks)*

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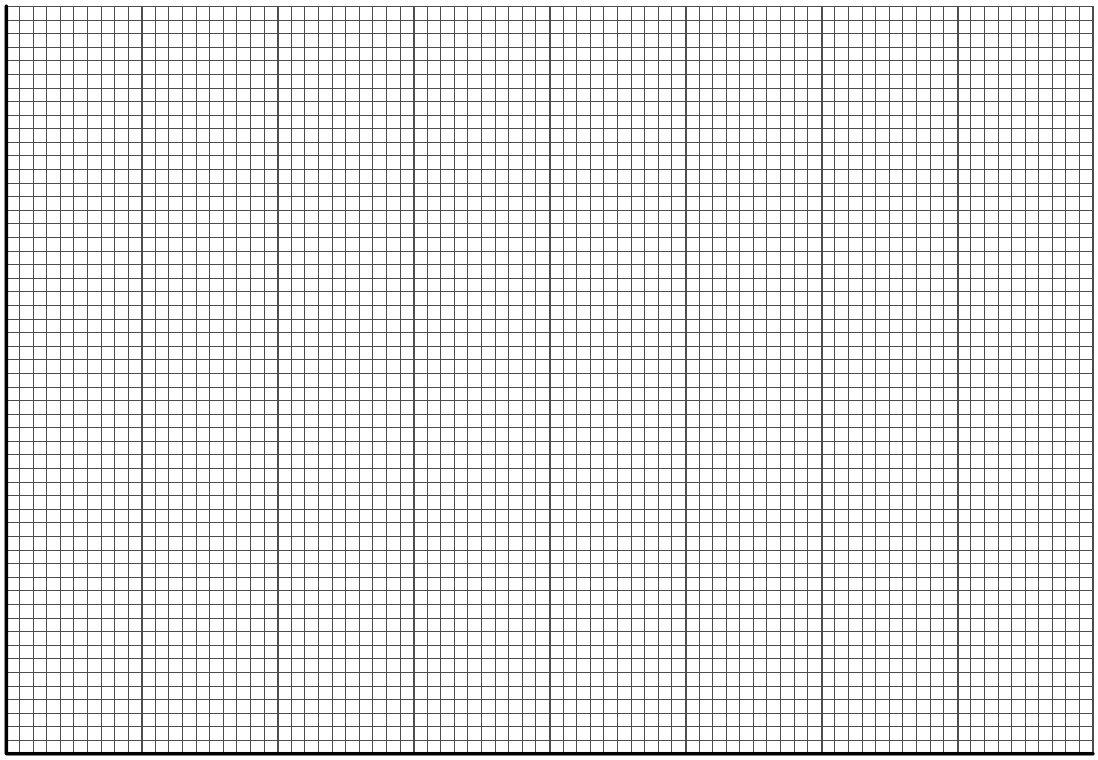

Section D

Answer **all** questions.

Answer each question in the space provided for that question.

Use **Honeybees** *on page 6 of the Data Sheet.*

6 Sam has three hives of honeybees in his back garden. In a particular year, he is lucky with the weather and there is a surplus of honey, with the hives producing 16 kg, 20 kg and 14.5 kg respectively. He can sell the honey in jars for £ 3.50 each.

The weight of honey in a jar follows a normal distribution with a mean of 460 g and a standard deviation of 15 g.

(a) How many jars containing 460 g of honey can be filled? *(2 marks)*

(b) If Sam sells 80 % of his jars of honey, what income will he receive? *(2 marks)*

(c) Find the probability that the weight of honey in a jar is more than 472 g. *(4 marks)*

(d) Labels on the jars indicate the nominal weight of honey in the jars is 454 g.

Sam performs calculations and realises that approximately 34.5 % of jars may contain less than the nominal weight of 454 g. Sam wants to reduce the probability that a jar of honey contains less than the nominal weight of 454 g.

If the standard deviation remains at 15 g, what would the new mean value need to be so that 90 % of the jars have a weight above 454 g (the nominal value)? *(4 marks)*

QUESTION PART REFERENCE

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Answer space for question 6

END OF QUESTIONS

There are no questions printed on this page

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ANSWER IN THE SPACES PROVIDED

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