Centre Number						Candidate Number				
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Other Names										
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For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
TOTAL	

General Certificate of Education
Advanced Subsidiary Examination
June 2015

Mathematics MS1A/W

Unit Statistics 1A

Wednesday 3 June 2015 9.00 am to 10.15 am

For this paper you must have:
- the blue AQA booklet of formulae and statistical tables.

You may use a graphics calculator.

Time allowed
- 1 hour 15 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.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- Unit Statistics 1A has a **written paper and coursework**.

Advice
- Unless stated otherwise, you may quote formulae, without proof, from the booklet.
- You do not necessarily need to use all the space provided.

Do not write outside the box

Answer **all** questions.

Answer each question in the space provided for that question.

1 The weights, in grams, of 10 new cricket balls to be used in men's senior cricket are as follows.

161 157 156 162 160 158 163 158 161 159

Calculate values for the median and the interquartile range of these 10 weights.

[4 marks]

QUESTION PART REFERENCE

Answer space for question 1

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QUESTION PART REFERENCE

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2 In a particular country, 35 per cent of the population is estimated to have at least one mobile phone.

A sample of 40 people is selected from the population.

Use the distribution $\mathrm{B}(40, 0.35)$ to estimate the probability that the number of people in the sample that have at least one mobile phone is:

(a) at most 15;

(b) more than 12 but fewer than 18;

(c) exactly equal to the mean of the distribution.

[7 marks]

QUESTION PART REFERENCE

Answer space for question 2

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3 Aisha and Bryony independently attend an evening youth club.

The probability that Aisha attends on any particular evening is 0.70 and the probability that Bryony attends on any particular evening is 0.60.

(a) Calculate the probability that, on a particular evening:

(i) neither attends the youth club;

(ii) exactly one attends the youth club.

[3 marks]

(b) Clare also attends the youth club.

Independently of whether or not Aisha attends the youth club, the probability that Clare attends is 0.85 when Bryony attends, but is only 0.25 when Bryony does not attend.

Calculate the probability that, on a particular evening:

(i) all three attend the youth club;

(ii) none of the three attends the youth club;

(iii) Aisha and Clare but not Bryony attend the youth club;

(iv) exactly two of the three attend the youth club.

[9 marks]

QUESTION PART REFERENCE

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4 Stephan is a roofing contractor who is often required to replace loose ridge tiles on house roofs. In order to help him to quote more accurately the prices for such jobs in the future, he records, for each of 11 recently repaired roofs, the number of ridge tiles replaced, x_i, and the time taken, y_i hours. His results are shown in the table.

Roof (*i*)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
x_i	8	11	14	14	16	20	22	22	25	27	30
y_i	5.0	5.2	6.3	7.2	8.0	8.8	10.6	11.0	11.8	12.1	13.0

(a) (i) Calculate the equation of the least squares regression line of y_i on x_i, and draw your line on the scatter diagram shown on the opposite page.

[6 marks]

(ii) Interpret your values for the gradient and for the intercept of this regression line.

[3 marks]

(b) Estimate the time that it would take Stephan to replace 15 loose ridge tiles on a house roof.

[1 mark]

(c) Given that r_i denotes the residual for the point representing roof i:

(i) calculate the value of r_6;

[2 marks]

(ii) state why the value of $\sum_{i=1}^{11} r_i$ gives no useful information about the connection between the number of ridge tiles replaced and the time taken.

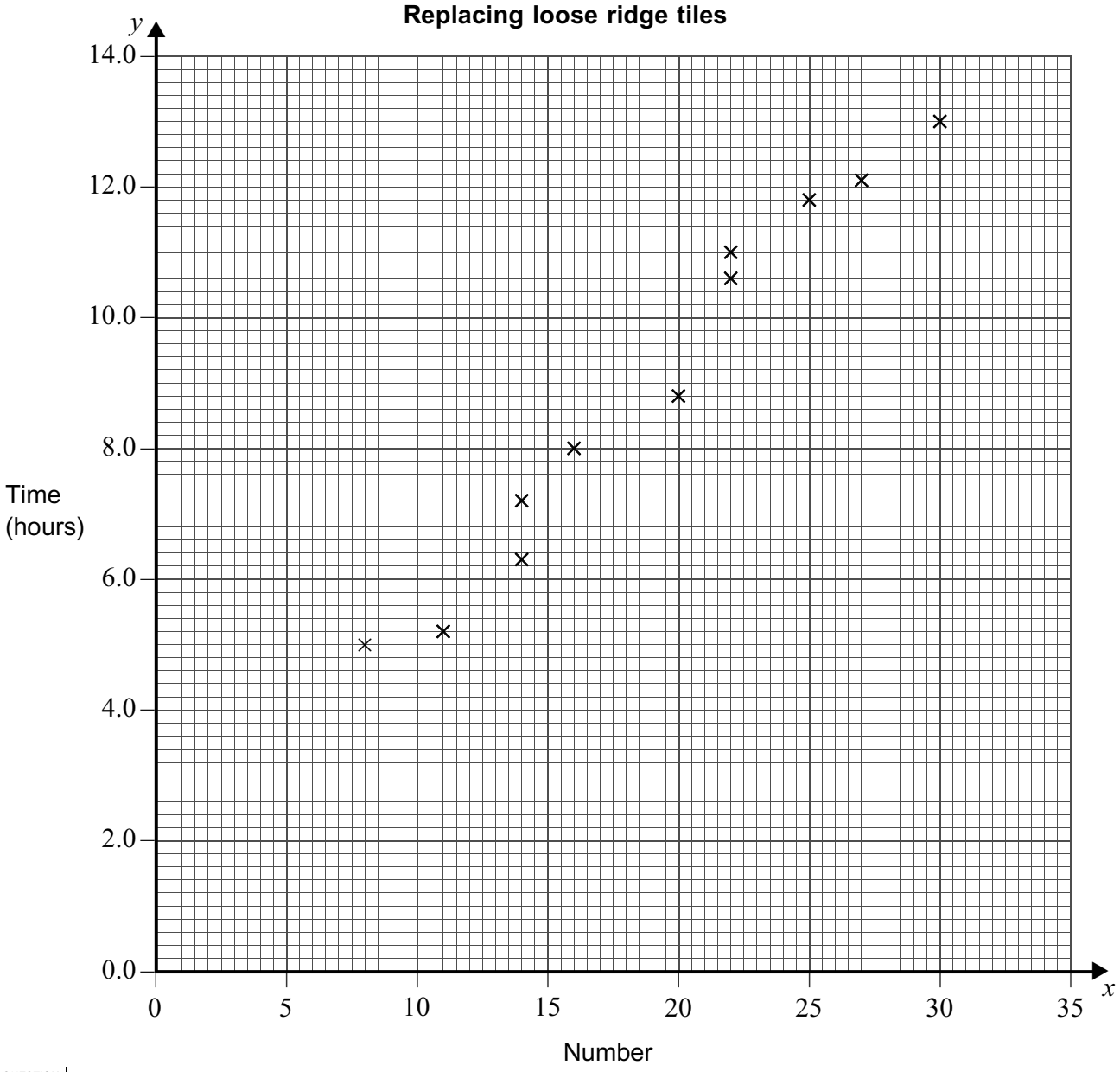
[1 mark]

QUESTION PART REFERENCE

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5 (a) Wooden lawn edging is supplied in $1.8\,\text{m}$ length rolls. The actual length, X metres, of a roll may be modelled by a normal distribution with mean 1.81 and standard deviation 0.08.

Determine the probability that a randomly selected roll has length:

(i) less than $1.90\,\text{m}$;

(ii) greater than $1.85\,\text{m}$;

(iii) between $1.81\,\text{m}$ and $1.85\,\text{m}$.

[6 marks]

(b) Plastic lawn edging is supplied in $9\,\text{m}$ length rolls. The actual length, Y metres, of a roll may be modelled by a normal distribution with mean μ and standard deviation σ.

An analysis of a batch of rolls, selected at random, showed that

$$\text{P}(Y < 9.25) = 0.88$$

(i) Use this probability to find the value of z such that

$$9.25 - \mu = z \times \sigma$$

where z is a value of $Z \sim \text{N}(0, 1)$.

[2 marks]

(ii) Given also that

$$\text{P}(Y > 8.75) = 0.975$$

find values for μ and σ.

[4 marks]

QUESTION PART REFERENCE

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6 (a) The weight of a sack of mixed dog biscuits can be modelled by a normal distribution with a mean of $10.15\,\text{kg}$ and a standard deviation of $0.3\,\text{kg}$.

A pet shop purchases 12 such sacks that can be considered to be a random sample.

Calculate the probability that the mean weight of the 12 sacks is less than $10\,\text{kg}$.

[4 marks]

(b) The weight of dry cat food in a pouch can also be modelled by a normal distribution.

The contents, x grams, of each of a random sample of 40 pouches were weighed. Subsequent analysis of these weights gave

$$\bar{x} = 304.6 \quad \text{and} \quad s = 5.37$$

(i) Construct a 99% confidence interval for the mean weight of dry cat food in a pouch. Give the limits to one decimal place.

[4 marks]

(ii) Comment, with justification, on **each** of the following two claims.

Claim 1: The mean weight of dry cat food in a pouch is more than 300 grams.

Claim 2: All pouches contain more than 300 grams of dry cat food.

[4 marks]

QUESTION PART REFERENCE

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END OF QUESTIONS

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