# OCR
RECOGNISING ACHIEVEMENT

**ADVANCED SUBSIDIARY GCE**

**MATHEMATICS (MEI)**      **4766**

Statistics 1

**Monday 15 June 2009**
**Afternoon**

**Duration:** 1 hour 30 minutes

**INSTRUCTIONS TO CANDIDATES**

*   Write your name clearly in capital letters, your Centre Number and Candidate Number in the spaces provided on the Answer Booklet.
*   Use black ink. Pencil may be used for graphs and diagrams only.
*   Read each question carefully and make sure that you know what you have to do before starting your answer.
*   Answer **all** the questions.
*   Do **not** write in the bar codes.
*   You are permitted to use a graphical calculator in this paper.
*   Final answers should be given to a degree of accuracy appropriate to the context.

**INFORMATION FOR CANDIDATES**

*   The number of marks is given in brackets **[ ]** at the end of each question or part question.
*   You are advised that an answer may receive **no marks** unless you show sufficient detail of the working to indicate that a correct method is being used.
*   The total number of marks for this paper is **72**.
*   This document consists of **8** pages. Any blank pages are indicated.

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**Turn over**

**Section A** (36 marks)

1   In a traffic survey, the number of people in each car passing the survey point is recorded. The results are given in the following frequency table.

| Number of people | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Frequency | 50 | 31 | 16 | 5 |

   **(i)** Write down the median and mode of these data.  **[2]**

   **(ii)** Draw a vertical line diagram for these data.  **[2]**

   **(iii)** State the type of skewness of the distribution.  **[1]**

2   There are 14 girls and 11 boys in a class. A quiz team of 5 students is to be chosen from the class.

   **(i)** How many different teams are possible?  **[2]**

   **(ii)** If the team must include 3 girls and 2 boys, find how many different teams are possible.  **[3]**

3   Dwayne is a car salesman. The numbers of cars, $x$, sold by Dwayne each month during the year 2008 are summarised by

$$n = 12, \qquad \Sigma x = 126, \qquad \Sigma x^2 = 1582.$$

   **(i)** Calculate the mean and standard deviation of the monthly numbers of cars sold.  **[3]**

   **(ii)** Dwayne earns £500 each month plus £100 commission for each car sold. Show that the mean of Dwayne's monthly earnings is £1550. Find the standard deviation of Dwayne's monthly earnings.  **[3]**

   **(iii)** Marlene is a car saleswoman and is paid in the same way as Dwayne. During 2008 her monthly earnings have mean £1625 and standard deviation £280. Briefly compare the monthly numbers of cars sold by Marlene and Dwayne during 2008.  **[2]**

4   The table shows the probability distribution of the random variable $X$.

| $r$ | 10 | 20 | 30 | 40 |
|---|---|---|---|---|
| P($X = r$) | 0.2 | 0.3 | 0.3 | 0.2 |

   **(i)** Explain why E($X$) = 25.  **[1]**

   **(ii)** Calculate Var($X$).  **[3]**

**5**   The frequency table below shows the distance travelled by 1200 visitors to a particular UK tourist destination in August 2008.

| Distance ($d$ miles) | $0 \leqslant d < 50$ | $50 \leqslant d < 100$ | $100 \leqslant d < 200$ | $200 \leqslant d < 400$ |
|---|---|---|---|---|
| Frequency | 360 | 400 | 307 | 133 |

   **(i)** Draw a histogram on graph paper to illustrate these data.   **[5]**

   **(ii)** Calculate an estimate of the median distance.   **[3]**

**6**   Whitefly, blight and mosaic virus are three problems which can affect tomato plants. 100 tomato plants are examined for these problems. The numbers of plants with each type of problem are shown in the Venn diagram. 47 of the plants have none of the problems.
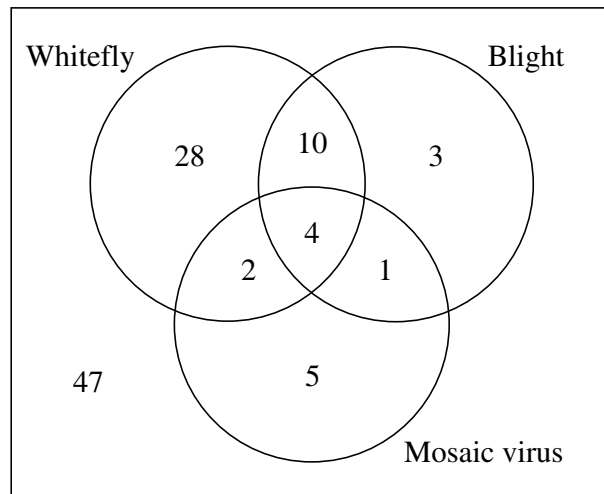


   **(i)** One of the 100 plants is selected at random. Find the probability that this plant has

   (*A*)  at most one of the problems,   **[1]**

   (*B*)  exactly two of the problems.   **[2]**

   **(ii)** Three of the 100 plants are selected at random. Find the probability that all of them have at least one of the problems.   **[3]**

**Section B** (36 marks)

**7** Laura frequently flies to business meetings and often finds that her flights are delayed. A flight may be delayed due to technical problems, weather problems or congestion problems, with probabilities 0.2, 0.15 and 0.1 respectively. The tree diagram shows this information.
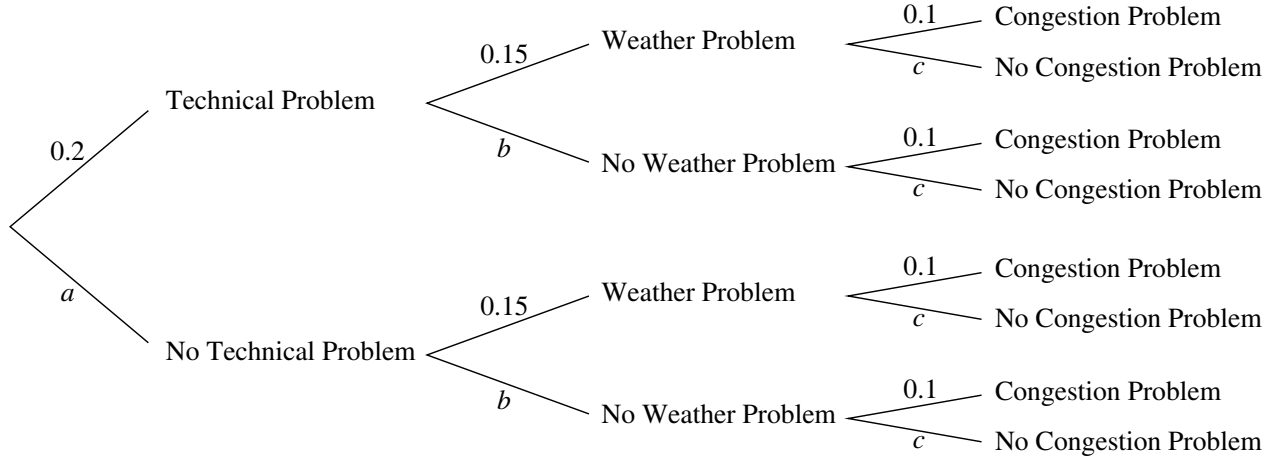


(i) Write down the values of the probabilities $a$, $b$ and $c$ shown in the tree diagram. **[2]**

One of Laura's flights is selected at random.

(ii) Find the probability that Laura's flight is not delayed and hence write down the probability that it is delayed. **[4]**

(iii) Find the probability that Laura's flight is delayed due to just one of the three problems. **[4]**

(iv) Given that Laura's flight is delayed, find the probability that the delay is due to just one of the three problems. **[3]**

(v) Given that Laura's flight has no technical problems, find the probability that it is delayed. **[3]**

(vi) In a particular year, Laura has 110 flights. Find the expected number of flights that are delayed. **[2]**

**8** The Department of Health 'eat five a day' advice recommends that people should eat at least five portions of fruit and vegetables per day. In a particular school, 20% of pupils eat at least five a day.

  **(i)** 15 children are selected at random.

    (*A*) Find the probability that exactly 3 of them eat at least five a day. **[3]**

    (*B*) Find the probability that at least 3 of them eat at least five a day. **[3]**

    (*C*) Find the expected number who eat at least five a day. **[2]**

A programme is introduced to encourage children to eat more portions of fruit and vegetables per day. At the end of this programme, the diets of a random sample of 15 children are analysed. A hypothesis test is carried out to examine whether the proportion of children in the school who eat at least five a day has increased.

 **(ii)** (*A*) Write down suitable null and alternative hypotheses for the test.

    (*B*) Give a reason for your choice of the alternative hypothesis. **[4]**

 **(iii)** Find the critical region for the test at the 10% significance level, showing all of your calculations. Hence complete the test, given that 7 of the 15 children eat at least five a day. **[6]**