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Other Names	
Candidate Signature	

Centre Number						Candidate Number				
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Examiner Comments		Total Marks

MATHEMATICS

CM

AS PAPER 2

December Mock Exam (Edexcel Version)

Time allowed: 1 hour and 15 minutes

Instructions to candidates:

- In the boxes above, write your centre number, candidate number, your surname, other names and signature.
- Answer ALL of the questions.
- You must write your answer for each question in the spaces provided.
- You may use a calculator.

Information to candidates:

- Full marks may only be obtained for answers to ALL of the questions.
- The marks for individual questions and parts of the questions are shown in round brackets.
- There are 9 questions in this question paper. The total mark for this paper is 60.

Advice to candidates:

- You should ensure your answers to parts of the question are clearly labelled.
- You should show sufficient working to make your workings clear to the Examiner.
- Answers without working may not gain full credit.

AS/P2/D17

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Section A: Statistics

1 Lauren wants to find the average daily mean windspeed in Hurn in 1987.

She only has access to the large data set. She uses it to obtain a random sample of the daily mean windspeeds, t knots, on n days in Hurn in 1987.

The data collected by Lauren are summarised as follows

$$\sum(t - 5) = 55 \quad \bar{t} = 10$$

(a) Find n . (2)

Lauren uses the same sampling method to estimate that the average daily mean windspeed in Hurn in 2015 was 11 mph.

(b) Convert 11 mph into knots. (1)

(c) Hence, compare the average daily mean windspeed in Hurn in 1987 and 2015. (1)

(d) With reference to the large data set, state **one** limitation of your conclusion in part (c). (1)

(e) Explain how Lauren can

(i) improve her data collection method (1)

(ii) improve her data processing (1)

to allow for a more reliable comparison in part (c).

- 2 Chris investigates the price of petrol, p pence, per litre at fuel stations r miles from his house. He collects data from his local petrol stations and summarises his data in the scatter graph in **Figure 1**.

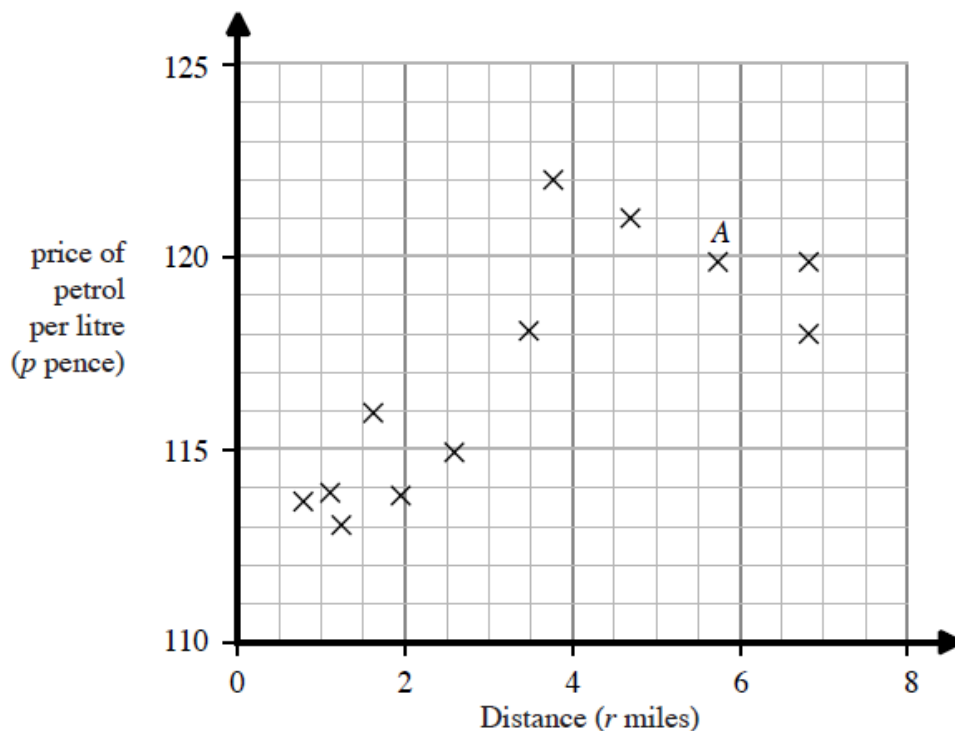


Figure 1

The equation of the regression line of p on r is $p = 113 + 1.13r$.

- (a) Give an interpretation of the gradient of this regression line. (1)

The petrol station *A*, labelled on the graph, is 5.70 miles from Chris' home. A new petrol station *B* has opened 5.80 miles from Chris' home.

- (b) Show that the station *B* is likely to charge less for petrol than station *A*. (2)

Chris is going to visit a friend 100 miles away and wants to estimate the price of petrol near his friend.

- (c) Explain, with the aid of a suitable calculation, why Chris should not use his current model to estimate the price of petrol near his friend. (2)

- 3 A fair four-sided die has faces numbered 1, 2, 3 and 4. A coin is biased so that the probability of tossing heads is $\frac{1}{5}$. The die is thrown once and the number n that it lands on is recorded. The biased coin is then thrown $(n + 2)$ times. So, for example, if the die lands on 3, the coin is thrown 5 times.

- (a) Find the probability that the die lands on 4 and the coin shows heads 4 times. (3)

- (b) Find the probability that the number the die lands on is the same as the number of times the coin shows heads. (3)

- 4 Emma collects information on the number of hours it took individuals to pass their driving test. To collect her data, Emma uses an opportunity sample. She samples 53 individuals and obtained 50 data points. All of Emma's data is summarised by the histogram in **Figure 2**.

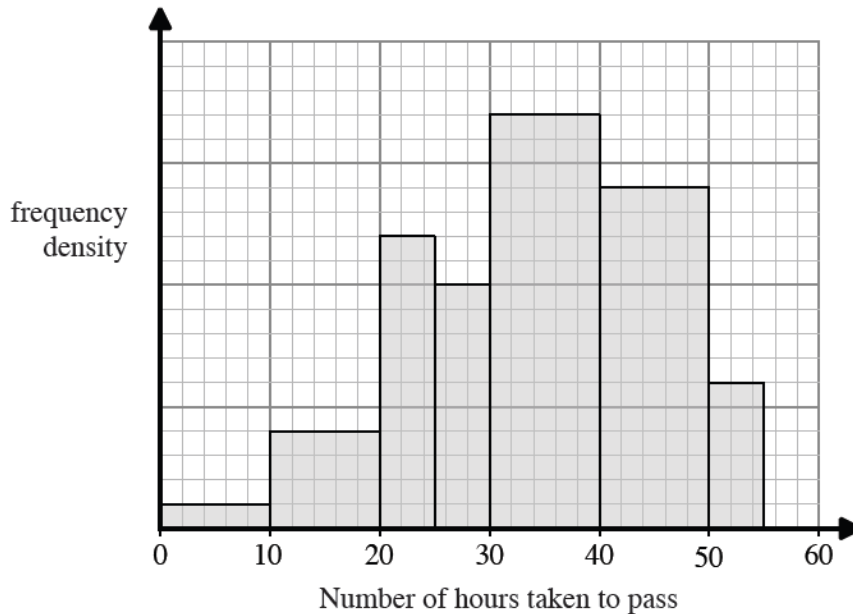


Figure 2

- (a) Suggest why Emma did not obtain 53 data points. (1)
- (b) Find the number of individuals in Emma's sample that took between 25–38 hours to pass their driving test. (4)
- (c) Calculate an estimate for the median of these data. (2)
- 5 (a) Explain briefly what you understand by the critical region of a test statistic. (1)
- (b) A commercial airline reports that two in every thirty of its passengers do not turn up to their flight, and therefore the airline routinely overbooks their flights. An investigative journalist disputes the airline's claims, believing that the proportion is much lower. The journalist picks 50 scheduled passengers at random and finds that one passenger failed to turn up their flight. Investigate the journalist's claims at the 5% level of significance. (4)

Section B: Mechanics

Unless otherwise indicated, whenever a numerical value of g is required, take $g = 9.8 \text{ m s}^{-2}$ and give your answer to either 2 significant figures or 3 significant figures.

- 6** A particle of mass m is attached to one end of a light inextensible string and the other end of the string is fixed to the ceiling. The mass is displaced at an angle, with the string taut, and released.
- (a) State the assumptions made by
- (i) modelling the mass as a particle
 - (ii) modelling the string as light **(3)**
- (b) Suggest **one** assumption it may be useful to make about the environment. **(1)**
- 7** A particle of mass 3 kg is moving on a smooth horizontal surface. At time $t = 0$, the particle passes through the point A and is moving at a constant speed of 15 m/s. After 8 s, the surface becomes rough and the particle is subject to a constant frictional force of magnitude 18 N. The particle subsequently comes to rest at the point B on the surface.
- (i) Find the total time taken for the particle to come to rest.
- (ii) Find the distance between the points A and B . **(7)**
- 8** [In this question, \mathbf{i} and \mathbf{j} are unit vectors directed due east and due north respectively.]
Two forces $(8\mathbf{i} + 3\mathbf{j}) \text{ N}$ and $(x\mathbf{i} + y\mathbf{j}) \text{ N}$ act on a particle.
The resultant force acting on the particle acts at a bearing of 315° .
- (a) Show that $x + y + 11 = 0$. **(2)**
- The magnitude of the resultant force acting on the particle is $28\sqrt{2} \text{ N}$.
- (b) Find the value of x and the value of y . **(6)**

- 9 A light lift L is attached to a vertical light inextensible string. The lift carries two masses A and B and the mass A rests on top of B , as shown in **Figure 3**. The mass of A is 300 g and the mass of B is 750 g.

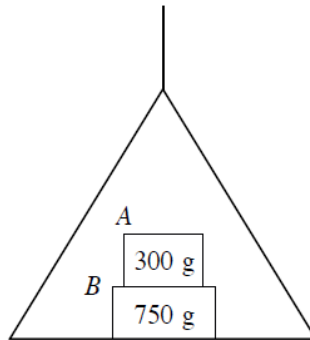


Figure 3

The lift is raised vertically using the string at 2.5 m s^{-2} .

- (a) Find the tension in the string. (3)
 (b) Find the force exerted on the mass B by the mass A . (3)

The lift L and a particle P , of mass $m \text{ kg}$, are then attached to the ends of a light inextensible string. The string passes over a small smooth fixed pulley. The lift and the particle hang freely with the string taut, as shown in **Figure 4**. The mass of P is chosen such that the lift rises vertically with acceleration 2.5 m s^{-2} , as before.

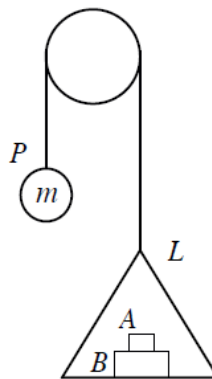


Figure 4

- (c) Find the value of m . (3)
 (d) Calculate the magnitude and direction of the force exerted by the string on the pulley. (2)