

Practice Paper 1(Applied)

Total: 60

Section A- Statistics

Section B- Mechanics

Time to complete: 1 Hour 15 Mins



**MATHSFLEX
TUTORING**
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Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- Fill in the boxes at the top of this page with your name.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided – there may be more space than you need.
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Inexact answers should be given to three significant figures unless otherwise stated.

Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- There are 9 questions in this question paper. The total mark is 60.
- The marks for **each** question are shown in brackets – use this as a guide as to how much time to spend on each question.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Question	Marks
Section A	
1	
2	
3	
4	
5	
Section B	
6	
7	
8	
9	
TOTAL/60	

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Q1

Ted is studying the daily mean wind speed for Heathrow using the large data set from 1987.

The data for one month are summarised in Table 1 below.

Windspeed	n/a	3	4	5	6	7	8	9
Frequency	17	1	1	3	3	2	3	1

Table 1

a. Calculate the mean for these data. **(1 mark)**

b. Calculate the standard deviation for these data and state the units. **(2 marks)**

The means and standard deviations of the daily mean wind speed for the other months from the large data set for Heathrow in 1987 are given in Table 2 below. The data are not in month order.

Month	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
Mean	4.77	5.97	5.77	5.10	5.74
Standard Deviation	1.36	3.10	2.35	1.36	1.76

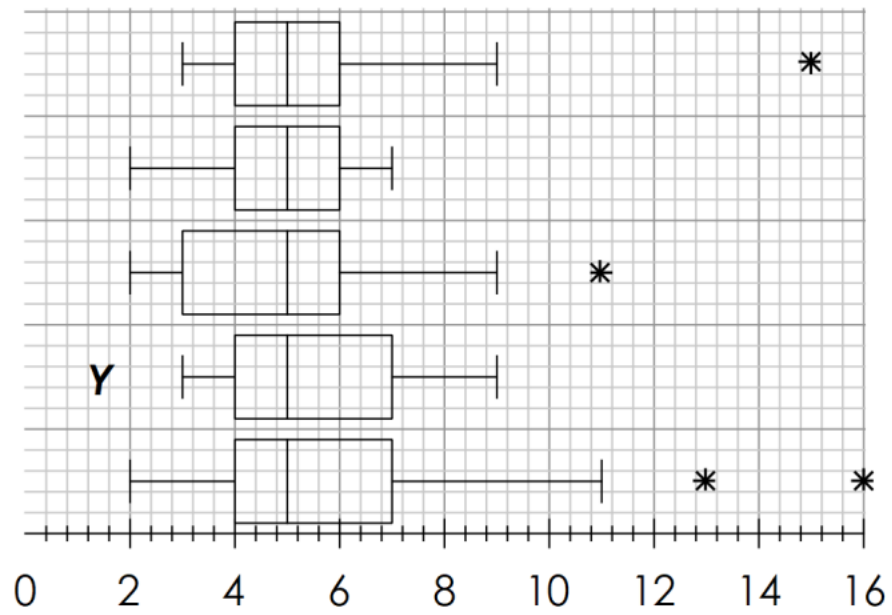
Table 2

c. Using your knowledge of the large data set, suggest, giving a reason, which month had a mean of 4.77. **(2 marks)**

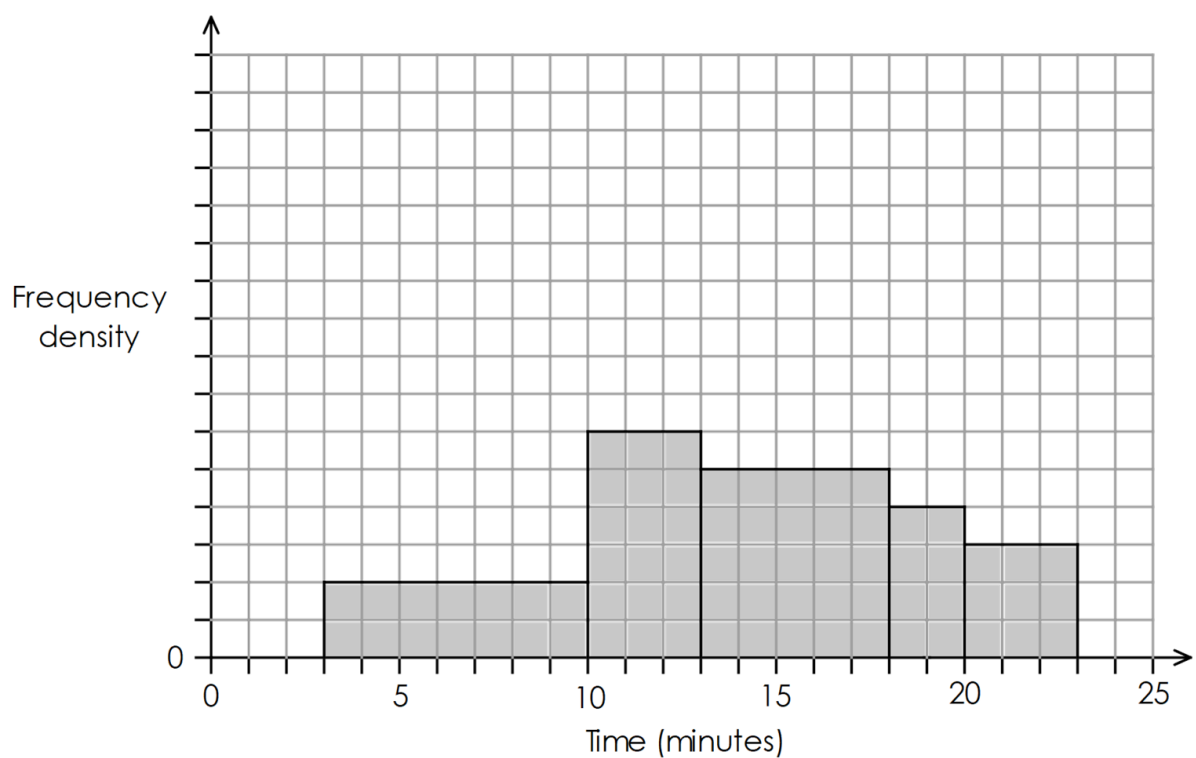
The data for these months are summarised in the box plots below.

They are not in month order or the same order as in Table 2.

- d.
- State the meaning of the * symbol on some of the box plots.
 - Suggest, giving your reasons, which of the months in Table 2 is most likely to be summarised in the box plot marked Y. **(3 marks)**

[illegible]

Q2

**Figure 1**

The histogram in Figure 1 shows the times taken to complete a crossword by a random sample of students.

The number of students who completed the crossword in more than 13 minutes is 105.

Estimate the percentage of students who took less than 12 minutes to complete the crossword.

(4 marks)

Q5

Rebecca is playing a game with four friends. The game is designed to be a game of chance so that the probability of Rebecca winning each game is $\frac{1}{5}$

Rebecca and her friends play the game 30 times.

- a. Find the probability that Rebecca wins
 - i. exactly 4 games
 - ii. more than 7 games

(3 marks)

Rebecca claims she has a method to help her win more than 15 of the games. To test this claim, the five of them played the game again 64 times and Rebecca won 19 of these games.

- b. Stating your hypotheses clearly, test Rebecca's claim at the 5% level of significance.

(4 marks)

[illegible]

[illegible]

END OF SECTION A: STATISTICS

Q7

A train travels along a straight horizontal track between two stations, A and B .

In a model of the motion, the train starts from rest at A and moves with constant acceleration of $0.2ms^{-2}$ for 90s.

The train then moves at a constant velocity before it moves with a constant deceleration of 0.4ms^{-2} , coming to rest at B .

- a. For this model of the motion of the train between A and B ,
 - i. state the value of the constant velocity of the train,
 - ii. state the time for which the train is decelerating,
 - iii. sketch a velocity-time graph.

(3 marks)

The total distance between the two stations is 1845m.

- b. Using the model, find the total time taken by the train to travel from A to B .

(3 marks)

- c. Suggest one improvement that could be made to the model of the motion of the train from *A* to *B* in order to make the model more realistic.

(1 mark)

[illegible]

[illegible]

$$x = \frac{1}{2}t^2(t^2 - 4t + 4)$$
[illegible]

[illegible]

Q9

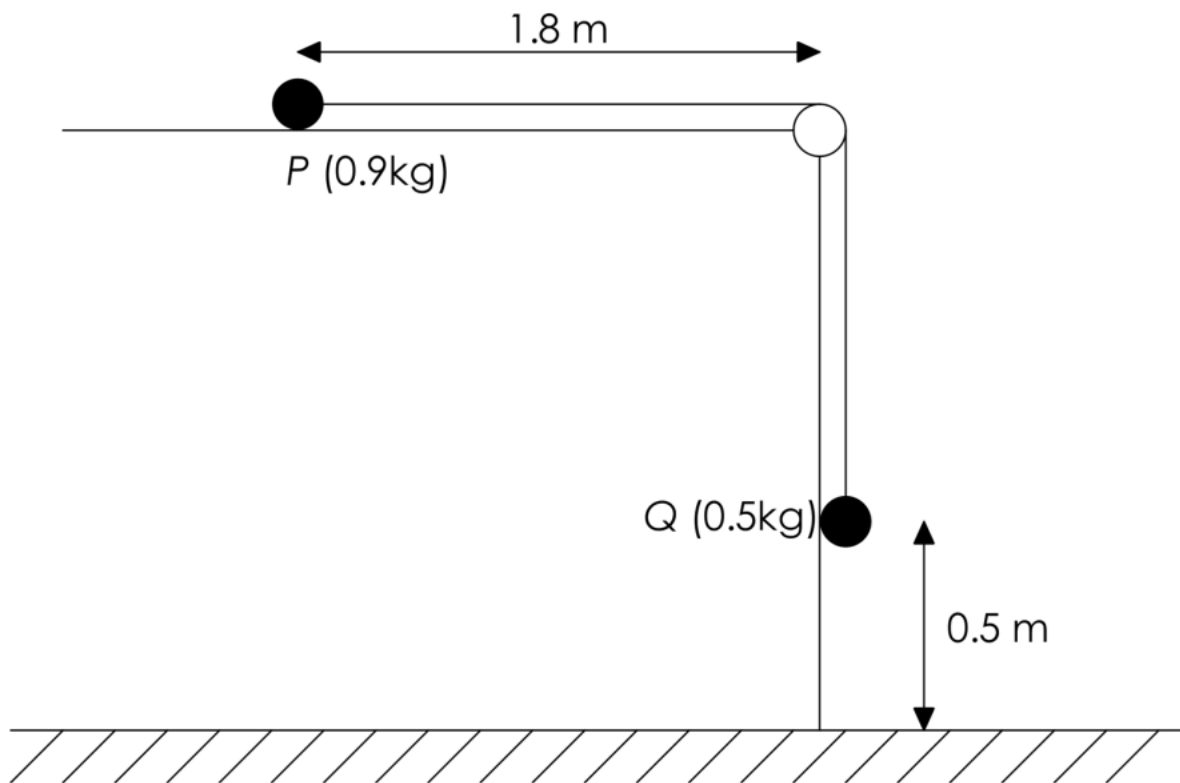


Figure 2

A small ball, P , of mass 0.9kg , is held at rest on a smooth horizontal table and is attached to one end of a thin rope.

The rope passes over a pulley that is fixed at the edge of the table.

The other end of the rope is attached to another small ball, Q , of mass 0.5kg , that hangs freely below the pulley.

Ball P is released from rest, with the rope taut, with P at a distance of 1.8m from the pulley and with Q at a height of 0.5m above the horizontal floor, as shown in Figure 1.

Ball Q descends, hits the floor and does not rebound.

The balls are modelled as particles, the rope as light and inextensible string and the pulley as small and smooth.

Using this model,

- show that the acceleration of Q , as it falls, is 3.5ms^{-2} **(5 marks)**
- find the time taken by P to hit the pulley from the instant when P is released. **(6 marks)**

[illegible]

[illegible]

END OF SECTION B: MECHANICS