Name	 Class
	 Date

Materials

For this paper you must have:

- The booklet of formulae and statistical tables
- You may use a graphics calculator.

Instructions

- Use black ink or black ball-point pen. Pencil should be used for drawing.
- Answer **all** questions.
- You must answer each question in the space provided for that question. If you require extra space, use a 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.

Advice

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

Question	Mark
1	
2	
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9	
Total	

	Section A	
	Answer all questions. Write your answer in the spaces provided.	
1	A bag contains 5 red balls and 7 yellow balls. Two balls are drawn from the bag without replacement.	
a	Draw a tree diagram to illustrate this situation.	[2 marks]
b	Find the probability that the two balls are different colours.	[3 marks]
С	A third ball is drawn. Find the probability that all three balls are the same colour.	[3 marks]

The table shows the daily maximum temperatures recorded at Heathrow during the
month of June in 1987

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	Daily maximum
Date	temperature (°C) in
	1987
	1907
June 1 st	20.5
June 2 nd	15.5
June 3 rd	19.0
June 4 th	19.1
June 5 th	15.6
June 6 th	18.3
June 7 th	16.7
June 8 th	14.2
June 9 th	13.4
June 10 th	17.3
June 11 th	17.2
June 12 th	18.2
June 13 th	17.1
June 14 th	17.9
June 15 th	18.0
June 16 th	16.5
June 17 th	16.2
June 18 th	18.2
June 19 th	16.2
June 20 th	20.0
June 21 st	19.7
June 22 rd	15.9
June 23 rd	19.6
June 24 th	19.1
June 25 th	17.6
June 26 th	21.3
June 27 th	22.1
June 28 th	25.1
June 29 th	28.5
June 30 ^m	24.4

a Calculate the mean and standard deviation for the daily maximum temperatures recorded at Heathrow in June 1987

[2 marks]

Calcu	late the mean and standard deviation of the original temperatures	[4 m
Carcu	and the mean and standard deviation of the original temperatures.	[4 11]
Comr	pare briefly the two data sets.	[1]
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3 a	l	A set of 5 pieces of data has variance 6.64. If $\sum x = 43$, work out $\sum x^2$	[2 marks]
		A different set of 5 pieces of data is coded using the formula $y = 10x - 50$ and the coded values have variance 458.8	
ł)	Work out the variance of the <i>x</i> -values in this set, hence compare this data with the set in part \mathbf{a} .	[3 marks]
		Turn over for the next question	
		Turn over for the next question	

manufactured contain flaws. A sample of 20 jugs is taken.	
The number of jugs which are flawed is given by the random variable <i>X</i> . Suggest a suitable probability distribution to model <i>X</i>	[1 m
i Calculate $P(X = 2)$.	[2 ma
ii Find P(<i>X</i> > 3).	[2 ma
After a new manufacturing process is put in place, customers claim that the new process has altered the number of jugs which are flawed. A new sample of 25 jugs is taken and it is found that there is only one flawed jug. Test, at the 10% level of significance, the hypothesis that the new manufacturing process has altered the number of flaws. You must state your hypotheses clearly.	[5 ma
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	End of section A	
I I		

	Section B	
	Answer all questions in the spaces provided	
5	A stone is dropped vertically from a height of 30 m above the ground. Assume $g = g$	9.81 m s^{-2}
a	How long does it take for the stone to reach the ground?	[2 marks]
b	With what velocity does the stone hit the ground?	[2 marks]
c	State an assumption you have made.	[1 mark]
	Turn over for the next question	
	i uin over for the next question	

Find the distance between the two cars 15 seconds after car P passes A	[5 m

7	A particle starts with velocity 2 m s ⁻¹ and moves with acceleration $a = (2+3t)$ m s ⁻²	
a	Find an expression for v , the velocity of the particle at time t	[4 marks]
h	Find the distance travelled by the particle between $t = 1$ s and $t = 5$ s	[4 marks]
b	Find the distance travelled by the particle between $t = 1$ s and $t = 5$ s	[4 marks]
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8 Two particles, P and Q, are connected by a light inextensible string and pass over a smooth pulley as shown in the diagram.



The mass of particle P is 2 kg and the mass of particle Q is 7 kg $\,$

a The system is released from rest. Work out the magnitude and direction of the acceleration and the tension in the string. You may assume that $g = 10 \text{ m s}^{-2}$ [5 marks]

b State the significance of the string being inextensible.

[1 mark]

An object is in equilibrium and has forces $F_1 = 3\mathbf{i} + 2\mathbf{j}$, $F_2 = -2\mathbf{i} + 4\mathbf{j}$ and $F_3 = a\mathbf{i} + b\mathbf{j}$ acting on Find the magnitude and direction of the force F_2 .
End of section B