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**1.** Sam is playing a computer game.

When Sam earns a reward in the game, she randomly receives either a Silver reward or

a Gold reward.

Each time that Sam earns a reward, the probability of receiving a Gold reward is 0.4

One day Sam plays the computer game and earns 11 rewards.

(*a*)Find the probability that she receives

(i) exactly 2 Gold rewards,

**(2)**

(ii) at least 5 Gold rewards.

**(2)**

In the next month Sam earns 300 rewards.

She decides to use a Normal distribution to estimate the probability that she will receive

at least 135 Gold rewards.

(*b*)(i) Find the mean and variance of this Normal distribution.

**(2)**

(ii) Estimate the probability that Sam will receive at least 135 Gold rewards.

**(2)**

**(Total for Question 1 is 8 marks)**

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**2.** Xiang is investigating how room temperature affects a person’s score in a task.

She gets Simon to complete the task 11 times at various controlled room temperatures,

*x* °C.

Xiang records the temperature, *x*, and Simon’s score, *y*, where *y* is an integer.

The results are shown in the scatter diagram below.



(*a*)Use the scatter diagram to find

(i) the median score

(ii) the range of the scores.

**(2)**

The temperature was increased each time Simon completed the task.

Xiang believes that as the room temperature increases, Simon’s score will decrease.

Xiang calculates the product moment correlation coefficient from her data as –0.9286

(*b*)Use this calculated value to carry out a suitable hypothesis test to investigate her

belief at a 5% level of significance.

State clearly

* your hypotheses
* your critical value

**(3)**

Xiang is concerned that because Simon is repeating the same task his scores

may improve.

(*c*)Comment on how this concern may affect Xiang’s conclusion to the test in part (*b*).

**(1)**

**(Total for Question 2 is 6 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**3.**



Figure 1 shows a Venn diagram with two events, *A* and *B*, and their

associated probabilities.

(*a*)Explain whether or not events *A* and *B* are independent.

Show your working clearly.

**(3)**

(*b*)Find P (*B* | *A*ʹ)

**(2)**

(*c*)Complete the tree diagram in Figure 2 by calculating the probabilities associated

with each branch.



**(4)**

**On the next page is a spare copy of Figure 2 if you need to redraw your tree diagram.**

**(Total for Question 3 is 9 marks)**

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**Only use this copy of Figure 2 if you need to redraw your tree diagram.**



**4.** Kaiyang and Maggie are studying the pattern of rainfall where they live in Hurn.

Kaiyang decides to record whether or not it is raining at 6 a.m. for the next 10 days.

(*a*)State the name of the sampling method Kaiyang is using.

**(1)**

Kaiyang suggests that the binomial distribution with *n* = 10 would be a good model for

the number of days in a 10-day period when it is raining at 6 a.m.

(*b*)Explain why the binomial distribution might not be a good model in this situation.

**(1)**

Maggie uses data from the large data set for Hurn in 2015.

She randomly selects 30 days from the large data set for Hurn in 2015 and for each day

records the Daily Total Rainfall, *x* (mm)

Some of her 30 days have ‘tr’ recorded as the Daily Total Rainfall.

(*c*)Using your knowledge of the large data set

* state what ‘tr’ means
* suggest what Maggie could do with these ‘tr’ entries to clean her data set
* explain what effect this action is likely to have on an estimate of the mean
Daily Total Rainfall

**(3)**

Maggie summarises her data in the grouped frequency table shown below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Daily Total Rainfall, *x* (mm)** | 0 | 0 < *x* ≤ 1 | 1 < *x* ≤ 3 | 3 < *x* ≤ 7 | 7 < *x* ≤ 15 |
| **Frequency, f** | 7 | 10 | 2 | 7 | 4 |

(*d*)Use this information to estimate the mean Daily Total Rainfall for these 30 days.

**(2)**

(*e*)Show that the estimated value of S*xx* for the Daily Total Rainfall for these 30 days is

411.4 to 1 decimal place.

**(3)**

Maggie defines an outlier as a value which is more than 3 standard deviations from

the mean.

(*f*)State, giving a reason, whether or not there could be any possible outliers in

Maggie’s data.

**(3)**

**(Total for Question 4 is 13 marks)**

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**5.** Kim and Tom are both learning to tune a violin.

Kim’s teacher asks her to tune the *A*-*string* of her violin to the correct frequency in

hertz (Hz).

When Kim tunes the *A*-*string*, its frequency may be modelled by a Normal distribution.

When Kim first starts learning, she tunes the *A*-*string* with a mean frequency of 443 Hz

and a standard deviation of 6 Hz.

The correct frequency for the *A*-*string* is 440 Hz.

Find the probability that Kim tunes the *A*-*string*

(*a*)lower than the correct frequency,

**(2)**

(*b*)more than 5 Hz away from the correct frequency.

**(2)**

After practising for a month, Kim tunes the *A*-*string* with a standard deviation of 4.5 Hz.

She claims that the mean frequency when she tunes the *A*-*string* is now less

than 443 Hz.

Kim’s teacher asks Kim to tune the *A*-*string* 20 times and finds that the mean frequency

is 442 Hz.

(*c*)Test at the 5% level of significance whether or not there is evidence to support

Kim’s claim.

You should state your hypotheses and show your working clearly.

**(4)**

When Tom tunes the *A*-*string*, its frequency, *T* Hz, may be modelled by *T* ~ N (*μ*, *σ*2)

Given that P (*T* < 438) = 0.2 and that P (*T* > 445) = 0.1

(*d*)find the value of *μ* and the value of *σ*, giving your answers, in Hz,

to 1 decimal place.

**(6)**

**(Total for Question 5 is 14 marks)**

**TOTAL FOR STATISTICS IS 50 MARKS**