Cambridge International AS & A Level

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Mathematics 9709/52

Paper 5 Probability & Statistics 1 **May/June 2023**

Question No (2)

2 A sports event is taking place for 4 days, beginning on Sunday. The probability that it will rain on Sunday is 0.4. On any subsequent day, the probability that it will rain is 0.7 if it rained on the previous day and 0.2 if it did not rain on the previous day.

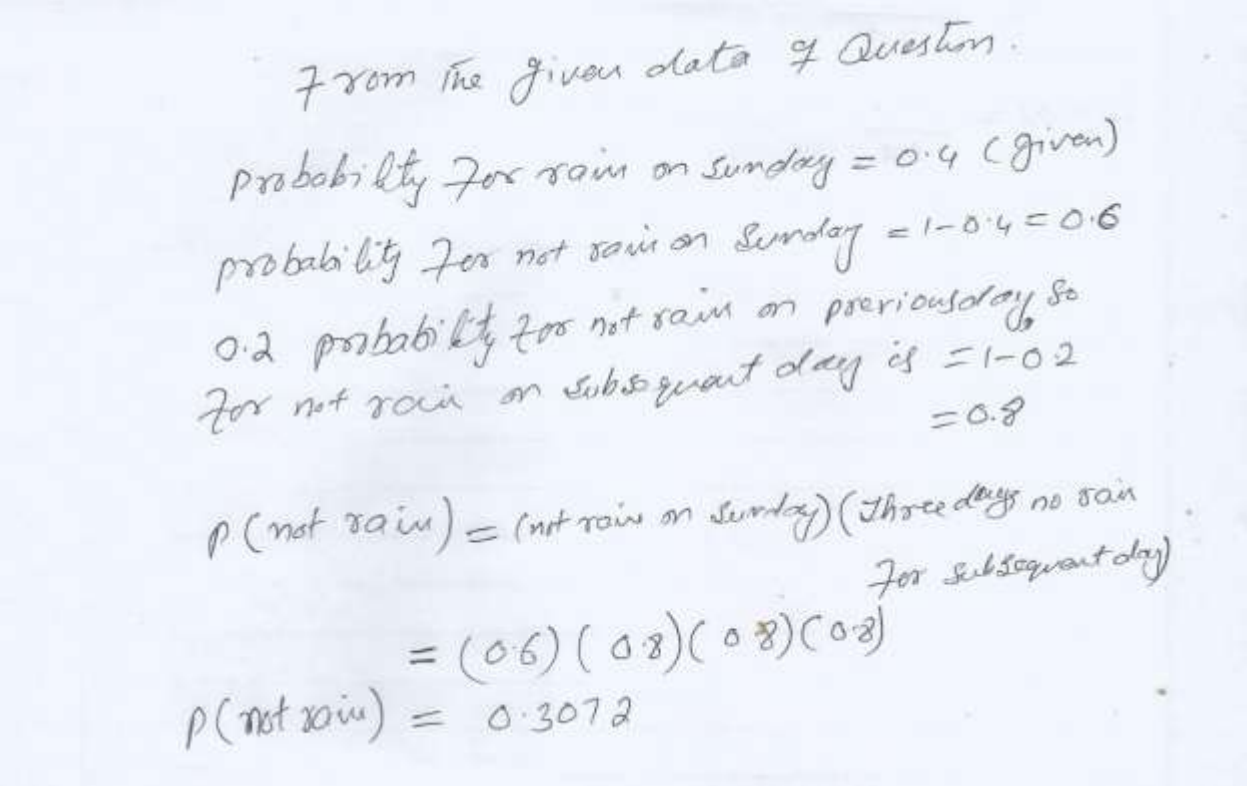
(a) Find the probability that it does **not** rain on any of the 4 days of the event.

(b) Find the probability that the first day on which it rains during the event is Tuesday.

(c) Find the probability that it rains on exactly one of the 4 days of the event.

Solution:

(a)



(b)

From part (a), not rain on Sunday 0.6.

not rain on subsequent day 0.8

rain on subsequent day 0.2

P(rain on Tuesday) = (0.6)(0.8)(0.2)

= 0.096

(c)

Let R = rain , D = dry

There may be rain on any one of the 4 days. We shall find the probability of

P(RDDD), P(DRDD), P(DDRD), P(DDDR)

From the statement of the question and partial probability of rain on first day (0.4) i.e on Sunday.

Now dry for next day is 1 − 0.7 = 0.3

As it does not rain on previous day, so for third dry day we have 0.8 and for fourth day 0.8 (dry previous day).

so probability for first day rain during 4 days is

$$P(RDDD) = (0.4)(0.3)(0.8)(0.8)$$
$$= 0.0768$$

now for the rain on second day

$$P(DRDD) = (0.6)(0.2)(0.3)(0.8)$$
$$= 0.0288$$

similarly for third day rain

$$P(DDRD) = (0.6)(0.8)(0.2)(0.3)$$
$$= 0.0288$$

for fourth day rain

$$P(DDDR) = (0.6)(0.8)(0.8)(0.2)$$
$$= 0.0768$$

so the probability for exactly one day rain in 4 days is

$$= P(RDDD) + P(DRDD) + P(DDRD) + P(DDDR)$$
$$= 0.076 + 0.028 + 0.028 + 0.076$$
$$P = 0.211$$