CATCHING THE COPYCAT
II. CATCHING THE COPYCAT (70 MARKS)  There are two coins A and C, of which C is a copycat. You are heading an effort to catch the copycat coin C. Coin A has a mind of its own and tossing it gives heads with probability 2/3. The behavior of coin C is dependent on whether it is tossed first or after coin A. If coin C is tossed first, the toss gives heads with probability 1/2. On the other hand, if C is tossed after coin A, coin C tries to copy the outcome of the toss of coin A. Specifically, if the toss of A gave heads, the toss of C gives heads with probability 3/4. If the toss of A gave tails, the toss of C gives heads with probability 1/3.  You are scheduled to see the coins perform at an exhibition. The performance will proceed as follows. The two coins (identities unknown) will be brought in a jar. One of the coins will be picked randomly from the jar and tossed. Following this, the other coin in the jar will be tossed. You decide that you will choose the coin that is tossed first to be coin C in case the outcomes of the two tosses are different. Else, you will choose the second coin to be tossed to be coin C. Answer the following questions. [Hint: Tree diagrams may come in handy.]
<ul> <li>(a) (4 marks) What is the probability that coin A is chosen for the first toss?</li> <li>(b) (12 marks) What is the probability that the first coin toss gives heads and the second gives tails?</li> <li>(c) (12 marks) What is the probability that the first coin toss gives tails and the second gives heads?</li> <li>(d) (12 marks) What is the probability that both coin tosses give heads?</li> <li>(e) (12 marks) What is the probability that both coin tosses give tails?</li> <li>(f) (18 marks) What is the probability that you will choose the correct coin C?</li> </ul>
A 1/2 Mc (A, TA, Mc)  TA 2/3
TO (A, TA, TC)  TE (A, TA, TC)  TE (A, TA, TC)  TO YOU MA (C, MC, MA)  TO 2/2  MA (C, TC, MA)
TH (C,TC,TA)  A so He event Heat coin A was forsed first.  Cooke event Heat coin C was toosed first.
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P[A]=1/2.
(b) This happens in his mutually exclusive ways. The events are {(A, MA, Te)} and {(C, Mc, TA)}  The probability of Redesired event is  P[?(A, MA, Te)] + P[?(C, Mc, TA)]
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(F) One of the Mutually exclusive events below must occur for you to choose the cornect
(C) Tc, HA) Since the outcomes of the Josses are different you will choose the first cointribe coin C.  Those are the events where
(A,TA, Tc) fint coin.
you will chose the second coin to be coin C. There are the two events, which when either occurs, will have you guess comedly-
P[Yon choosing the connect coin] = P[{(C, Tc, HA)}]+P[{(C, Hc, TA)}]
$ + P\left[(A, HA, HC)\right] + P\left[(A, TA, TZ)\right] $ $ = (4)(4)(2) + (4)(4)(3)$ $ + (4)(2)(2) + (4)(3)(2)$ $ + (4)(3)(2)(3)$
= \frac{1}{4} + \frac{1}{4} + \frac{1}{9} = \frac{1}{2} + \frac{1}{9} \tau 0.6/1.
The C, innespective of the outcomes? What is the probability that you will choose the correct coinc? Is this better on worse??  B) Can you Rich of abetter deterministic strategy
flan in the question?
I. Two Coin Tosses (30 Marks)  You perform an experiment that involves tossing a coin twice and noting the outcome of each toss. A coin toss leads to an outcome from the set $\{H, T\}$ , where outcome $H$ denotes heads and outcome $T$ denotes tails. The coin tosses are independent and the probability that a toss gives heads is $p$ . Answer the following questions.  (a) (4 marks) In terms of the given set of outcomes, write down the event that the first toss gives heads. Express
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1. Two CON TOSSES (30 MARKS)  You perform an experiment that involves tossing a coin twice and noting the outcome of each toss. A coin toss leads to an outcome from the set (14.7), where outcome 18 denotes heads and outcome 7 denotes tails. The coin tosses are independent and the probability that a toss gives heads is p. Amore the following upscisos.  (a) (a marks) In terms of the probability that a toss gives heads is p. Amore the following upscisos.  (b) (a marks) Similar to above, write down the event that at least one toss gives heads. Express the probability of the event in terms of the probability of the cent in terms of the probability of the event the interns of the probability of heads in the first toss gives heads. Express the probability of heads in the first toss gives heads. Suggest heads using standard notation. What is this probability as a function of p?  (b) (a marks) What is the probability of heads in the cointineed on heads in the first toss. Express it using notation. What is this probability as a function of p?  (c) (a marks) What is the probability of the heads contineed on heads in the first toss. Express it using notation. What is the probability of the heads on the first toss, given that at least one heads was observed?  (d) (a marks) What is the probability of the ads on the first toss, given that at least one heads was observed?  (e) (a marks) What is the probability of the heads on the first toss, given that at least one heads was observed?  (e) (a marks) What is the probability of the case of the probability of the heads on the first toss, given that at least one heads was observed?  (e) (a marks) What is the probability of the heads on the first toss, given that at least one heads was observed?  (f) (a marks) What is the probability of the heads on the first toss, given that at least one heads was observed?  (e) (marks) What is the probability of the heads of the probability of the head
1. Two COIN TOSSES (30 MARKS)  You perform an experiment that involves tossing a coin twice and outcome of each toss. A coin toss leads to an outcome from the set {H_II}, where contended the probability of the event in terms of probability at a toss gives heads is in. Answer the following questions.  (a) (a marks) final to above, write down the event that the first toss gives heads. Express the probability of the event in terms of probabilities of the outcomes it contains.  (b) (a marks) Similar to above, write down the event that a loss does too story the sheet. Express the probability of the event in terms of probabilities of the outcomes it contains.  (c) (a marks) Too pick the outcome of any coin toos. What is the probability at the outcome is H?  (d) (a marks) Express the probability of feasts in the second toos conditioned on the knowledge that the first toos give heads using another the probability of the east on the first toos. Express it using notation. What is this probability as a function of p?  (d) (a marks) Marks is the probability of the least one heads was observed, given that the second toos gave heads?  (g) (6 marks) What is the probability that at least one heads was observed?  (d) (a marks) What is the probability of heads on the first toos, given that at least one heads was observed?  (e) (a marks) What is the probability of heads on the first toos, given that at least one heads was observed?  (e) (a marks) What is the probability of heads on the first toos, given that at least one heads was observed?  (f) (a marks) What is the probability of heads on the first toos, given that at least one heads was observed?  (g) (a marks) What is the probability of heads on the first toos, given that the first toos gave heads?  (g) (a marks) What is the probability of heads on the first toos given heads of the probability of heads on the first too heads was observed.  (g) (a marks) What is the probability of heads on the first too heads was observed.  (g) (a marks) What is the probability of heads in the
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