

Tree diagrams and independent events

About 50 minutes No calculator 44 marks



Hints online, answers free with an account:
mathswariz.uk/worksheets/gcse-tree-diagrams-and-independent-events/

Date _____

A Do Now

The first question is what today's lesson needs. The others bring back earlier topics.

- A1** Needed today [2 marks] **A2** From chapter 17 [2 marks]
- Jon has £150. Jon spends $\frac{3}{5}$ of it on a bike and $\frac{5}{6}$ of what is left on a helmet. How much money is left?
- Solve the simultaneous equations $x^2 + y^2 = 73$ and $y = x + 11$.

Answer

Answer

- A3** Last lesson [2 marks] **A4** From chapter 10 [2 marks]
- A spinner can land on red, blue, green or yellow. $P(\text{red}) = 0.37$ and $P(\text{blue}) = 0.27$. Green and yellow are equally likely. Find $P(\text{green})$.
- Find the equation of the line through $(0, -2)$ and $(3, 7)$.

Answer

Answer

B Example, then your turn

Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

The probability that it rains on any day is 0.25, and the days are independent. Work out the probability that it rains on at least one of two days.

Hint The only way it does not happen is no rain on both days: $0.75 \times 0.75 = 0.5625$. Take that from 1.

- B1** [2 marks]
- A house has two smoke alarms. Each one fails with probability 0.15, independently of the other. Work out the probability that at least one alarm fails.

Answer

EXAMPLE 2

A drawer holds 6 black and 3 white socks. Two are taken at random without replacement. Work out the probability that both are black.

Hint After one black sock has gone there are 5 black socks left out of 8.

B2 A box holds 7 white and 5 brown eggs. Two are taken at random without replacement. Work out the probability that both are white. [2 marks]

Answer

c Practice

C1 A fair dice is thrown three times. [2 marks]
Work out the probability that the first six comes on the third throw.

Answer

C2 A bag holds 5 red and 4 white beads. Two are taken at random without replacement. Work out $P(\text{at least one is red})$. [3 marks]

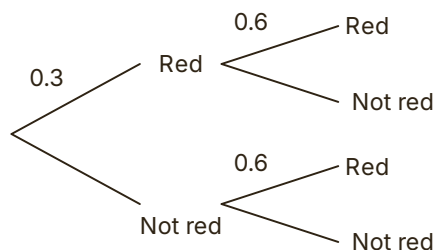
Answer

C3 A coin is biased. It is thrown twice, and the probability of two heads is 0.4225. Work out the probability of two tails. [3 marks]

Answer

C4 $P(A) = 0.6$, $P(B) = 0.35$ and $P(A \text{ and } B) = 0.21$. Are A and B independent? Show how you decide. [2 marks]

C5 Two spinners are spun. The tree diagram shows the probability that each lands on red. Complete the tree diagram, then work out the probability that exactly one of them lands on red. [3 marks]



Answer

C6 A spinner lands on 1, 2 or 3. $P(1) = 0.4$, $P(2) = 0.5$ and $P(3) = 0.1$. It is spun twice and the two scores are added. Work out the probability that the total is 4. [3 marks]

Answer

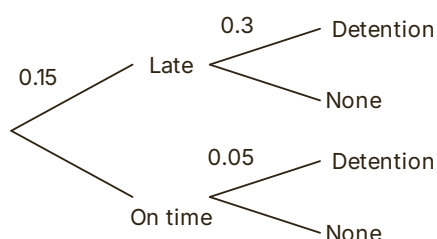
D Exam-style questions

- D1** A bag holds 8 counters. 3 are blue and the rest are yellow. Two counters are taken at random without replacement. Sam says, "The probability that both are blue is $\frac{3}{8} \times \frac{3}{8} = \frac{9}{64}$." Explain what Sam has done wrong, and work out the correct probability. [3 marks]

Answer

- D2** A box holds 12 raffle tickets, and 4 of them win a prize. Ana takes a ticket, puts it back, then takes another. Ben takes two tickets without putting the first back. Who is more likely to get at least one winning ticket? You must show your working. [4 marks]

- D3** The probability that Ella is late for school is 0.15. If she is late, the probability that she gets a detention is 0.3. If she is on time, the probability that she gets a detention is 0.05.



- (a) Complete the tree diagram. Work out the probability that Ella is late and gets a detention. [2 marks]

Answer

- (b) Work out the probability that Ella gets a detention. [2 marks]

Answer

- (c) Ella goes to school on 400 days. On how many of them would you expect her to get a detention? [1 mark]

Answer

Total for D3: 5 marks

E Extension

No route is given. The hints are at the end of the sheet. Use one at a time.

- E1** A pot holds 3 red, 4 blue and 5 green pens. Three pens are taken at random without replacement. Work out the probability that there is one pen of each colour. [4 marks]

Answer

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** Work out the probability of red, then blue, then green, in that order.
- Hint 2** $\frac{3}{12} \times \frac{4}{11} \times \frac{5}{10} = \frac{60}{1320}$. Every order of the three colours gives the same answer.
- Hint 3** There are 6 orders, so multiply by 6.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

- I can multiply along a tree and add between its paths. ☐ ☐ ☐
- I can use $1 - P(\text{none})$ for "at least one". ☐ ☐ ☐
- I can change the second probability when nothing is put back. ☐ ☐ ☐