Name:

Exam Style Questions

Tree Diagrams

Corbettmaths

Equipment needed: Calculator, pen

Guidance

1. Read each question carefully before you begin answering it.
2. Check your answers seem right.
3. Always show your workings

Video Tutorial

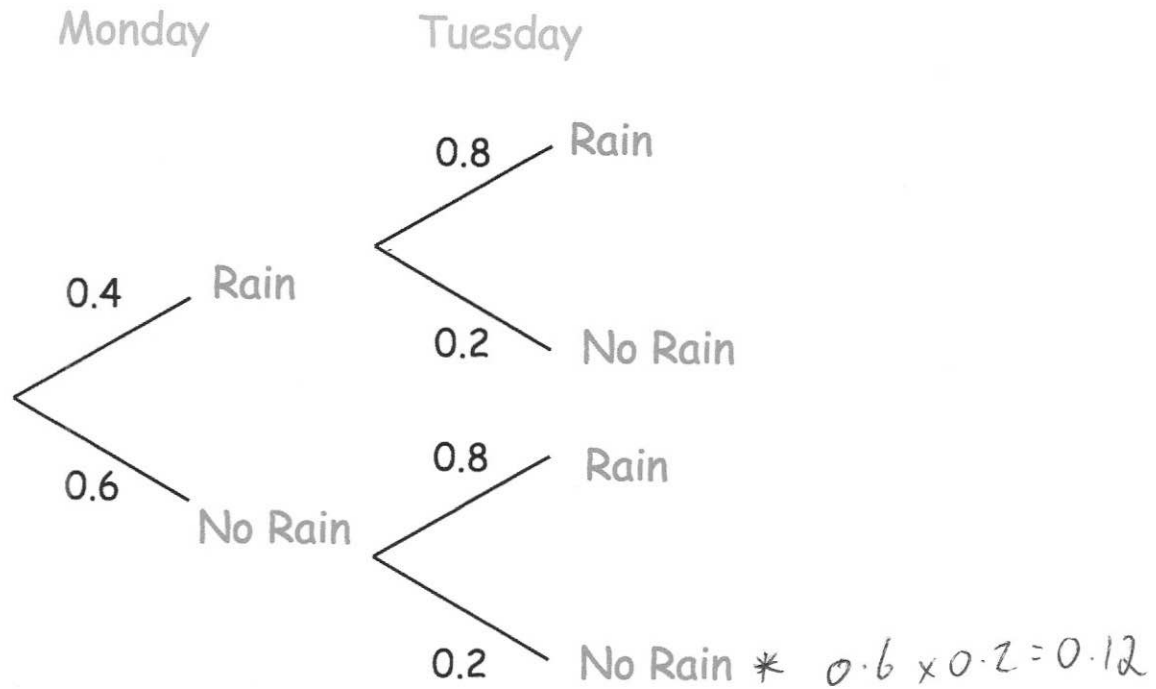www.corbettmaths.com/contents

Video 252

Answers and Video Solutions

1. The probability that it rains on Monday is 0.4
The probability that it rains on Tuesday is 0.8

The probability tree diagram shows this information.

Monday   Tuesday

                              0.8   Rain
              0.4   Rain
                              0.2   No Rain

                              0.8   Rain
              0.6   No Rain
                              0.2   No Rain * $0.6 \times 0.2 = 0.12$

Work out the probability that there will be **no rain** on Monday and **no rain** on Tuesday.

$$0.6 \times 0.2 = 0.12$$

0.12
....
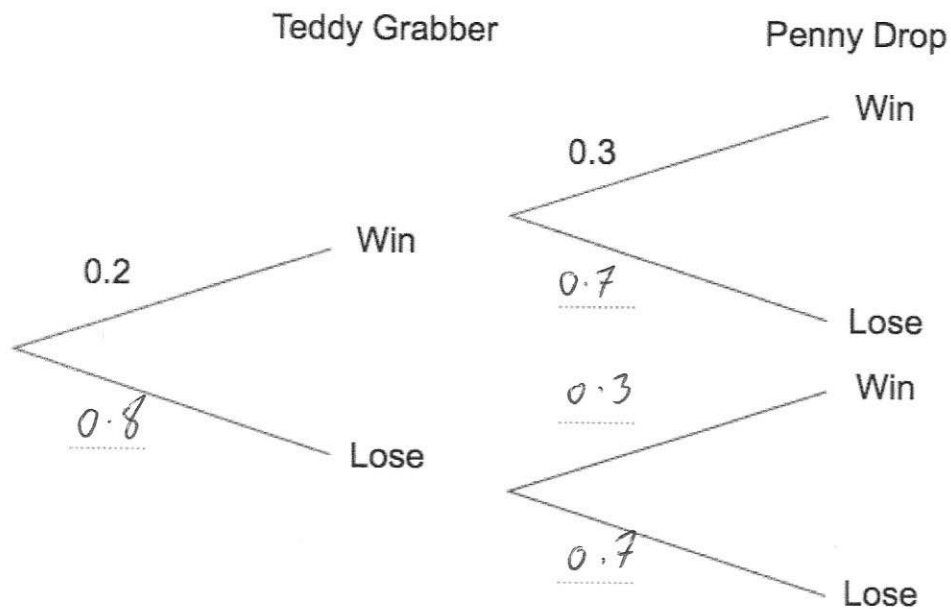
(2)

2. James goes to an arcade.

He has one go on the Teddy Grabber.
He has one go on the Penny Drop.

The probability that he wins on the Teddy Grabber is 0.2.
The probability that he wins on the Penny Drop is 0.3.

(a) Complete the tree diagram.

Teddy Grabber   Penny Drop

                                         Win

                           0.3

                Win

0.2

                             0.7

                                     Lose

                           0.3   Win

0.8

                Lose

                           0.7

                                     Lose

(2)

(b) Work out the probability that James wins on the Teddy Grabber and he also wins on the Penny Drop.

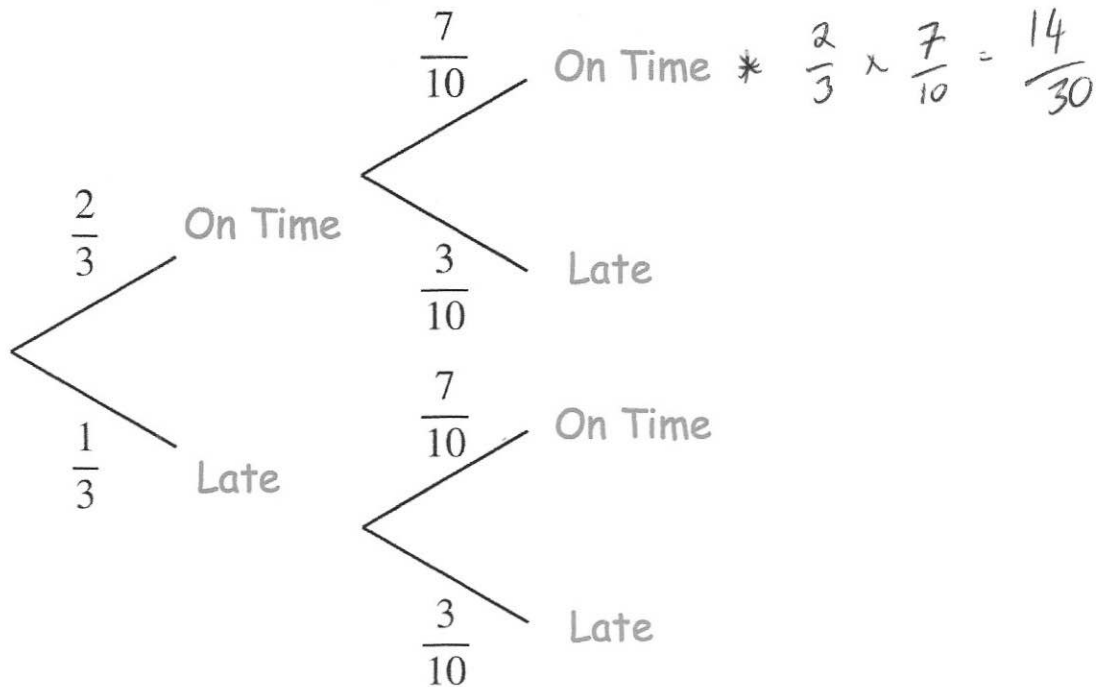$$P(ww) = 0.2 \times 0.3 = 0.06$$

0.06

(2)

3. Ross posts a birthday card to Salvador and a birthday card to Pablo.

The probability tree shows the probabilities of each card arriving on time or late.

Salvador's Card   Pablo's Card

$\dfrac{2}{3}$ On Time

$\dfrac{7}{10}$ On Time $*$ $\dfrac{2}{3} \times \dfrac{7}{10} = \dfrac{14}{30}$

$\dfrac{3}{10}$ Late

$\dfrac{1}{3}$ Late

$\dfrac{7}{10}$ On Time

$\dfrac{3}{10}$ Late

Work out the probability that both cards arrive **on time**.

$$\dfrac{2}{3} \times \dfrac{7}{10} = \dfrac{14}{30}$$

$$= \dfrac{7}{15}$$

$\dfrac{14}{30}$ or $\left(\dfrac{7}{15}\right)$

....

(2)

4. Natalie has 8 socks in a drawer.

5 of the socks are black.
3 of the socks are white.

Natalie takes out a sock at random, writes down its colour and puts it back into the drawer.
Then Natalie takes out a second sock, at random, and writes down its colour.

(a) Complete the probability tree diagram.

First sock   Second sock

$\frac{5}{8}$ Black   *

$\frac{5}{8}$ Black

$\frac{3}{8}$ White

$\frac{5}{8}$ Black

$\frac{3}{8}$ White

$\frac{3}{8}$ White   *

(2)

(b) Work out the probability that the two socks are the same colour.

$$P(BB) = \frac{5}{8} \times \frac{5}{8} = \frac{25}{64}$$

$$P(WW) = \frac{3}{8} \times \frac{3}{8} = \frac{9}{64}$$

$$\frac{25}{64} + \frac{9}{64} = \frac{34}{64}$$

$$= \frac{17}{32}$$

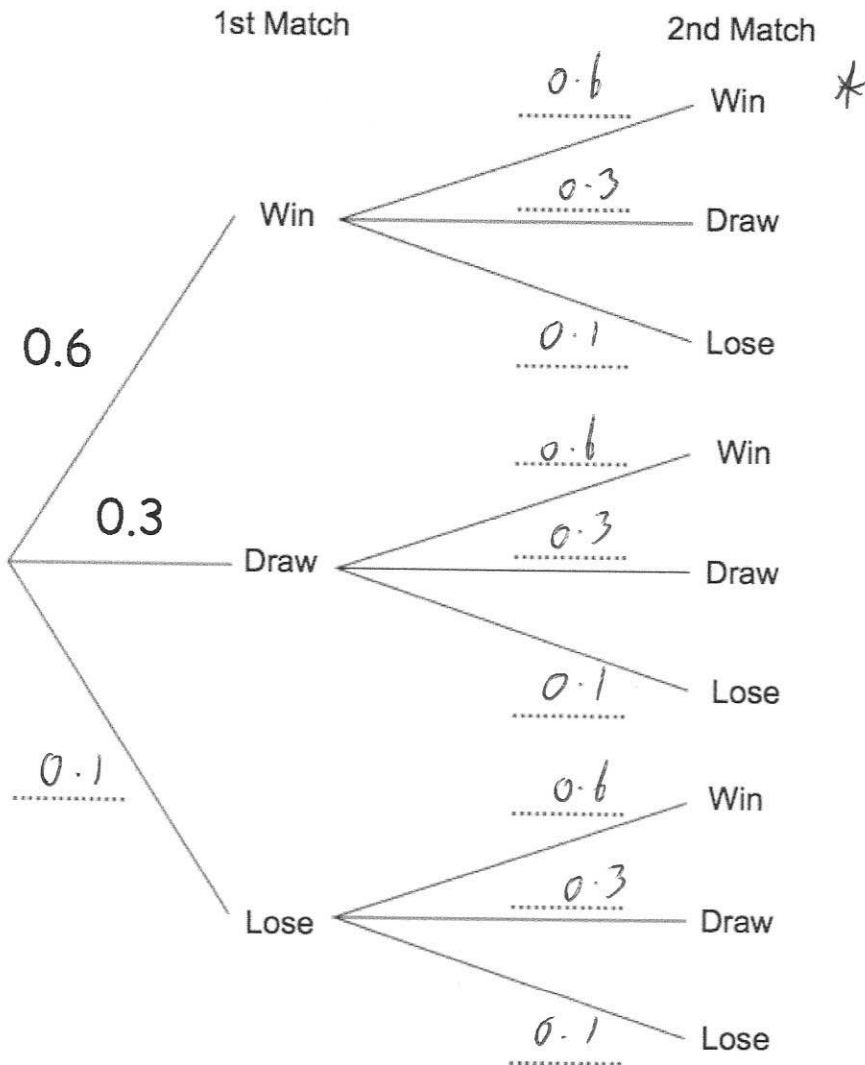$\frac{17}{32}$ or $\left(\frac{34}{64}\right)$

(2)

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5. A football team has two matches to play.

The probability that the team wins is 0.6
The probability that the team draws is 0.3

(a) Complete the tree diagram.

1st Match   2nd Match

                                0.6
                          .... Win   ✱

                                0.3
              Win ≤   .... Draw

                                0.1
                          .... Lose

                                0.6
                          .... Win

0.6   0.3
      0.3   Draw ≤   .... Draw

                                0.1
                          .... Lose

      0.1   0.6
   .... Win

                                0.3
              Lose ≤   .... Draw

                                0.1
                          .... Lose

(2)

(b) Work out the probability that the team will win both matches.

$$P(ww) = 0.6 \times 0.6 = 0.36$$

.... 0.36 ....

(2)

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6. There are green and blue counters in a container.

Kevin takes at random a counter from the container.
He replaces the counter in the container.

Kevin takes at random a second counter from the container.

(a) Complete the probability tree diagram.

First counter   Second counter

$\frac{7}{8}$ ⟶ Green

Green

$\frac{1}{8}$ ⟶ Blue ✳

$\frac{7}{8}$

$\frac{7}{8}$ ⟶ Green ✳

$\frac{1}{8}$

Blue

$\frac{1}{8}$ ⟶ Blue

(2)
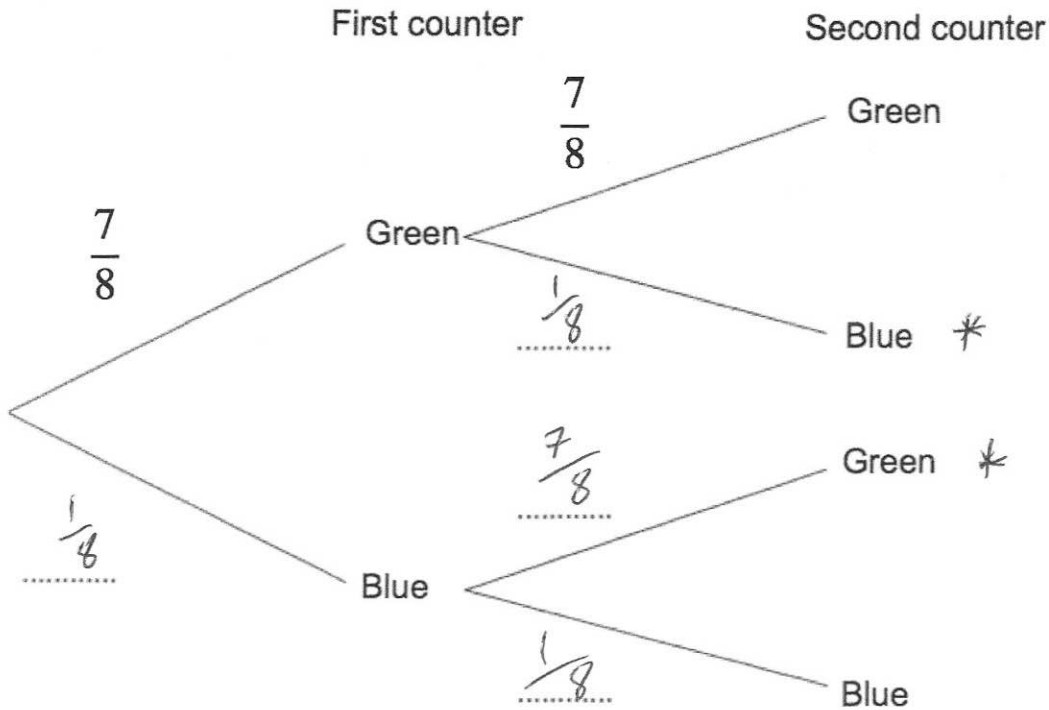
(b) Work out the probability that Kevin picks counters that are different colour.

$P(GB) = \frac{7}{8} \times \frac{1}{8} = \frac{7}{64}$

$P(BG) = \frac{1}{8} \times \frac{7}{8} = \frac{7}{64}$

$P(\text{different colour}) = \frac{7}{64} + \frac{7}{64} = \frac{14}{64}$

or

$\frac{7}{32}$

$\frac{7}{32}$ or $\left(\frac{14}{64}\right)$

....

(2)

7. Jennifer is playing darts.
She throws two darts aiming for a Bullseye.

The probability Jennifer hits the Bullseye on her first throw is $\frac{1}{4}$

The probability she hits the Bullseye on her second throw is $\frac{1}{3}$

(a) Complete the tree diagram.

First throw   Second throw

$\frac{1}{3}$

$\frac{1}{4}$ Hit   Hit ✳

$\frac{2}{3}$ ....   Miss ✳

$\frac{1}{3}$ ....   Hit ✳

$\frac{3}{4}$

....   Miss

$\frac{2}{3}$ ....   Miss

(b) Work out the probability Jennifer hits the Bullseye at least once.

$P(HH) = \frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$

$P(HM) = \frac{1}{4} \times \frac{2}{3} = \frac{2}{12}$

$P(MH) = \frac{3}{4} \times \frac{1}{3} = \frac{3}{12}$

$P(\text{at least one hit}) = \frac{1}{12} + \frac{2}{12} + \frac{3}{12} = \frac{6}{12}$

....

or

$\frac{1}{2}$

(2)

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8. Two boxes contain cupcakes

In box 1, there are 2 lemon and 3 chocolate cupcakes. $2+3=5$
In box 2, there are 6 chocolate and 5 vanilla cupcakes. $6+5=11$

Nafisa picks a cupcake at random from box 1 and then a cupcake at random from box 2.

(a) Complete the probability tree diagram.

Box 1   Box 2

                          $\frac{6}{11}$
                          .... Chocolate ✳

$\frac{2}{5}$ Lemon $\frac{5}{11}$
.... Vanilla

$\frac{3}{5}$ $\frac{6}{11}$
.... Chocolate
        Chocolate
                          $\frac{5}{11}$
                          .... Vanilla ⊬

(2)
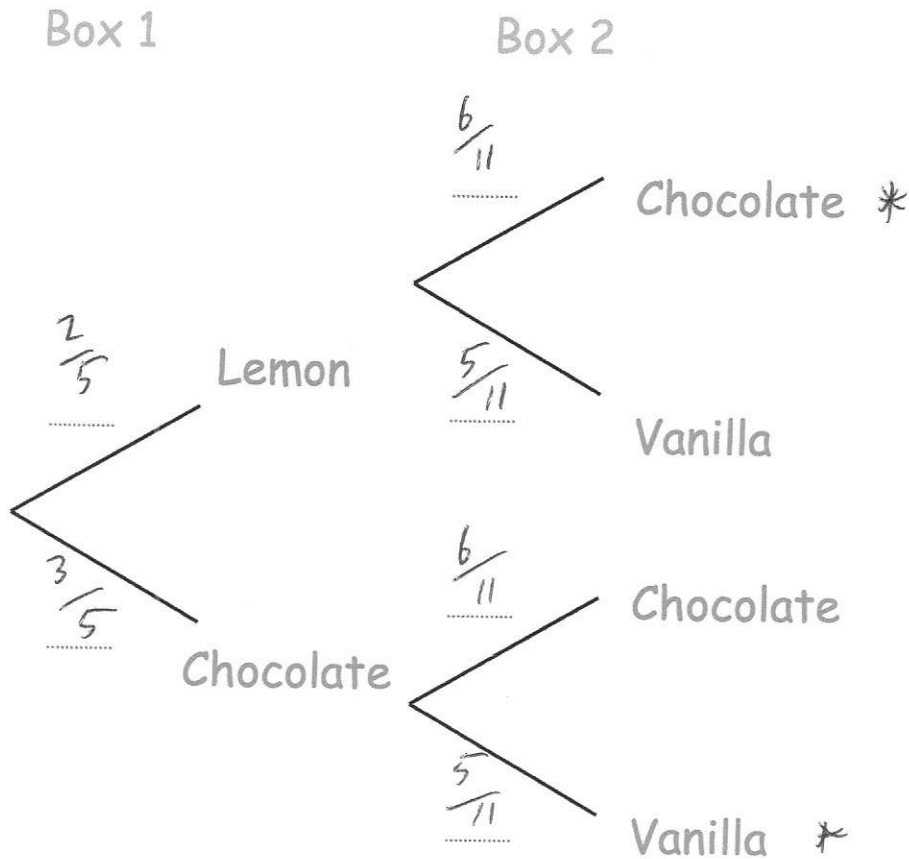
(b) Work out the probability that Nafisa picks exactly one chocolate cupcake.

$P(LC) = \frac{2}{5} \times \frac{6}{11} = \frac{12}{55}$

$P(CV) = \frac{3}{5} \times \frac{5}{11} = \frac{15}{15}$

$\frac{12}{55} + \frac{15}{55} = \frac{27}{55}$

$\frac{27}{55}$
....

(2)

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9.

In a small village, one bus arrives a day.

The probability of rain in the village is 0.3.

If it rains, the probability of a bus being late is 0.4.
If it does not rain, the probability of a bus being late is 0.15.

(a) Complete the tree diagram

0.3 — Rain

0.4 — Late *

0·6 — On Time

0·7 — No Rain

0.15 — Late *

0·85 — On Time
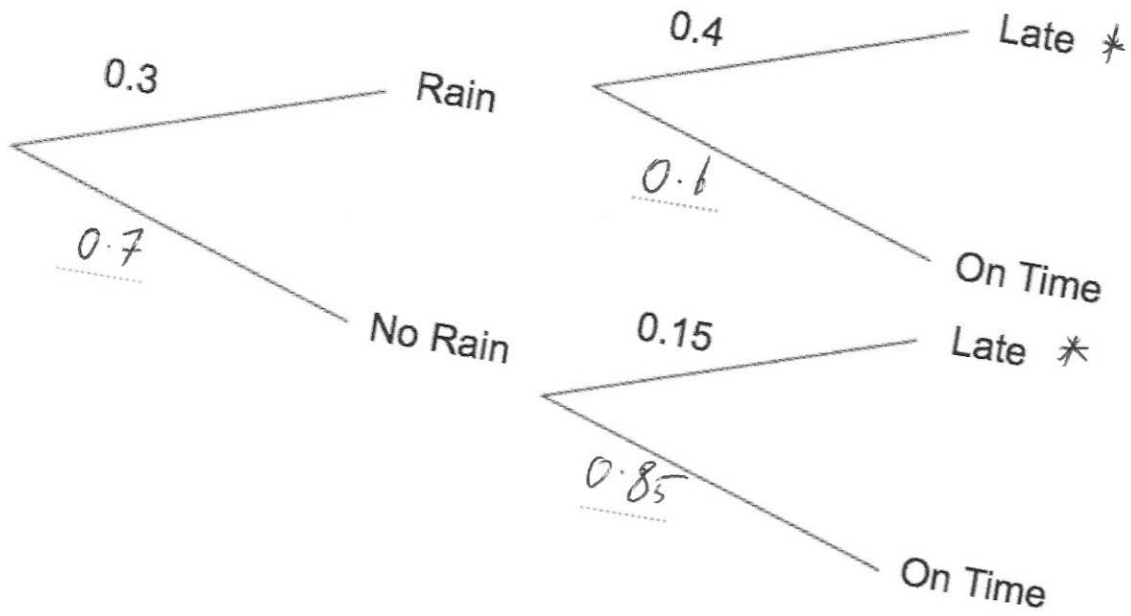
(b) Work out the number of days the bus should be late over a period of 200 days.

(2)

$P(RL) = 0.3 \times 0.4 = 0.12$

$P(NR\ L) = 0.7 \times 0.15 = 0.105$

$P(late) = 0.225$

$200 \times 0.225 = 45$

45 days

(3)

10. Shown is a spinner.
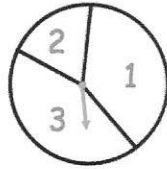
The probability of a 1 is 2x
The probability of a 2 is x
The probability of a 3 is 2x

(a) Calculate the value of x.

$2x + x + 2x = 5x$

$5x = 1$ ← probabilities add to 1.

$x = 0.2$

_0.2_

(2)

The spinner is spun twice and the scores are added together.

(b) Work out the probability of the final score being 4.
You may use the tree diagram to help you.

1st spin   2nd spin

0.4   3

0.4   3

0.2   2

0.4   1 ✱ $P(31) = 0.4 \times 0.4 = 0.16$

0.4   3

0.2   2 ✱ $P(22) = 0.2 \times 0.2 = 0.04$

0.2   2

0.4   1

0.4   3 ✱ $P(13) = 0.4 \times 0.4 = 0.16$

0.4   1

0.2   2

0.36

0.4   1

_0.36_

(4)

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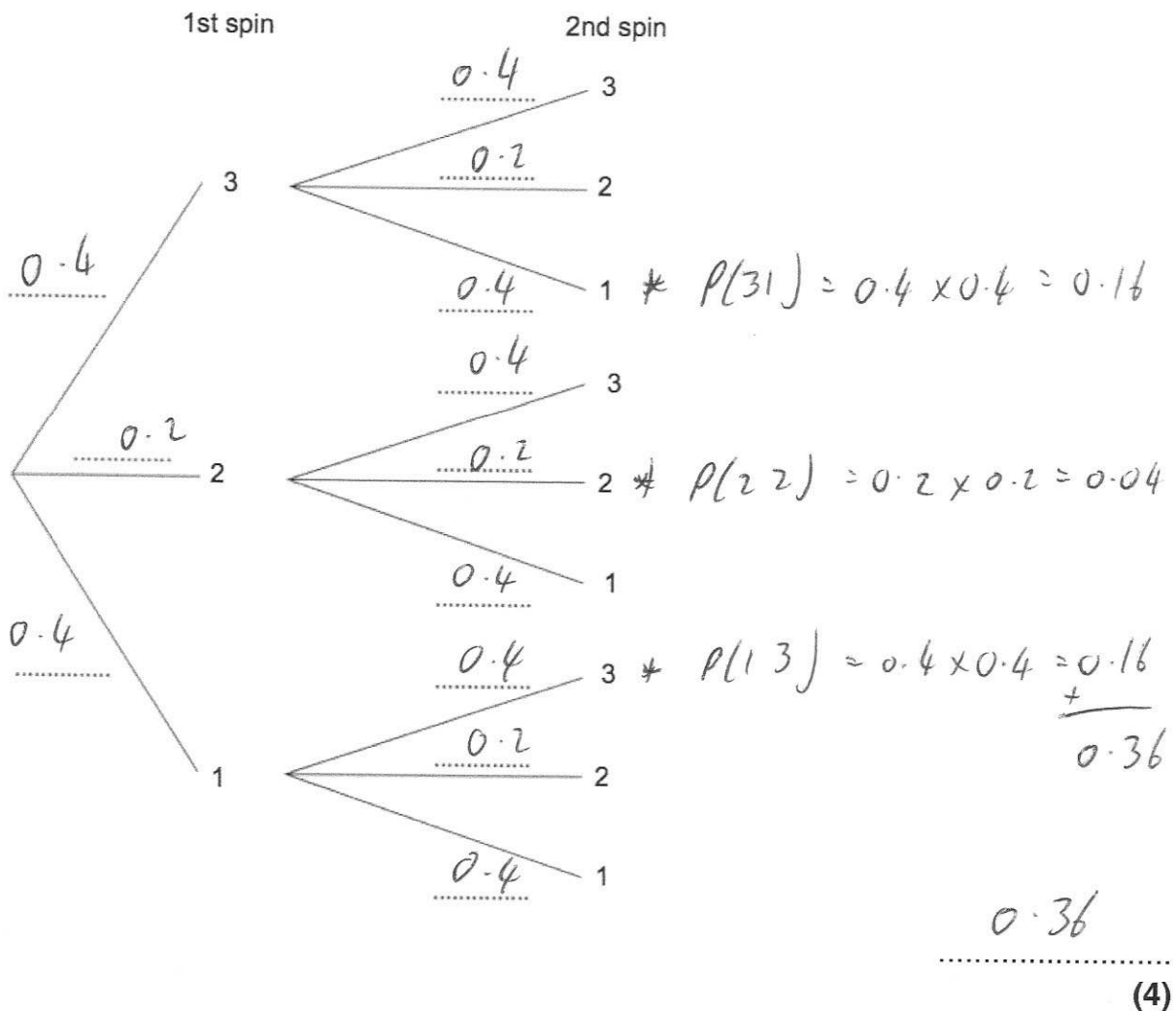
11. Alfie has a biased coin.
When flipped, the probability that the coin lands on tails is 0.79

Alfie flips the coin twice and draws this tree diagram.

Flip 1 | Flip 2

0.21
0.11 — Heads

0.21
0.11 — Heads

0.79 — Tails

0.21
0.11 — Heads

0.79 — Tails

0.79 — Tails

$1 - 0.79 = 0.21$
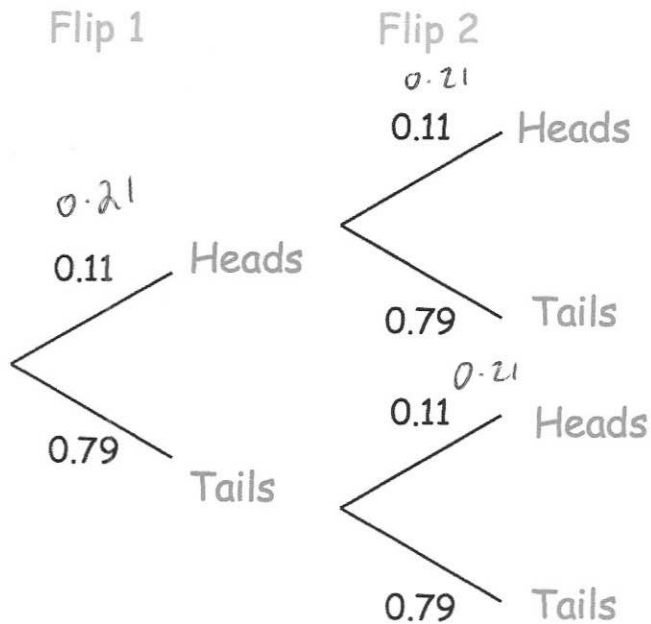
Give a criticism of Alfie's tree diagram.

The probability of tails is 0.79, so the probability of heads is 0.21, not 0.11.

(1)

12. The probability that a train arrives late is 0.2

James is travelling by train on Saturday and Sunday.

(a) Show this information on a probability tree diagram.

Saturday   Sunday O = on time
                                            L = late

              0·8   O
        0·8   O
                    0·2   L

                    0·8   O
        0·2   L
                    0·2   L
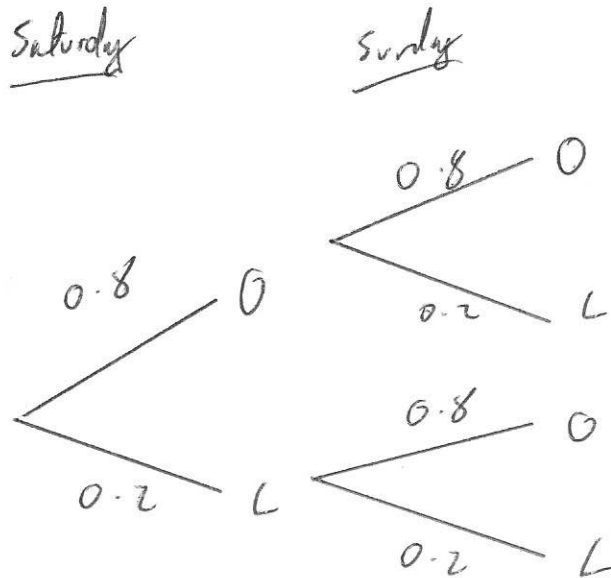
(2)

(b) Calculate the probability the train is on time both days.

$$P(OO) = 0·8 \times 0·8 = 0·64$$

0·64

(2)

13. A college course consists of 12 weeks of teaching with a final exam at the end of the course.

If a student fails the final exam, they have one opportunity to retake the exam.

The probability of a student passing the final exam is 0.8
The probability of a student passing the retake is 0.4

(a) Complete the probability tree diagram.

Final exam   Retake

Pass

0.8

0.2   Fail   0.4   Pass

0.6   Fail
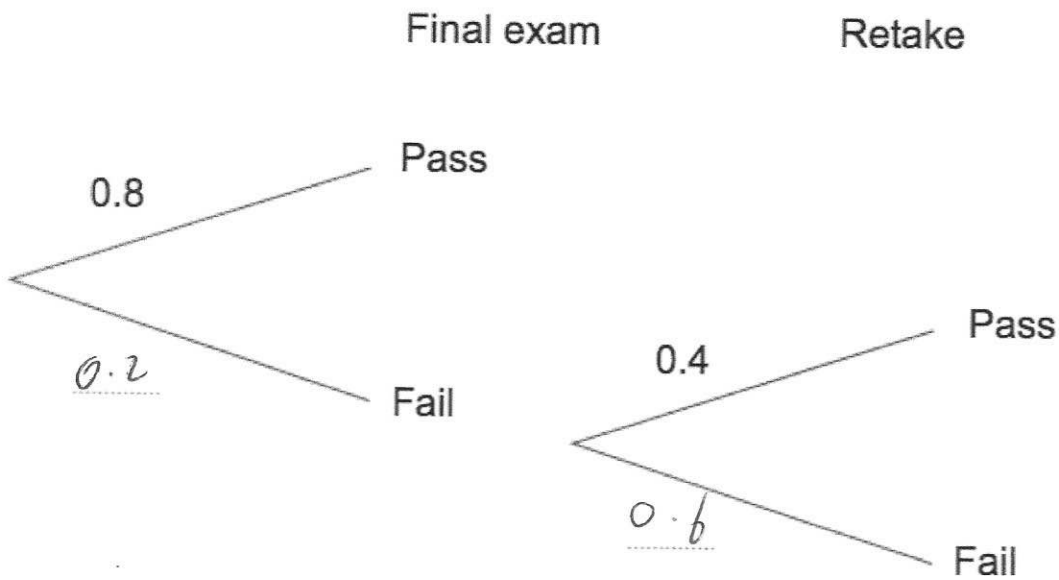
(2)

If a student passes the final exam or the retake, they receive a certificate.

(b) Work out the probability of a student receiving a certificate.

$$P(P) = 0.8$$

$$P(FP) = 0.2 \times 0.4 = 0.08$$

$$+ \quad \underline{\quad\quad}$$

$$0.88$$

0.88

(2)

14. Isaac has designed a game to raise money for charity during a school fa
There are two boxes of counters, box 1 and box 2.
Each box contains red and green counters.

This two-way table shows the number of each colour in each box.

Box 1

$P(Red) = \frac{160}{200} = \frac{4}{5}$

$P(Green) = \frac{40}{200} = \frac{1}{5}$

	Box 1	Box 2
Red	160	50
Green	40	25
	200	75

Box 2

$P(Red) = \frac{50}{75} = \frac{2}{3}$

$P(green) = \frac{25}{75} = \frac{1}{3}$

To play the game, each person selects a counter at random from each box.
✳ If both counters are green, they win a prize.
The counters are then returned to their boxes.

It costs £2 to play the game and each prize is worth £8.50

In total, the game is played 180 times.

Work out an estimate of how much money Isaac raised for charity.

Box 1   Box 2

                    $\frac{2}{3}$ Red

        $\frac{4}{5}$ Red $\frac{1}{3}$
                                    Green
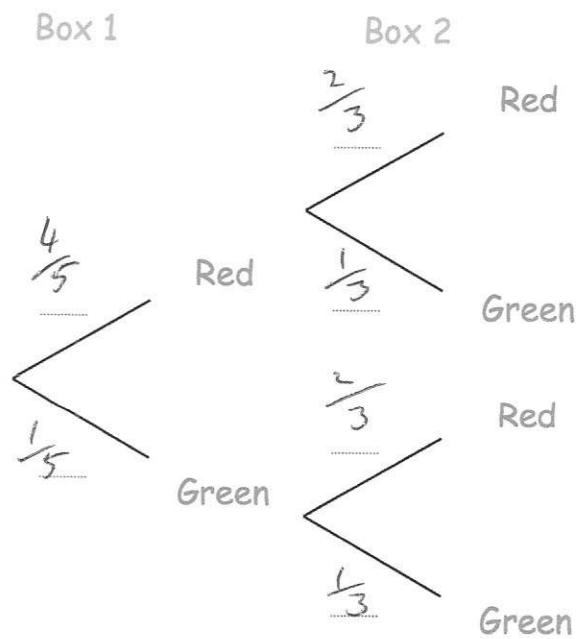
                              $\frac{2}{3}$ Red
        $\frac{1}{5}$
            Green
                              $\frac{1}{3}$ Green $P(GG) = \frac{1}{5} \times \frac{1}{3} = \frac{1}{15}$

$180 \times \frac{1}{15} = 12$ winners (estimate)

$180 \times 2 = 360$

$12 \times 8.50 = -102$
_____
258

£258
....
(6)

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15. Sally and Laura sit their driving tests.

The probability of Sally passing her driving test is 0.7
The probability of both Sally and Laura passing is 0.56

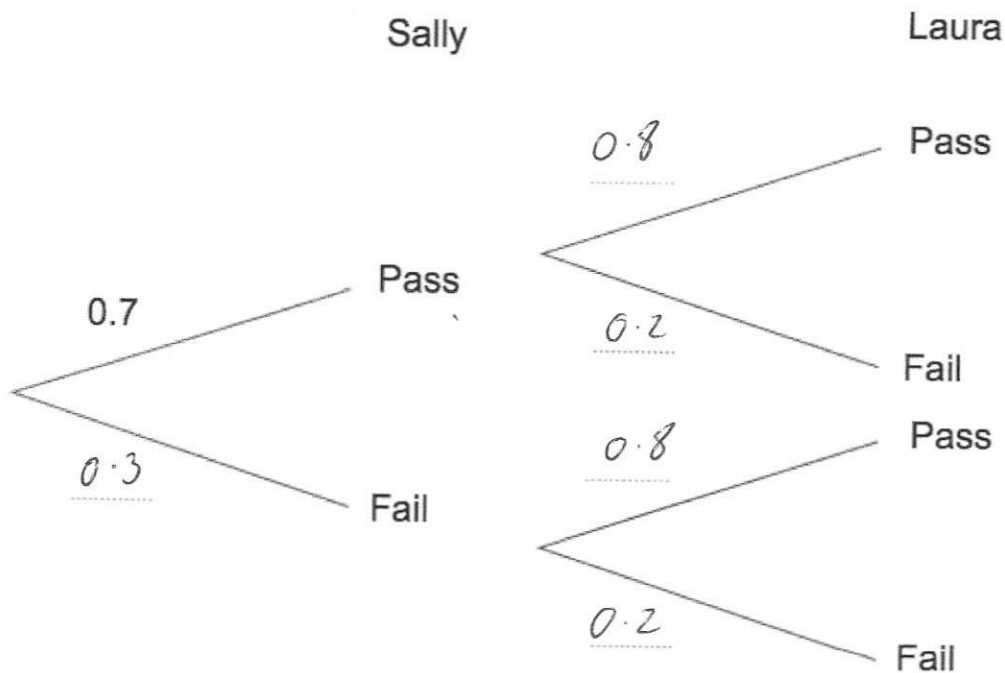(a) Work out the probability of Laura passing her driving test.

$$0.7 \times y = 0.56$$

$$y = 0.8$$

......0.8......

(2)

(b) Complete the tree diagram.

Sally   Laura

0.8 ———— Pass

Pass

0.7

0.2 ———— Fail

0.8 ———— Pass

0.3 ———— Fail

0.2 ———— Fail

(2)

(c) Find the probability of both women failing.

$$P(FF) = 0.3 \times 0.2 = 0.06$$

......0.06......

(2)

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16. Kyle takes the free kicks for his local football team.
    He takes 70% of the free kicks with his right foot.

    Kyle scores 40% of the free kicks that he takes with his right foot.
    Overall, Kyle scores 32.5% of the free kicks that he takes.

    Work out what percentage of the free kicks, taken with his left foot, that Kyle
    scores.

Foot

Outcome

Right
Foot

0.7

0.4 Goal

0.6 Miss

0.3

left
foot

x Goal

Miss
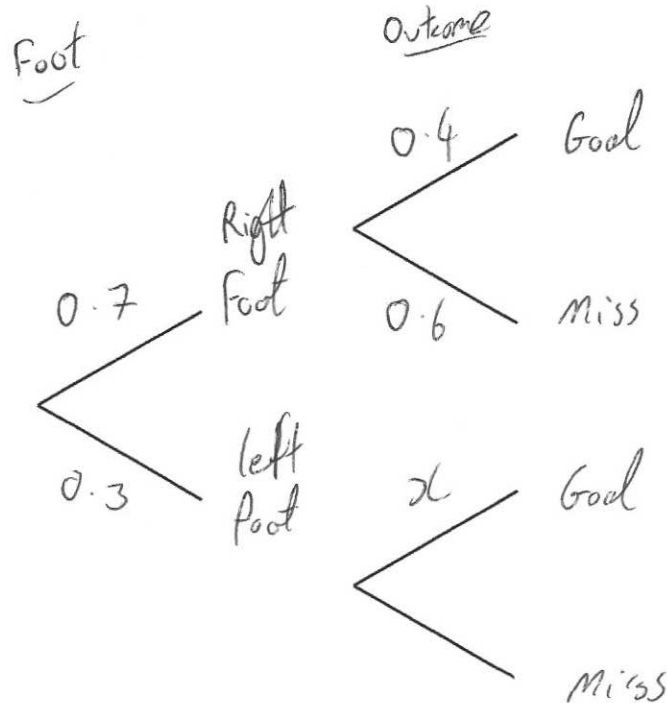
$P(RG) = 0.7 \times 0.4 = 0.28$

$P(LG) = 0.3 \times x = 0.3x$

$0.28 + 0.3x = 0.325$
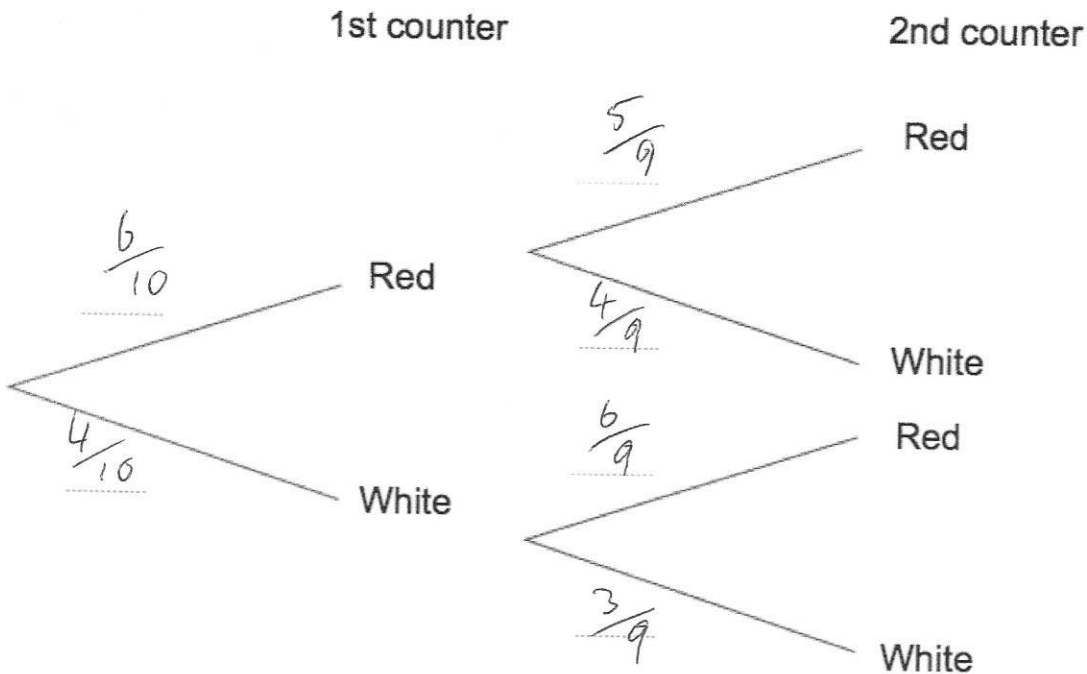
$0.3x = 0.045$

$x = 0.15$

15

........................%

(4)

17. George has a bag of marbles.
There are 6 red and 4 white marbles.

George takes out a marble at random and records its colour.
Without replacement, George takes out another marble, at random.

(a) Complete the probability tree diagram.

1st counter   2nd counter

$\frac{6}{10}$ Red

$\frac{5}{9}$ Red

$\frac{4}{9}$ White

$\frac{4}{10}$ White

$\frac{6}{9}$ Red

$\frac{3}{9}$ White

(2)

(b) Find the probability that the two marbles are the same colour.

$$P(RR) = \frac{6}{10} \times \frac{5}{9} = \frac{30}{90}$$

$$P(WW) = \frac{4}{10} \times \frac{3}{9} = \frac{12}{90}$$

$$P(\text{same colour}) = \frac{30}{90} + \frac{12}{90} = \frac{42}{90}$$

$\frac{7}{15}$

or $\frac{21}{45}$

(3)

or $\frac{14}{30}$

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