Tree diagrams

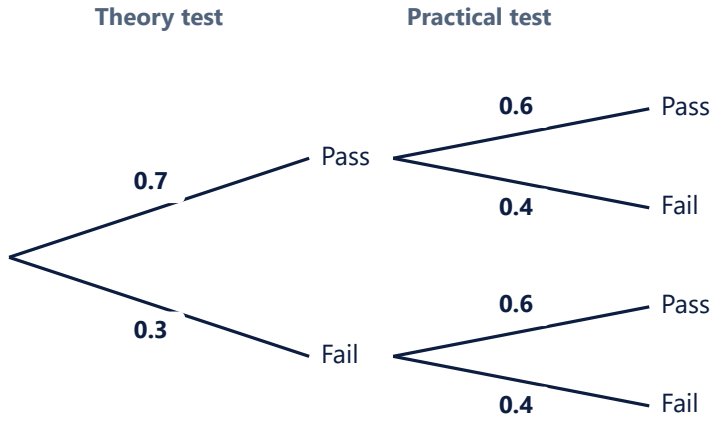
Grade 5 | Worked solutions

GCSE Statistics topic practice

1 Priya is learning to drive. She has to take a theory test and a practical test. The probability tree diagram shows the probabilities that she passes or fails each test.

a. Write down the probability that Priya fails the practical test. (1)

b. Work out the probability that Priya passes both tests. (2)



(3 marks)

a)

The fail branch for the practical test shows 0.4

b)

Multiply along the branches

$0.7 \times 0.6 = 0.42$

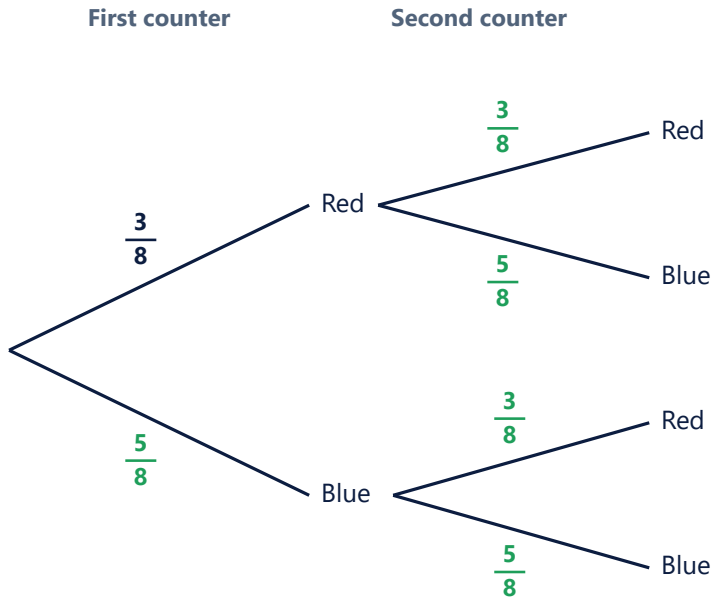
a) 0.4 b) 0.42

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2 A bag contains 3 red counters and 5 blue counters. Kasia takes a counter at random, writes down its colour and puts it back in the bag. She then takes a second counter at random.

a. Complete the probability tree diagram. (2)

b. Work out the probability that the two counters are the same colour. (2)



(4 marks)

a)

8 counters in the bag and 5 are blue

$$P(\text{blue}) = \frac{5}{8}$$

The counter is put back, so the second branches are $\frac{3}{8}$ and $\frac{5}{8}$ both times.

b)

Either red then red, or blue then blue

$$P(\text{red, red}) = \frac{3}{8} \times \frac{3}{8}$$

$$= \frac{9}{64}$$

$$P(\text{blue, blue}) = \frac{5}{8} \times \frac{5}{8}$$

$$= \frac{25}{64}$$

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

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$$\frac{34}{64} = \frac{17}{32}$$

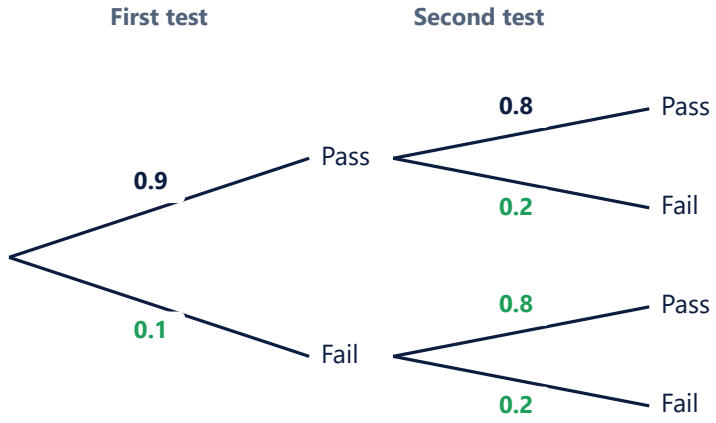
a) tree completed with $\frac{3}{8}$ and $\frac{5}{8}$ b) $\frac{17}{32}$

3 A factory tests each smoke alarm twice. The probability that an alarm passes the first test is 0.9. The probability that an alarm passes the second test is 0.8. The results of the two tests are independent.

a. Complete the probability tree diagram. (2)

b. Work out the probability that an alarm passes both tests. (1)

c. Work out the probability that an alarm passes exactly one of the two tests. (2)



(5 marks)

a)

P(fail first test) = 1 - 0.9

= 0.1

P(fail second test) = 1 - 0.8

= 0.2

The second test branches are 0.8 and 0.2 both times.

b)

0.9 x 0.8 = 0.72

c)

Either pass then fail, or fail then pass

P(pass then fail) = 0.9 x 0.2

= 0.18

P(fail then pass) = 0.1 x 0.8

= 0.08

0.18 + 0.08 = 0.26

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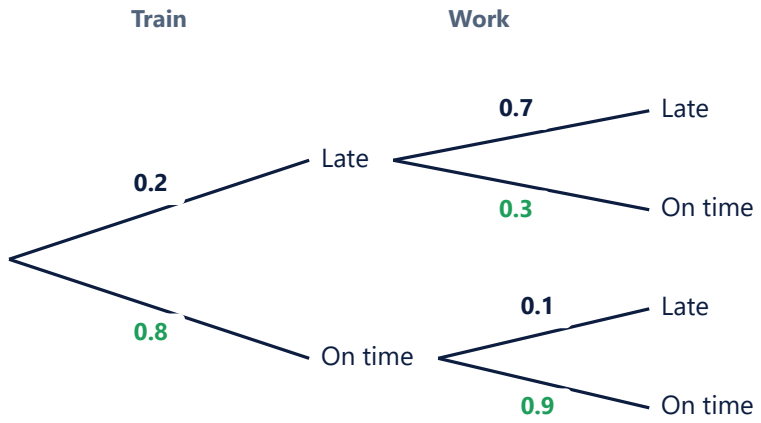
a) 0.1, then 0.2, 0.8, 0.2 b) 0.72 c) 0.26

4 The probability that Mia's train is late is 0.2. When her train is late, the probability that she is late for work is 0.7. When her train is on time, the probability that she is late for work is 0.1.

a. Complete the probability tree diagram. (2)

b. Work out the probability that Mia is late for work. (2)

c. Mia goes to work on 50 days. Work out an estimate for the number of days she is late for work. (1)



(5 marks)

a)

$P(\text{train on time}) = 1 - 0.2$

$= 0.8$

$1 - 0.7 = 0.3$

$1 - 0.1 = 0.9$

Work on time is 0.3 after a late train and 0.9 after a train that is on time.

b)

Two ways to be late for work

$P(\text{train late, work late}) = 0.2 \times 0.7$

$= 0.14$

$P(\text{train on time, work late}) = 0.8 \times 0.1$

$= 0.08$

$0.14 + 0.08 = 0.22$

The probability she is late for work is 0.22

c)

$0.22 \times 50 = 11$

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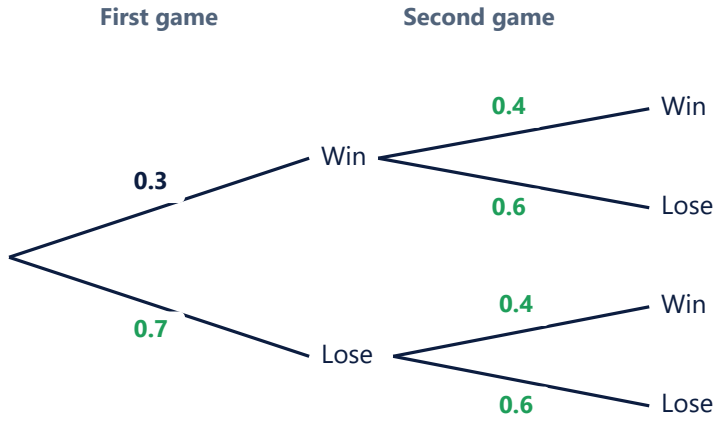
a) 0.8, then 0.3 and 0.9 b) 0.22 c) 11 days

5 Dev plays two different games at a fair. The probability that he wins the first game is 0.3. The probability that he wins both games is 0.12. The results of the two games are independent.

a. Work out the probability that Dev wins the second game. (2)

b. Complete the probability tree diagram. (1)

c. Work out the probability that Dev wins at least one of the two games. (2)



(5 marks)

a)

Independent, so multiply along the branches

$0.3 \times P(\text{win second}) = 0.12$

$P(\text{win second}) = 0.12 \div 0.3$

$P(\text{win second}) = 0.4$

So the win branches for the second game are 0.4

b)

$P(\text{lose first}) = 1 - 0.3$

$= 0.7$

$P(\text{lose second}) = 1 - 0.4$

$= 0.6$

The second game branches are 0.4 and 0.6 both times.

c)

At least one win means not losing both

$P(\text{lose both}) = 0.7 \times 0.6$

$= 0.42$

$1 - 0.42 = 0.58$

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a) 0.4 b) 0.7, then 0.4, 0.6, 0.4, 0.6 c) 0.58

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