

Probability and Tree Diagrams

GCSE Mathematics • Foundation Tier • Grades 4–5 • Non-calculator

WORKED SOLUTIONS

Name: worked example

Class:

Total: 51 / 51

Show all your working. Marks are given for correct method as well as the final answer.

1. A fair six-sided dice is rolled. Write down the probability of rolling a 4. [1 mark]

one 4 out of six faces

Answer: $\frac{1}{6}$

2. A fair dice is rolled. Work out the probability of an even number. [2 marks]

2, 4, 6 = 3 out of 6

Answer: $\frac{1}{2}$

3. The probability it rains is 0.3. Work out the probability it does not rain. [2 marks]

$1 - 0.3 = 0.7$

all probabilities add to 1

Answer: 0.7

4. A bag has 5 red and 3 blue counters. One is taken at random. Work out $P(\text{red})$. [2 marks]

5 red out of 8 total

Answer: $\frac{5}{8}$

5. A spinner has outcomes A, B and C with $P(A) = 0.2$ and $P(B) = 0.5$. Work out $P(C)$. [2 marks]

$0.2 + 0.5 = 0.7$

$1 - 0.7 = 0.3$

Answer: 0.3

6. A coin is flipped 200 times. Work out the expected number of heads. [2 marks]

$200 \times 0.5 = 100$

Answer: 100

7. The probability of a faulty bulb is 0.04. In a batch of 500, work out the expected number of faulty bulbs. [2 marks]

$500 \times 0.04 = 20$

Answer: 20

8. A dice is rolled 60 times and a 6 comes up 15 times. Work out the relative frequency of a 6. [2 marks]

$\frac{15}{60} = 0.25$

experimental, not theoretical

Answer: 0.25

9. Using the same data, explain whether the dice seems fair. [2 marks]

a fair dice gives about 0.167

0.25 is noticeably higher, so possibly biased

Answer: no, $0.25 > \frac{1}{6}$

10. The table shows how 60 students travel to school. Work out the probability a student chosen at random travels by bus. [2 marks]

	Bus	Walk	Total
Year 10	18	12	30
Year 11	14	16	30
Total	32	28	60

*32 out of 60
simplify by 4*

Answer: $\frac{32}{60} = \frac{8}{15}$

11. Using the same table, work out the probability a student is in Year 11 and walks. [2 marks]

16 out of 60

Answer: $\frac{16}{60} = \frac{4}{15}$

12. Using the same table, a Year 10 student is chosen. Work out the probability they walk. [3 marks]

*out of Year 10 only, so out of 30
the total changes*

Answer: $\frac{12}{30} = \frac{2}{5}$

13. A coin is flipped twice. Work out the probability of two heads. [2 marks]

$\frac{1}{2} \times \frac{1}{2}$
AND means multiply

Answer: $\frac{1}{4}$

14. The probability a bus is late is 0.2. Work out the probability it is late on two days running. [2 marks]

$0.2 \times 0.2 = 0.04$

Answer: 0.04

15. Using the same bus, work out the probability it is on time both days. [3 marks]

on time = 0.8
 $0.8 \times 0.8 = 0.64$

Answer: 0.64

16. Using the same bus over two days, work out the probability it is late exactly once. [4 marks]

*late then on time: $0.2 \times 0.8 = 0.16$
on time then late: $0.8 \times 0.2 = 0.16$
TWO ways, so add them
 $0.16 + 0.16 = 0.32$*

Answer: 0.32

17. A bag has 4 red and 6 blue counters. Two are taken without replacement. Write down the probability the first is red. [1 mark]

4 out of 10

Answer: $\frac{4}{10} = \frac{2}{5}$

18. From the same bag, given the first was red, write down the probability the second is also red. [2 marks]

one red gone, one counter gone
BOTH numbers drop

Answer: _____ $\frac{3}{9} = \frac{1}{3}$ _____

19. A bag has 4 red and 6 blue counters. Two are taken without replacement.

(a) Work out the probability both are red.

[3 marks]

$$\frac{4}{10} \times \frac{3}{9} = \frac{12}{90}$$
$$= \frac{2}{15}$$

(b) Work out the probability they are different colours.

[4 marks]

red then blue: $\frac{4}{10} \times \frac{6}{9} = \frac{24}{90}$

blue then red: $\frac{6}{10} \times \frac{4}{9} = \frac{24}{90}$

add: $\frac{48}{90} = \frac{8}{15}$

Answer: _____ $\frac{2}{15} ; \frac{8}{15}$ _____

20. A box has 3 toffees and 5 mints. Two sweets are taken without replacement.

(a) Work out the probability both are mints.

[3 marks]

$$\frac{5}{8} \times \frac{4}{7} = \frac{20}{56}$$
$$= \frac{5}{14}$$

(b) Work out the probability at least one is a toffee.

[3 marks]

at least one = 1 - none

$$1 - \frac{5}{14} = \frac{9}{14}$$

Answer: _____ $\frac{5}{14} ; \frac{9}{14}$ _____