eClassroom

GCSE Mathematics

Tree Diagrams & Conditional Probability

Questions

Pearson Edexcel GCSE & iGCSE Mathematics

Section A — Foundation

Worked Examples

[Fluency]

A bag has 3 red and 2 blue counters. One is drawn and replaced, then a second is drawn. Find P(both red).

$$P(RR) = \frac{3}{5} \times \frac{3}{5} = \frac{9}{25}$$

[Reasoning]

Same bag, drawn without replacement. Find P(both red).

$$P(RR) = \frac{3}{5} \times \frac{2}{4} = \frac{6}{20} = \frac{3}{10}$$

[Problem Solving]

P(A) = 0.4. P(B|A) = 0.6 and P(B|A') = 0.3. Find P(B).

$$P(B) = P(B|A) \cdot P(A) + P(B|A') \cdot P(A')$$

$$= 0.6 \times 0.4 + 0.3 \times 0.6 = 0.24 + 0.18 = 0.42$$

[Fluency]

1. A bag has 3 red and 2 blue counters. A counter is drawn and replaced, then a second is drawn.

(a) Draw a tree diagram. (2)

(b) Find P(both red). (1)

(c) Find P(at least one red). (2)

(5 marks)

[Fluency]

2. A bag has 3 red and 2 blue counters. Two counters are drawn **without replacement**.

(a) Draw a tree diagram. (2)

(b) Find P(both red). (1)

(c) Find P(one of each colour). (2)

(5 marks)

[Fluency]

3. P(A) = 0.6 and P(B|A) = 0.4.

Find P(A and B).

(2 marks)

[Fluency]

4. A fair coin is flipped three times.

(a) Draw a tree diagram. (2)

(b) Find P(all heads). (1)

(c) Find P(exactly two heads). (2)

(5 marks)

[Reasoning]

5. P(A) = 0.3. P(B|A) = 0.7 and P(B|A') = 0.2.

Draw a tree diagram and find P(B).

(3 marks)

[Reasoning]

6. A bag contains 5 red and 3 blue counters. Two are drawn without replacement.

Find P(different colours).

(3 marks)

[Reasoning]

7. P(rain on Monday) = 0.4. If it rains on Monday, P(rain on Tuesday) = 0.7. If it does not rain on Monday, P(rain on Tuesday) = 0.3.

(a) Find P(rain on both days). (2)

(b) Find P(rain on Tuesday). (2)

(4 marks)

[Problem Solving]

8. A box contains 4 defective and 16 good items. Two are chosen without replacement.

Find P(both defective).

(2 marks)

[Problem Solving]

9. P(rain on Monday) = 0.4 and P(rain on Tuesday) = 0.46 (from Question 7).

Find P(it rains on Monday | it rains on Tuesday).

(3 marks)

[Problem Solving]

10. A bag contains 6 red, 4 blue and 2 green counters. Two are drawn without replacement.

(a) Find P(both the same colour). (4)

(b) Find P(at least one red). (3)

(7 marks)

Section B — Higher

Worked Examples

[Fluency]

Bag: 4R, 3B, 2G. Two drawn without replacement. P(same colour)?

$$P(\text{same}) = \frac{4}{9}\cdot\frac{3}{8} + \frac{3}{9}\cdot\frac{2}{8} + \frac{2}{9}\cdot\frac{1}{8} = \frac{12+6+2}{72} = \frac{20}{72} = \frac{5}{18}$$

[Reasoning]

Medical test: P(disease)=0.01. P(+|disease)=0.95. P(+|no disease)=0.05. Find P(disease|+).

$$P(+) = 0.01 \times 0.95 + 0.99 \times 0.05 = 0.0590$$

$$P(\text{disease}\mid +) = \frac{0.0095}{0.0590} = \frac{19}{118} \approx 0.161$$

[Problem Solving]

Three children, each independently P(girl)=0.5. Find P(≥2 girls | at least 1 girl).

$$P(\geq 2G) = \frac{1}{2}, \quad P(\geq 1G) = \frac{7}{8}$$

$$P(\geq 2G \mid \geq 1G) = \frac{1/2}{7/8} = \frac{4}{7}$$

[Fluency]

1. A bag contains 4 red, 3 blue and 2 green counters. Two are drawn without replacement. Find P(both the same colour).

(4 marks)

[Fluency]

2. P(A∩B) = 0.15 and P(B) = 0.4.
Find P(A|B).

(2 marks)

[Fluency]

3. A medical test has P(disease)=0.01, P(positive|disease)=0.95, P(positive|no disease)=0.05.

(a) Find P(positive). (2)

(b) Find P(disease|positive). Give your answer to 3 s.f. (2)

(4 marks)

[Reasoning]

4. Urn A has 3 red and 2 blue balls. Urn B has 1 red and 4 blue balls. An urn is chosen at random, then a ball is drawn.

Find P(red).

(3 marks)

[Reasoning]

5. Ten cards are numbered 1–10. Two are drawn without replacement.

Find P(both numbers are prime).

(3 marks)

[Reasoning]

6. P(A|B) = 0.6 and P(B) = 0.3.

Find P(A∩B).

(2 marks)

[Problem Solving]

7. Three children are born independently. P(girl) = 0.5 for each.

Find P(at least 2 girls | at least 1 girl).

(4 marks)

[Problem Solving]

8. A bag contains 6 red and 4 blue counters. Three are drawn without replacement.

Find P(at least 2 red).

(4 marks)

[Problem Solving]

9. P(B|A) = 2×P(B|A'). P(A) = 0.5 and P(B) = 0.5.

Find P(B|A) and P(B|A').

(4 marks)

[Problem Solving]

10. State Bayes' Theorem. Use it with the medical test from Question 3 to verify P(disease|positive).

Explain in words why the probability of disease given a positive test is so low even though the test is 95% accurate.

(4 marks)