GCSE Mathematics

Basic Probability

Worked Solutions

Pearson Edexcel GCSE & iGCSE Mathematics

Section A — Foundation — Worked Solutions

[Fluency] Question 1

Total=10

(a) P(red)=3/10

(b) P(not red)=1−3/10=7/10

∴ **(a) 3/10 (b) 7/10**

[Fluency] Question 2

(a) P(7)=0 (impossible)

(b) P(<7)=1 (certain)

(c) P(even)=3/6=1/2

∴ **(a) 0 (b) 1 (c) 1/2**

[Fluency] Question 3

(a) Expected heads=200×0.6=120

(b) Expected tails=200×0.4=80

∴ **(a) 120 (b) 80**

[Fluency] Question 4

Mutually exclusive: add probabilities

0.3+0.5

∴ **0.8**

[Fluency] Question 5

Expected=0.12×25

∴ **3 students**

[Reasoning] Question 6

(a) P(lose)=1−0.35−0.25=0.40

(b) Expected wins=38×0.35=13.3

∴ **(a) 0.40 (b) ≈13 wins**

[Reasoning] Question 7

Primary colours: red(4), blue(3), yellow(1)=8 counters

P=8/10

∴ **4/5**

[Reasoning] Question 8

(a) Expected=50×(1/6)=8.33 times each

(b) Random variation — theoretical values are what we *expect* on average over many trials, not guaranteed results.

∴ **(a) ≈8.3 times each (b) Due to random variation**

[Problem Solving] Question 9

(a) P(A or B or C)=0.25+0.35+0.20=0.80

(b) Expected B=500×0.35=175

∴ **(a) 0.80 (b) 175 times**

[Problem Solving] Question 10

(a) P(A or B)=0.4+0.3=0.7

(b) P(neither)=1–0.7=0.3

(c) P(A not B)=P(A)=0.4 (since ME, B cannot occur with A)

∴ **(a) 0.7 (b) 0.3 (c) 0.4**

Section B — Higher — Worked Solutions

[Fluency] Question 1

$P(A \cup B) = 0.45 + 0.30 - 0.15$

∴ **0.60**

[Fluency] Question 2

$P(A \cup B) = \frac{1}{3} + \frac{1}{4} = \frac{4}{12} + \frac{3}{12}$

∴

[Reasoning] Question 3

$P(A \cap B) = P(A) + P(B) - P(A \cup B) = 0.5 + 0.6 - 0.8 = 0.3$

Since P(A∩B)=0.3≠0, A and B can both occur → not mutually exclusive ✓

∴ **P(A∩B)=0.3≠0, so not mutually exclusive ✓**

[Reasoning] Question 4

(a) P(not 6)=1−1/4=3/4

(b) Remaining 5 outcomes share prob 3/4 equally: P(each)=3/4÷5=3/20

∴ **(a) 3/4 (b) 3/20**

[Reasoning] Question 5

(a) Relative frequency=175/500=0.35

(b) With a large number of trials, relative frequency approaches the true probability.

∴ **(a) 0.35 (b) Use as an estimate of P (law of large numbers)**

[Reasoning] Question 6

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

$= 0.3 \times 0.6 + 0.5 \times 0.4 = 0.18 + 0.20$

∴ **P(B) = 0.38**

[Problem Solving] Question 7

$E = \frac{1}{6} \times 4 + \frac{5}{6} \times (-1) = \frac{4}{6} - \frac{5}{6} = -\frac{1}{6}$

(b) 60 games: expected total=60×(–1/6)=–£10

∴ **(a) Expected profit = –£1/6 ≈ –17p per game (b) Expected loss of £10**

[Problem Solving] Question 8

P(A)×P(B)=0.7×0.4=0.28=P(A∩B)

Since P(A∩B)=P(A)×P(B), A and B are independent ✓

∴ **Independent ✓**

[Problem Solving] Question 9

(a) $P(A \cap B) = P(A) + P(B) - P(A \cup B) = 0.5 + 0.4 - 0.75 = 0.15$

(b) P(A)×P(B)=0.5×0.4=0.20≠0.15 → not independent

∴ **(a) 0.15 (b) Not independent (0.15≠0.20)**

[Problem Solving] Question 10

$P(\text{nobody shares}) = \left(\frac{364}{365}\right)^n < 0.5$

$n > \frac{\ln 0.5}{\ln(364/365)} \approx 252.7$

Minimum n=253

∴ **n = 253**