50 multiple-choice questions

Question 1 (Level 1) — *Simple conditional from a table*
A class of 30 students: 18 like soccer, 12 like basketball, and 6 like both. If a student likes soccer, what is the probability they also like basketball?

(A) $\frac{1}{3}$

(B) $\frac{1}{5}$

(C) $\frac{6}{30}$

(D) $\frac{6}{12}$

Question 2 (Level 1) — *Conditional probability from frequency*
A bag has 5 red and 3 blue marbles. One marble is drawn and it is known to be red. What is the probability it is the largest red marble if there is exactly one largest?

(A) $\frac{1}{5}$

(B) $\frac{1}{8}$

(C) $\frac{1}{3}$

(D) $\frac{5}{8}$

Question 3 (Level 1) — *Two-way table reading*
In a two-way table, 20 students play sport and are male, 10 play sport and are female, 5 don't play sport and are male, 15 don't play sport and are female. Given a student is male, what is the probability they play sport?

(A) $\frac{4}{5}$

(B) $\frac{2}{5}$

(C) $\frac{20}{50}$

(D) $\frac{20}{30}$

Question 4 (Level 1) — *Conditional probability definition*
Which formula correctly defines $\Pr(A|B)$?

(A) $\frac{\Pr(A \cap B)}{\Pr(B)}$

(B) $\frac{\Pr(A \cap B)}{\Pr(A)}$

(C) $\Pr(A) \times \Pr(B)$

(D) $\frac{\Pr(A \cup B)}{\Pr(B)}$

Question 5 (Level 1) — *Simple given information*
A die is rolled and shows an even number. What is the probability it shows a 6?

(A) $\frac{1}{3}$

(B) $\frac{1}{6}$

(C) $\frac{1}{2}$

(D) $\frac{2}{3}$

Question 6 (Level 1) — *Card draw conditional*
A card is drawn from a standard deck and is known to be a heart. What is the probability it is a face card (J, Q, K)?

(A) $\frac{3}{13}$

(B) $\frac{3}{52}$

(C) $\frac{12}{52}$

(D) $\frac{4}{13}$

Question 7 (Level 1) — *Interpreting conditional probability*
$\Pr(\text{Rain}|\text{Cloudy}) = 0.4$. What does this mean?

(A) If it is cloudy, there is a 40% chance of rain

(B) If it rains, there is a 40% chance of clouds

(C) 40% of days are both rainy and cloudy

(D) The chance of clouds or rain is 40%

Question 8 (Level 1) — *Coin toss conditional*
Two coins are tossed. Given that at least one is heads, what is the probability both are heads?

(A) $\frac{1}{3}$

(B) $\frac{1}{4}$

(C) $\frac{1}{2}$

(D) $\frac{2}{3}$

Question 9 (Level 1) — *Simple tree diagram*
A tree diagram shows: $\Pr(A) = 0.5$, $\Pr(B|A) = 0.3$. What is $\Pr(A \cap B)$?

(A) 0.15

(B) 0.8

(C) 0.3

(D) 0.2

Question 10 (Level 1) — *Reduced sample space*
A number from 1 to 10 is chosen. Given it is greater than 6, what is the probability it is even?

(A) $\frac{1}{2}$

(B) $\frac{2}{10}$

(C) $\frac{5}{10}$

(D) $\frac{3}{4}$

Question 11 (Level 2) — *Two-way table conditional*
In a survey: 40 males own a pet, 20 males don't, 30 females own a pet, 10 females don't. What is Pr(female|owns pet)?

(A) $\frac{3}{7}$

(B) $\frac{30}{100}$

(C) $\frac{3}{4}$

(D) $\frac{4}{7}$

Question 12 (Level 2) — *Tree diagram two stages*
Box A has 3 red, 2 blue. Box B has 1 red, 4 blue. A box is chosen at random, then a ball drawn. Given the ball is red, what is the probability it came from Box A?

(A) $\frac{3}{4}$

(B) $\frac{1}{2}$

(C) $\frac{3}{5}$

(D) $\frac{1}{4}$

Question 13 (Level 2) — *Independence check*
$\Pr(A) = 0.4$, $\Pr(B) = 0.5$, $\Pr(A \cap B) = 0.2$. Are A and B independent?

(A) Yes, because $\Pr(A) \times \Pr(B) = \Pr(A \cap B)$

(B) No, because $\Pr(A) + \Pr(B) \neq 1$

(C) No, because $\Pr(A \cap B) \neq 0$

(D) Yes, because $\Pr(A|B) = \Pr(B)$

Question 14 (Level 2) — *Conditional from Venn diagram*
In a group of 50 people, 30 like tea, 25 like coffee, 10 like both. What is Pr(coffee|tea)?

(A) $\frac{1}{3}$

(B) $\frac{2}{5}$

(C) $\frac{10}{50}$

(D) $\frac{10}{25}$

Question 15 (Level 2) — *Multiplication rule*
$\Pr(A) = 0.6$ and $\Pr(B|A) = 0.5$. Find $\Pr(A \cap B)$.

(A) 0.3

(B) 1.1

(C) 0.5

(D) 0.12

Question 16 (Level 2) — *Drawing without replacement*
A jar has 4 red and 6 blue marbles. Two are drawn without replacement. What is the probability the second is red given the first was blue?

(A) $\frac{4}{9}$

(B) $\frac{4}{10}$

(C) $\frac{3}{9}$

(D) $\frac{6}{9}$

Question 17 (Level 2) — *Testing independence numerically*
$\Pr(A) = 0.3$, $\Pr(B) = 0.4$, $\Pr(A \cap B) = 0.15$. Are A and B independent?

(A) No, because $0.3 \times 0.4 = 0.12 \neq 0.15$

(B) Yes, because $0.15 < 0.3$

(C) Yes, because $\Pr(A \cap B) > 0$

(D) No, because $\Pr(A) + \Pr(B) < 1$

Question 18 (Level 2) — *Complementary conditional*
If $\Pr(A|B) = 0.7$, what is $\Pr(A'|B)$?

(A) 0.3

(B) 0.7

(C) 0.49

(D) Cannot be determined

Question 19 (Level 2) — *Two-way table completion*
A two-way table has: $\Pr(A \cap B) = 0.1$, $\Pr(A \cap B') = 0.3$, $\Pr(A' \cap B) = 0.25$. Find $\Pr(B|A)$.

(A) 0.25

(B) $\frac{0.1}{0.35}$

(C) 0.4

(D) 0.1

Question 20 (Level 2) — *Sequential events tree*

The probability of rain on Monday is 0.3. If it rains Monday, the probability of rain Tuesday is 0.6; otherwise it is 0.2. What is Pr(rain both days)?

(A) 0.18

(B) 0.9

(C) 0.14

(D) 0.32

Question 21 (Level 3) — *Bayes' theorem intro*

1% of a population has a disease. A test is 95% accurate (for both positive and negative). A person tests positive. What is Pr(disease|positive)? Round to 3 decimal places.

(A) 0.161

(B) 0.950

(C) 0.500

(D) 0.010

Question 22 (Level 3) — *Law of total probability*

Factory A makes 60% of products with 2% defect rate. Factory B makes 40% with 5% defect rate. Find Pr(defective).

(A) 0.032

(B) 0.07

(C) 0.035

(D) 0.02

Question 23 (Level 3) — *Bayes with factories*

Using the previous scenario: Factory A (60%, 2% defect), Factory B (40%, 5% defect). Given a product is defective, what is the probability it came from Factory B?

(A) 0.625

(B) 0.375

(C) 0.500

(D) 0.050

Question 24 (Level 3) — *Conditional with three events*
Three boxes: Box 1 (2 red, 3 blue), Box 2 (4 red, 1 blue), Box 3 (1 red, 1 blue). A box is chosen equally likely, then a ball drawn. Find Pr(red).

(A) $\frac{17}{30}$

(B) $\frac{7}{12}$

(C) $\frac{1}{2}$

(D) $\frac{7}{15}$

Question 25 (Level 3) — *Independence from table*
A two-way table shows: Male & Pass = 30, Male & Fail = 20, Female & Pass = 15, Female & Fail = 10. Are gender and passing independent?

(A) Yes, Pr(Pass|Male) = Pr(Pass) = 0.6

(B) No, because more males pass than females

(C) No, because Pr(Male) $\neq$ Pr(Pass)

(D) Cannot determine from this data

Question 26 (Level 3) — *Conditional probability chain*
$\Pr(A) = 0.5$, $\Pr(B|A) = 0.6$, $\Pr(C|A \cap B) = 0.8$. Find $\Pr(A \cap B \cap C)$.

(A) 0.24

(B) 1.9

(C) 0.30

(D) 0.40

Question 27 (Level 3) — *Reversed conditional*
$\Pr(A) = 0.4$, $\Pr(B) = 0.5$, $\Pr(B|A) = 0.7$. Find $\Pr(A|B)$.

(A) 0.56

(B) 0.28

(C) 0.70

(D) 0.35

Question 28 (Level 3) — *At least one success*
Two independent events each have probability 0.3. Given at least one occurs, what is the probability both occur?

(A) $\frac{3}{17}$

(B) $\frac{9}{100}$

(C) $\frac{9}{51}$

(D) $\frac{1}{3}$

Question 29 (Level 3) — *Three-way partition Bayes*
Students travel by bus (50%), car (30%), walk (20%). Late rates: bus 10%, car 5%, walk 15%. A student is late. What is Pr(bus|late)?

(A) $\frac{10}{19}$

(B) $\frac{1}{2}$

(C) $\frac{1}{10}$

(D) $\frac{5}{19}$

Question 30 (Level 3) — *Independence implication*
If A and B are independent, which of the following must be true?

(A) $\Pr(A|B) = \Pr(A)$

(B) $\Pr(A \cap B) = 0$

(C) $\Pr(A \cup B) = \Pr(A) + \Pr(B)$

(D) $\Pr(A) = \Pr(B)$

Question 31 (Level 4) — *Bayes' theorem with low prevalence*
A disease affects 0.5% of the population. A test has sensitivity 98% and specificity 96%. Find Pr(disease|positive). Round to 3 d.p.

(A) 0.110

(B) 0.980

(C) 0.500

(D) 0.049

Question 32 (Level 4) — *Conditional with continuous context*
If $\Pr(A) = p$, $\Pr(B|A) = q$, and $\Pr(B|A') = r$, express $\Pr(A|B)$ in terms of p, q, r.

(A) $\frac{pq}{pq+(1-p)r}$

(B) $\frac{pq}{r}$

(C) $\frac{pq}{pq+pr}$

(D) $\frac{q}{q+r}$

Question 33 (Level 4) — *Sequential draws without replacement*
From 5 red and 3 blue balls, 3 are drawn without replacement. What is the probability all are red given the first is red?

(A) $\frac{2}{7}$

(B) $\frac{5}{28}$

(C) $\frac{3}{7}$

(D) $\frac{1}{7}$

Question 34 (Level 4) — *Double Bayes application*
Machine A (40% production, 3% defect), Machine B (35%, 4% defect), Machine C (25%, 5% defect). An item is defective. Find $\Pr(C|D)$. Round to 3 d.p.

(A) 0.325

(B) 0.250

(C) 0.364

(D) 0.050

Question 35 (Level 4) — *Independence test with table*
A contingency table: (Sport & A-grade: 24), (Sport & not A: 36), (No sport & A-grade: 16), (No sport & not A: 24). Test for independence between sport and A-grade.

(A) Independent, because $\Pr(A|S) = \Pr(A) = 0.4$

(B) Not independent, because more sport students get A

(C) Not independent, because the numbers differ

(D) Independent, because $\Pr(S) = \Pr(A)$

Question 36 (Level 4) — *Repeated Bayes updates*
Prior: $\Pr(H) = 0.6$. Evidence E_1: $\Pr(E_1|H) = 0.9$, $\Pr(E_1|H') = 0.3$. After E_1, what is the posterior $\Pr(H|E_1)$? Give exact fraction.

(A) $\frac{9}{11}$

(B) $\frac{3}{4}$

(C) $\frac{9}{10}$

(D) $\frac{2}{3}$

Question 37 (Level 4) — *Conditional with union*
$\Pr(A) = 0.5$, $\Pr(B) = 0.4$, $\Pr(A \cup B) = 0.7$. Find $\Pr(A|B')$.

(A) 0.5

(B) 0.3

(C) 0.6

(D) 0.75

Question 38 (Level 4) — *Monty Hall variant*

There are 3 doors: one has a prize. You pick door 1. The host opens door 3 (no prize). What is Pr(prize behind door 2|door 3 opened)?

(A) $\frac{2}{3}$

(B) $\frac{1}{2}$

(C) $\frac{1}{3}$

(D) $\frac{3}{4}$

Question 39 (Level 4) — *Finding Pr(B) for independence*

$\Pr(A) = 0.3$ and $\Pr(A \cap B) = 0.12$. Find $\Pr(B)$ if A and B are independent.

(A) 0.4

(B) 0.36

(C) 0.12

(D) 0.042

Question 40 (Level 4) — *Multi-stage conditional*

Bag has 3R, 2B. Draw two without replacement. Find Pr(2nd red|1st red) and Pr(2nd red|1st blue). Hence find Pr(2nd red).

(A) $\frac{3}{5}$

(B) $\frac{1}{2}$

(C) $\frac{2}{5}$

(D) $\frac{3}{4}$

Question 41 (Level 5) — *Triple Bayes with four partitions*

Four suppliers: S_1 (20%, 1% defect), S_2 (30%, 2%), S_3 (35%, 3%), S_4 (15%, 4%). An item is defective. Find $\Pr(S_3|D)$. Round to 3 d.p.

(A) 0.429

(B) 0.350

(C) 0.245

(D) 0.510

Question 42 (Level 5) — *Sequential Bayes updates*

Prior $\Pr(\theta) = 0.5$. Two independent tests: $\Pr(+|\theta) = 0.8$, $\Pr(+|\theta') = 0.3$. Both tests are positive. Find the posterior $\Pr(\theta| ++)$. Give exact fraction.

(A) $\frac{64}{73}$

(B) $\frac{8}{11}$

(C) $\frac{16}{19}$

(D) $\frac{32}{41}$

Question 43 (Level 5) — *Prove independence breaks*
A and B are independent with $\Pr(A) = 0.4$, $\Pr(B) = 0.3$. Let $C = A \cup B$. Find $\Pr(A|C)$. Give exact fraction.

(A) $\frac{20}{29}$

(B) $\frac{2}{5}$

(C) $\frac{12}{29}$

(D) $\frac{4}{7}$

Question 44 (Level 5) — *Finding unknown probability*
$\Pr(A) = p$, $\Pr(B) = 0.6$, $\Pr(A|B) = 0.5$. Find p if A and B are independent.

(A) 0.5

(B) 0.3

(C) 0.6

(D) 0.83

Question 45 (Level 5) — *Bayes with algebraic setup*
$\Pr(A) = x$, $\Pr(B|A) = 2x$, $\Pr(B|A') = x$. Given $\Pr(A|B) = \frac{2}{3}$, find x.

(A) $\frac{1}{2}$

(B) $\frac{1}{3}$

(C) $\frac{2}{3}$

(D) $\frac{1}{4}$

Question 46 (Level 5) — *Exam-style Bayes multi-part*
In a town, 70% of households have a dog. Of dog owners, 40% also have a cat. Of non-dog owners, 60% have a cat. A household has a cat. Find the probability they also have a dog. Give exact fraction.

(A) $\frac{14}{23}$

(B) $\frac{7}{10}$

(C) $\frac{2}{5}$

(D) $\frac{9}{23}$

Question 47 (Level 5) — *Conditional expectation context*

Events A, B, C partition Ω with $\Pr(A) = 0.2$, $\Pr(B) = 0.5$, $\Pr(C) = 0.3$. Given $\Pr(D|A) = 0.1$, $\Pr(D|B) = 0.4$, $\Pr(D|C) = 0.7$. Find $\Pr(C|D)$.

(A) $\frac{21}{43}$

(B) $\frac{3}{10}$

(C) $\frac{20}{43}$

(D) $\frac{7}{10}$

Question 48 (Level 5) — *Two-stage sampling Bayes*

Urn 1: 3R, 7B. Urn 2: 6R, 4B. A fair coin decides the urn. Two balls are drawn without replacement from the chosen urn. Both are red. Find Pr(Urn 2|both red). Give exact fraction.

(A) $\frac{5}{6}$

(B) $\frac{1}{2}$

(C) $\frac{3}{4}$

(D) $\frac{1}{6}$

Question 49 (Level 5) — *Simpson's paradox setup*

Treatment A: 80/100 success (hospital 1), 10/50 success (hospital 2). Treatment B: 50/60 success (hospital 1), 20/90 success (hospital 2). Which treatment has a higher overall success rate?

(A) Treatment A with overall rate 0.6

(B) Treatment B with overall rate 0.467

(C) Both equal at 0.5

(D) Treatment B with overall rate 0.6

Question 50 (Level 5) — *Generalized Bayes with odds*

Prior odds of H vs H' are $3 : 2$. A test with likelihood ratio $\frac{\Pr(E|H)}{\Pr(E|H')} = 4$ is observed. What are the posterior odds $\Pr(H|E) : \Pr(H'|E)$?

(A) $6 : 1$, so $\Pr(H|E) = \frac{6}{7}$

(B) $3 : 2$, unchanged

(C) $12 : 2$, so $\Pr(H|E) = \frac{6}{8}$

(D) $4 : 1$, so $\Pr(H|E) = \frac{4}{5}$

Solutions

Q1: (A)
There are 18 soccer fans and 6 like both. $\Pr(B|S) = \frac{6}{18} = \frac{1}{3}$.
Q2: (A)
Given red, there are 5 red marbles, exactly 1 is the largest. $\Pr = \frac{1}{5}$.
Q3: (A)
Males total $= 20 + 5 = 25$. Males who play sport $= 20$. $\Pr(\text{sport}|\text{male}) = \frac{20}{25} = \frac{4}{5}$.
Q4: (A)
$\Pr(A|B) = \frac{\Pr(A \cap B)}{\Pr(B)}$, provided $\Pr(B) > 0$.
Q5: (A)
Given even: sample space $= \{2, 4, 6\}$. $\Pr(6|\text{even}) = \frac{1}{3}$.
Q6: (A)
Hearts: 13 cards, 3 are face cards (J, Q, K). $\Pr = \frac{3}{13}$.
Q7: (A)
It means: given that it is cloudy, the probability of rain is 0.4 (or 40%).
Q8: (A)
At least one head: $\{HH, HT, TH\}$, 3 outcomes. Both heads: 1 outcome. $\Pr = \frac{1}{3}$.
Q9: (A)
$\Pr(A \cap B) = \Pr(A) \times \Pr(B|A) = 0.5 \times 0.3 = 0.15$.
Q10: (A)
Greater than 6: $\{7, 8, 9, 10\}$. Even in this set: $\{8, 10\}$. $\Pr = \frac{2}{4} = \frac{1}{2}$.
Q11: (A)
Pet owners $= 40 + 30 = 70$. Female pet owners $= 30$. $\Pr(\text{female}|\text{pet}) = \frac{30}{70} = \frac{3}{7}$.
Q12: (A)
$\Pr(A \cap R) = \frac{1}{2} \times \frac{3}{5} = \frac{3}{10}$. $\Pr(B \cap R) = \frac{1}{2} \times \frac{1}{5} = \frac{1}{10}$. $\Pr(R) = \frac{4}{10}$. $\Pr(A|R) = \frac{3/10}{4/10} = \frac{3}{4}$.
Q13: (A)
$\Pr(A) \times \Pr(B) = 0.4 \times 0.5 = 0.2 = \Pr(A \cap B)$. Yes, they are independent.
Q14: (A)
$\Pr(\text{coffee}|\text{tea}) = \frac{10}{30} = \frac{1}{3}$.
Q15: (A)
$\Pr(A \cap B) = 0.6 \times 0.5 = 0.3$.
Q16: (A)
After drawing blue first: 9 left, 4 red. $\Pr(R_2|B_1) = \frac{4}{9}$.
Q17: (A)
$\Pr(A) \times \Pr(B) = 0.12 \neq 0.15 = \Pr(A \cap B)$. Not independent.
Q18: (A)
$\Pr(A'|B) = 1 - \Pr(A|B) = 1 - 0.7 = 0.3$.
Q19: (A)
$\Pr(A) = 0.1 + 0.3 = 0.4$. $\Pr(B|A) = \frac{0.1}{0.4} = 0.25$.
Q20: (A)
$\Pr(R_M \cap R_T) = 0.3 \times 0.6 = 0.18$.
Q21: (A)
$\Pr(D|+) = \frac{0.01 \times 0.95}{0.01 \times 0.95 + 0.99 \times 0.05} = \frac{0.0095}{0.0095 + 0.0495} = \frac{0.0095}{0.059} \approx 0.161$.
Q22: (A)
$\Pr(D) = 0.6 \times 0.02 + 0.4 \times 0.05 = 0.012 + 0.02 = 0.032$.
Q23: (A)
$\Pr(B|D) = \frac{0.4 \times 0.05}{0.032} = \frac{0.02}{0.032} = 0.625$.
Q24: (A)
$\Pr(R) = \frac{1}{3}\left(\frac{2}{5} + \frac{4}{5} + \frac{1}{2}\right) = \frac{1}{3}\left(\frac{4+8+5}{10}\right) = \frac{1}{3} \times \frac{17}{10} = \frac{17}{30}$.

Q25: (A)
$\Pr(\text{Pass}|\text{Male}) = \frac{30}{50} = 0.6$. $\Pr(\text{Pass}) = \frac{45}{75} = 0.6$. Equal, so independent.
Q26: (A)
$\Pr(A \cap B \cap C) = 0.5 \times 0.6 \times 0.8 = 0.24$.
Q27: (A)
$\Pr(A|B) = \frac{0.7 \times 0.4}{0.5} = \frac{0.28}{0.5} = 0.56$.
Q28: (A)
$\Pr(\text{both}) = 0.09$. $\Pr(\text{at least one}) = 1 - 0.49 = 0.51$. $\Pr(\text{both}|\text{at least one}) = \frac{0.09}{0.51} = \frac{3}{17}$.
Q29: (A)
$\Pr(L) = 0.05 + 0.015 + 0.03 = 0.095$. $\Pr(\text{bus}|L) = \frac{0.05}{0.095} = \frac{10}{19}$.
Q30: (A)
If A and B are independent, then $\Pr(A|B) = \Pr(A)$.
Q31: (A)
$\Pr(D|+) = \frac{0.005 \times 0.98}{0.005 \times 0.98 + 0.995 \times 0.04} = \frac{0.0049}{0.0049 + 0.0398} = \frac{0.0049}{0.0447} \approx 0.110$.
Q32: (A)
$\Pr(A|B) = \frac{pq}{pq + (1-p)r}$.
Q33: (A)
Given first red: $\Pr(\text{all red}|R_1) = \frac{4}{7} \times \frac{3}{6} = \frac{12}{42} = \frac{2}{7}$.
Q34: (A)
$\Pr(D) = 0.012 + 0.014 + 0.0125 = 0.0385$. $\Pr(C|D) = \frac{0.0125}{0.0385} \approx 0.325$.
Q35: (A)
$\Pr(A|S) = \frac{24}{60} = 0.4$. $\Pr(A) = \frac{40}{100} = 0.4$. Since $\Pr(A|S) = \Pr(A)$, they are independent.
Q36: (A)
$\Pr(H|E_1) = \frac{0.54}{0.54 + 0.12} = \frac{0.54}{0.66} = \frac{9}{11}$.
Q37: (A)
$\Pr(A \cap B) = 0.5 + 0.4 - 0.7 = 0.2$. $\Pr(A \cap B') = 0.5 - 0.2 = 0.3$. $\Pr(B') = 0.6$. $\Pr(A|B') = \frac{0.3}{0.6} = 0.5$.
Q38: (A)
By Bayes' theorem: $\Pr(\text{door 2}|\text{open 3}) = \frac{2}{3}$. Switching doubles your chance.
Q39: (A)
$\Pr(B) = \frac{\Pr(A \cap B)}{\Pr(A)} = \frac{0.12}{0.3} = 0.4$.
Q40: (A)
$\Pr(R_2|R_1) = \frac{2}{4}$, $\Pr(R_2|B_1) = \frac{3}{4}$. $\Pr(R_2) = \frac{2}{4} \times \frac{3}{5} + \frac{3}{4} \times \frac{2}{5} = \frac{6}{20} + \frac{6}{20} = \frac{3}{5}$.
Q41: (A)
$\Pr(D) = 0.2(0.01) + 0.3(0.02) + 0.35(0.03) + 0.15(0.04) = 0.002 + 0.006 + 0.0105 + 0.006 = 0.0245$. $\Pr(S_3|D) = \frac{0.0105}{0.0245} \approx 0.429$.
Q42: (A)
$\Pr(\theta| ++) = \frac{0.5 \times 0.64}{0.5 \times 0.64 + 0.5 \times 0.09} = \frac{0.32}{0.32 + 0.045} = \frac{0.32}{0.365} = \frac{64}{73}$.
Q43: (A)
$\Pr(C) = 0.58$. $\Pr(A \cap C) = \Pr(A) = 0.4$. $\Pr(A|C) = \frac{0.4}{0.58} = \frac{20}{29}$.
Q44: (A)
Independence gives $\Pr(A|B) = \Pr(A)$, so $p = 0.5$.
Q45: (A)
$\frac{2x^2}{x^2 + x} = \frac{2}{3}$. $6x^2 = 2x^2 + 2x$. $4x^2 = 2x$. $x = \frac{1}{2}$.
Q46: (A)
$\Pr(D \cap C) = 0.28$. $\Pr(C) = 0.28 + 0.18 = 0.46$. $\Pr(D|C) = \frac{0.28}{0.46} = \frac{14}{23}$.
Q47: (A)
$\Pr(D) = 0.02 + 0.20 + 0.21 = 0.43$. $\Pr(C|D) = \frac{0.21}{0.43} = \frac{21}{43}$.
Q48: (A)

$\Pr(RR|U_1) = \frac{6}{90} = \frac{1}{15}$. $\Pr(RR|U_2) = \frac{30}{90} = \frac{1}{3}$. $\Pr(U_2|RR) = \frac{\frac{1}{2}\cdot\frac{1}{3}}{\frac{1}{2}\cdot\frac{1}{15}+\frac{1}{2}\cdot\frac{1}{3}} = \frac{\frac{1}{6}}{\frac{1}{30}+\frac{1}{6}} = \frac{\frac{1}{6}}{\frac{6}{30}} = \frac{5}{6}$.

Q49: (A)

A overall: $\frac{80+10}{100+50} = \frac{90}{150} = 0.6$. B overall: $\frac{50+20}{60+90} = \frac{70}{150} \approx 0.467$. Treatment A is higher overall.

Q50: (A)

Posterior odds $= \frac{3}{2} \times 4 = 6$, i.e., $6:1$. So $\Pr(H|E) = \frac{6}{7}$.