4.19 Probability (Higher): 2-hour Pack

EDEXCEL 1MA1 · Calculator allowed · about 120 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A fair spinner is equally likely to land on each of the numbers 1, 2, 3, 4 and 5. Write down the probability that it lands on an odd number.

(Total for Question 1 is 1 mark)

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2 The probability that a particular bus arrives on time is 0.71. Write down the probability that the bus does not arrive on time.

(Total for Question 2 is 1 mark)

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3 A jar contains 3 strawberry sweets, 2 mint sweets and 5 lemon sweets. One sweet is taken at random. Work out the probability the sweet is strawberry or lemon.

(Total for Question 3 is 4 marks)

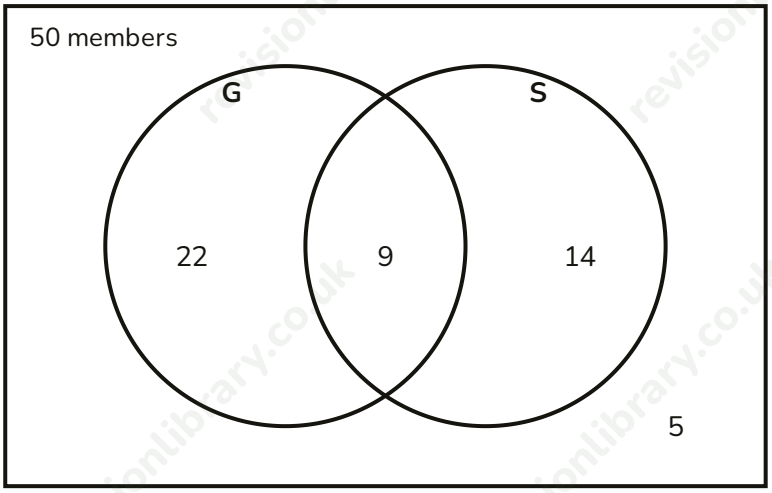
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4 Two coins are different: one is a 1p coin and one is a 2p coin. Both are fair. They are flipped once. Find the probability that the total value of coins that land heads is 3p.

(Total for Question 4 is 3 marks)

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5 The Venn diagram shows information about 50 members of a leisure centre. G = members who use the gym. S = members who swim. Only gym = 22, only swim = 14, both gym and swim = 9, neither = 5.



(a) Write down n(G and S), the number of members in both G and S. **(1)**

.....

(b) Write down P(G or S), the probability a member is in G or S (or both). **(1)**

.....

(c) Write down P(G'). **(2)**

.....

(Total for Question 5 is 4 marks)

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6 In a group of 90 students, P(studies Art) = 0.4, P(studies Music) = 0.3, and P(studies both Art and Music) = 0.1.

(a) Work out P(Art or Music). **(2)**

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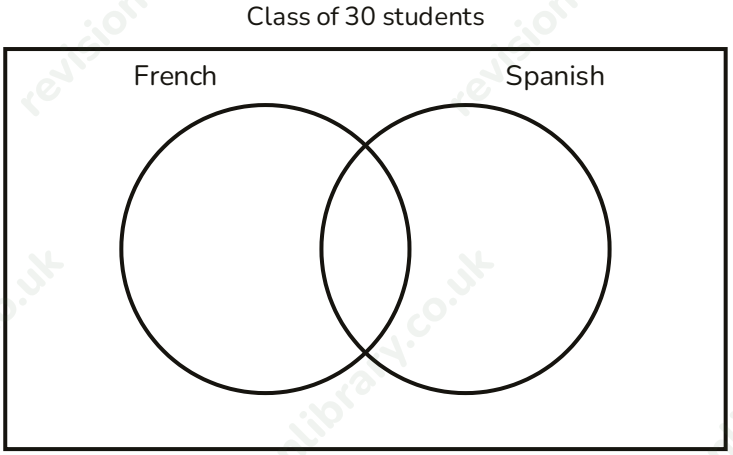
(b) Work out the number of students who study neither Art nor Music. **(2)**

.....

(Total for Question 6 is 4 marks)

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7 In a class of 30 students, 14 study French, 16 study Spanish and 5 study both French and Spanish. Every student studies French, Spanish, both, or neither.



(a) Work out the number of students who study only French. **(1)**

.....

(b) Work out the number of students who study neither French nor Spanish. **(2)**

.....

(c) A student is picked at random from the class. Find the probability that the student studies both French and Spanish. Give your answer as a fraction in its simplest form. **(2)**

.....

(Total for Question 7 is 5 marks)

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8 100 students in Year 10 were asked whether they walk or take the bus to school. The incomplete two-way table shows some of the results.

	Walk	Bus	Total
Boys	22	28	50
Girls	?	24	50
Total	?	52	100

(a) Complete the two-way table. **(2)**

(b) One student is picked at random from all 100 students. Find the probability that the student is a boy who takes the bus. **(2)**

.....

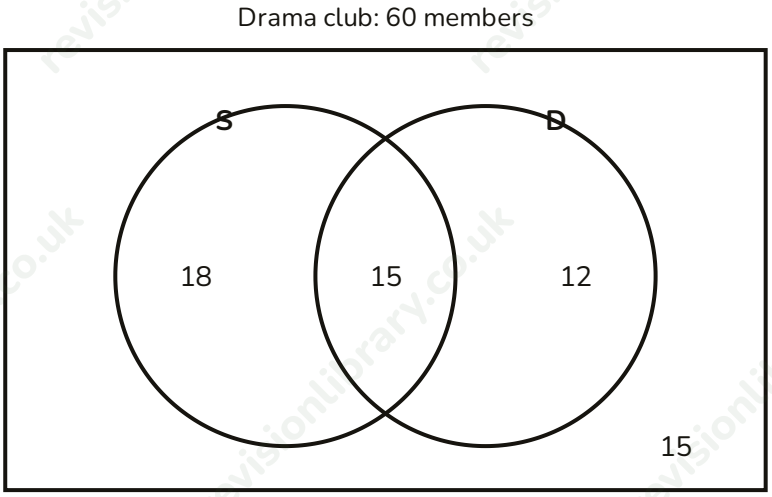
(c) Given that the student picked walks to school, find the probability that the student is a girl. **(2)**

.....

(Total for Question 8 is 6 marks)

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9 The Venn diagram shows information about 60 members of a drama club. S = members who can sing. D = members who can dance. Only sing = 18, only dance = 12, both sing and dance = 15, neither = 15.



(a) Write down n(S and D). **(1)**

.....

(b) Write down the number of members who can dance. **(1)**

.....

(c) A member is picked at random. Find P(S or D)'. **(2)**

.....

(d) Write down P(D and S'). **(2)**

.....

(Total for Question 9 is 6 marks)

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10 A fair four-sided dice, with faces numbered 1 to 4, is rolled twice. The two scores are multiplied together. Find the probability that the product is 4.

(Total for Question 10 is 2 marks)

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11 A fair spinner can land on amber, teal or violet. The table shows two of the probabilities.

Colour	Amber	Teal	Violet
Probability	0.28	y	0.39

Work out the value of y.

(Total for Question 11 is 2 marks)

---

12 A fair coin is flipped once and, at the same time, a fair four-sided spinner numbered 1 to 4 is spun once. Find the probability of getting a head and a number greater than 2.

(Total for Question 12 is 2 marks)

---

13 At Freya's market stall, every customer chooses tea, coffee or water. These are the only three drinks available and each customer chooses exactly one. P(tea) = 0.34 and P(coffee) = 0.41.

(a) Work out P(water). **(2)**

.....

(b) Work out P(tea or water). **(1)**

.....

(Total for Question 13 is 3 marks)

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14 A bag contains 6 red counters and 4 blue counters. Two counters are drawn at random without replacement. Work out the probability that both counters are red.

(Total for Question 14 is 5 marks)

---

15 A bag contains counters labelled 1, 2, 3 and 4. A counter is chosen at random and then replaced. Two independent draws are made. Work out the probability that the first draw is 3 and the second draw is less than 3.

(Total for Question 15 is 4 marks)

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16 A fair spinner has three equal regions labelled A, B and C. Jamie spins the spinner twice. Work out the probability Jamie gets A both times.

(a) Work out the probability of getting A on one spin. **(1)**

.....

(b) Work out the probability Jamie gets A on both spins. Show your method. **(4)**

.....

(Total for Question 16 is 5 marks)

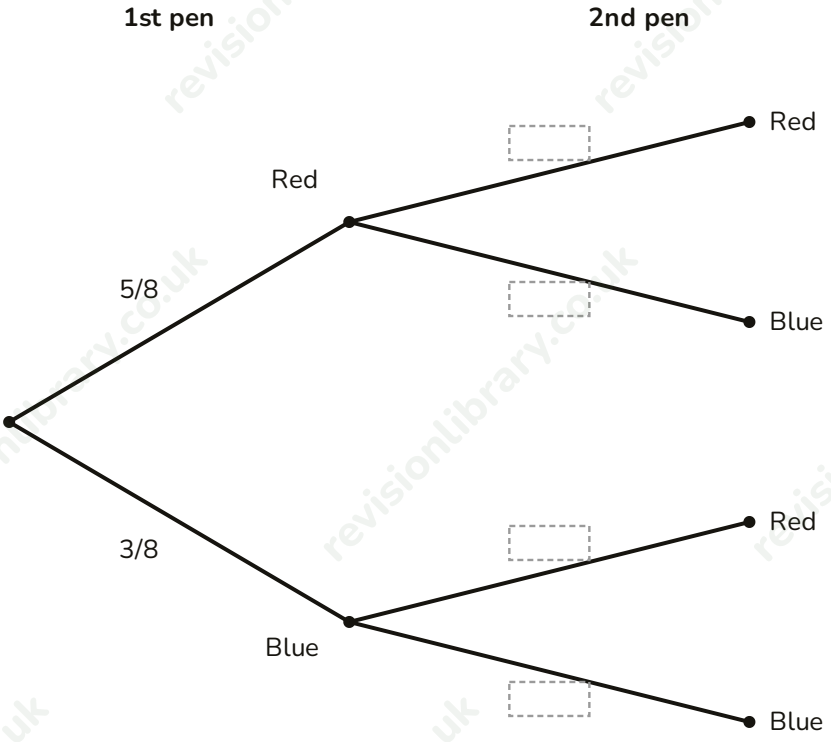
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17 A single fair six-sided die is rolled once. Work out the probability that the result is an even number greater than 2.

(Total for Question 17 is 2 marks)

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18 A box contains 5 red pens and 3 blue pens. Nadia takes a pen at random from the box and does not replace it. She then takes a second pen at random from the box.



(a) Complete the tree diagram to show the probabilities for both pens. **(3)**

(b) Work out the probability that Nadia takes two red pens. **(2)**

.....

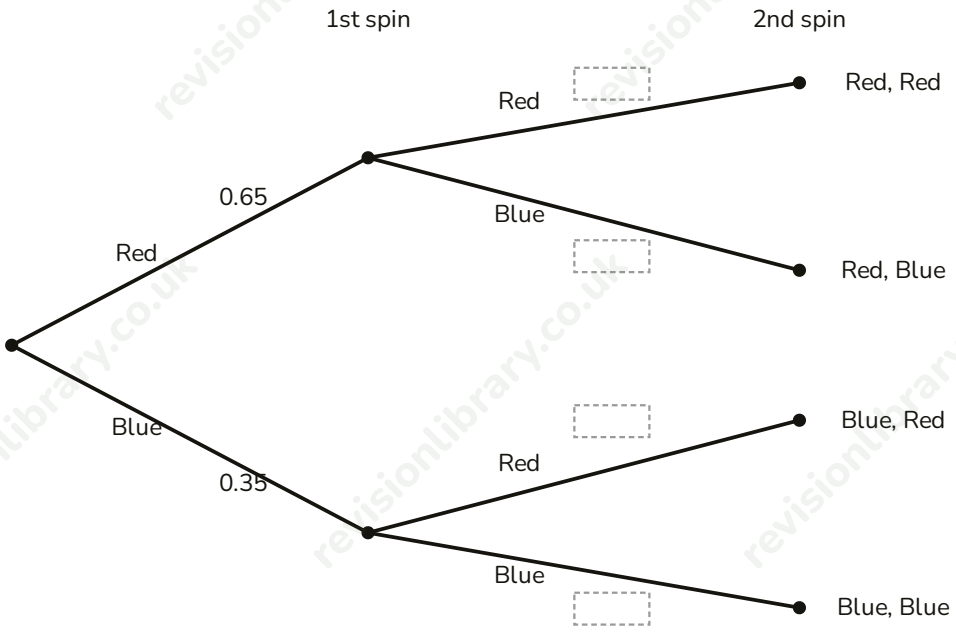
(c) Work out the probability that Nadia takes at least one blue pen. **(3)**

.....

(Total for Question 18 is 8 marks)

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19 Meera has a biased spinner with P(lands on red) = 0.65 and P(lands on blue) = 0.35. She spins the spinner twice.



(a) Complete the tree diagram to show the probabilities for both spins. **(2)**

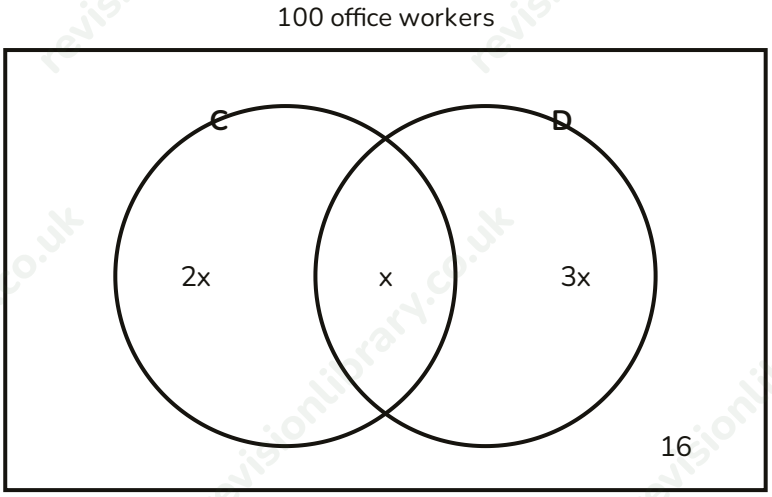
(b) Work out the probability that the spinner lands on the same colour both times. **(3)**

.....

(Total for Question 19 is 5 marks)

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20 In a survey of 100 office workers, some cycle to work (C) and some drive to work (D). The number who only cycle is 2x, the number who both cycle and drive is x, the number who only drive is 3x, and the number who do neither is 16.



(a) Form and solve an equation to find the value of x. **(3)**

(b) A worker is picked at random. Find the probability that the worker cycles to work (whether or not they also drive). **(3)**

(Total for Question 20 is 6 marks)

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21 A game gives a prize according to the following rule. A bag contains tokens labelled with values £1, £2 and £5. The probabilities of drawing each are proportional to 1, 2 and 1 respectively. A player draws one token at random and receives that amount. The player may then choose to redraw once: if they redraw they must accept the second token.

(a) Find the probability of drawing each value on a single draw. **(2)**

(b) Determine the expected winning with the strategy: keep first draw only if it is at least £2; otherwise redraw. Show working and give expected value to nearest pence. **(5)**

(c) Is this strategy better than always keeping the first draw? Justify with a comparison. **(3)**

(Total for Question 21 is 10 marks)

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22 The probability that a biased coin lands on heads is p. The coin is flipped twice. The probability of getting two heads is 1/2 more than the probability of getting two tails.

(a) Form an equation in p, and simplify it using the difference of two squares. **(2)**

(b) Solve your equation to find the value of p. **(2)**

(Total for Question 22 is 4 marks)

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Mark scheme · 4.19 Probability (Higher): 2-hour Pack

Question 1

3/5 oe (accept 0.6, 60%) **B1**

Answer: 3/5

Question 2

0.29 oe **B1**

Answer: 0.29

Question 3

identify favourable outcomes 3+5 and total 3+2+5 = 10 **M1**

state the fraction 8/10 oe **M1**

show method to simplify 8/10 to 4/5 **M1**

4/5 cao **A1**

Answer: 4/5

Question 4

list of all four equally likely outcomes for heads/tails on the two coins, e.g. (1p H,2p H), (1p H,2p T), (1p T,2p H), (1p T,2p T) or equivalent **M1**

identify favourable outcome(s): both coins heads gives total 3p **M1**

1/4 cao **A1**

Answer: 1/4

Question 5

(a) 9 cao **B1**

(a) Answer: 9

(b) 9/10 oe (accept 45/50) **B1**

(b) Answer: 9/10

(c) 14 + 5 oe (= 19, not in G) **M1**

(c) 19/50 cao **A1**

(c) Answer: 19/50

Question 6

(a) 0.4 + 0.3 - 0.1 oe **M1**

(a) 0.6 cao **A1**

(a) Answer: 0.6

(b) (1 - 0.6) x 90 oe, ft their (a) **M1**

(b) 36 cao **A1**

(b) Answer: 36

Question 7

(a) 9 cao **B1**

(a) Answer: 9

(b) 30 - (9 + 11 + 5) oe **M1**

(b) 5 cao **A1**

(b) Answer: 5

(c) 5/30 oe **M1**

(c) 1/6 cao **A1**

(c) Answer: 1/6

Question 8

(a) Girls Walk = 26 **B1**

(a) Total Walk = 48 **B1**

(a) Answer: Girls Walk = 26, Total Walk = 48

(b) 28/100 oe **M1**

(b) 7/25 cao **A1**

(b) Answer: 7/25

(c) 26/48 oe, ft their (a) **M1**

(c) 13/24 cao ft **A1**

(c) Answer: 13/24

Question 9

(a) 15 cao **B1**

(a) Answer: 15

(b) 27 cao **B1**

(b) Answer: 27

(c) 15/60 oe **M1**

(c) 1/4 cao **A1**

(c) Answer: 1/4

(d) 12/60 oe **M1**

(d) 1/5 cao **A1**

(d) Answer: 1/5

Question 10

identifies the 3 outcomes (1,4), (4,1) and (2,2) out of 16 equally likely outcomes **M1**

3/16 cao **A1**

Answer: 3/16

Question 11

1 - 0.28 - 0.39 oe **M1**

y = 0.33 cao **A1**

Answer: y = 0.33

Question 12

identifies the 2 successful outcomes (H,3) and (H,4) out of 8 equally likely outcomes **M1**

1/4 oe cao **A1**

Answer: 1/4

Question 13

(a) 1 - 0.34 - 0.41 oe **M1**

(a) 0.25 cao **A1**

(a) Answer: 0.25

(b) 0.59 oe, ft: 0.34 + their (a) **B1**

(b) Answer: 0.59

Question 14

P(first red) = 6/10 stated **M1**

P(second red after first red) = 5/9 stated **M1**

multiply probabilities: (6/10) x (5/9) shown **M1**

simplify product 30/90 shown **M1**

1/3 cao **A1**

Answer: 1/3

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Question 15

P(first = 3) = 1/4 identified	**M1**
P(second < 3) = 2/4 identified	**M1**
multiply probabilities for independent events: (1/4) x (2/4) = 2/16 shown	**M1**
1/8 cao	**A1**

Answer: 1/8

Question 16

(a) 1/3 cao	**B1**

(a) Answer: 1/3

(b) state independence and multiply: (1/3) x (1/3) oe	**M1**
(b) multiply to give 1/9	**M1**
(b) show product as fraction 1/9 oe	**M1**
(b) 1/9 cao	**A1**

(b) Answer: 1/9

Question 17

identify favourable outcomes 4 and 6 or method showing count 2/6	**M1**
1/3 cao	**A1**

Answer: 1/3

Question 18

(a) first branches 5/8 and 3/8	**B1**
(a) second branches after Red: 4/7 and 3/7	**B1**
(a) second branches after Blue: 5/7 and 2/7	**B1**

(a) Answer: First: 5/8, 3/8. After Red: 4/7, 3/7. After Blue: 5/7, 2/7.

(b) 5/8 x 4/7	**M1**
(b) 5/14 cao (oe 20/56)	**A1**

(b) Answer: 5/14

(c) recognises P(at least one blue) = 1 - P(both red)	**M1**
(c) 1 - their (b) correctly using a common denominator	**dM1**
(c) 9/14 cao ft	**A1**

(c) Answer: 9/14

Question 19

(a) second-level branches after red: 0.65 and 0.35	**B1**
(a) second-level branches after blue: 0.65 and 0.35	**B1**

(a) Answer: 0.65 and 0.35 in each missing space

(b) 0.65 x 0.65 oe	**M1**
(b) 0.35 x 0.35 oe	**M1**
(b) 0.545 cao	**A1**

(b) Answer: 0.545

Question 20

(a) 2x + x + 3x + 16 = 100 oe	**M1**
(a) 6x = 84 oe	**M1**
(a) x = 14 cao	**A1**

(a) Answer: x = 14

(b) identifies cycles = 2x + x = 3x, ft their x	**M1**
(b) 42/100 oe ft	**M1**
(b) 21/50 cao ft	**A1**

(b) Answer: 21/50

Question 21

(a) recognise probabilities proportional to 1:2:1 so total parts =4	**M1**
(a) P(1)=1/4, P(2)=2/4=1/2, P(5)=1/4 cao	**A1**

(a) Answer: P(£1)=1/4, P(£2)=1/2, P(£5)=1/4

(b) identify cases: keep if first draw £2 or £5; redraw if £1	**M1**
(b) compute expected value on redraw = E(second draw) = 1*(1/4)+2*(1/2)+5*(1/4) = (1/4)+(1)+(5/4)= (1/4+1+1.25)=2.5	**M1**
(b) compute total expectation: P(first £1)*E(second) + P(first £2)*2 + P(first £5)*5	**M1**
(b) substitute: (1/4)*2.5 + (1/2)*2 + (1/4)*5 = 0.625 + 1.0 + 1.25 = 2.875	**A1**
(b) final answer £2.88 to nearest pence cao	**A1**

(b) Answer: £2.88

(c) compute expected value if always keep first draw = E(first) = 2.5	**M1**
(c) compare 2.875 > 2.5 and state strategy gives higher expectation	**A1**
(c) conclude strategy is better, justify by difference £0.375 or 37.5p	**B1**

(c) Answer: Yes. Always keeping first draw has expected value £2.50. The strategy gives £2.875, so it is better by £0.375 (37.5p).

Question 22

(a) $p^2 - (1-p)^2 = 1/2$ oe	**M1**
(a) simplifies using the difference of two squares to 2p - 1 = 1/2 oe (accept fully expanded equivalent)	**A1**

(a) Answer: 2p - 1 = 1/2

(b) 2p = 3/2 oe, ft their (a)	**M1**
(b) p = 3/4 cao	**A1**

(b) Answer: p = 3/4

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