5.23 Venn Diagrams: Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

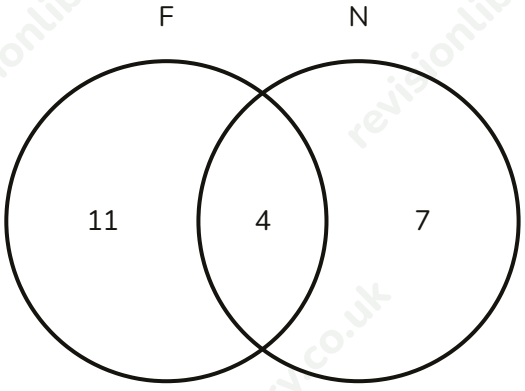
Answer ALL questions. Show all your working.

1 Here is a Venn diagram with two sets. 7 students like apples only, 5 students like bananas only and 3 students like both apples and bananas. Every student asked likes at least one of these fruits. How many students were asked in total?

(Total for Question 1 is 1 mark)

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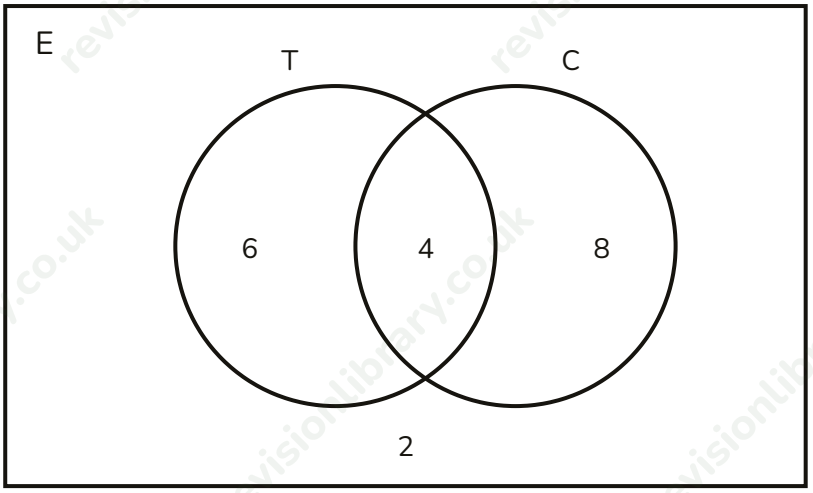
2 A two-circle Venn diagram shows pupils who play football (F) and pupils who play netball (N). The numbers are: F only 11, N only 7, both 4. A pupil is chosen at random from those who play at least one of these two sports. Give the probability that the pupil plays netball. Give your answer as a fraction in lowest terms.



(Total for Question 2 is 3 marks)

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3 20 people were asked whether they drink tea (T) or coffee (C). The Venn diagram shows: 6 people in T only, 4 people in the overlap of T and C, 8 people in C only, and 2 people outside both circles.



(a) Write down n(T intersect C'). **(1)**

.....

(b) A person is chosen at random from the 20 people. Find P(C). **(2)**

.....

(Total for Question 3 is 3 marks)

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4 In a class of 32, pupils chose morning activities. 18 chose reading, 14 chose drawing and 6 chose both reading and drawing.

(a) How many pupils chose neither activity? **(3)**

.....

(b) Explain briefly how you obtained your answer to part (a). **(2)**

.....

.....

(Total for Question 4 is 5 marks)

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5 The universal set is E = {1, 2, 3, ..., 20}.
A is the set of multiples of 4 in E.
B is the set of multiples of 6 in E.

(a) List the elements of A intersect B. **(1)**

(b) List the elements of (A union B)'. **(2)**

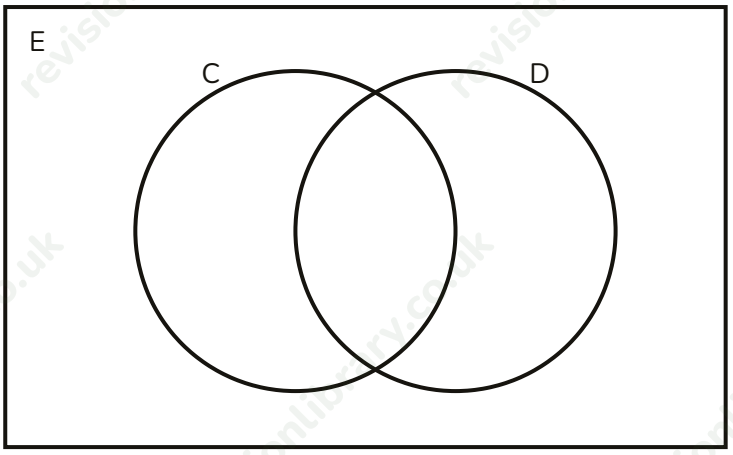
(c) Write down another way of expressing (A union B)' using set notation. **(1)**

.....

(Total for Question 5 is 4 marks)

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6 A survey of 50 people asked whether they own a cat (C) or a dog (D). 22 people own a cat, 19 people own a dog, and 8 people own both a cat and a dog.



(a) Complete a Venn diagram to show this information. State the number of people in each of the four regions: C only, both C and D, D only, and neither. **(3)**

(b) Using your Venn diagram, find the probability that a randomly selected person owns a dog but not a cat. **(2)**

.....

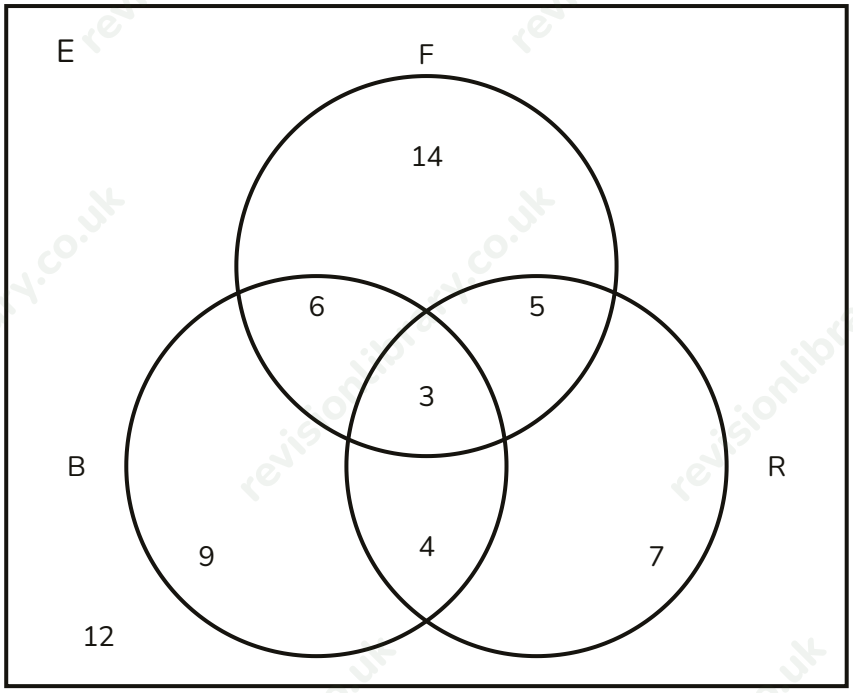
(c) Find P(C union D). **(2)**

.....

(Total for Question 6 is 7 marks)

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7 60 students were surveyed about which sports they play: football (F), basketball (B) and rugby (R). The three-circle Venn diagram shows: F only = 14, B only = 9, R only = 7, F and B only = 6, F and R only = 5, B and R only = 4, all three sports = 3, and none of the three = 12.



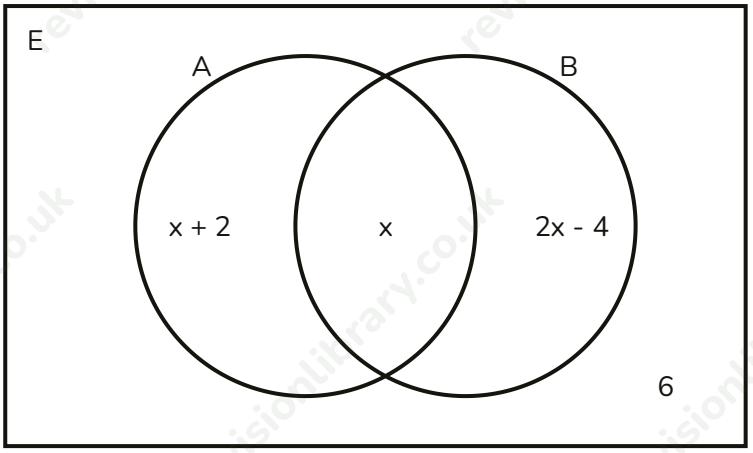
(a) Find the number of students who play at least two of the three sports. **(2)**

(b) Find the probability that a randomly selected student plays exactly one sport. **(2)**

(Total for Question 7 is 4 marks)

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8 There are 40 students in a group split by whether they are in set A, set B, both, or neither. On a Venn diagram, the number in A only is x + 2, the number in B only is 2x - 4, the number in both A and B is x, and the number in neither is 6.



(a) Show that the total number of students gives the equation 4x + 4 = 40. **(2)**

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

.....

(c) Work out n(A). **(2)**

.....

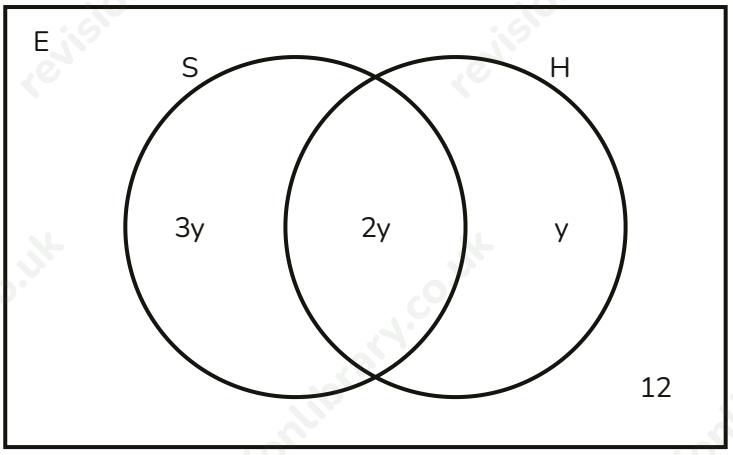
(d) Find the probability that a randomly selected student is in B but not A. **(2)**

.....

(Total for Question 8 is 8 marks)

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9 The Venn diagram shows solar panels (S) and heat pumps (H) for the 48 houses on a street in Manchester. S only = 3y, H only = y, both S and H = 2y, and 12 houses have neither.



(a) Form an equation in y and solve it. **(3)**

.....

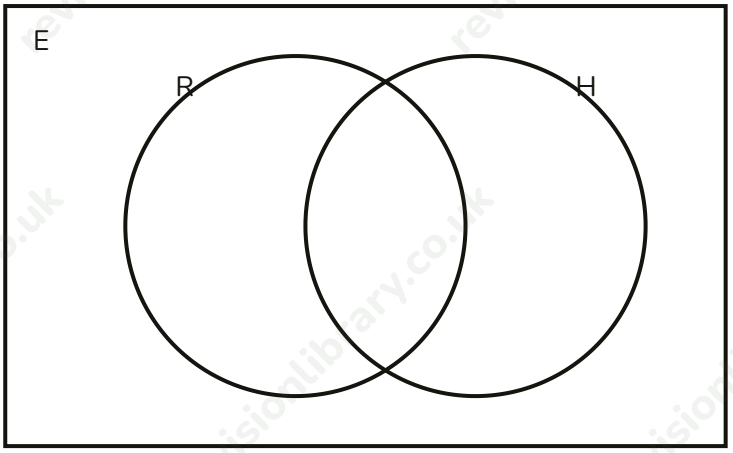
(b) A house is selected at random. Find P(S). **(1)**

.....

(Total for Question 9 is 4 marks)

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10 In a school of 200 students, R is the event that a student plays rugby and H is the event that a student plays hockey. 90 students play rugby, 70 students play hockey, and 50 students play neither sport.



(a) Find n(R intersect H). **(2)**

.....

(b) A student who plays hockey is selected at random. Find the probability that they also play rugby. **(2)**

.....

(c) Two students are selected at random from all 200 students, without replacement. Find the probability that both students play rugby only (rugby but not hockey). **(3)**

.....

(Total for Question 10 is 7 marks)

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Mark scheme · 5.23 Venn Diagrams: Test Pack

A correct answer earns full marks unless the question asks for working, a method, proof or explanation.

Question 1

15 cao **B1**

Answer: 15 students (7 + 5 + 3 = 15).

Question 2

identify total who play netball = 7 + 4 = 11 **M1**

identify total pupils = 11 + 7 + 4 = 22 **M1**

11/22 = 1/2 cao (give final fraction in lowest terms) **A1**

Answer: 1/2 (11/22 = 1/2).

Question 3

(a) 6 cao **B1**

(a) Answer: 6

(b) (8 + 4)/20 oe seen **M1**

(b) 3/5 oe **A1**

(b) Answer: 3/5

Question 4

(a) compute reading or drawing = 18 + 14 - 6 = 26 **M1**

(a) compute neither = 32 - 26 **M1**

(a) 6 cao **A1**

(a) Answer: 6 pupils

(b) state formula or method: used union formula or added and subtracted overlap **B1**

(b) clear explanation: subtract number who do at least one from total **B1**

(b) Answer: Used 18 + 14 - 6 to find pupils doing at least one activity (26) then 32 - 26 = 6. Explanation: avoid double counting by subtracting the overlap.

Question 5

(a) {12} cao **B1**

(a) Answer: A intersect B = {12}

(b) A union B correctly found as {4,6,8,12,16,18,20} **M1**

(b) {1,2,3,5,7,9,10,11,13,14,15,17,19} cao **A1**

(b) Answer: {1, 2, 3, 5, 7, 9, 10, 11, 13, 14, 15, 17, 19}

(c) A' intersect B' oe **B1**

(c) Answer: A' intersect B'

Question 6

(a) 8 placed correctly in the overlap of C and D **B1**

(a) 14 in C only (22 - 8) and 11 in D only (19 - 8), ft from their overlap value **M1**

(a) 17 outside both circles, cao (50 - 14 - 8 - 11) **A1**

(a) Answer: C only = 14, both = 8, D only = 11, neither = 17

(b) 11/50 oe seen, ft from part (a) **M1**

(b) 11/50 cao **A1**

(b) Answer: 11/50

(c) (14 + 8 + 11)/50 oe seen, ft **M1**

(c) 33/50 cao **A1**

(c) Answer: 33/50

Question 7

(a) 6 + 5 + 4 + 3 (identifies the four relevant regions) **M1**

(a) 18 cao **A1**

(a) Answer: 18

(b) 14 + 9 + 7 (= 30) oe **M1**

(b) 30/60 oe (= 1/2) **A1**

(b) Answer: 30/60 = 1/2

Question 8

(a) (x + 2) + (2x - 4) + x + 6 = 40 seen **M1**

(a) cso, correctly simplified to 4x + 4 = 40 **A1**

(a) Answer: 4x + 4 = 40

(b) 4x = 36 **M1**

(b) x = 9 cao **A1**

(b) Answer: x = 9

(c) (9 + 2) + 9 oe, ft from their x **M1**

(c) 20 cao **A1**

(c) Answer: 20

(d) 14/40 oe, ft from their x **M1**

(d) 7/20 oe **A1**

(d) Answer: 7/20

Question 9

(a) 3y + y + 2y + 12 = 48 oe (correct equation formed) **M1**

(a) 6y = 36 (oe, correct simplification) **M1**

(a) y = 6 cao **A1**

(a) Answer: y = 6

(b) 30/48 oe (= 5/8), ft from part (a) **B1**

(b) Answer: 30/48 = 5/8

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Question 10

(a) 90 + 70 - (200 - 50) oe seen	**M1**
(a) 10 cao	**A1**

(a) Answer: 10

(b) 10/70 oe, ft from part (a)	**M1**
(b) 1/7 oe	**A1**

(b) Answer: 1/7

(c) 80/200 for the first student, ft from part (a) using rugby only = 90 - their 10	**M1**
(c) 79/199 for the second student, dependent on the first method mark, and multiplied together	**dM1**
(c) 158/995 oe	**A1**

(c) Answer: 158/995

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