HIGHER

1.1 Sets and Venn Notation: Test Pack

EDEXCEL 4MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 In a Venn diagram for sets A and B, the number of elements in 'only A' is 2x + 4, in 'both A and B' is x, in 'only B' is x + 5, and 9 elements are in neither set. The universal set has 34 elements.
(a) Find the value of x.
(b) Work out n(A union B).

(Total for Question 1 is 4 marks)

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2 A Venn diagram of the universal set shows these numbers of elements in each region: outside both sets: 1, only B: 9, only A: 1, both A and B: 9.
Work out n(A intersection B').

(Total for Question 2 is 2 marks)

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3 28 people were asked about their activities. 17 of them own a cat, 7 of them own a dog, and 7 of them do neither.
One of the people who own a dog is chosen at random. Find the probability that they also own a cat.

(Total for Question 3 is 4 marks)

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4 In a survey of 48 people, n(A) = 23, n(B) = 20 and n(C) = 18, where A, B and C are three sets. n(A intersection B) = 9, n(A intersection C) = 9, n(B intersection C) = 5 and n(A intersection B intersection C) = 4.
Work out the number of people who are in exactly two of the three sets.

(Total for Question 4 is 4 marks)

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5 A Venn diagram of the universal set shows these numbers of elements in each region: outside both sets: 9, only B: 5, only A: 3, both A and B: 8.
Work out n((A intersection B)').

(Total for Question 5 is 2 marks)

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6 The universal set is the set of whole numbers from 1 to 15.
A = {square numbers}, B = {cube numbers}.
List the members of the set A'.

(Total for Question 6 is 4 marks)

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7 In a Venn diagram for sets A and B, the number of elements in 'only A' is 3x, in 'both A and B' is 2x + 2, in 'only B' is 2x + 1, and 9 elements are in neither set. The universal set has 26 elements.

(a) Find the value of x.

(b) Work out n(A union B).

(Total for Question 7 is 4 marks)

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8 40 people were asked about their activities. 22 of them own a cat, 24 of them own a dog, and 4 of them do neither.

One of the people is chosen at random. Find the probability that they own a cat and own a dog.

(Total for Question 8 is 4 marks)

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9 In a survey of 41 people, n(A) = 17, n(B) = 16 and n(C) = 13, where A, B and C are three sets. n(A intersection B) = 6, n(A intersection C) = 3, n(B intersection C) = 3 and n(A intersection B intersection C) = 2.

Work out the number of people who are in none of the three sets.

(Total for Question 9 is 4 marks)

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10 A Venn diagram of the universal set shows these numbers of elements in each region: outside both sets: 4, only B: 2, only A: 8, both A and B: 7.
Work out n(A union B').

(Total for Question 10 is 2 marks)

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11 23 people were asked about their activities. 15 of them own a cat, 12 of them own a dog, and 4 of them do neither.
One of the people who own a dog is chosen at random. Find the probability that they also own a cat.

(Total for Question 11 is 4 marks)

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12 The universal set is the set of whole numbers from 1 to 15.
A = {odd numbers}, B = {multiples of 4}.
List the members of the set B'.

(Total for Question 12 is 4 marks)

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Mark scheme · 1.1 Sets and Venn Notation: Test Pack

Question 1

forms 2x + 4 + x + x + 5 + 9 = 34	**M1**
collects terms: 4x + 18 = 34	**M1**
x = 4	**A1**
n(A union B) = 34 - 9 = 25	**A1**

Answer: (a) x = 4; (b) 25

Question 2

identifies which regions are in A intersection B'	**M1**
1	**A1**

Answer: n(A intersection B') = 1

Question 3

uses n(A union B) = 28 - 7 = 21	**M1**
uses n(A intersection B) = 17 + 7 - 21	**M1**
3 people do both	**A1**
probability = 3/7 = 3/7	**A1**

Answer: 3/7

Question 4

subtracts the all-three count from a pair total, e.g. 9 - 4 = 5; or starts the pair-total sum 9 + 9 + 5	**M1**
finds all three exactly-two regions 5, 5 and 1; or subtracts 3 x 4 from the sum of the pair totals	**M1**
combines the exactly-two regions as 5 + 5 + 1; or evaluates (9 + 9 + 5) - 3 x 4	**M1**
11	**A1**

Answer: 11

Question 5

identifies which regions are in (A intersection B)'	**M1**
9 + 5 + 3 = 17	**A1**

Answer: n((A intersection B)') = 17

Question 6

A = {1, 4, 9}	**B1**
uses the universal set of whole numbers from 1 to 15 inclusive; may be implicit in a correct complement	**B1**
removes the members of A from the universal set, oe; may be implicit in a correct complement	**M1**
A' = {2, 3, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15}	**A1**

Answer: A' = {2, 3, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15}

Question 7

forms 3x + 2x + 2 + 2x + 1 + 9 = 26	**M1**
collects terms: 7x + 12 = 26	**M1**
x = 2	**A1**
n(A union B) = 26 - 9 = 17	**A1**

Answer: (a) x = 2; (b) 17

Question 8

uses n(A union B) = 40 - 4 = 36	**M1**
uses n(A intersection B) = 22 + 24 - 36	**M1**
10 people do both	**A1**
probability = 10/40 = 1/4	**A1**

Answer: 1/4

Question 9

finds the 'exactly two sets' regions by subtracting 2 from each pair, giving 4, 1 and 1	**M1**
finds the 'only' regions: A only = 10, B only = 9, C only = 9	**M1**
adds all seven regions to get n(A union B union C) = 36	**M1**
41 - 36 = 5	**A1**

Answer: 5

Question 10

identifies which regions are in A union B'	**M1**
4 + 8 + 7 = 19	**A1**

Answer: n(A union B') = 19

Question 11

uses n(A union B) = 23 - 4 = 19	**M1**
uses n(A intersection B) = 15 + 12 - 19	**M1**
8 people do both	**A1**
probability = 8/12 = 2/3	**A1**

Answer: 2/3

Question 12

uses the universal set of whole numbers from 1 to 15 inclusive; may be implicit in a correct complement	**B1**
B = {4, 8, 12}	**B1**
removes the members of B from the universal set, oe; may be implicit in a correct complement	**M1**
B' = {1, 2, 3, 5, 6, 7, 9, 10, 11, 13, 14, 15}	**A1**

Answer: B' = {1, 2, 3, 5, 6, 7, 9, 10, 11, 13, 14, 15}

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