HIGHER

1.1 Sets and Venn Notation: 1-hour Pack

EDEXCEL 4MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 In a survey of 39 people, n(A) = 21, n(B) = 15 and n(C) = 15, where A, B and C are three sets. n(A intersection B) = 6, n(A intersection C) = 7, n(B intersection C) = 8 and n(A intersection B intersection C) = 2.
Work out the number of people who are in the set A but not in the set B. (Use n(A) and n(A intersection B).)

(Total for Question 1 is 3 marks)

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2 22 members were asked about their activities. 15 of them swim, 11 of them cycle, and 4 of them do neither.
One of the members who cycle is chosen at random. Find the probability that they also swim.

(Total for Question 2 is 4 marks)

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3 In a Venn diagram for sets A and B, the number of elements in 'only A' is 2x + 2, in 'both A and B' is 2x + 3, in 'only B' is x + 2, and 9 elements are in neither set. The universal set has 46 elements.

(a) Find the value of x.

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

(Total for Question 3 is 4 marks)

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4 A Venn diagram of the universal set shows these numbers of elements in each region: outside all three sets: 3, only C: 2, only B: 5, B and C only: 9, only A: 4, A and C only: 3, A and B only: 4, A and B and C: 3.

Work out n(A intersection B intersection C').

(Total for Question 4 is 2 marks)

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5 In a survey of 46 people, n(A) = 18, n(B) = 19 and n(C) = 17, where A, B and C are three sets. n(A intersection B) = 8, n(A intersection C) = 6, n(B intersection C) = 7 and n(A intersection B intersection C) = 3.

Work out the number of people who are in exactly one of the three sets.

(Total for Question 5 is 4 marks)

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6 32 students were asked about their activities. 19 of them play football, 12 of them play netball, and 4 of them do neither.
One of the students who play netball is chosen at random. Find the probability that they also play football.

(Total for Question 6 is 4 marks)

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7 The universal set is the set of whole numbers from 1 to 24.
A = {cube numbers}, B = {multiples of 2}.
List the members of the set (A union B)'.

(Total for Question 7 is 4 marks)

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8 A Venn diagram of the universal set shows these numbers of elements in each region: outside both sets: 5, only B: 6, only A: 9, both A and B: 3.
Work out n((A intersection B)').

(Total for Question 8 is 2 marks)

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9 In a survey of 34 people, n(A) = 18, n(B) = 10 and n(C) = 13, where A, B and C are three sets. n(A intersection B) = 6, n(A intersection C) = 6, n(B intersection C) = 2 and n(A intersection B intersection C) = 1.
Work out the number of people who are in the set A but not in the set B. (Use n(A) and n(A intersection B).)

(Total for Question 9 is 3 marks)

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10 In a Venn diagram for sets A and B, the number of elements in 'only A' is 3x + 1, in 'both A and B' is x + 2, in 'only B' is x + 5, and 5 elements are in neither set. The universal set has 43 elements.
(a) Find the value of x.
(b) Work out n(A union B).

(Total for Question 10 is 4 marks)

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11 The universal set is the set of whole numbers from 1 to 15.
A = {cube numbers}, B = {even numbers}.
List the members of the set A union B.

(Total for Question 11 is 4 marks)

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12 A Venn diagram of the universal set shows these numbers of elements in each region: outside all three sets: 6, only C: 6, only B: 2, B and C only: 3, only A: 6, A and C only: 3, A and B only: 6, A and B and C: 8.

Work out n((A intersection B) union C).

(Total for Question 12 is 2 marks)

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13 22 pupils were asked about their activities. 9 of them study French, 9 of them study Spanish, and 7 of them do neither.

Work out the number of pupils who study French but do not study Spanish.

(Total for Question 13 is 4 marks)

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Mark scheme · 1.1 Sets and Venn Notation: 1-hour Pack

Question 1

uses n(A but not B) = n(A) - n(A intersection B), oe; may be implied by the correct numerical subtraction	**M1**
n(A) - n(A intersection B) = 21 - 6	**M1**
15	**A1**

Answer: 15

Question 2

uses n(A union B) = 22 - 4 = 18	**M1**
uses n(A intersection B) = 15 + 11 - 18	**M1**
8 members do both	**A1**
probability = 8/11 = 8/11	**A1**

Answer: 8/11

Question 3

forms 2x + 2 + 2x + 3 + x + 2 + 9 = 46	**M1**
collects terms: 5x + 16 = 46	**M1**
x = 6	**A1**
n(A union B) = 46 - 9 = 37	**A1**

Answer: (a) x = 6; (b) 37

Question 4

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

Answer: n(A intersection B intersection C') = 4

Question 5

finds the 'exactly two sets' regions by subtracting 3 from each pair, giving 5, 3 and 4	**M1**
finds the 'only' regions: A only = 7, B only = 7, C only = 7	**M1**
adds the only regions 7 + 7 + 7	**M1**
21	**A1**

Answer: 21

Question 6

uses n(A union B) = 32 - 4 = 28	**M1**
uses n(A intersection B) = 19 + 12 - 28	**M1**
3 students do both	**A1**
probability = 3/12 = 1/4	**A1**

Answer: 1/4

Question 7

A = {1, 8}	**B1**
B = {2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24}	**B1**
applies (A union B)' to these lists using the universal set	**M1**
(A union B)' = {3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23}	**A1**

Answer: (A union B)' = {3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23}

Question 8

identifies which regions are in (A intersection B)'	**M1**
5 + 6 + 9 = 20	**A1**

Answer: n((A intersection B)') = 20

Question 9

uses n(A but not B) = n(A) - n(A intersection B), oe; may be implied by the correct numerical subtraction	**M1**
n(A) - n(A intersection B) = 18 - 6	**M1**
12	**A1**

Answer: 12

Question 10

forms 3x + 1 + x + 2 + x + 5 + 5 = 43	**M1**
collects terms: 5x + 13 = 43	**M1**
x = 6	**A1**
n(A union B) = 43 - 5 = 38	**A1**

Answer: (a) x = 6; (b) 38

Question 11

A = {1, 8}	**B1**
B = {2, 4, 6, 8, 10, 12, 14}	**B1**
applies A union B to these lists	**M1**
A union B = {1, 2, 4, 6, 8, 10, 12, 14}	**A1**

Answer: A union B = {1, 2, 4, 6, 8, 10, 12, 14}

Question 12

identifies which regions are in (A intersection B) union C	**M1**
6 + 3 + 3 + 6 + 8 = 26	**A1**

Answer: n((A intersection B) union C) = 26

Question 13

uses n(A union B) = 22 - 7 = 15	**M1**
uses n(A intersection B) = 9 + 9 - 15	**M1**
3 pupils do both	**A1**
9 - 3 = 6	**A1**

Answer: 6

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