5.6 Venn Diagrams and Set Notation: Test Pack

Calculators not allowed · about 55 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Write down the meaning of each set notation.

(a) A n B **(1)**

(b) A u B **(1)**

(c) A' (the complement of A, within the universal set U) **(1)**

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2 In a class of 35 pupils, 10 play cats, 25 play dogs and 6 play both cats and dogs.
How many pupils play neither cats nor dogs?

(3)

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3 In a class of 36 pupils, 28 play French, 11 play Spanish and 7 play both French and Spanish.
One pupil is chosen at random. Work out the probability that the pupil plays neither French nor Spanish.

(4)

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4 The universal set is the whole numbers from 1 to 12. Set A = {1, 2, 4, 9} and set B = {1, 5, 6, 9}.
Work out the number of elements in A or B or both.

(2)

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5 The universal set is the whole numbers from 1 to 15. Set A = {9, 10, 11, 14} and set B = {1, 3, 11, 14}.
List the numbers that are not in A (the complement of A).

(2)

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6 In a class of 21 pupils, 15 play French, 9 play Spanish and 6 play both French and Spanish.
How many pupils play French only?

(2)

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7 Use inclusion-exclusion. In a class of 28, 12 read book A and 9 read book B. Work out how many read neither if 4 read both.

(2)

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8 In a class of 30 pupils, 15 play football, 10 play hockey and 3 play both football and hockey.
How many pupils play football only?

(2)

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9 In a class of 46 pupils, 26 play football, 17 play hockey and 1 play both football and hockey.
How many pupils play football only?

(2)

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10 The universal set is the whole numbers from 1 to 10. Set A = {1, 3, 4, 8, 10} and set B = {4, 6, 9, 10}.
List the numbers that are in both A and B.

(2)

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11 In a class of 28 pupils, 19 play French, 8 play Spanish and 6 play both French and Spanish.
How many pupils play neither French nor Spanish?

(3)

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12 Three-set Venn. In a group of 60, 30 are in A, 25 in B, 20 in C. Exactly 5 are in all three sets. There are 10 in both A and B, 8 in both A and C and 6 in both B and C (these pairwise numbers include the 5 who are in all three). Fill in the number of elements in each of the seven non-overlapping regions: (A only), (B only), (C only), (A and B only), (A and C only), (B and C only), (A and B and C).

(a) A and B and C (all three) **(1)**

(b) A and B only (in A and B but not C) **(1)**

.....

(c) A and C only (in A and C but not B) **(1)**

.....

(d) B and C only (in B and C but not A) **(1)**

.....

(e) A only **(1)**

.....

(f) B only **(1)**

.....

(g) C only **(1)**

.....

13 The universal set is the whole numbers from 1 to 10. Set A = {1, 6, 7, 8, 9, 10} and set B = {2, 4, 6, 8, 10}.
Work out the number of elements in A or B or both.

(2)

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14 In a survey of 100 people, 55 like tea, 40 like coffee, and 15 like both tea and coffee. Find the probability that a randomly selected person likes neither tea nor coffee, giving your answer as a fraction in simplest form.

(3)

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15 In a school of 250 students, 140 study French, 100 study Spanish, and 30 study both languages.

(a) Find the number of students who study exactly one of the two languages. **(2)**

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(b) Find the probability that a randomly selected student studies neither language, giving your answer as a fraction in simplest form. **(2)**

.....

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16 Sets A and B are disjoint (they have no elements in common) within a class of 35 pupils. $n(A) = 12$ and $n(B) = 9$. Find $n(A \cup B)$.

(1)

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Mark scheme · 5.6 Venn Diagrams and Set Notation: Test Pack

Question 1

(a) elements that are in both A and B (intersection) cao **B1**

(a) Answer: **elements in both A and B**

(b) elements that are in A or in B or in both (union) cao **B1**

(b) Answer: **elements in A or B or both**

(c) elements in the universal set U that are not in A (complement) cao **B1**

(c) Answer: **elements not in A (within the universal set)**

Question 2

10 + 25 - 6 = 29 **M1**

35 - 29 **M1**

6 cao **A1**

Answer: **6**

Question 3

21 French only, 4 Spanish only, 7 both **M1**

32 play at least one **M1**

36 - 32 **M1**

1/9 cao **A1**

Answer: **1/9**

Question 4

n(A) + n(B) - n(both) **M1**

6 cao **A1**

Answer: **6**

Question 5

at least half the numbers **M1**

1, 2, 3, 4, 5, 6, 7, 8, 12, 13, 15 cao **A1**

Answer: **1, 2, 3, 4, 5, 6, 7, 8, 12, 13, 15**

Question 6

15 - 6 **M1**

9 cao **A1**

Answer: **9**

Question 7

in at least one = 12 + 9 - 4 oe **M1**

11 cao **A1**

Answer: **11 pupils**

Question 8

15 - 3 **M1**

12 cao **A1**

Answer: **12**

Question 9

26 - 1 **M1**

25 cao **A1**

Answer: **25**

Question 10

at least one correct number or a clear method **M1**

4, 10 cao **A1**

Answer: **4, 10**

Question 11

19 + 8 - 6 = 21 **M1**

28 - 21 **M1**

7 cao **A1**

Answer: **7**

Question 12

(a) value given in question cao **B1**

(a) Answer: **5**

(b) pairwise minus triple: 10 - 5 cao **B1**

(b) Answer: **5**

(c) pairwise minus triple: 8 - 5 cao **B1**

(c) Answer: **3**

(d) pairwise minus triple: 6 - 5 cao **B1**

(d) Answer: **1**

(e) A only = A total minus parts in overlaps cao **B1**

(e) Answer: **17**

(f) B only = B total minus parts in overlaps cao **B1**

(f) Answer: **14**

(g) C only = C total minus parts in overlaps cao **B1**

(g) Answer: **11**

Question 13

n(A) + n(B) - n(both) **M1**

8 cao **A1**

Answer: **8**

Question 14

n(tea u coffee) = 55 + 40 - 15 = 80 **M1**

neither = 100 - 80 = 20 **M1**

1/5 cao **A1**

Answer: **1/5**

Question 15

(a) French only = 140 - 30 = 110 and Spanish only = 100 - 30 = 70 **M1**

(a) 180 cao **A1**

(a) Answer: **180**

(b) n(French u Spanish) = 140 + 100 - 30 = 210, so neither = 250 - 210 = 40 **M1**

(b) 4/25 cao **A1**

(b) Answer: **4/25**

Question 16

21 cao **B1**

Answer: **21**

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