Class Exercise 2

Sets and relations

Student's Name: Andrew Graff

Question 1:

Let A = {1, 2, 3, 5, 6}, B = {3, 4, 6, 8} be two subsets of the universal set

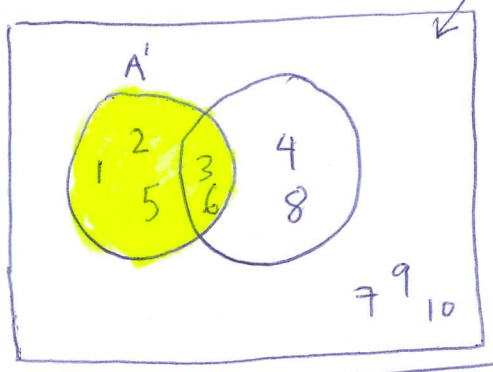
U = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}

Draw Venn diagrams to represent the following sets

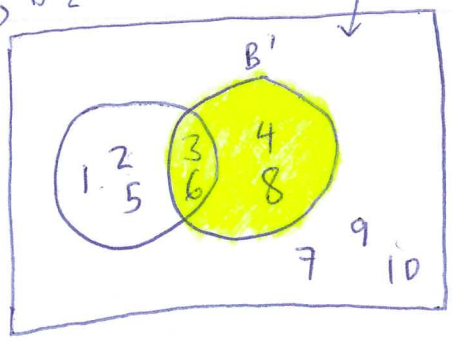
(a) A'
(b) B'
(c) A ∪ B
(d) A ∩ B
(e) (A ∪ B)'
(f) (A ∩ B)'

(a) opposite

A' = {4, 8, 7, 9, 10}

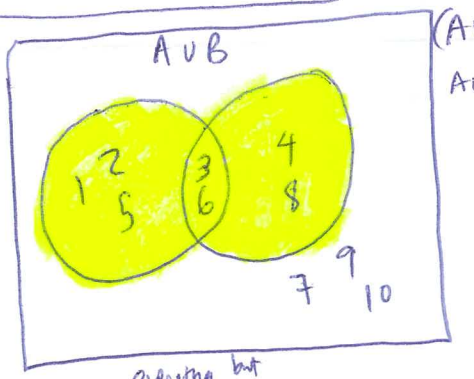


(b) B' {1, 2, 5, 7, 9, 10} opposite

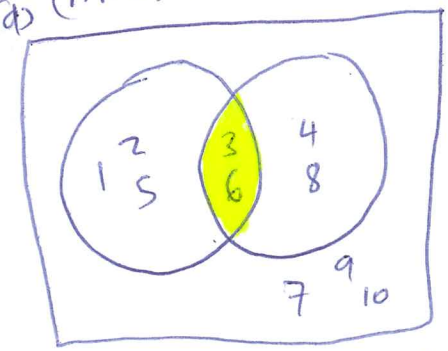


(c) A ∪ B (AUB) Union

A ∪ B = {1, 2, 5, 3, 6, 4, 8}

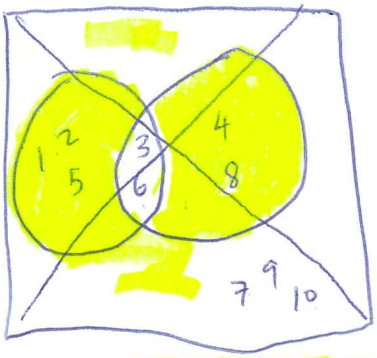


(d) (A ∩ B) Intersection

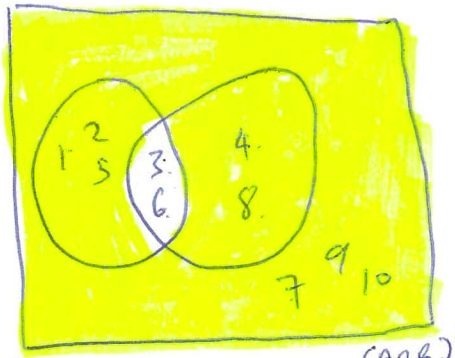


(A ∩ B) {3, 6}

(e) (A ∪ B)' everything but intersection

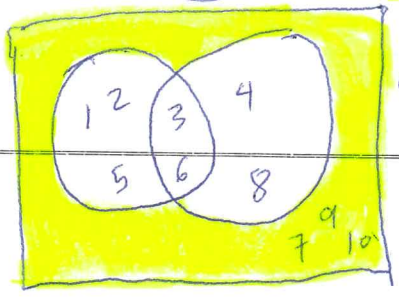


(f) (A ∩ B)' only the intersection



(A ∩ B)' {1, 2, 5, 4, 8, 7, 9, 10}

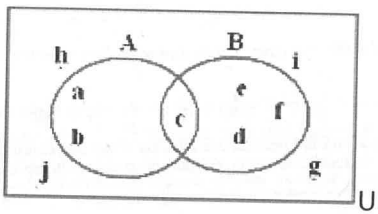
(e)



(A ∪ B)' → {7, 9, 10}

Question 2

From the adjoining figure list the elements of the following sets:



U

Universal set (a) U = {A, B, i, g, j, h, a, b, c, e, d, f}

Components of A (b) A' = {h, j, i, g, e, d, f}

Components of B (c) B' = {a, b, h, j, i, g}

Only the intersection (d) (A ∩ B)' = {a, b, d, e, f, g, h, i, j}

Everything but intersection (e) (A ∪ B)' = {h, j, i, g}

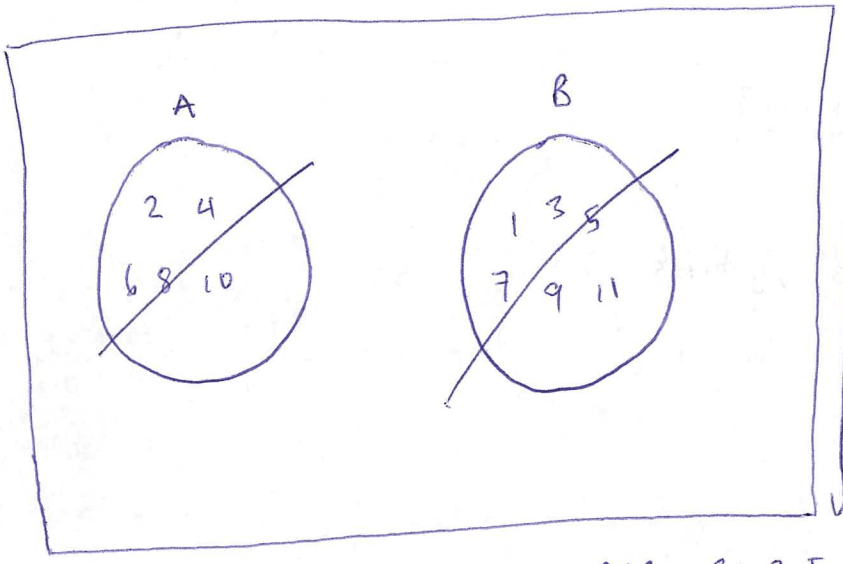
A or B and everything except (f) A' ∪ B' = {a, b, d, e, f, i, g, h, j}

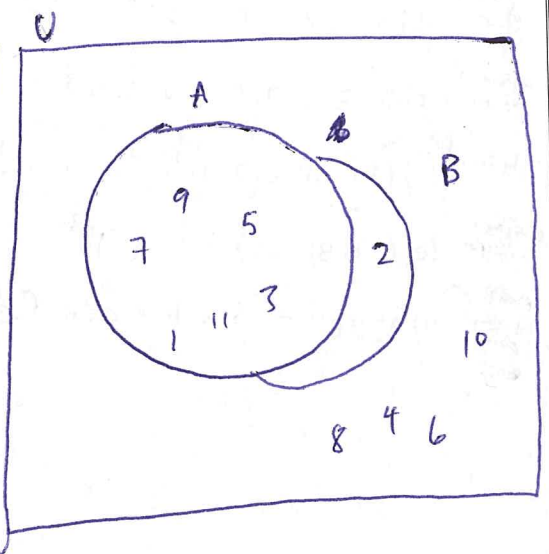
Question 3

We have universal set U = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11}. Let A be the set of odd numbers and let B be the set of prime numbers.

a) First establish the sets A and B.
b) What are the numbers in both sets?
c) Draw a Venn diagram for this information.

(a) ~~A = {2, 4, 6, 8, 10}~~
~~B = {1, 3, 5, 7, 9, 11}~~





(a) A = {1, 3, 5, 7, 9, 11}
B = {1, 2, 3, 5, 7, 11}

(b) A∩B = {1, 3, 5, 7, 9, 11}

Question 4

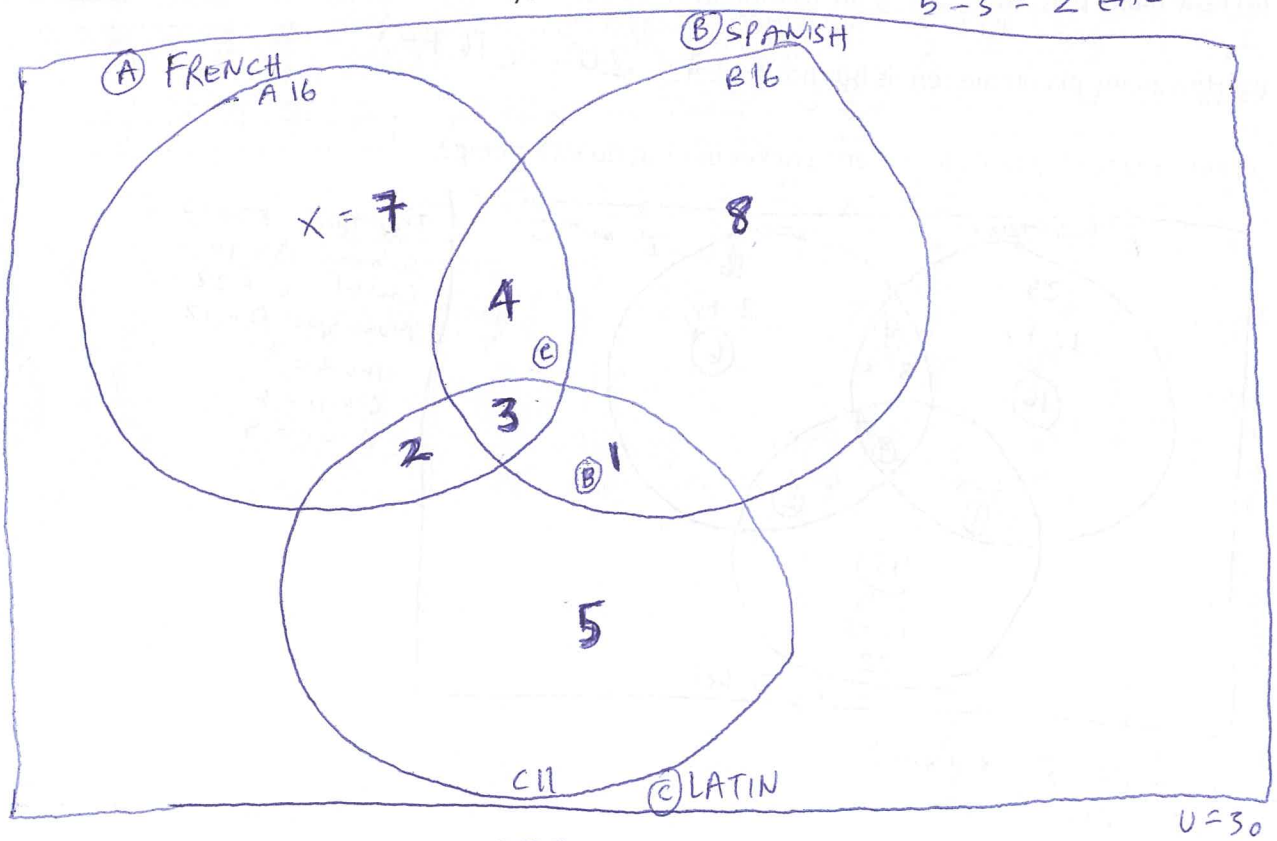
A guidance counselor is planning schedules for 30 students. Sixteen students say they want to take French, 16 want to take Spanish, and 11 want to take Latin. Five say they want to take both French and Latin, and of these, 3 wanted to take Spanish as well. Five want only Latin, and 8 want only Spanish.

$A \cup B \cup C = 30$

Find:

How many students want French only?

$5 = A \cap C$
$3 = A \cap B \cap C$
$5 - 3 = 2$



$C = 5 + 2 + 3$

$C11 = 5 + 2 + 3 + B$
$11 = 10 + B$
$B = 1$

$B16 = 8 + 1 + 3 + C$
$16 = 12 + C$
$C = 4$

$A = 16$
$B = 16$
$C = 11$

Calculate all regions $= 5 + 2 + 1 + 3 + 4 + 8 + x = 30$

$23 + x = 30$

$x = 7$

Answer: 7 students want french only.

Question 5

In a group of 60 students, 25 play table tennis, 16 do swimming and 22 play cricket, 8 play table tennis and do swimming, 6 play cricket and do swimming, 5 play table tennis and cricket, and 12 students do not play any of these game.

Find:

(a) how many play table tennis, do swimming and play cricket? 4

(b) How many play table tennis but not cricket? 20 (16 + 4)

(c) How many play table tennis and cricket but not do swimming? 1

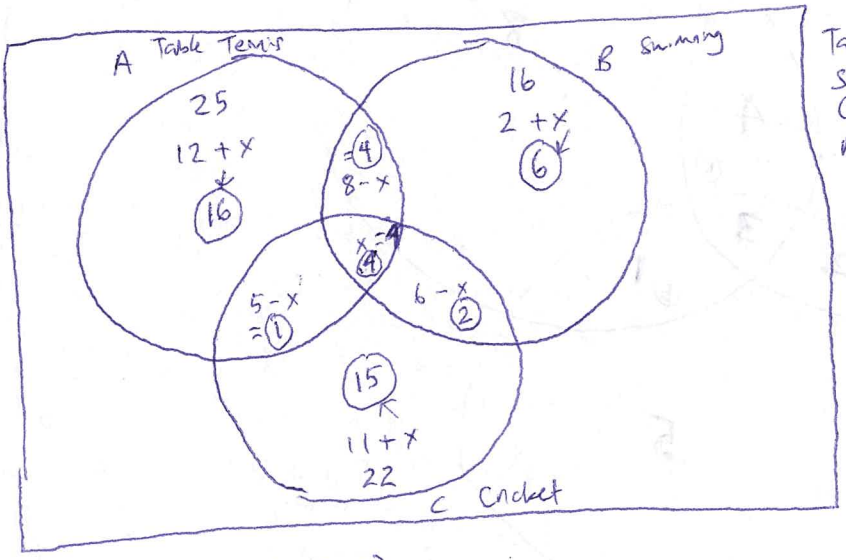


Table Tennis A = 25
Swiming B = 16
Cricket C = 22
Non-Spot D = 12
A ∪ B = 8
C ∪ B = 6
A ∪ C = 5

A - 25 - (5 - X + X + 8 - X)
25 - (13 - X)
12 + X

B - 16 - (6 - X + X + 8 - X)
16 - (14 - X)
2 + X

C 22 - (6 - X + X + 5 - X)
22 - (11 - X)
11 + X

12 + X + 8 - X + 2 + X + 5 - X + X + 6 - X + 11 + X = 60
44 + X + 12 = 60
(non spot student)
56 + X = 60
X = 4.

Question 6

Let the universal U = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10} and sets A, B, and C as follows:

A = {2, 4, 6, 8, 10}

B = {1, 3, 6, 7, 8}

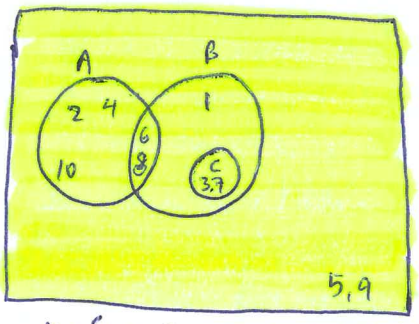
C = {3, 7}

(a) Illustrate the sets U, A, B and C in a Venn diagram, marking all the elements in the appropriate places.

(b) Using your Venn diagram, list the elements in each of the following sets: A ∩ B, A ∪ C , A′, B′, B ∩ A′, B ∩ C′, A – B, A Δ B

(c) Complete the statement using a single symbol: C - B = ...

(a)



U = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}

(B) A ∩ B : {6, 8}

A ∪ C : {2, 4, 10, 6, 8, 3, 7} (complements)

A′ : ~~{2, 4, 10, 6, 8}~~ {1, 3, 5, 7, 9} (all numbers except A as well)

B′ : ~~{1, 6, 8, 3, 7}~~ {2, 4, 5, 9, 10} (all numbers except B as well)

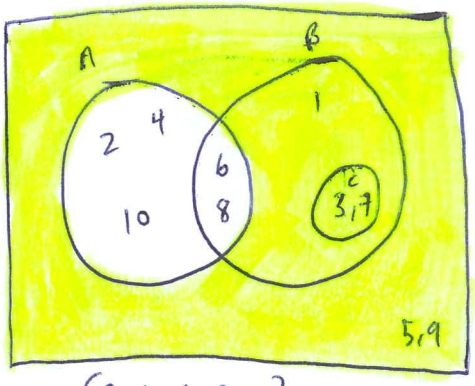
B ∩ A′ : ~~{2, 4, 10, 1, 3, 7, 5, 9}~~ {1, 3, 7}

B ∩ C : {1, 6, 8}

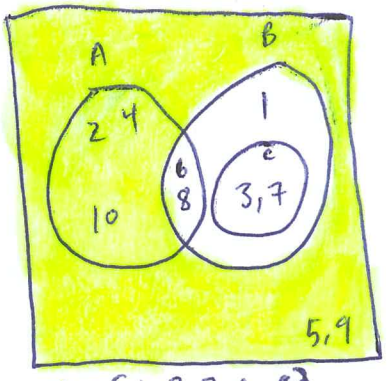
A − B : {2, 4, 10}

A Δ B : {1, 2, 3, 4, 7, 10}

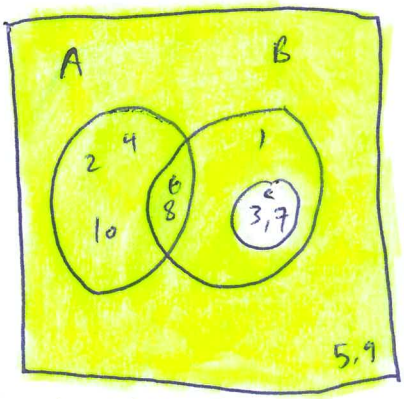
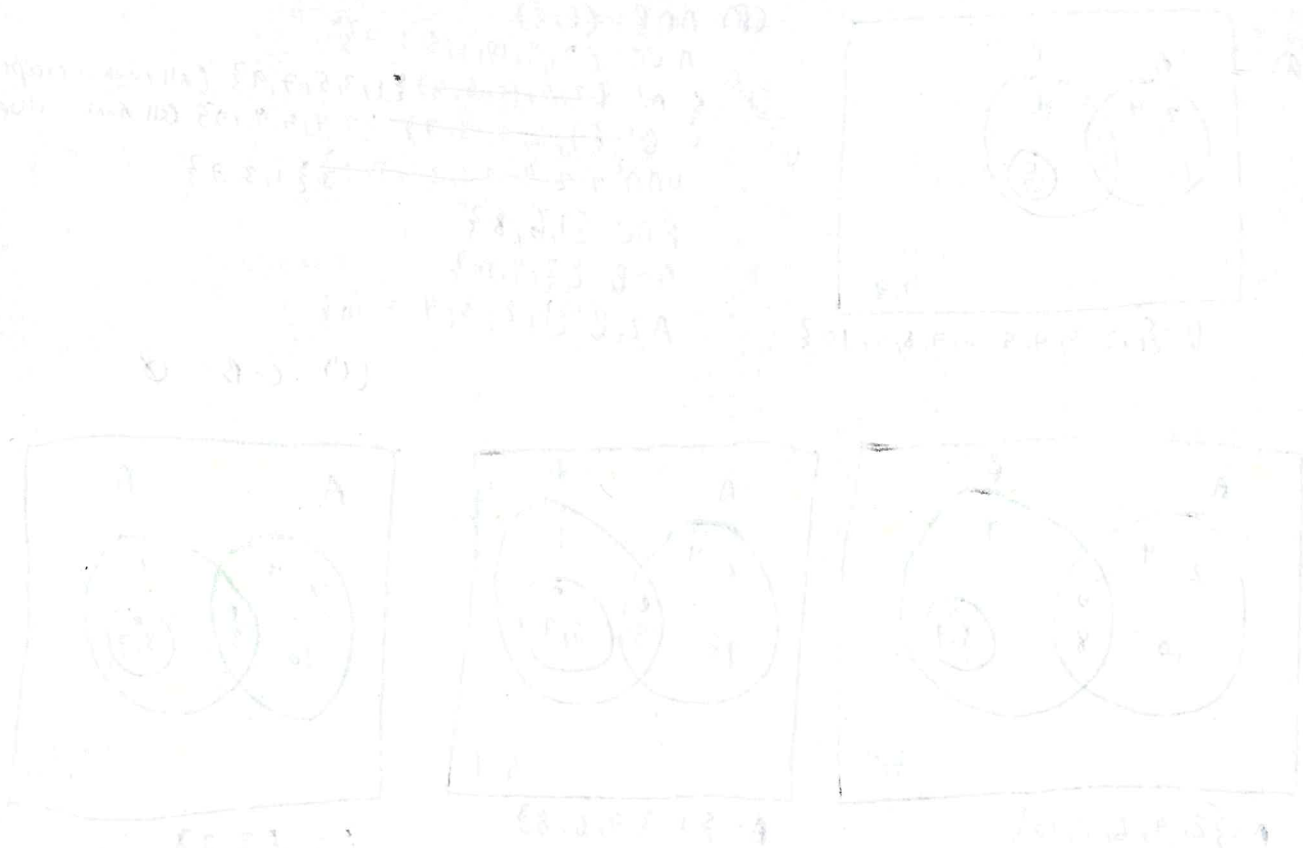
(c) C − B = ∅



A = {2, 4, 6, 8, 10}



B = {1, 3, 7, 6, 8}



C = {3, 7}