Venn diagrams

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This presentation contains examples similar to the ones we've done in class. Make sure you can do them with ease. The last two examples are solved with a slightly different method than the one we've used in class. It's up to you which one you want to use.

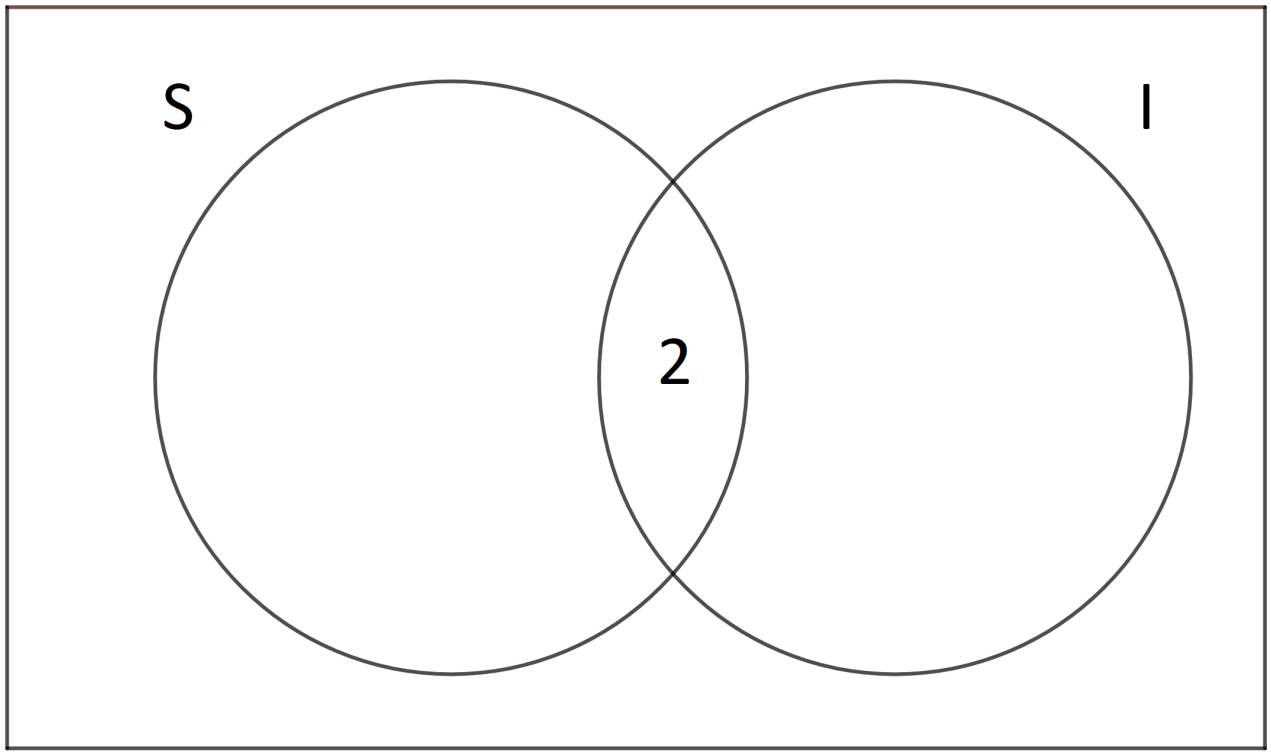
Example 1

There are 18 students in class. 9 of them speak Spanish, 6 speak Italian, 2 speak both Spanish and Italian.

Represent this information on a Venn diagram and find number of students (i) who do not speak any of the mentioned languages (ii) exactly one of the two languages.

Draw a Venn diagram with two sets.

Draw a Venn diagram with two sets. Start, if possible, by putting numbers that correspond to **one** region. For example 9 (number of students who speak Spanish) corresponds to two regions (marked below) and we don't know how to divide this number between these two regions. So we start with 2 (number of students who speak both Italian and Spanish):



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Similarly for those who speak Italian only we have $6 - 2 = 4$, so we put 4 into appropriate region.

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Now we have a total of 13 students. We want to have 18, so we put 5 in the appropriate region.

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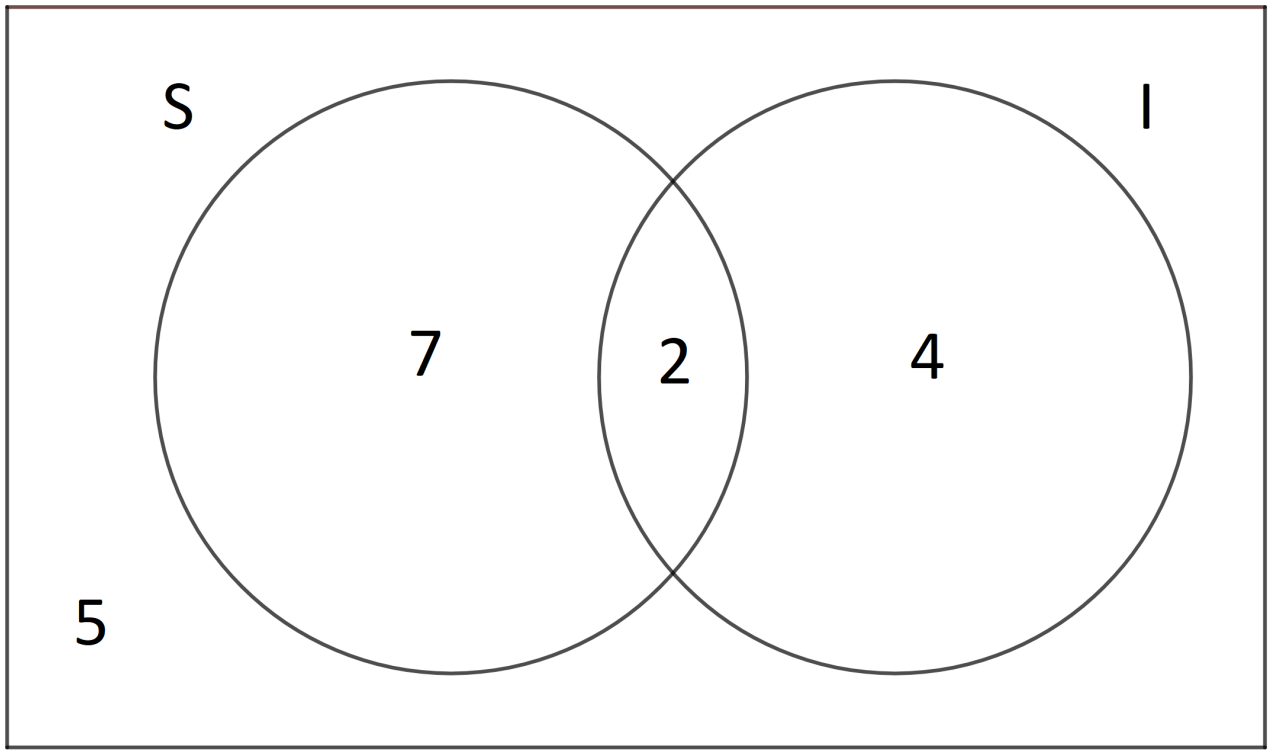
Now we have a total of 13 students. We want to have 18, so we put 5 in the appropriate region.



Now to answer the questions:

i. 5 students do not speak any of the mentioned languages,

ii. 11 students speak exactly one language.

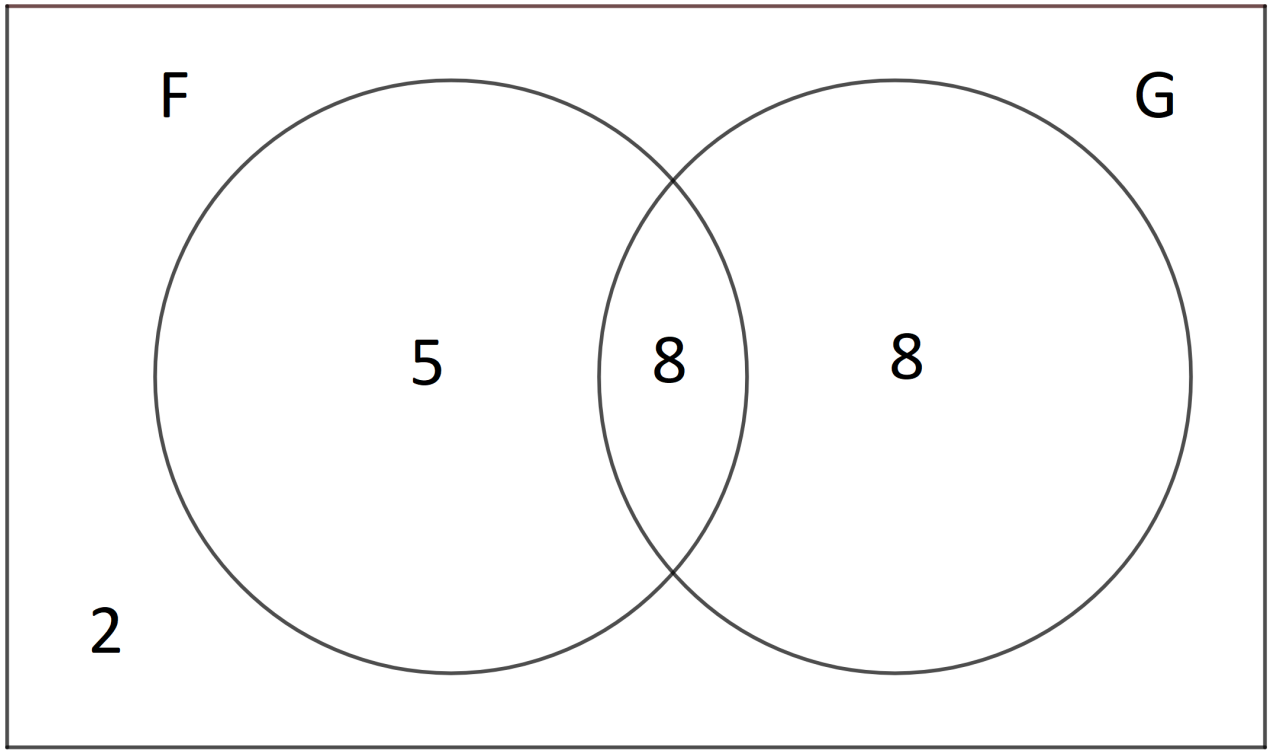
Question 1

There are 23 students in class. 13 of them speak French, 16 speak German, 8 speak both French and German.

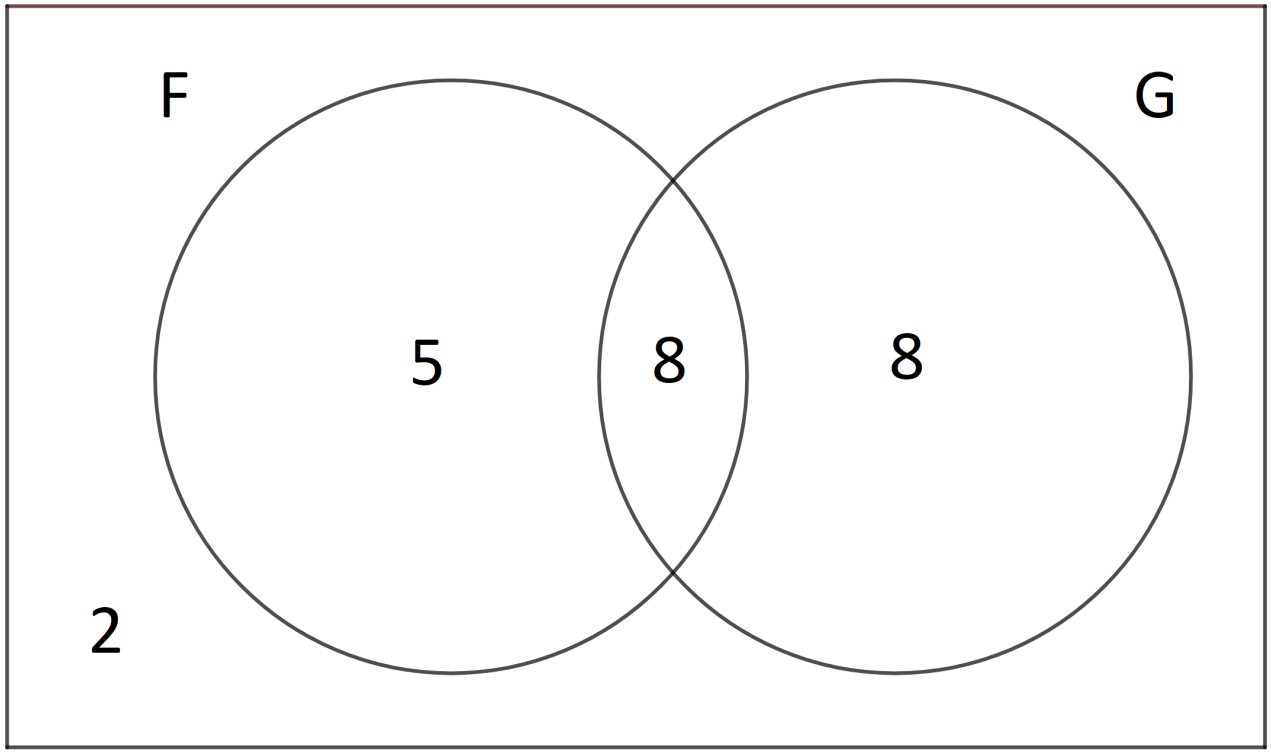
Represent this information on a Venn diagram and find number of students (i) who do not speak any of the mentioned languages (ii) exactly one of the two languages.

Solution:

Solution:



Solution:



i. 2 students do not speak any of the mentioned languages,

ii. 13 students speak exactly one language.

Example 2

There are 13 students in class. 8 of them speak Spanish, 4 speak only Italian, 3 speak both Spanish and Italian.

Represent this information on a Venn diagram and find number of students (i) who do not speak any of the mentioned languages (ii) who speak Italian.

We start by drawing a Venn diagram for two sets.

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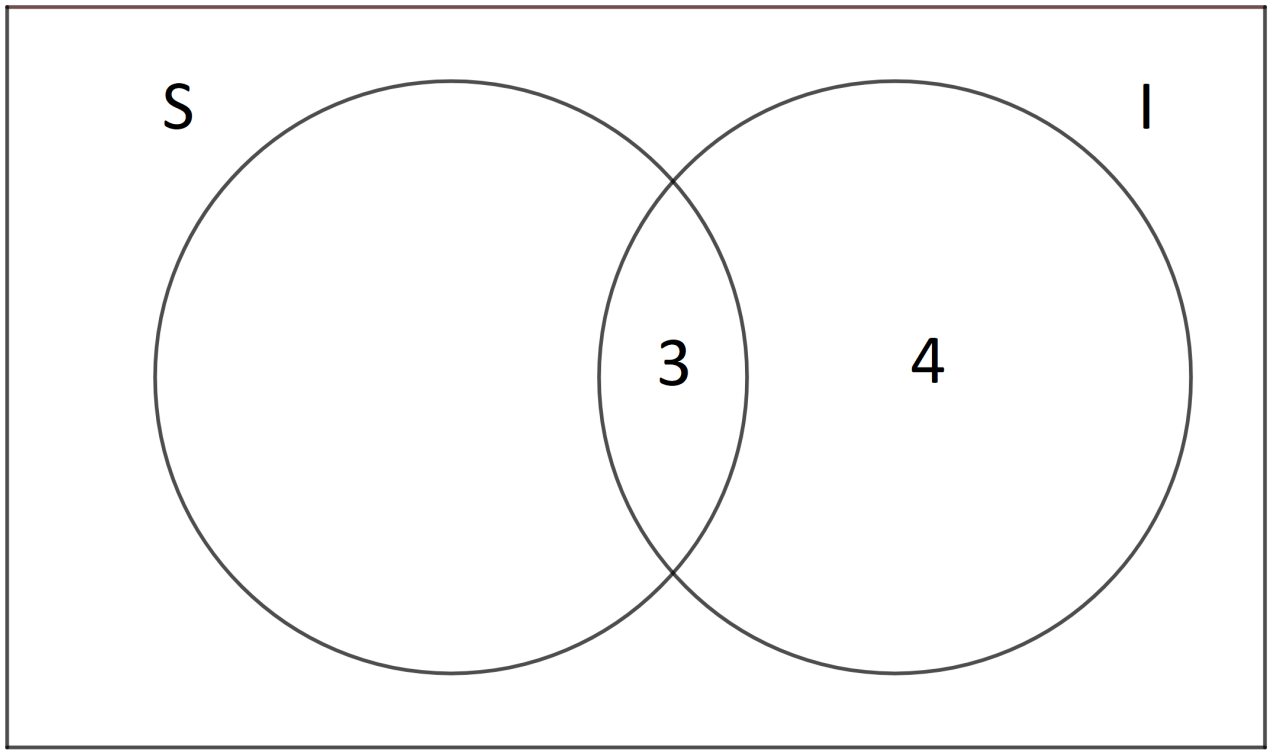

Now we have $8 - 3 = 5$, so 5 students study Spanish only. We can put this information on the diagram.
We have 12 students. We need 13, $13 - 12 = 1$, so we have:

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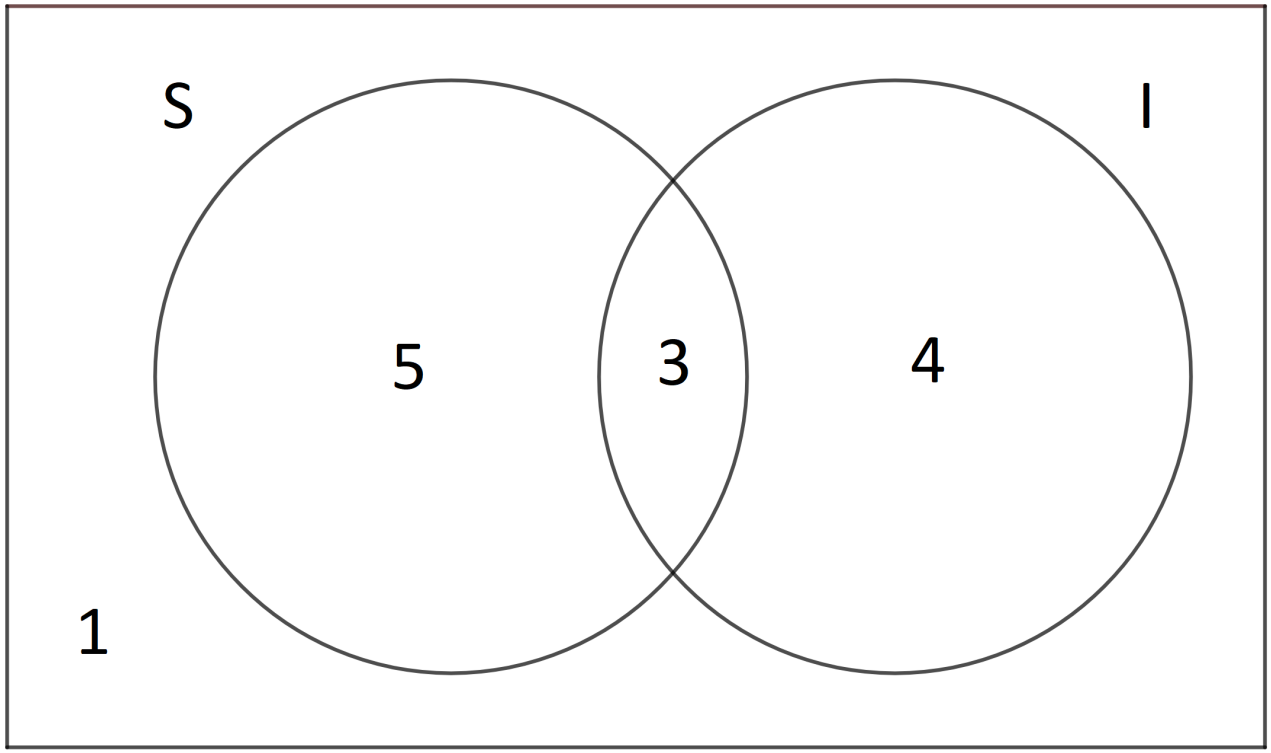
We have 12 students. We need 13, $13 - 12 = 1$, so we have:



Now to answer the questions:

i. 1 student does not speak any of the mentioned languages,

ii. 7 students speak Italian.

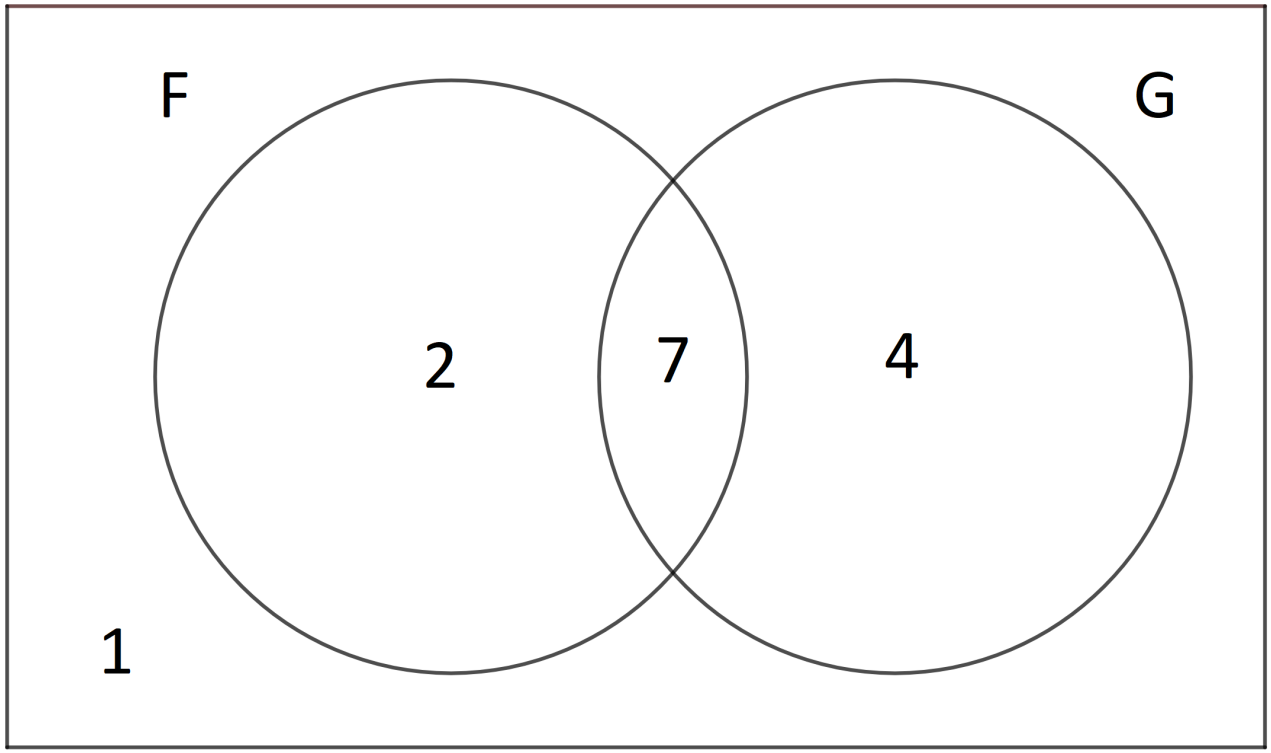
Question 2

There are 14 students in class. 11 of them speak German, 2 speak only French, 7 speak both German and French.

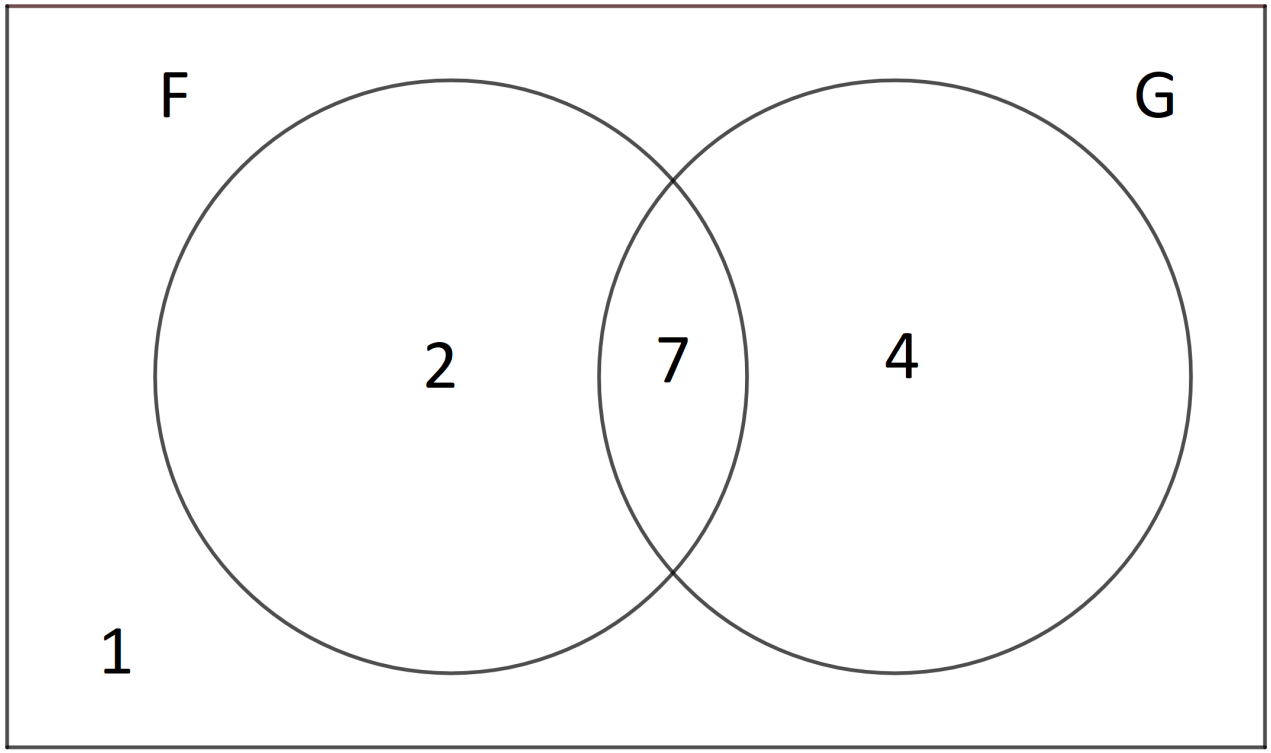
Represent this information on a Venn diagram and find number of students (i) who do not speak any of the mentioned languages (ii) who speak exactly one of the two languages.

Solution:

Solution:



Solution:



i. 1 student does not speak any of the mentioned languages,

ii. 6 students speak exactly one language.

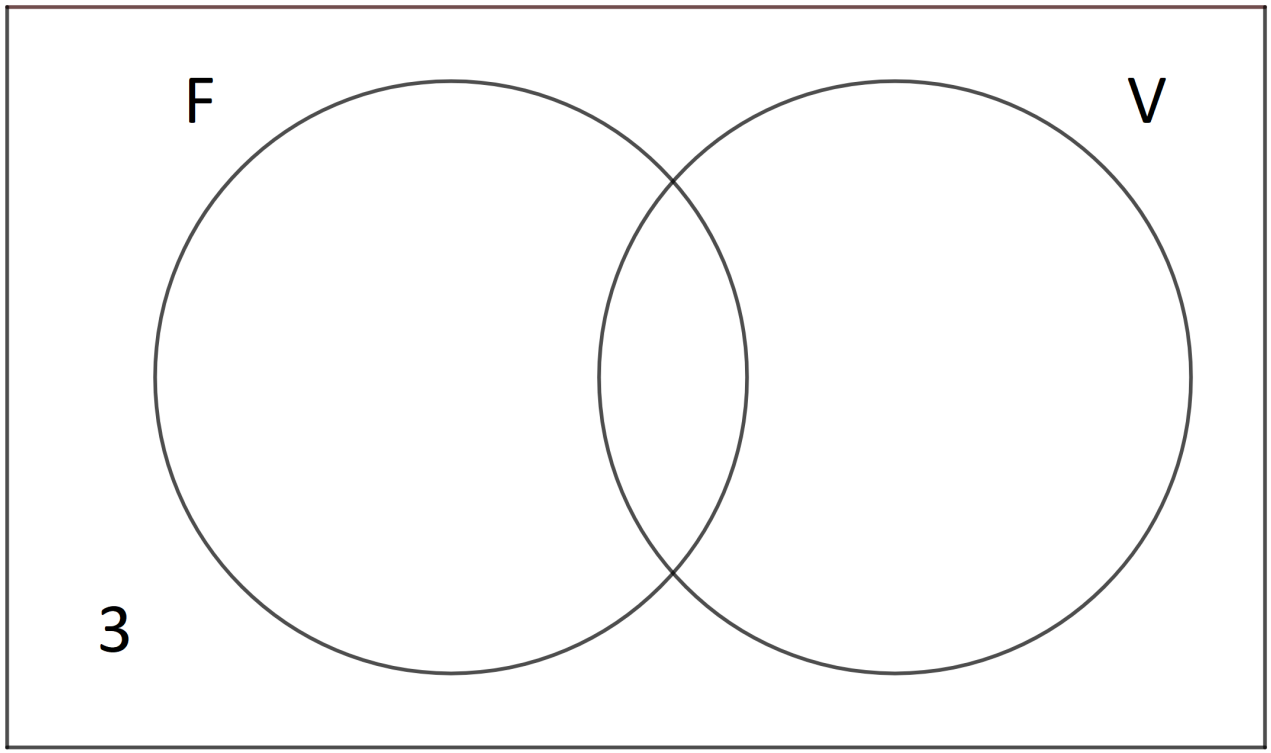
Example 3

There are 20 students in class. 11 of them like football, 12 like volleyball, 17 like at least one of the two sports. Represent this information on a

Venn diagram and find number of students (i) who like both sports (ii) who like football only.

We start by drawing a Venn diagram for two sets.

We start by drawing a Venn diagram for two sets. Now we can start with those who don't like any of the two sports. There are 20 students, 17 like at least one, so $20 - 17 = 3$, 3 students don't like any. Let's represent this on the diagram.



Now we are stuck. So let's put x in the middle. x will represent the number of students who like both sports.

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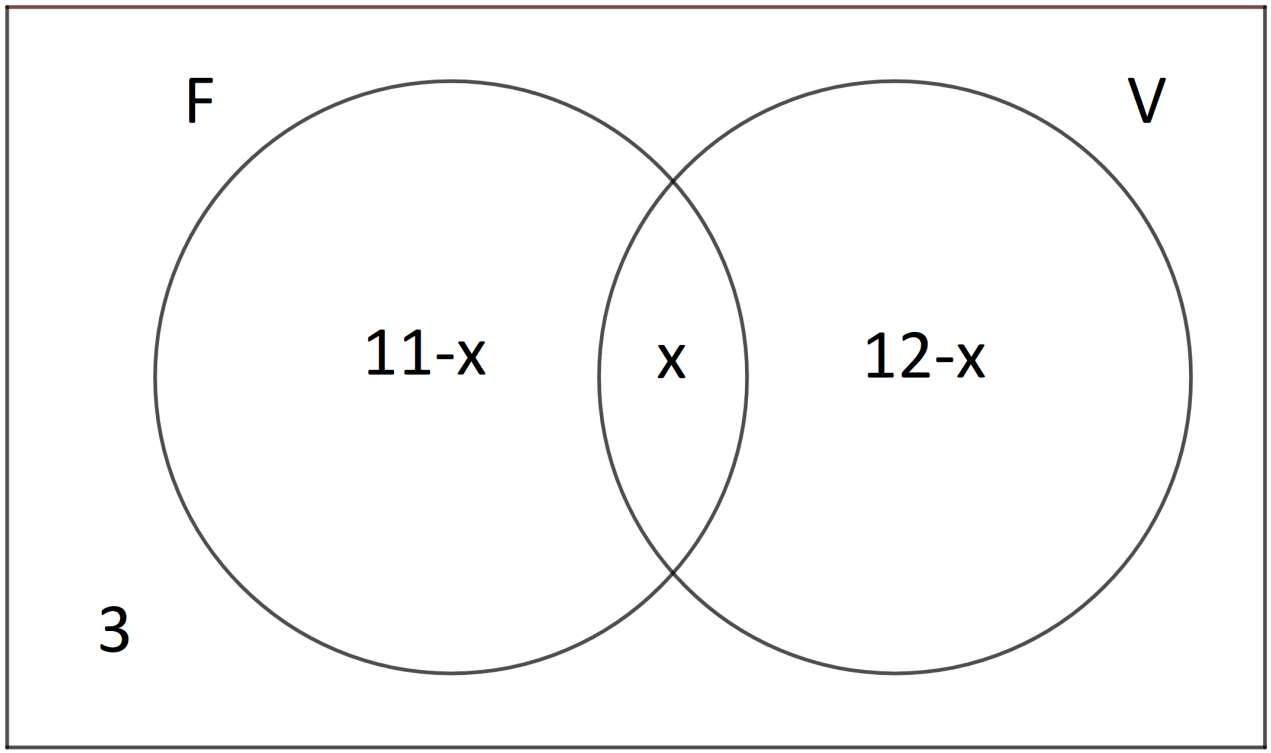


We can form an equation

$$(11 - x) + x + (12 - x) = 17$$

Because 17 students like at least one of the sports. Solving this equation gives:

$$23 - x = 17$$
$$x = 6$$

So there are 6 students who like both volleyball and football.

We can form an equation

$$(11 - x) + x + (12 - x) = 17$$

Because 17 students like at least one of the sports. Solving this equation gives:

$$23 - x = 17$$
$$x = 6$$

So there are 6 students who like both volleyball and football. Now the number of students who like football only is $11 - x = 11 - 6 = 5$.

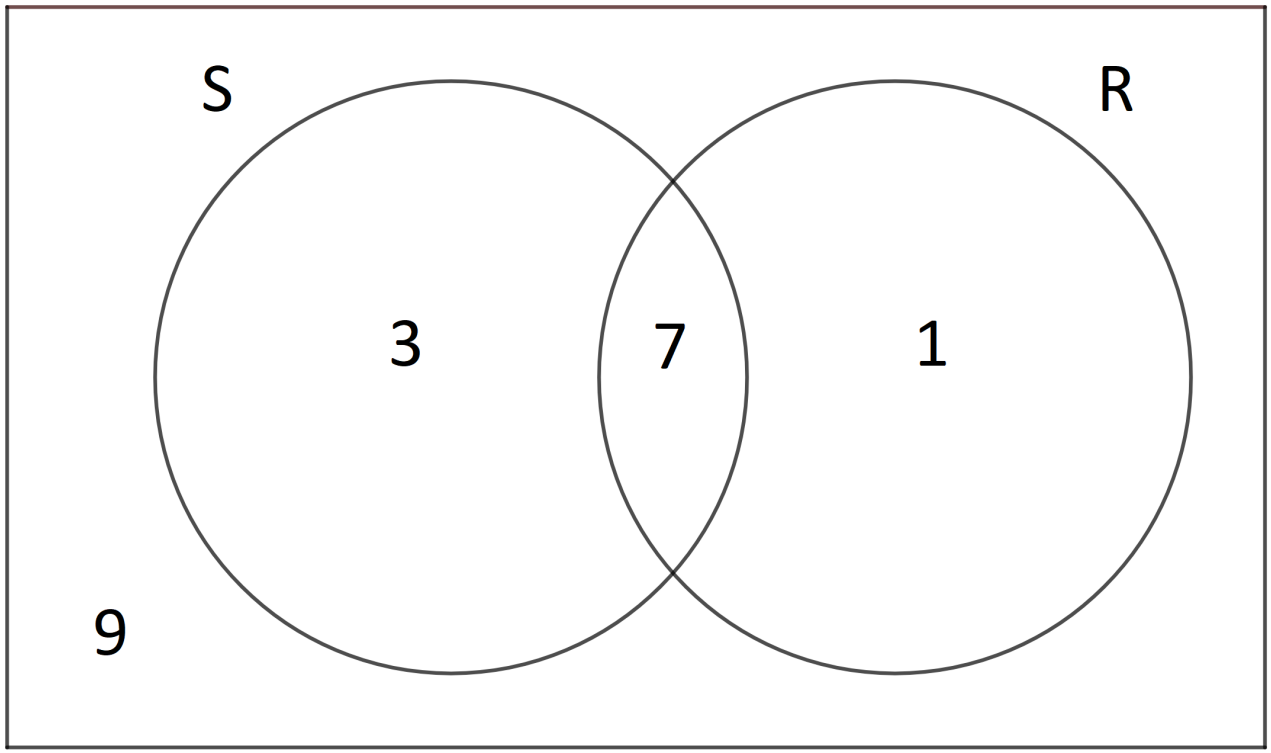
Question 3

There are 20 students in class. 10 of them like swimming, 8 like running, 11 like at least one of the two activities.

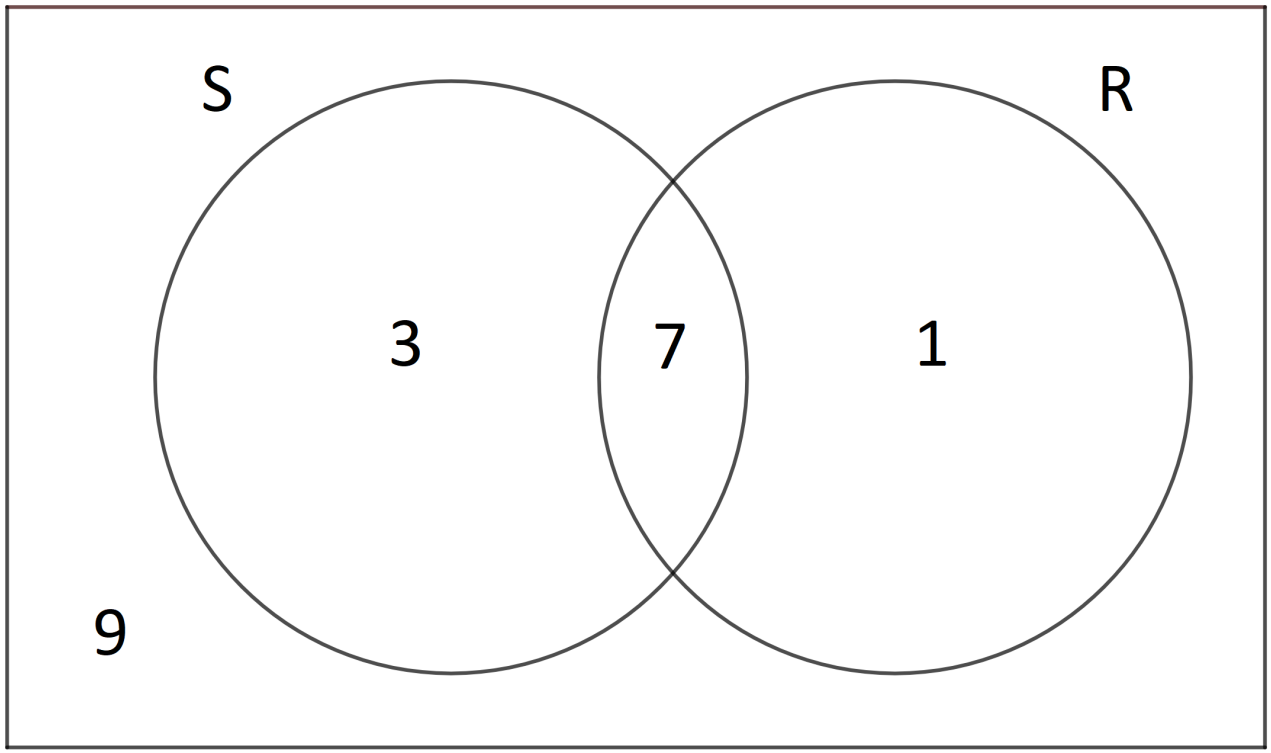
Represent this information on a Venn diagram and find number of students (i) who like both activities (ii) who like running, but don't like swimming.

Solution:

Solution:



Solution:



i. 7 students like both activities,

ii. 1 student likes swimming but not running.

Example 4

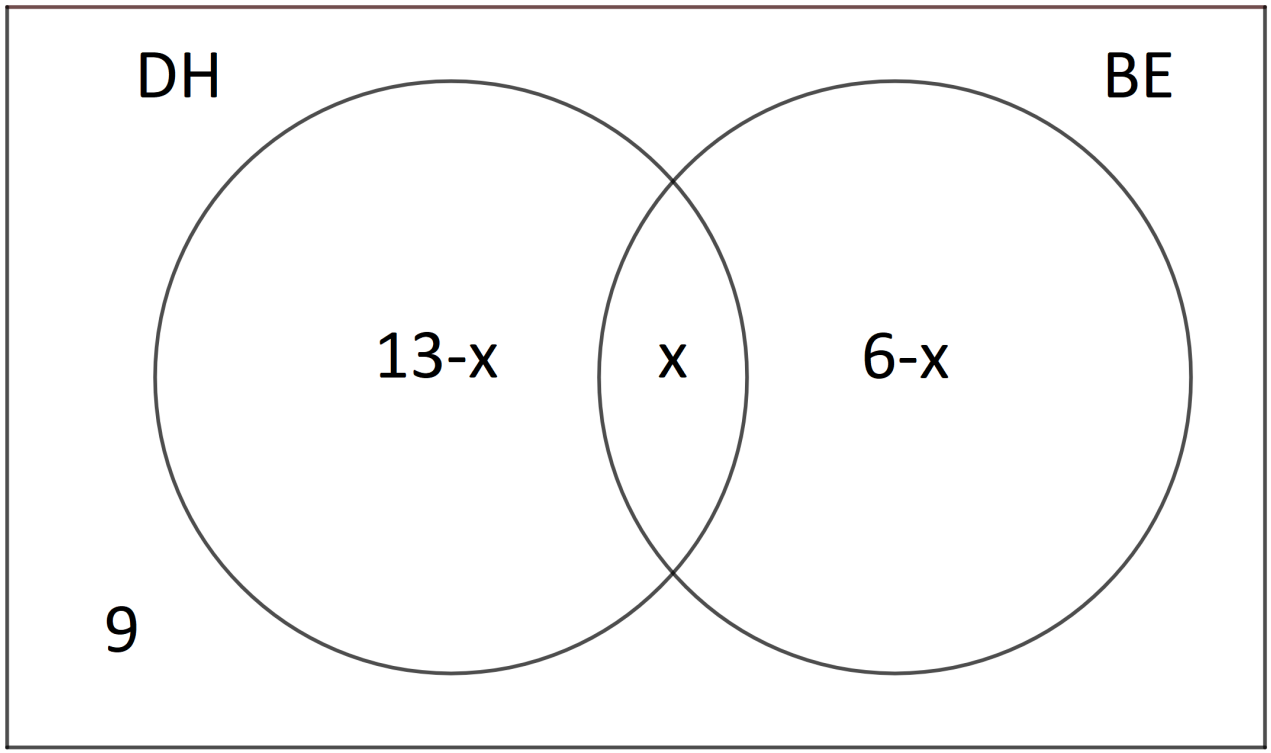
There are 25 students in class. 13 of them have dark hair, 6 have blue eyes, 9 have neither dark hair nor blue eyes.

Represent this information on a Venn diagram and find number of students (i) who have dark hair and blue eyes (ii) who have dark hair but do not have blue eyes.

We start by drawing a Venn diagram for two sets.

We start by drawing a Venn diagram for two sets. Let x represent the number of students with dark hair and blue eyes.

We start by drawing a Venn diagram for two sets. Let x represent the number of students with dark hair and blue eyes. Now the number of students who have dark hair but don't have blue eyes is $13 - x$ and the number of students who have blue eyes but don't have dark hair is $6 - x$. So we get the following diagram.



We can form an equation

$$(13 - x) + x + (6 - x) + 9 = 25$$

We've counted all of the students and there are 25 of them. We solve the equation:

$$28 - x = 25$$
$$x = 3$$

So there are 3 students with dark hair and blue eyes.

We can form an equation

$$(13 - x) + x + (6 - x) + 9 = 25$$

We've counted all of the students and there are 25 of them. We solve the equation:

$$28 - x = 25$$

$$x = 3$$

So there are 3 students with dark hair and blue eyes.
So the number of dark haired students who who do not have blue eyes is $13 - x = 13 - 3 = 10$.

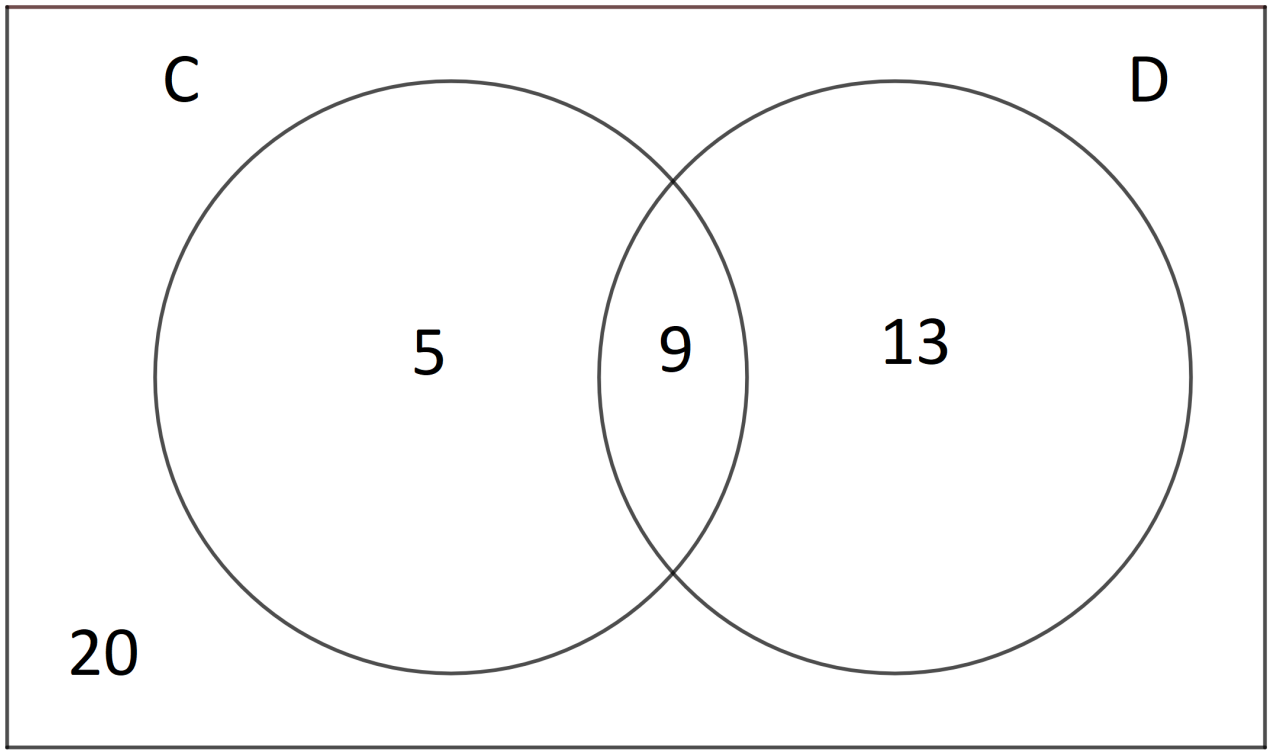
Question 4

There are 47 students in class. 14 of them have a cat, 22 have a dog, 20 have no pets.

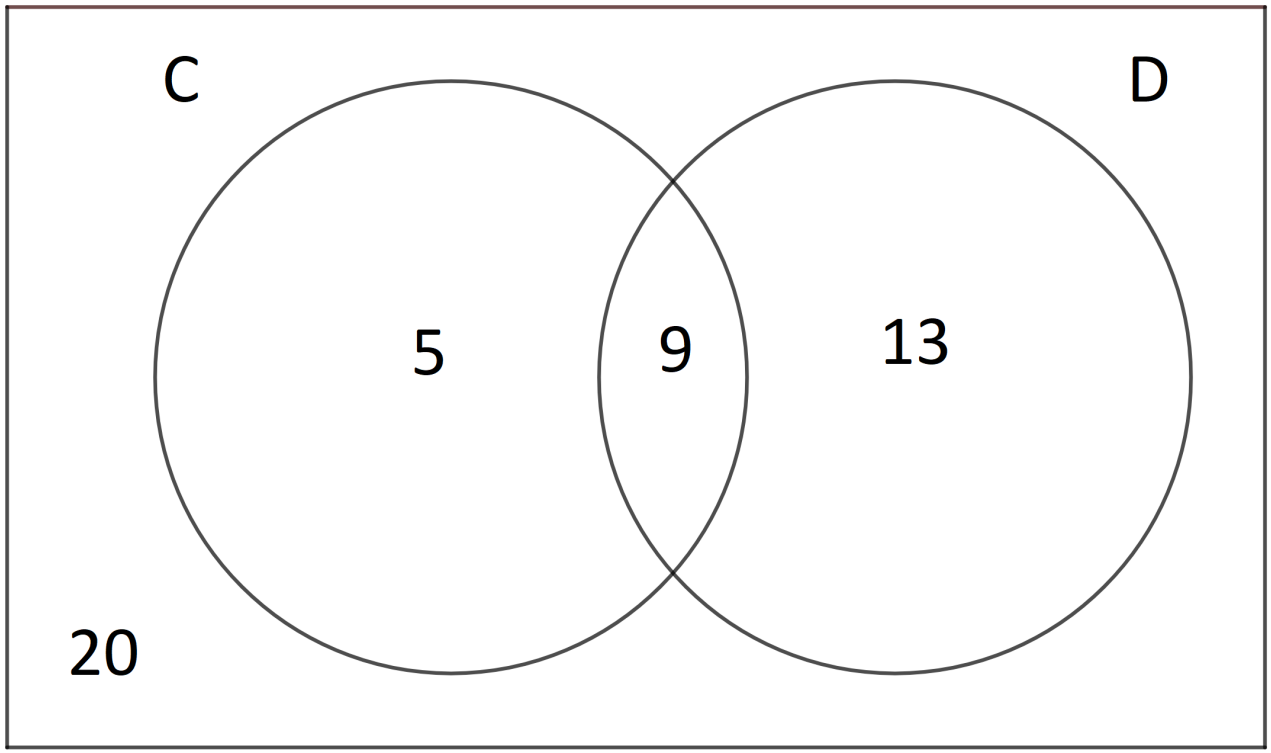
Represent this information on a Venn diagram and find number of students (i) who have a cat and a dog (ii) who have a cat, but no dog.

Solution:

Solution:



Solution:



i. 9 students have a cat and a dog,

ii. 5 students have a cat only.

The short test will be similar to the questions above.