CRITICAL THINKING

Lecture #23

Assessing Categorical Syllogisms

Professor David Emmanuel Gray

Four Standard Forms of Categorical Statements (Generalized)

Universal Positive

A: All *X* is *Y*.

Shade in all of *X* not shared with *Y*.

Universal Negative

E: No *X* is *Y*.

Shade in all of *X* shared with *Y*.

Particular Positive

I: Some *X* is *Y*.

Dot-*x* in *X* shared with *Y*.

Particular Negative

O: Some *X* is not *Y*.

Dot-*x* in *X* not shared with *Y*.

Note: A complement like non-*S* or non-*P* can substitute *X* or *Y*.

Categorical Syllogisms

Last time we looked at categorical syllogisms, which are arguments involving three categorical statements. In particular, we saw how to put arguments of either sort into standard symbolic form, and how that form can be used to determine its validity.

Argument #1: *Parsed, Terms, & Standard Symbolic Form*

Some famous CEOs are mediocre hacks, but no insightful

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entrepreneurs are mediocre hacks. As a result, some famous

CI C

CEOs are not insightful entrepreneurs.

Major term (P): Insightful entrepreneurs.

Minor term (S): Famous CEOs.

Middle term (M): Mediocre hacks.

1. No P is M.
2. Some S is M.

$\therefore$ Some S is not P.

Argument #1: *Parsed, Terms, & Standard Symbolic Form*

Some famous CEOs are mediocre hacks, but no insightful entrepreneurs are mediocre hacks. As a result, some famous CEOs are not insightful entrepreneurs.

2 1 CI C

Major term (P): Insightful entrepreneurs.

Minor term (S): Famous CEOs.

Middle term (M): Mediocre hacks.

1. No P is M.
2. Some S is M.

$\therefore$ Some S is not P.

But can we check validity without appealing to a memorized table?

Categorical Syllogisms: *Assessing Validity*

Recall that a **valid** argument is an argument where the truth of all its premises logically entails the truth of its conclusion.

So we check the validity of a categorical syllogism by assuming that all its premises are true and then checking whether the conclusion must also be true. If the conclusion *must be true*, then the syllogism is valid; if the conclusion is *either false or unknown*, then the syllogism is invalid.

Assessing Categorical Syllogisms: *Instructions*

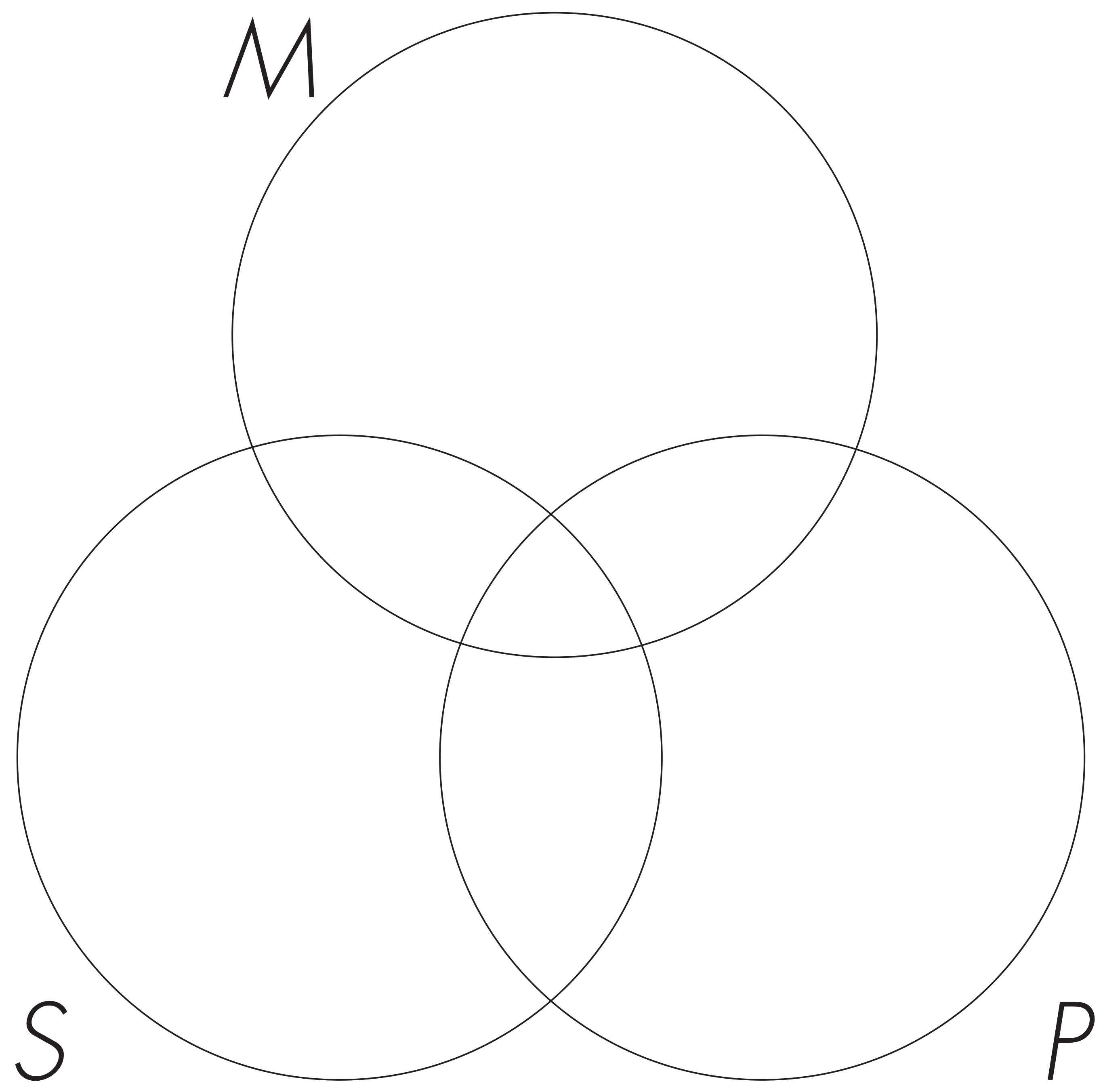
Assessing the validity of a categorical syllogism using Venn diagrams works as follows:

1. Identify the major term (*P*), the minor term (*S*), and the middle term (*M*);
2. Put the syllogism into standard symbolic form;
3. Create a Venn diagram of the premises,
4. Create a Venn diagram of the conclusion; and
5. Use those two Venn diagrams to explain whether the syllogism is valid or invalid.

(Keep in mind that it is now possible that *P*, *S*, and *M* are empty.)

Venn Diagram for the Premises

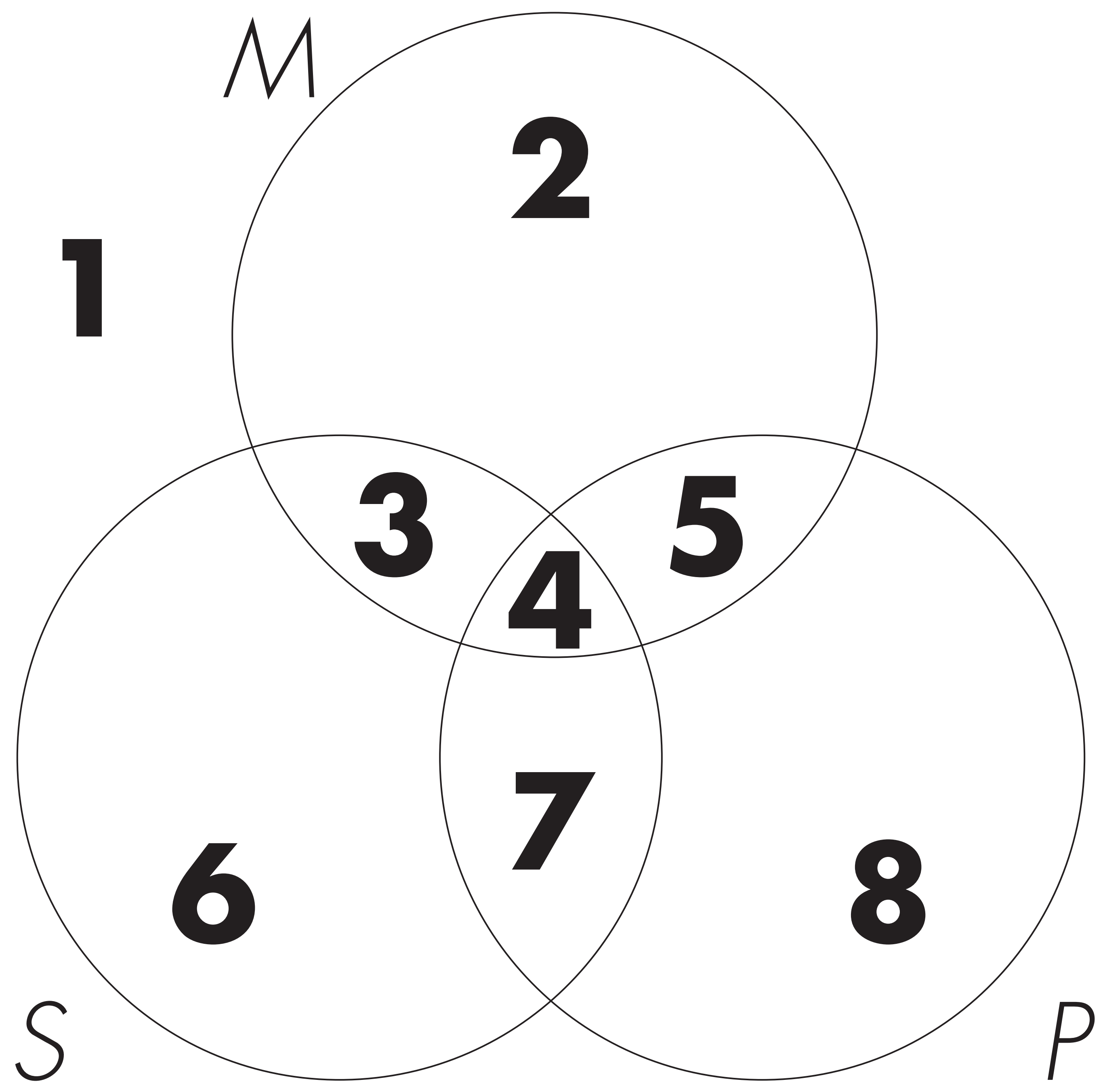
Step 1: Draw the three circles.



Note: To keep things consistent, *always* put the major term (*P*) on the right, the minor term (*S*) on the left, and the middle term (*M*) up top.

Venn Diagram for the Premises

Notice that there are now a lot more subcategories ("zones")!



Venn Diagram for the Premises

Step 2: Draw the premises.

Now you put the information expressed by the two premises into this diagram. However, there are two rules you must remember:

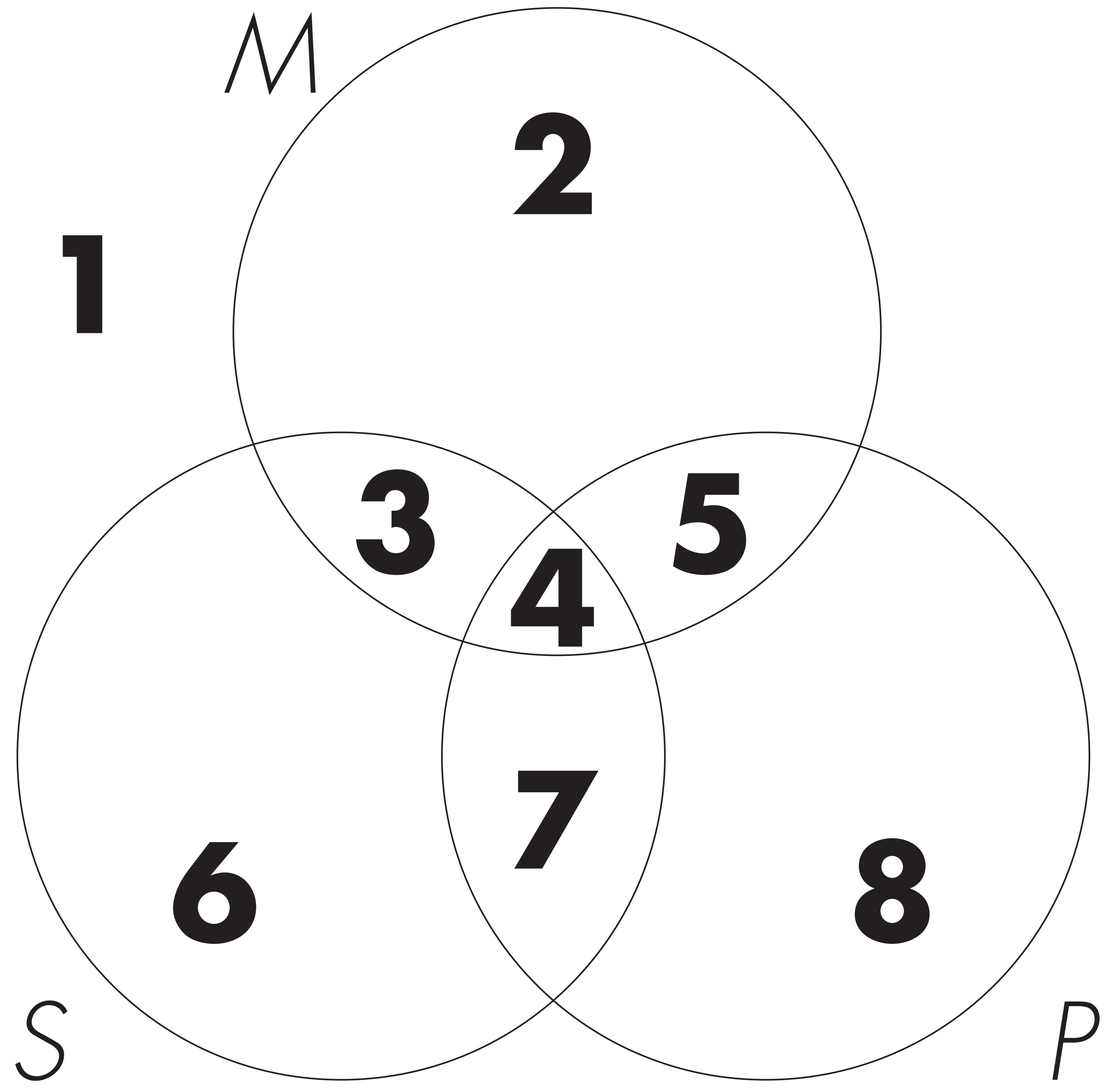
1. Diagram any universal statements first, and *then* diagram any particular statements.
2. If a particular statement is not clear on which side of a line a dot-*x* belongs, you must then draw the dot-*x* on top of that line.

Argument #1: *Venn Diagram for the Premises*

So we look at the premises and diagram any universal ones first.

1. No *P* is *M*.
2. Some *S* is *M*.

∴ Some *S* is not *P*.

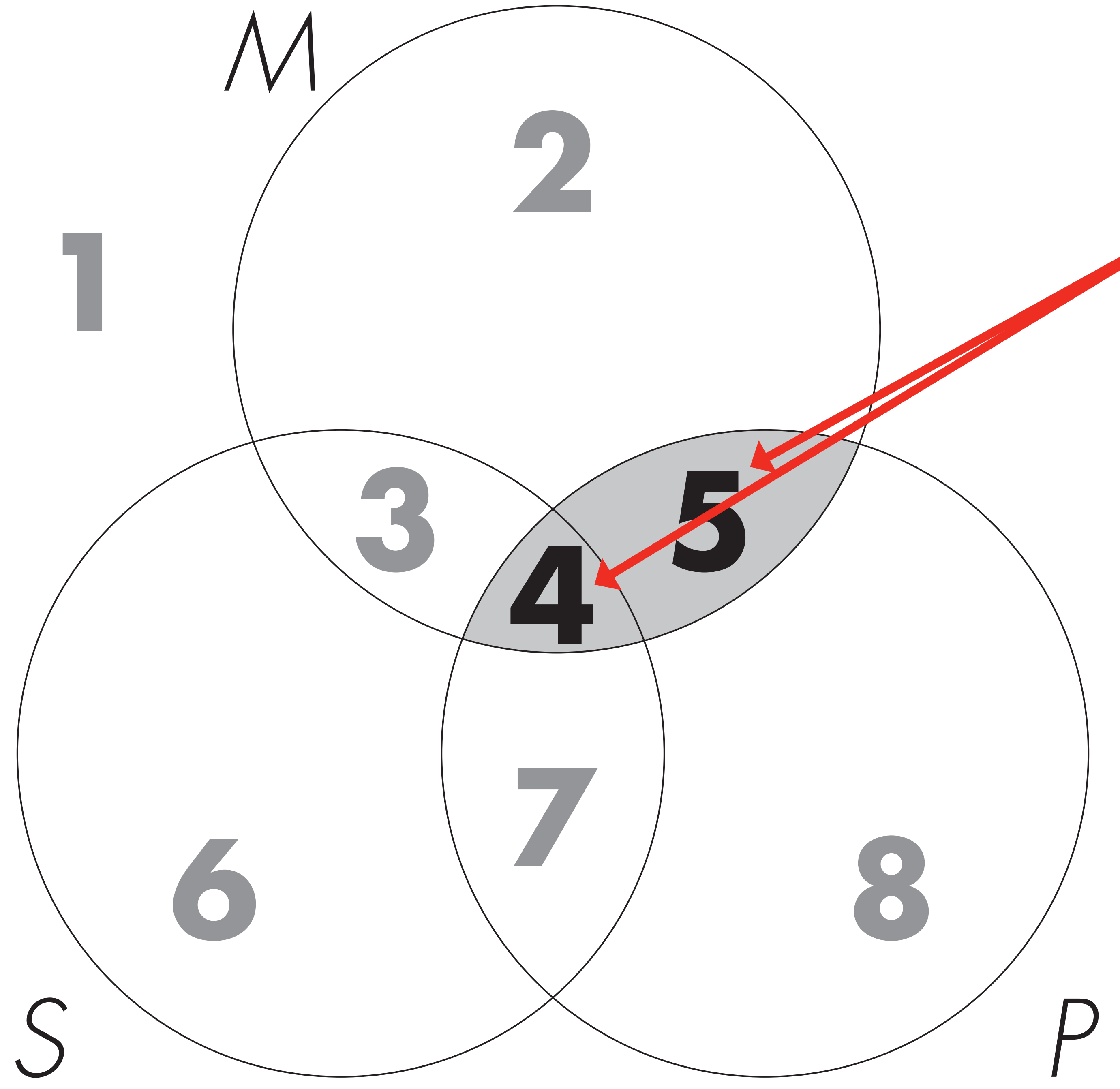


Argument #1: *Venn Diagram for the Premises*

Premise 1 is a universal statement (**E**: No *P* is *M*), so diagram that premise first.

1. No *P* is *M*.
2. Some *S* is *M*.

∴ Some *S* is not *P*.



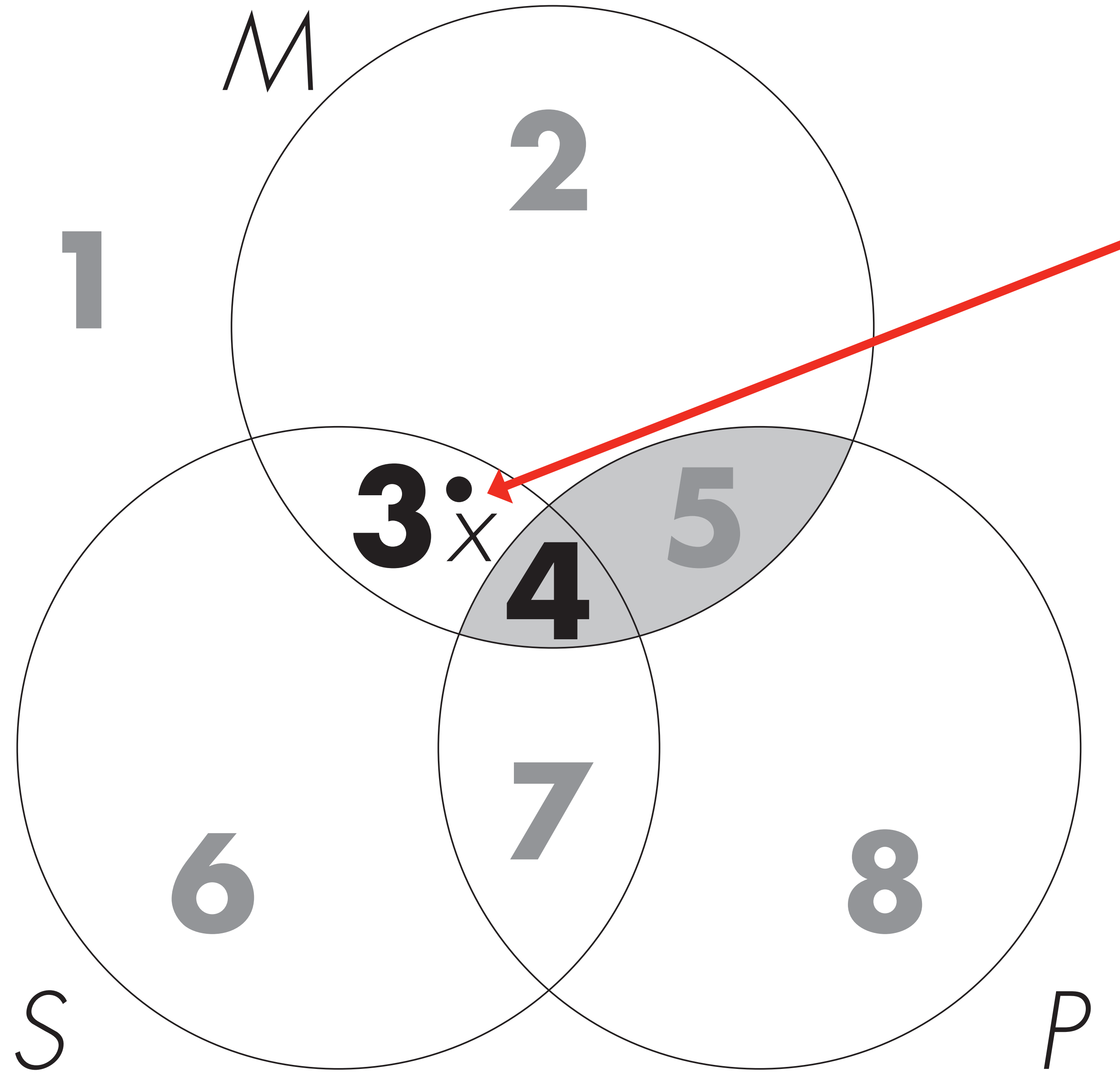
Remember: The rule for **E** statements says to shade the area that the two categories have in common. In this case, the common area for *P* and *M* are zones 4 and 5.

Argument #1: *Venn Diagram for the Premises*

Now we can add to this diagram the information from premise 2, which is a particular statement (**I**: Some *S* is *M*):

1. No *P* is *M*.
2. Some *S* is *M*.

∴ Some *S* is not *P*.



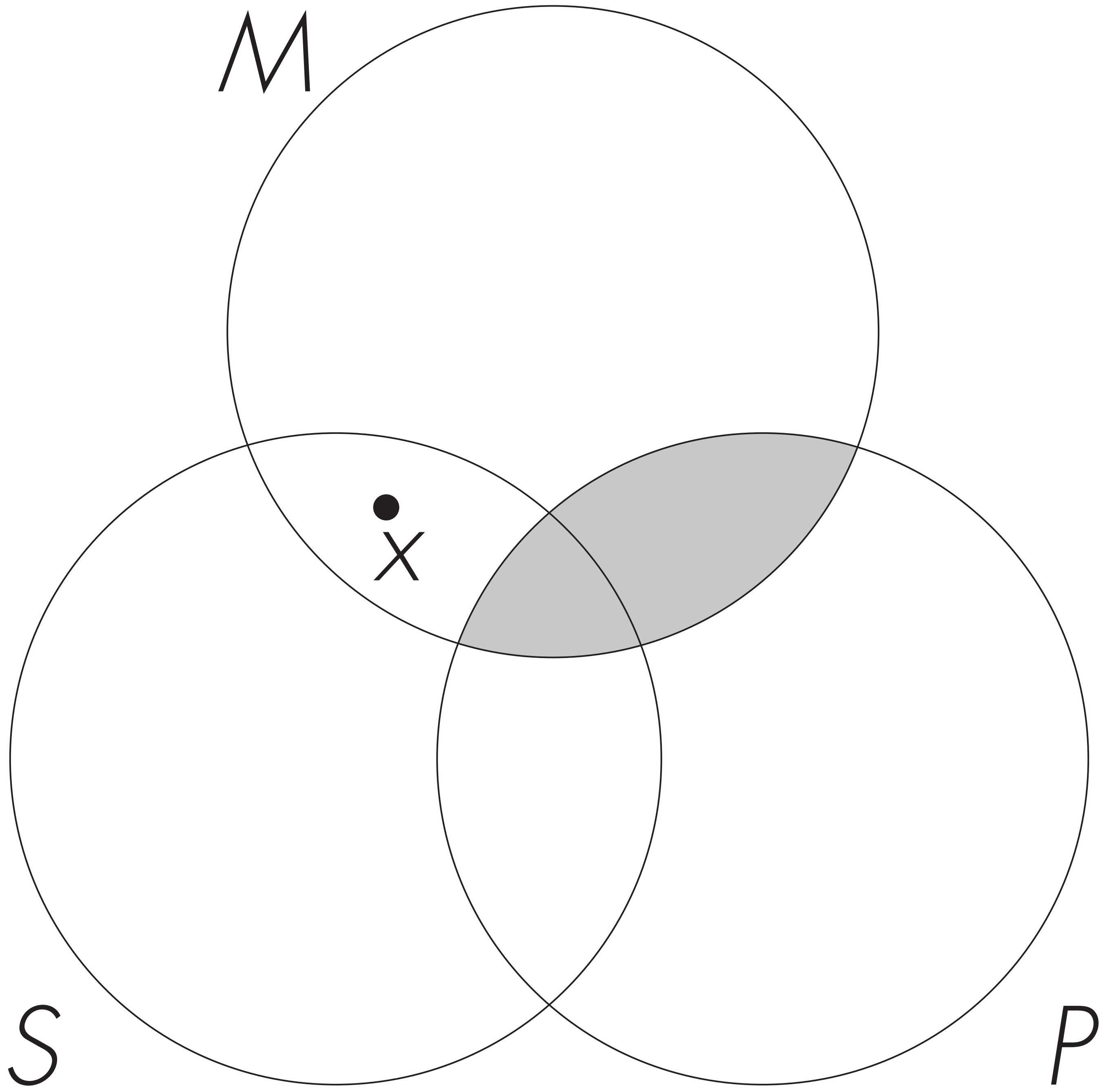
Remember: The rule for **I** statements says a dot-x goes in the area that the two categories have in common. For *S* and *M*, those are zones 3 and 4. However, the dot-x *cannot* be in zone 4. Why? Because zone 4 is empty (it is shaded in). So the dot-x must be put in zone 3.

Argument #1: *Venn Diagram for the Premises*

The Venn diagram of the premises is done!

1. No *P* is *M*.
2. Some *S* is *M*.

∴ Some *S* is not *P*.

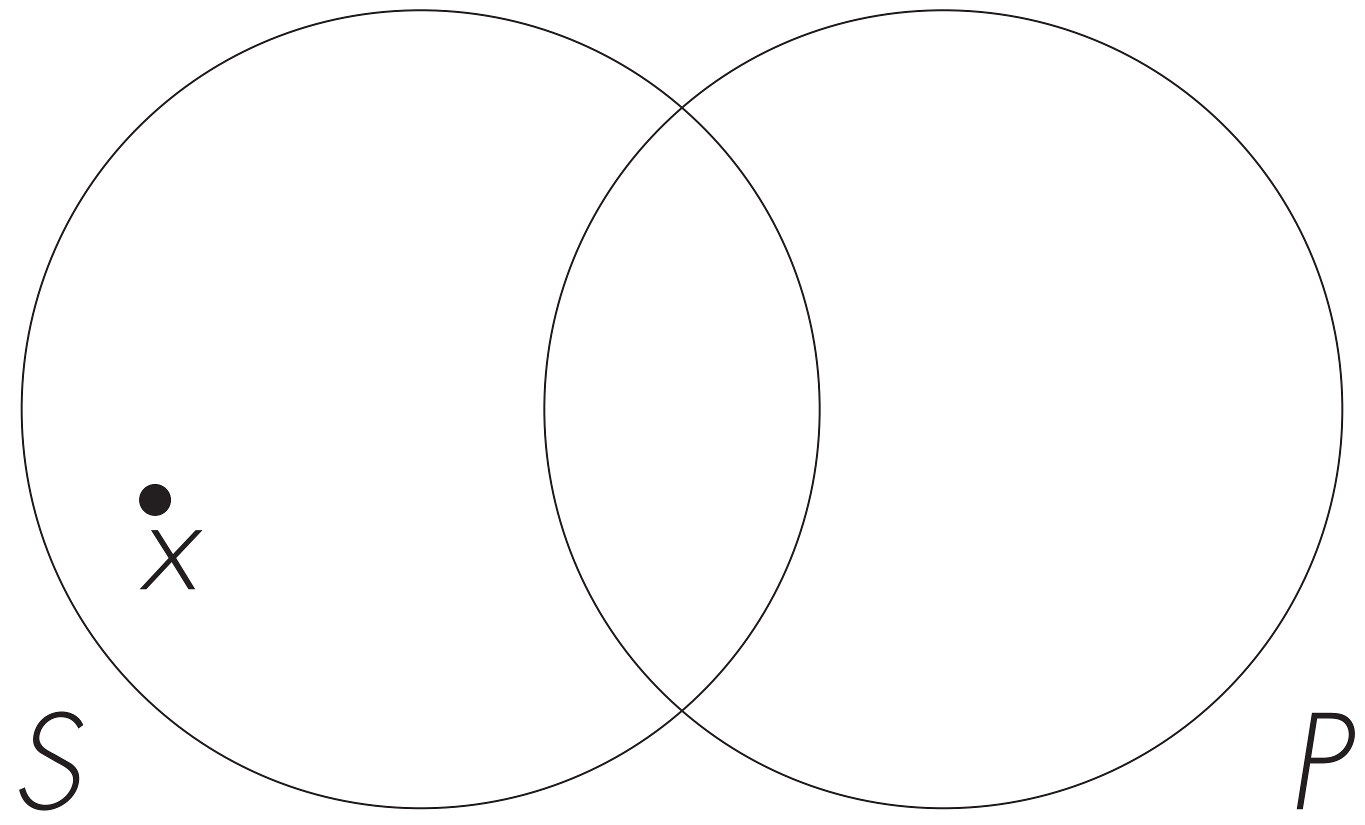


Argument #1: *Venn Diagram for the Conclusion*

Now we can make a *second* Venn diagram for the argument's conclusion.

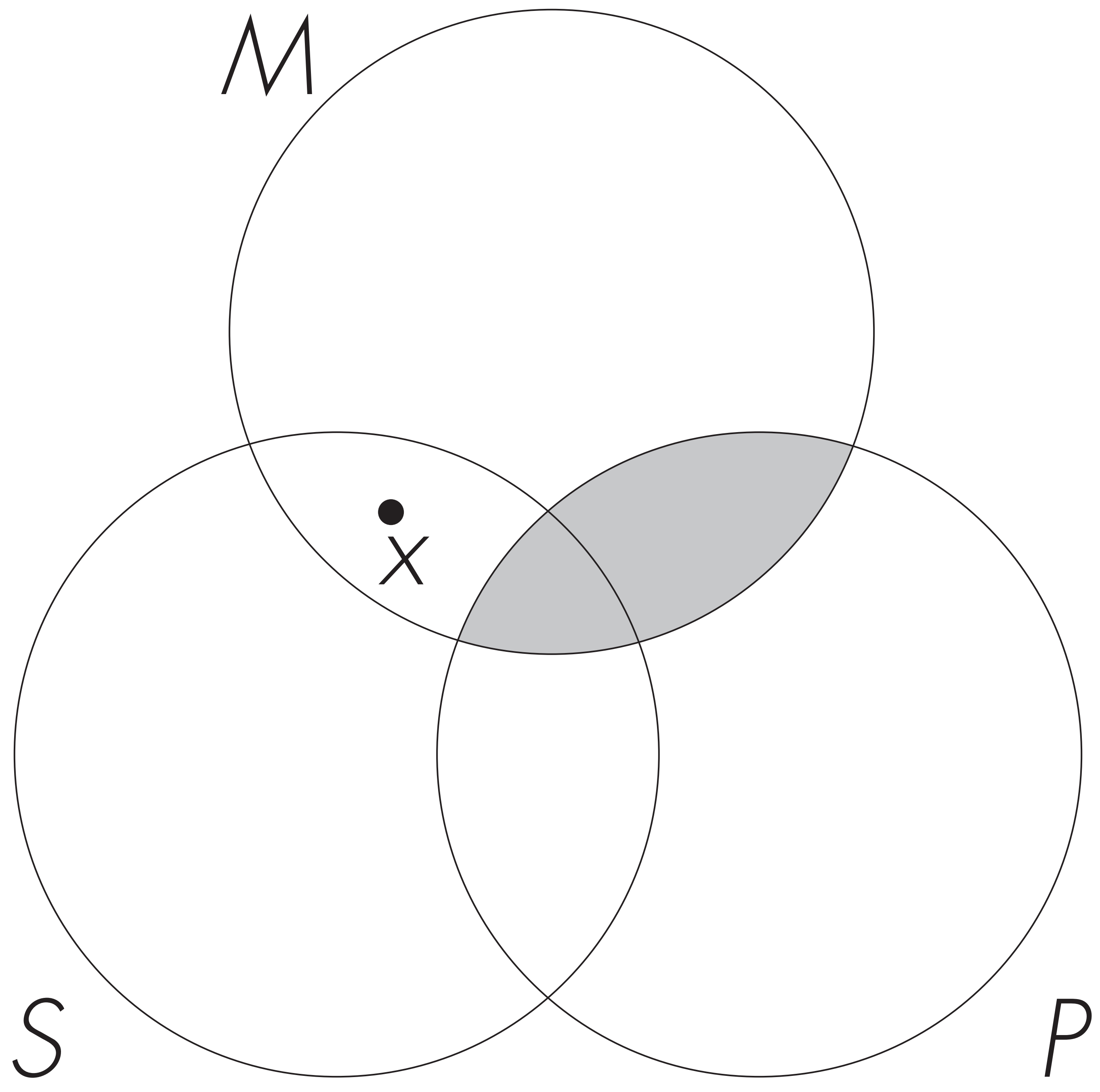
1. No *P* is *M*.
2. Some *S* is *M*.

∴ Some *S* is not *P*.

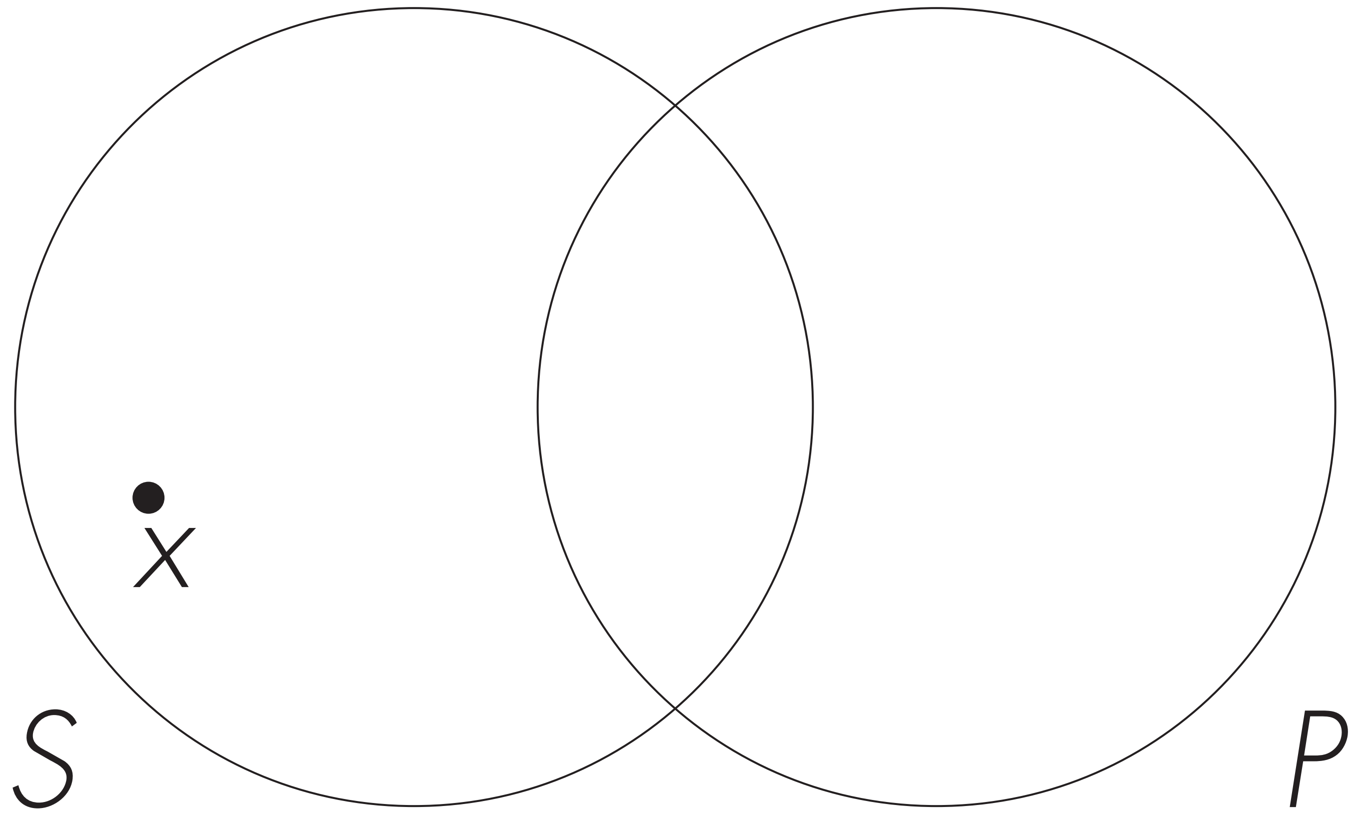


Argument #1: *Comparing the Two Venn Diagrams*

Now we compare these two Venn diagrams. We assume the diagram of the premises is true, and see if this confirms what the conclusion's diagram requires. If so, the syllogism is valid.



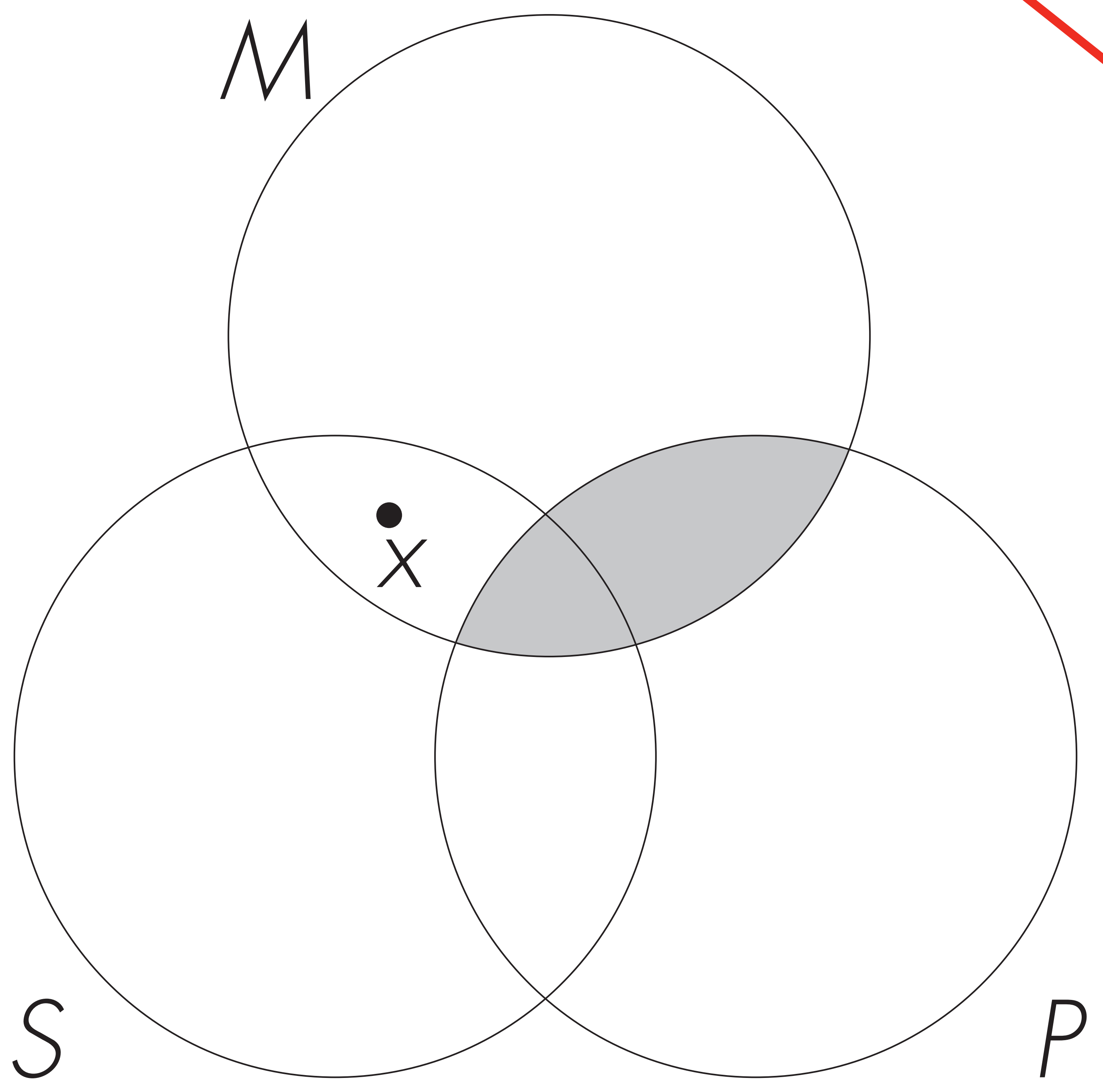
The Premises



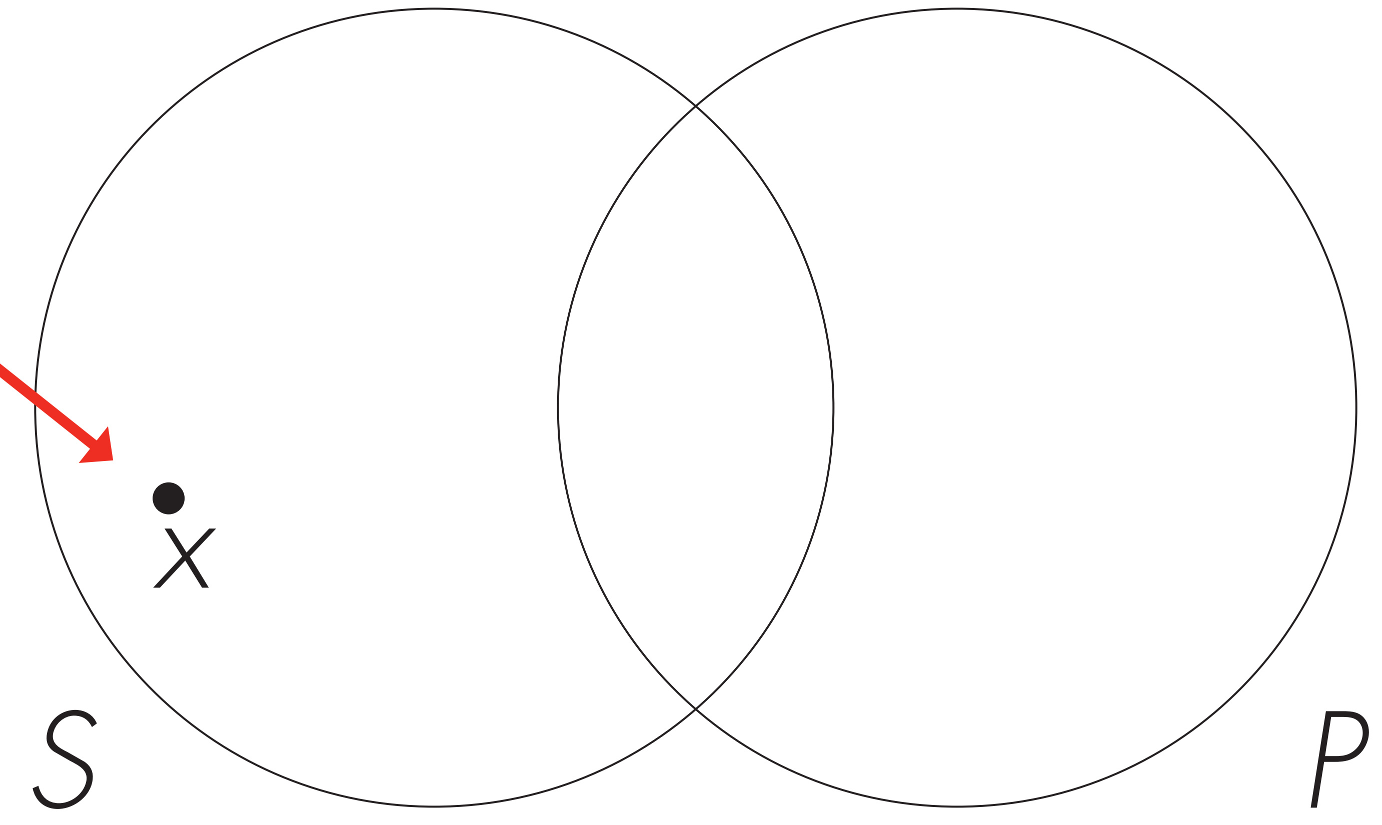
The Conclusion

Argument #1: *Comparing the Two Venn Diagrams*

In this case, the conclusion requires a dot-*x* in *S* but outside of *P*...



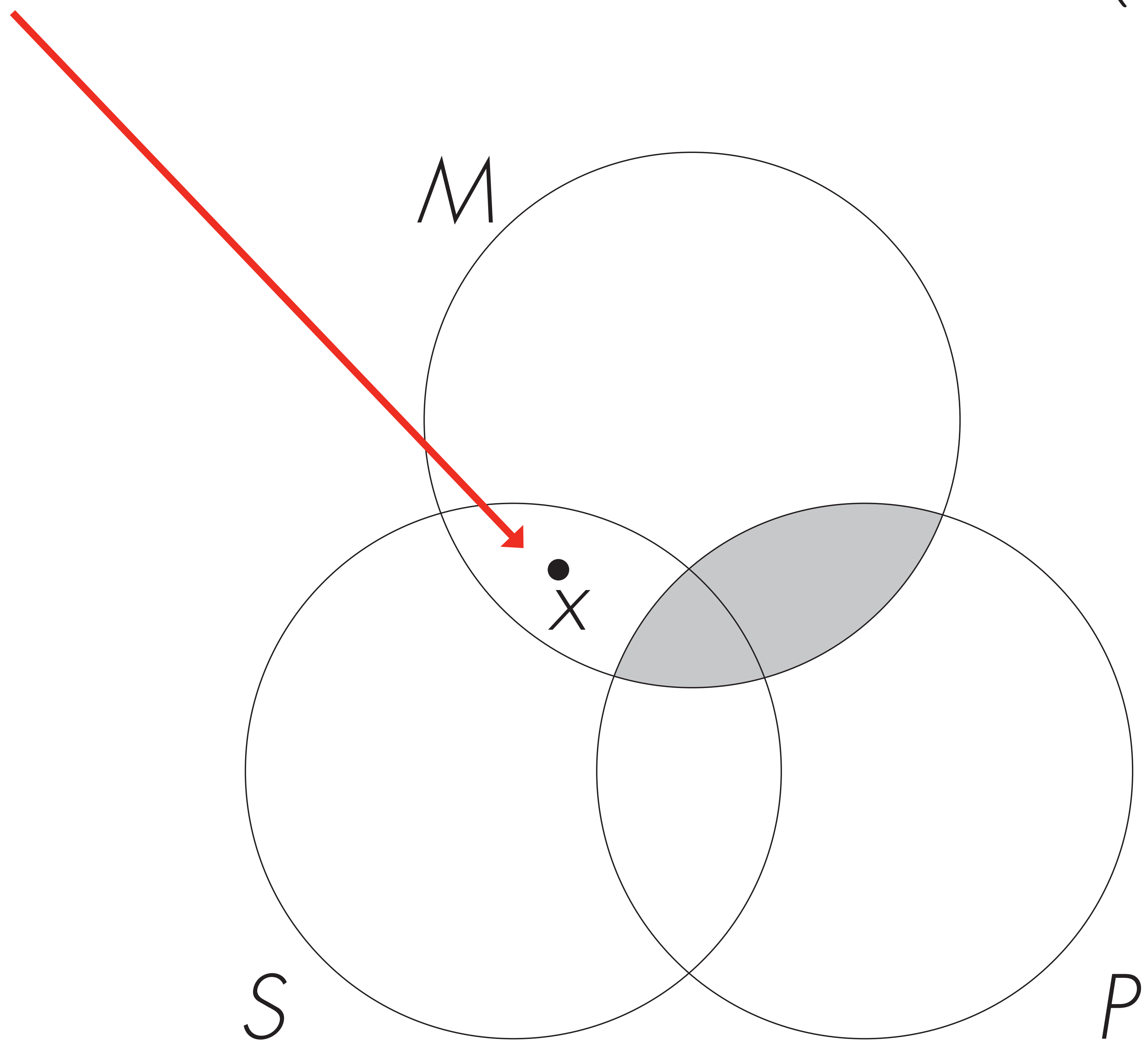
The Premises



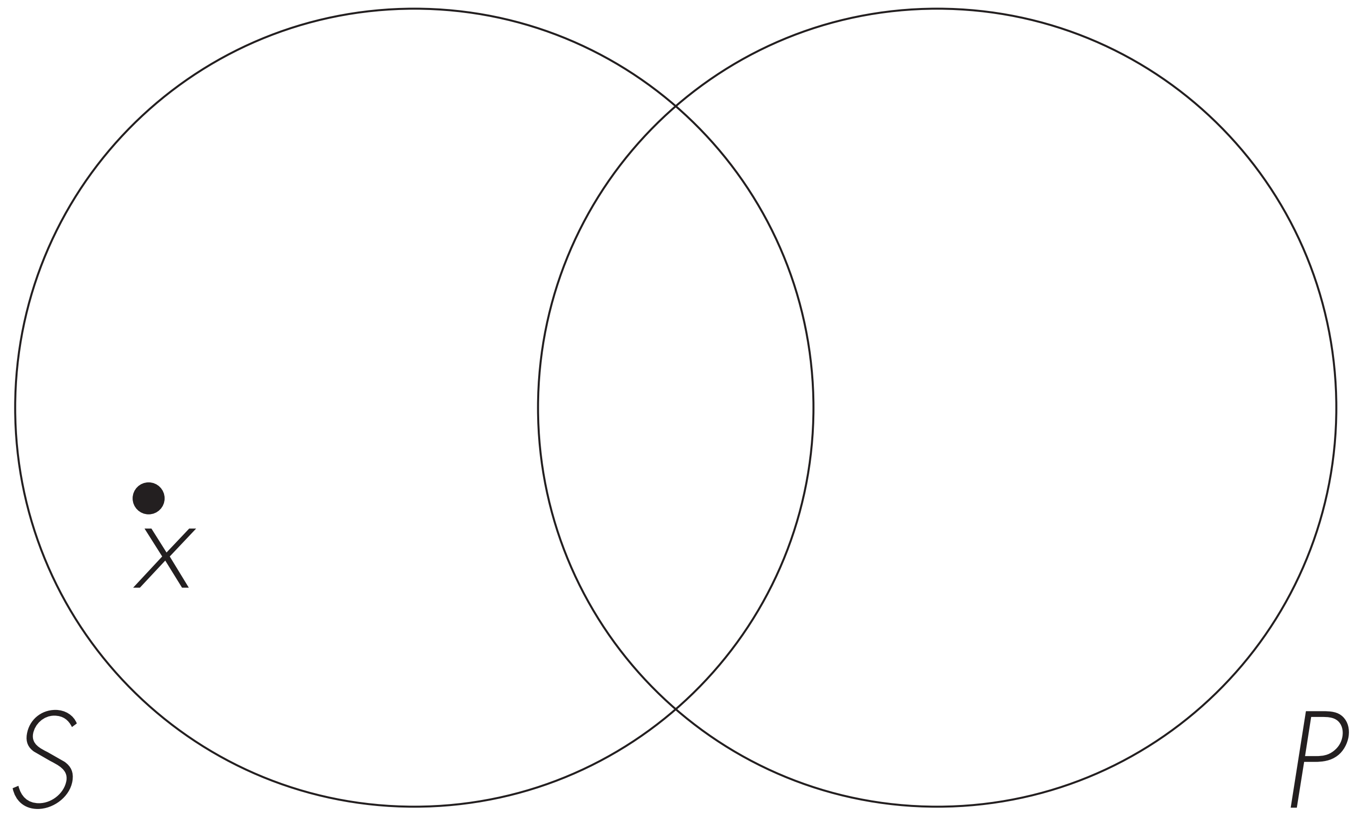
The Conclusion

Argument #1: *Comparing the Two Venn Diagrams*

In this case, the conclusion requires a dot-*x* in *S* but outside of *P*. Looking at the diagram of the premises, there is indeed a dot-*x* in *S* (and in *M*) but outside of *P*...



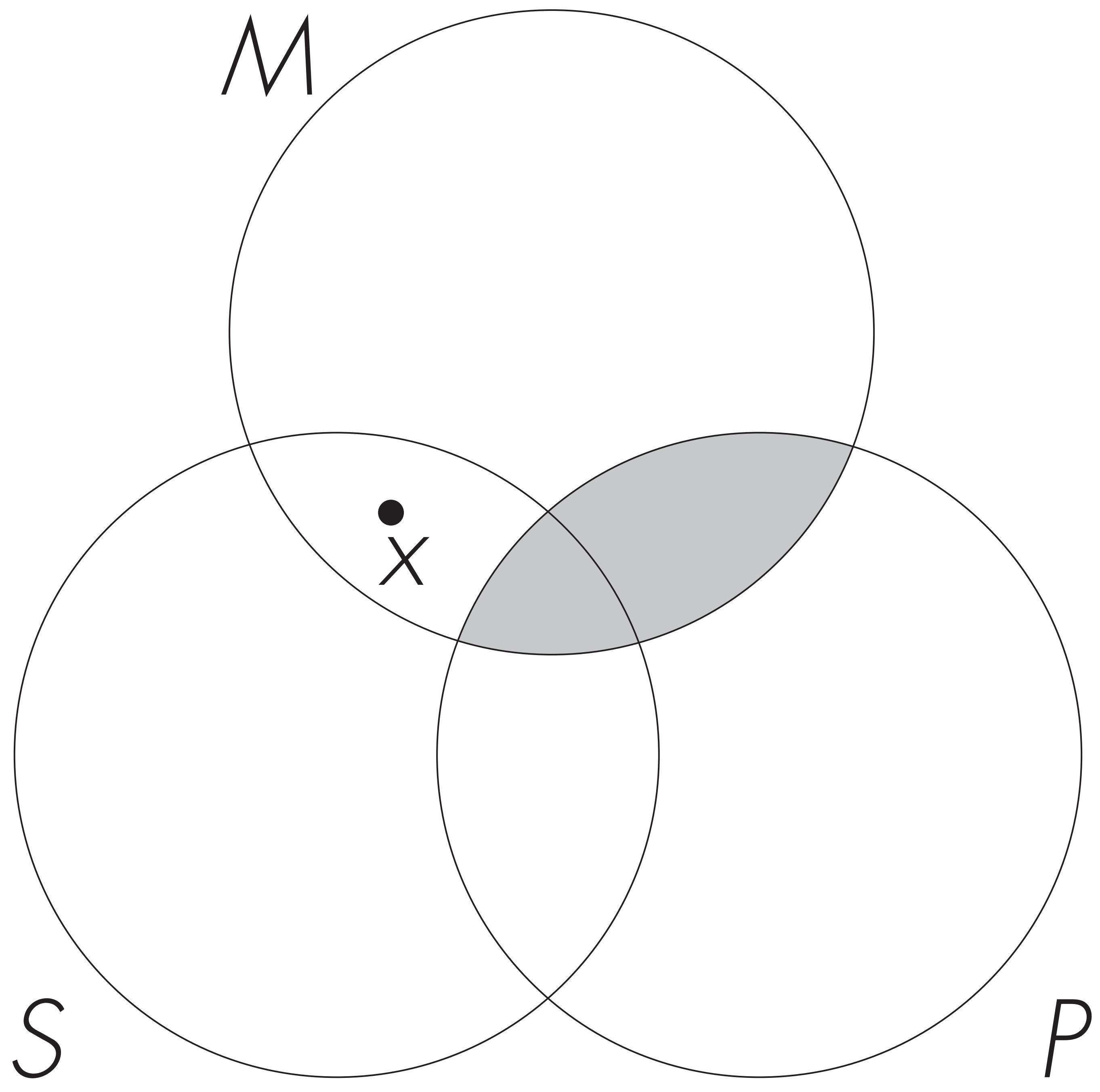
The Premises



The Conclusion

Argument #1: *Comparing the Two Venn Diagrams*

In this case, the conclusion requires a dot-*x* in *S* but outside of *P*. Looking at the diagram of the premises, there is indeed a dot-*x* in *S* (and in *M*) but outside of *P*. So this argument is *valid*!



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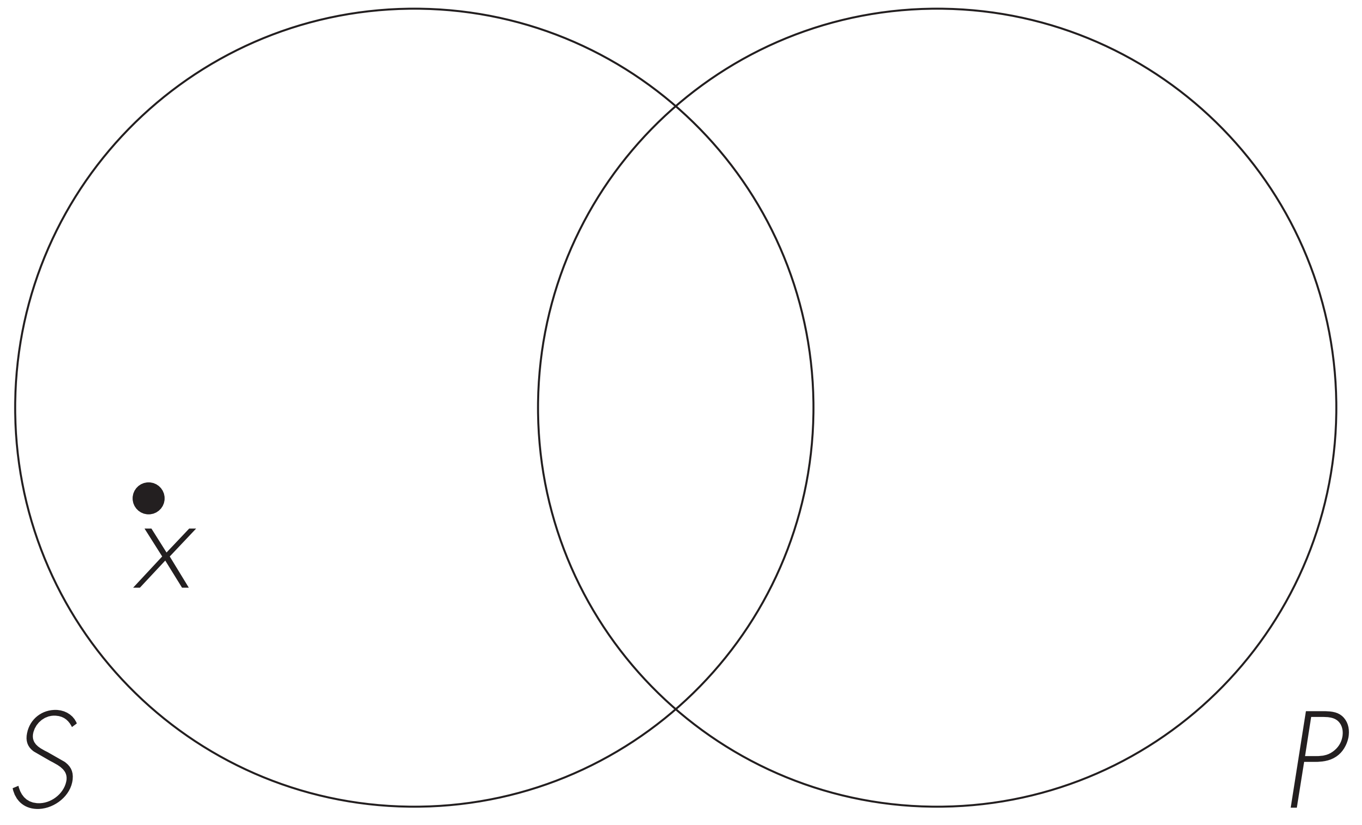

The Conclusion

Argument #2: *Parsed, Terms, & Standard Symbolic Form*

Some popular CEOs are mediocre hacks, but all pathetic failures are mediocre hacks. Thus, some popular CEOs are not pathetic failures.

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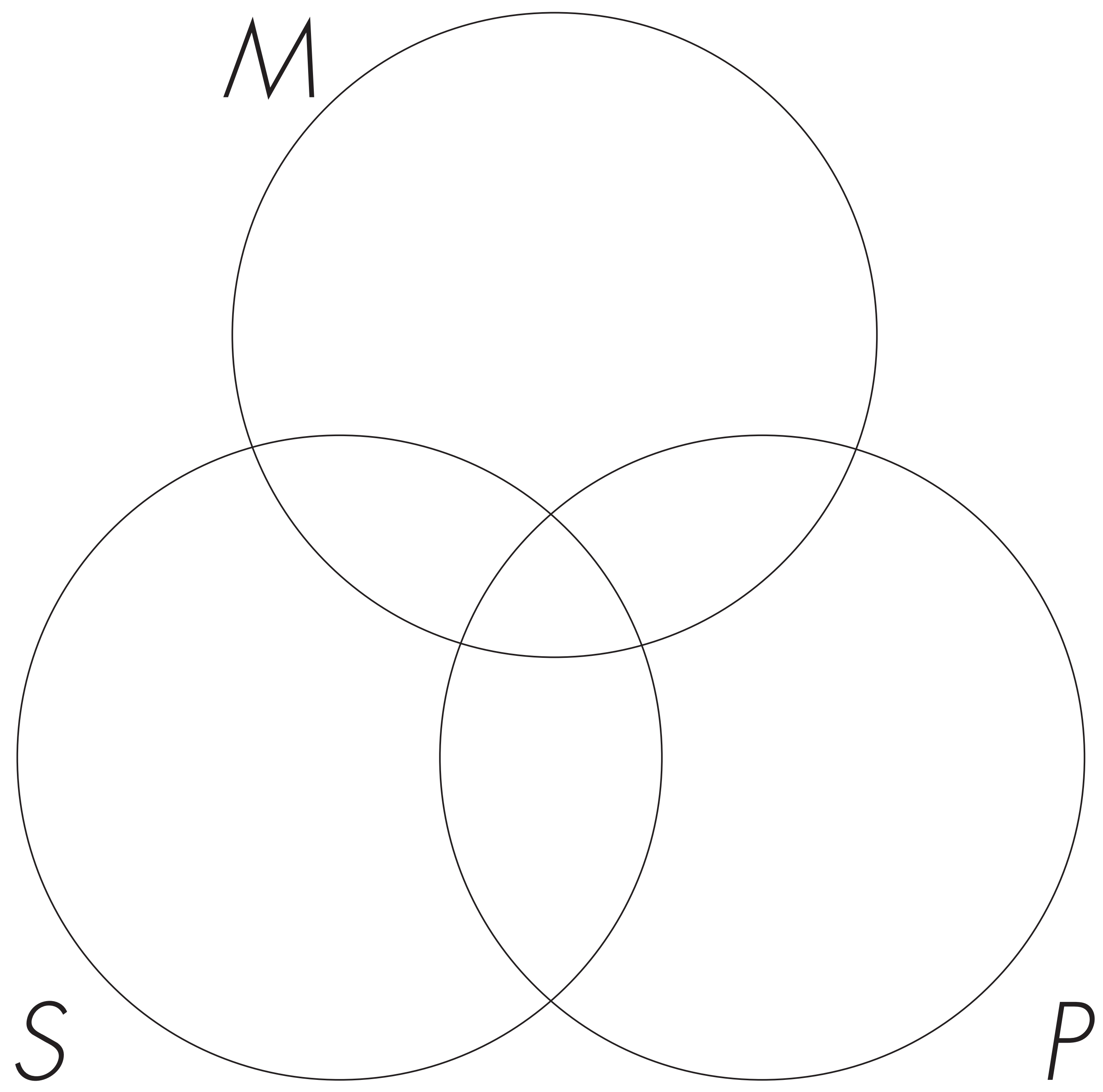
Major term (*P*): Pathetic failures.
Minor term (*S*): Popular CEOs.
Middle term (*M*): Mediocre hacks.

1. All *P* is *M*.
2. Some *S* is *M*.

∴ Some *S* is not *P*.

Argument #2: *Venn Diagram for the Premises*

Draw the three circles.

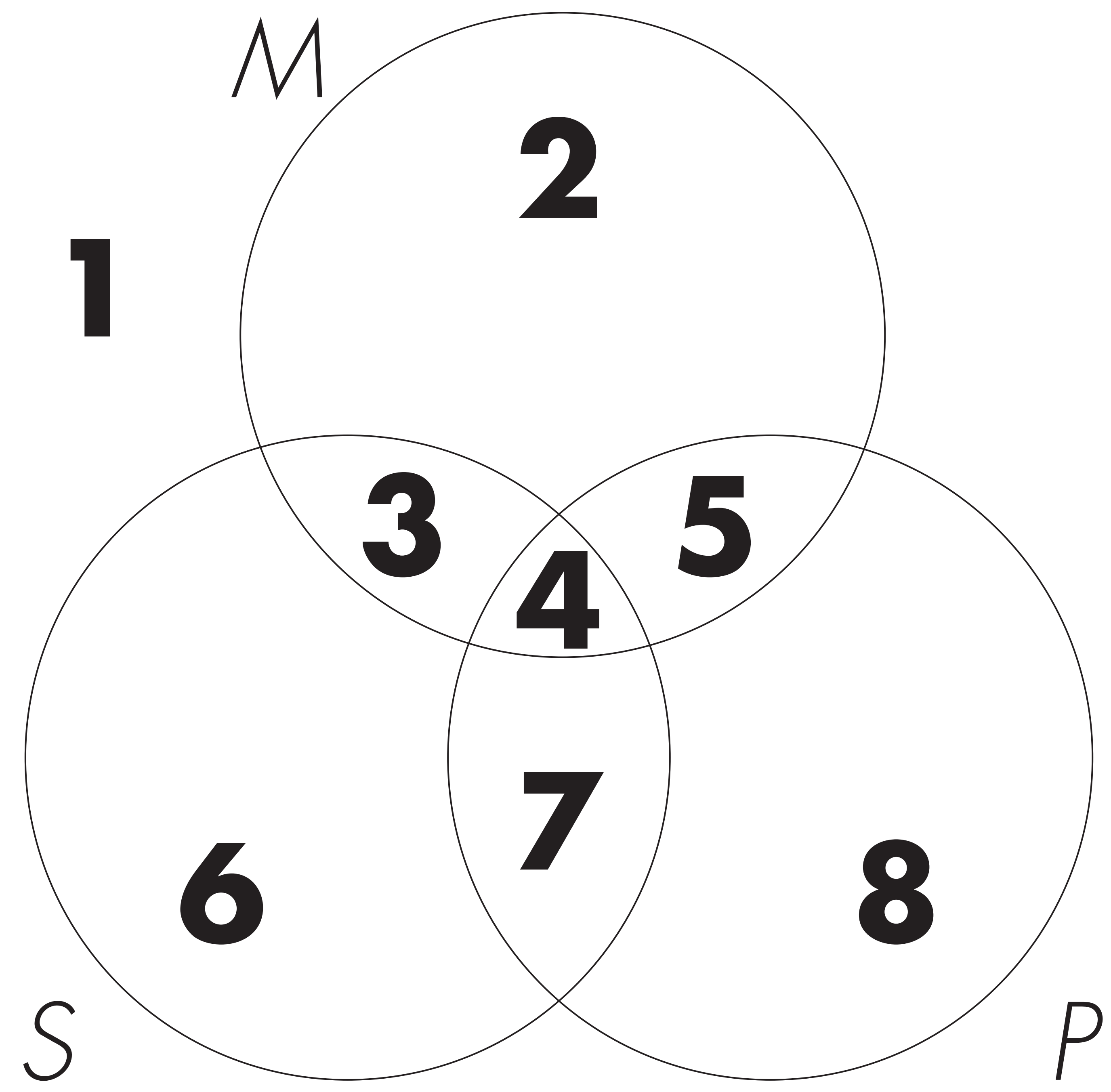


Argument #2: *Venn Diagram for the Premises*

As usual, look at the premises and diagram any universal ones first.

1. All *P* is *M*.
2. Some *S* is *M*.

∴ Some *S* is not *P*.

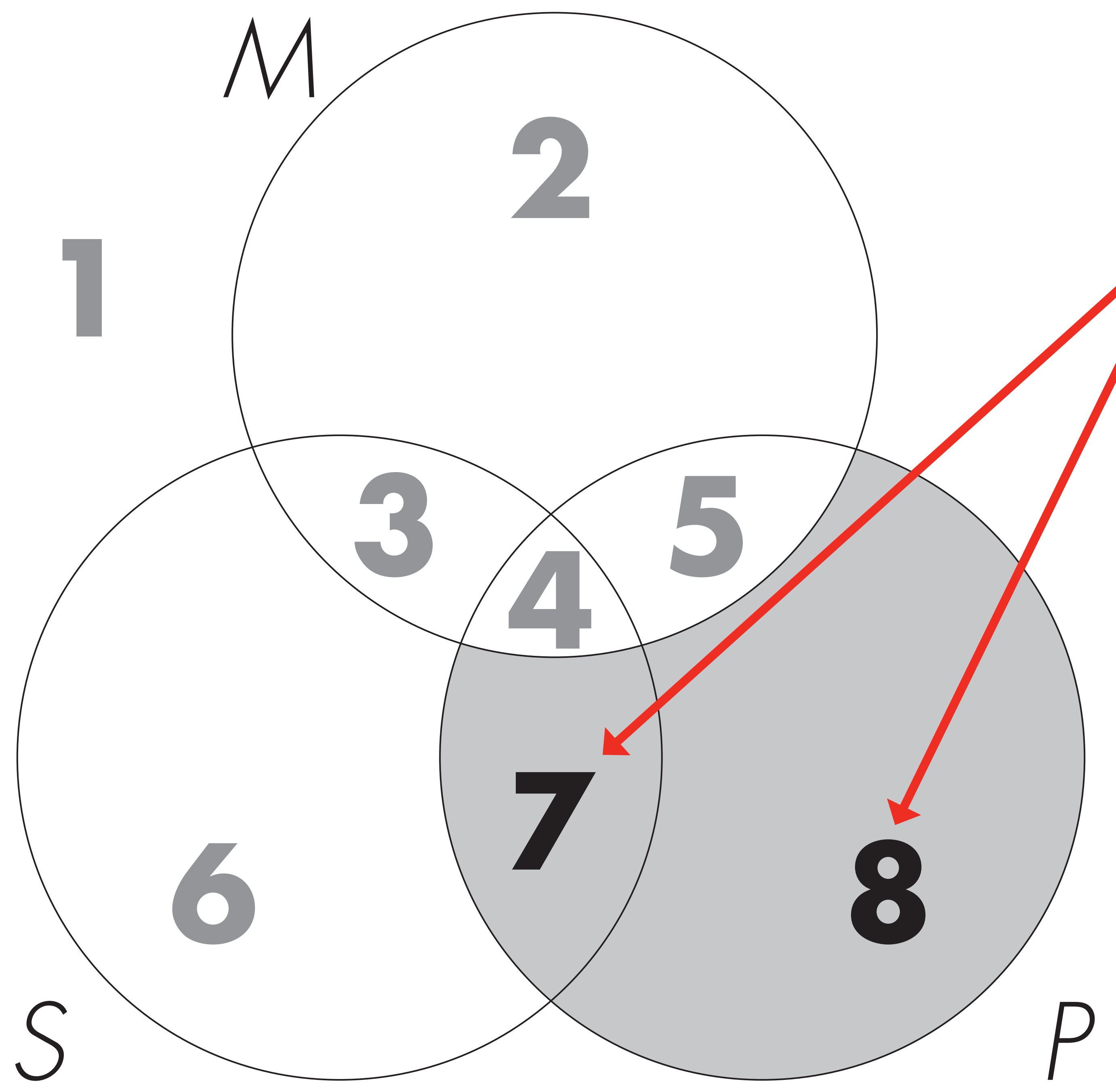


Argument #2: *Venn Diagram for the Premises*

Premise 1 is a universal statement (**A**: All *P* is *M*), so diagram that premise first.

1. All *P* is *M*.
2. Some *S* is *M*.

∴ Some *S* is not *P*.



Remember: The rule for **A** statements says to shade the area of *X* that is *not* shared with *Y*. In this case, *X* = *P* and *Y* = *M*. So we must shade in the area of *P* that is not shared with *M*, and that is zones 7 and 8.

Argument #2: *Venn Diagram for the Premises*

Now add any particular statements, like premise 2 (**I**: Some *S* is *M*):

1. All *P* is *M*.
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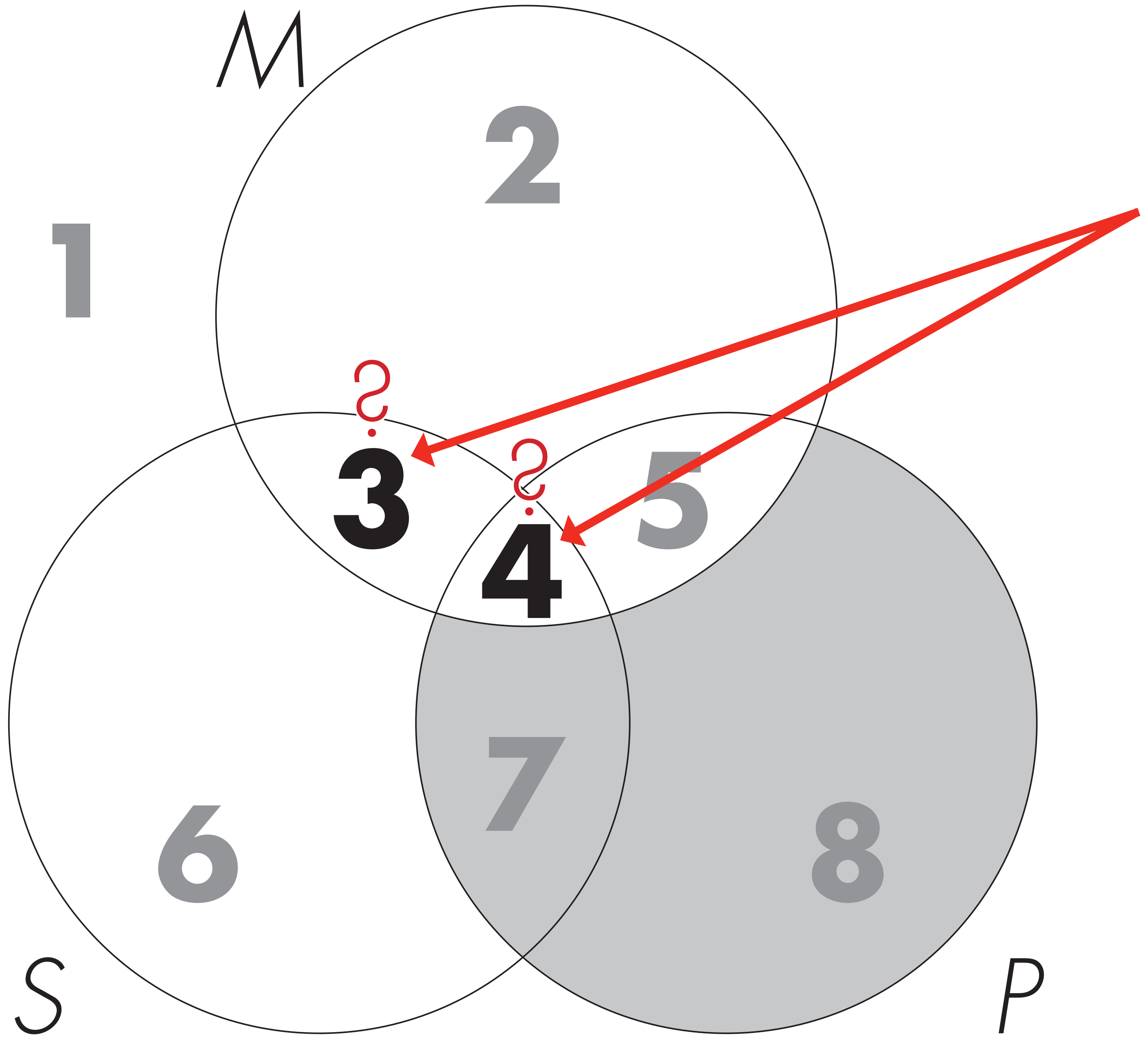

Remember: The rule for **I** statements says a dot-x goes in the area that the two categories have in common. For *S* and *M*, those are zones 3 and 4. However, we do not know in which zone the dot-x is put. It could logically be in *either* of them…

Argument #2: *Venn Diagram for the Premises*

Now add any particular statements, like premise 2 (**I**: Some *S* is *M*):

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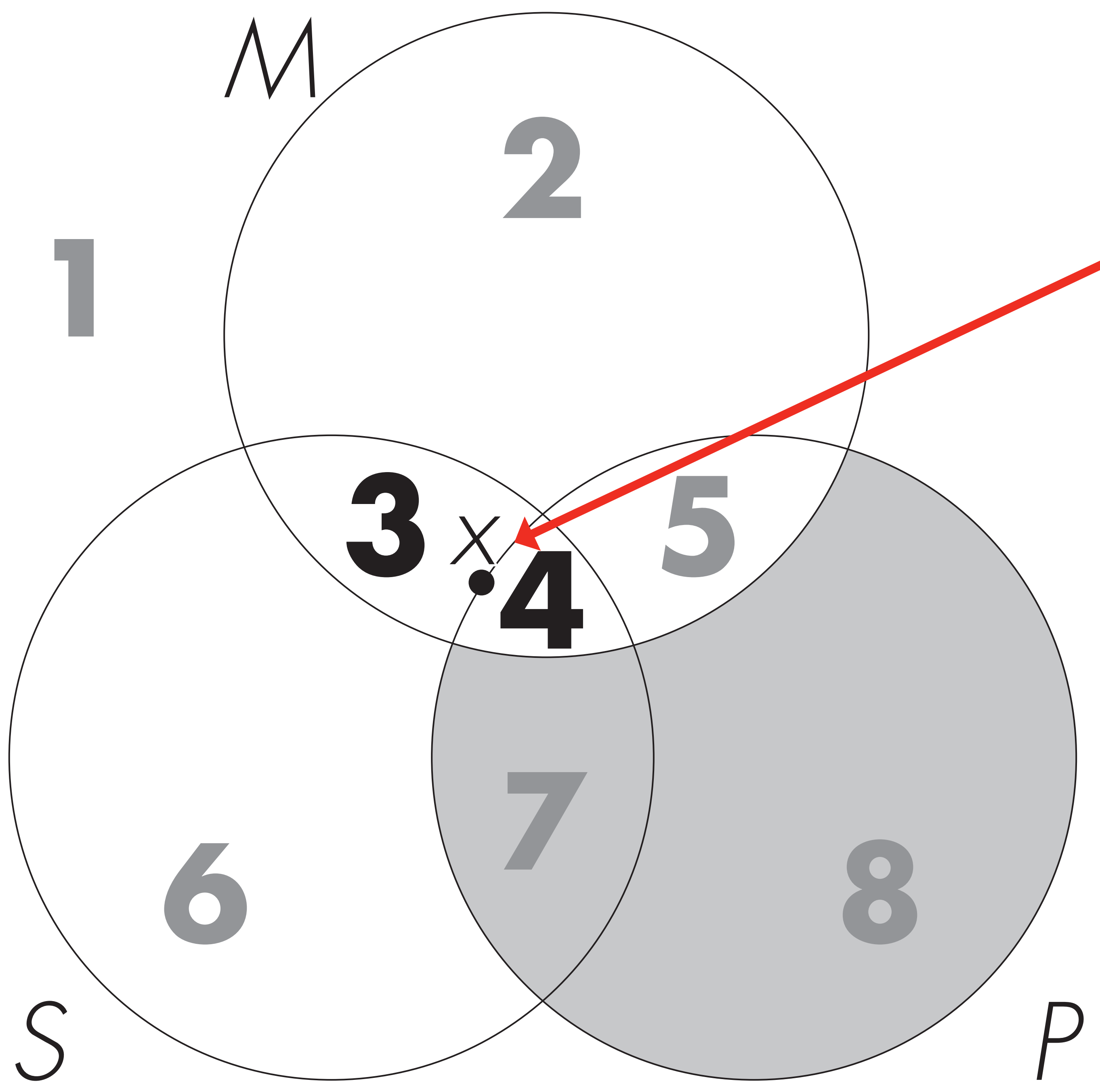


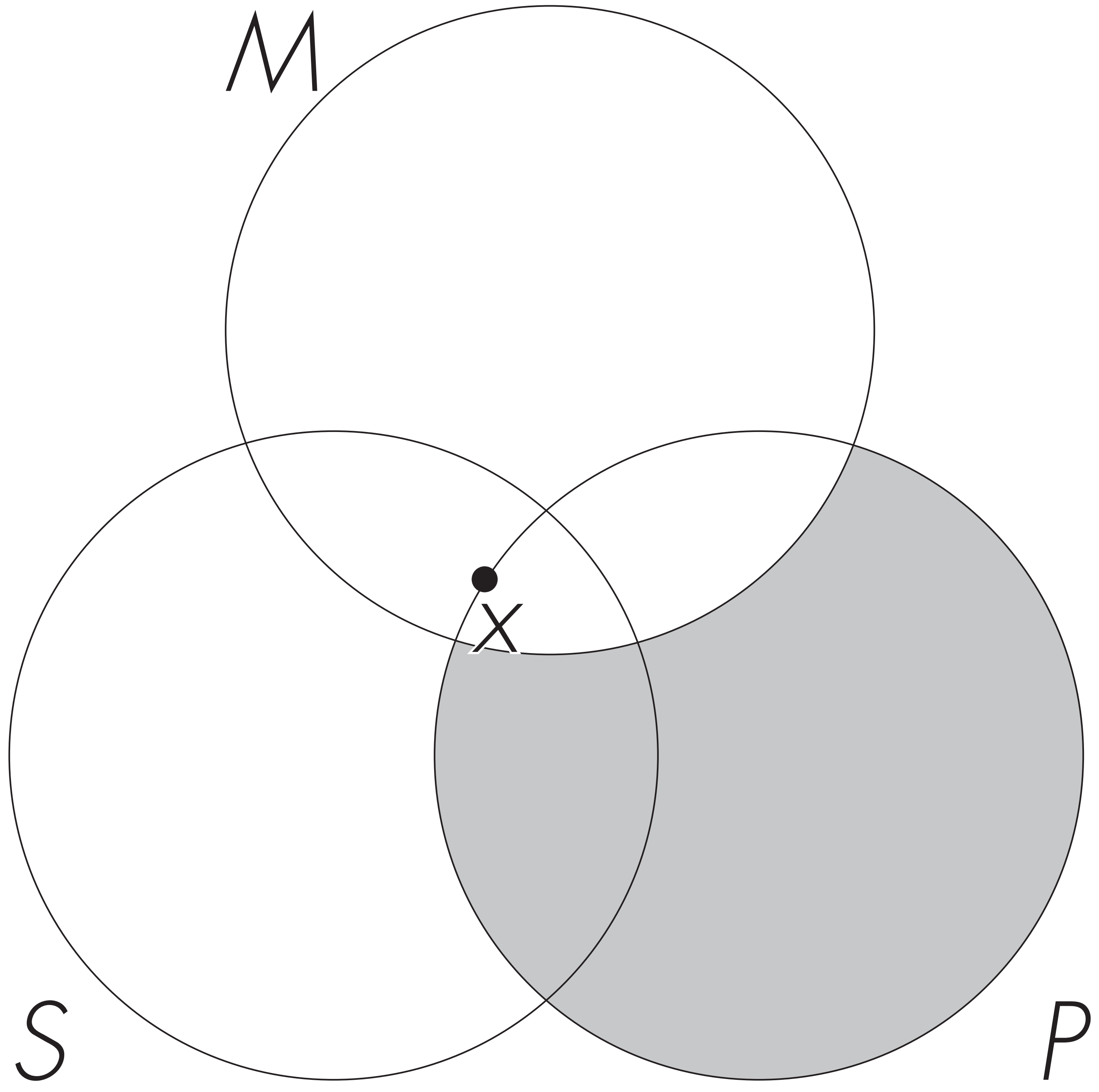
Remember: The rule for **I** statements says a dot-x goes in the area that the two categories have in common. For *S* and *M*, those are zones 3 and 4. However, we do not know in which zone the dot-x is put. It could logically be in *either* of them. So the dot-x *must* go on the line separating zones 3 and 4.

Argument #2: *Venn Diagram for the Premises*

The Venn diagram of the premises is done!

1. All *P* is *M*.
2. Some *S* is *M*.

∴ Some *S* is not *P*.



Argument #2: *Venn Diagram for the Conclusion*

Now we can make the *second* Venn diagram showing the argument's conclusion.

1. No *P* is *M*.
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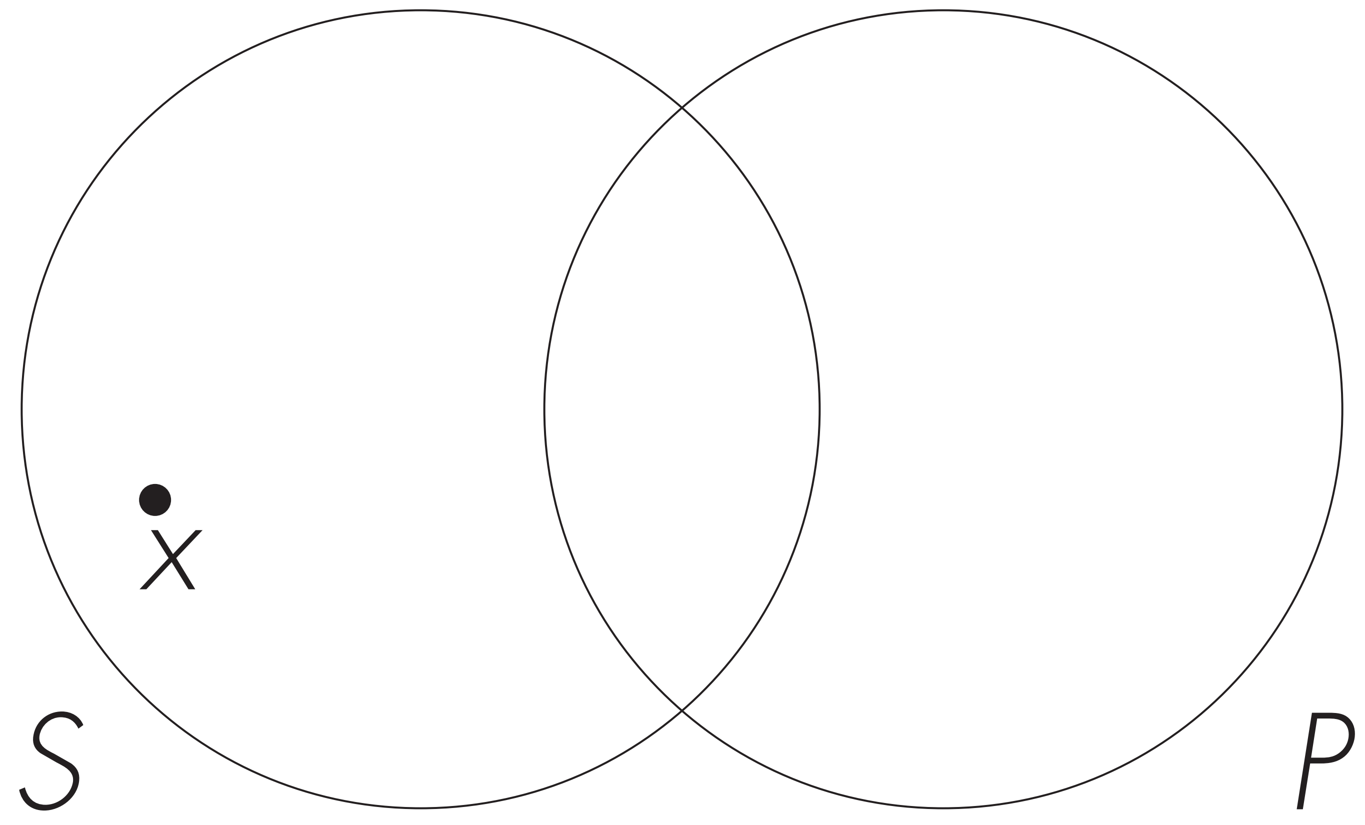

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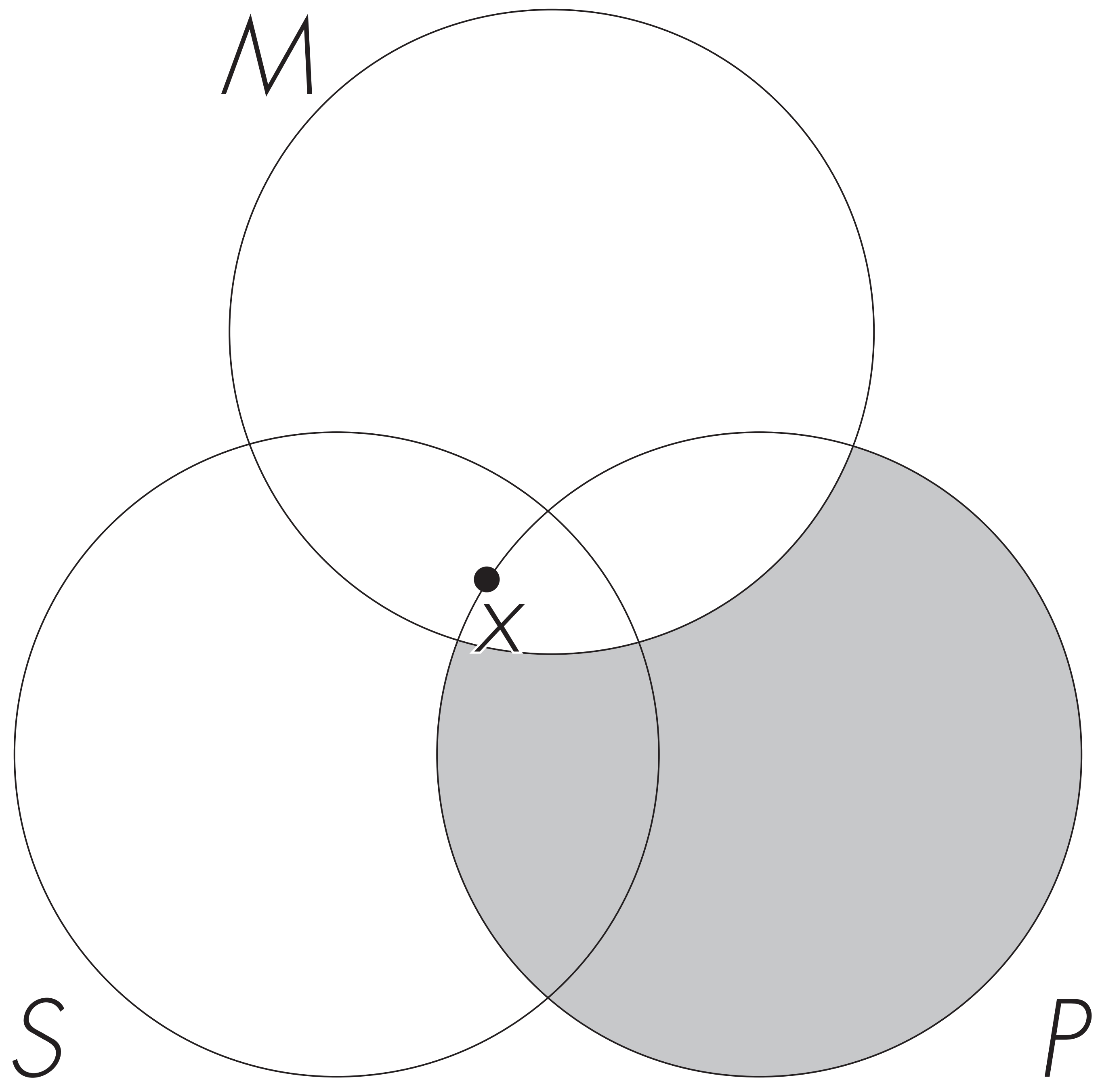
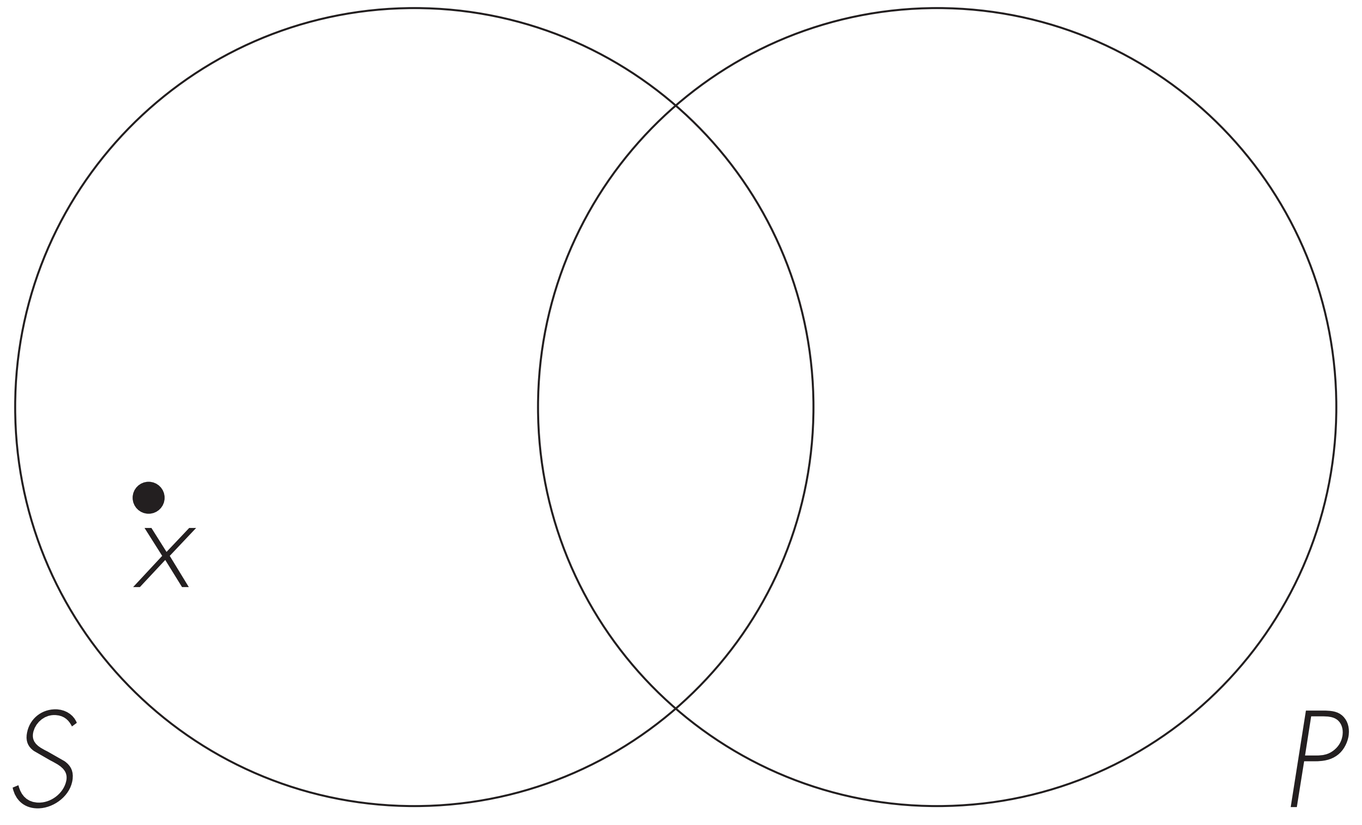


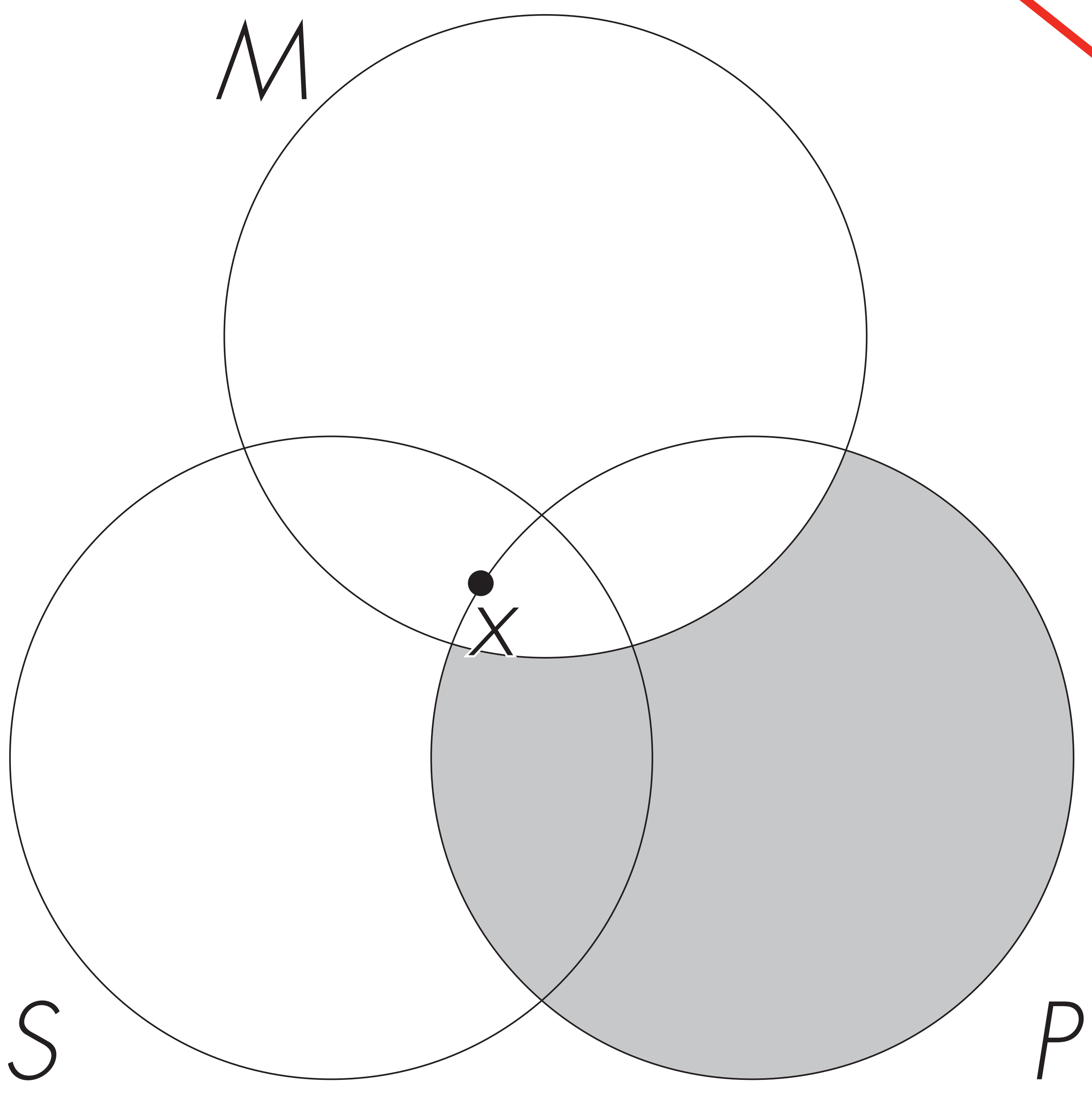
The Premises



The Conclusion

Argument #2: *Comparing the Two Venn Diagrams*

The conclusion requires a dot-*x* in *S* but *outside* of *P*...



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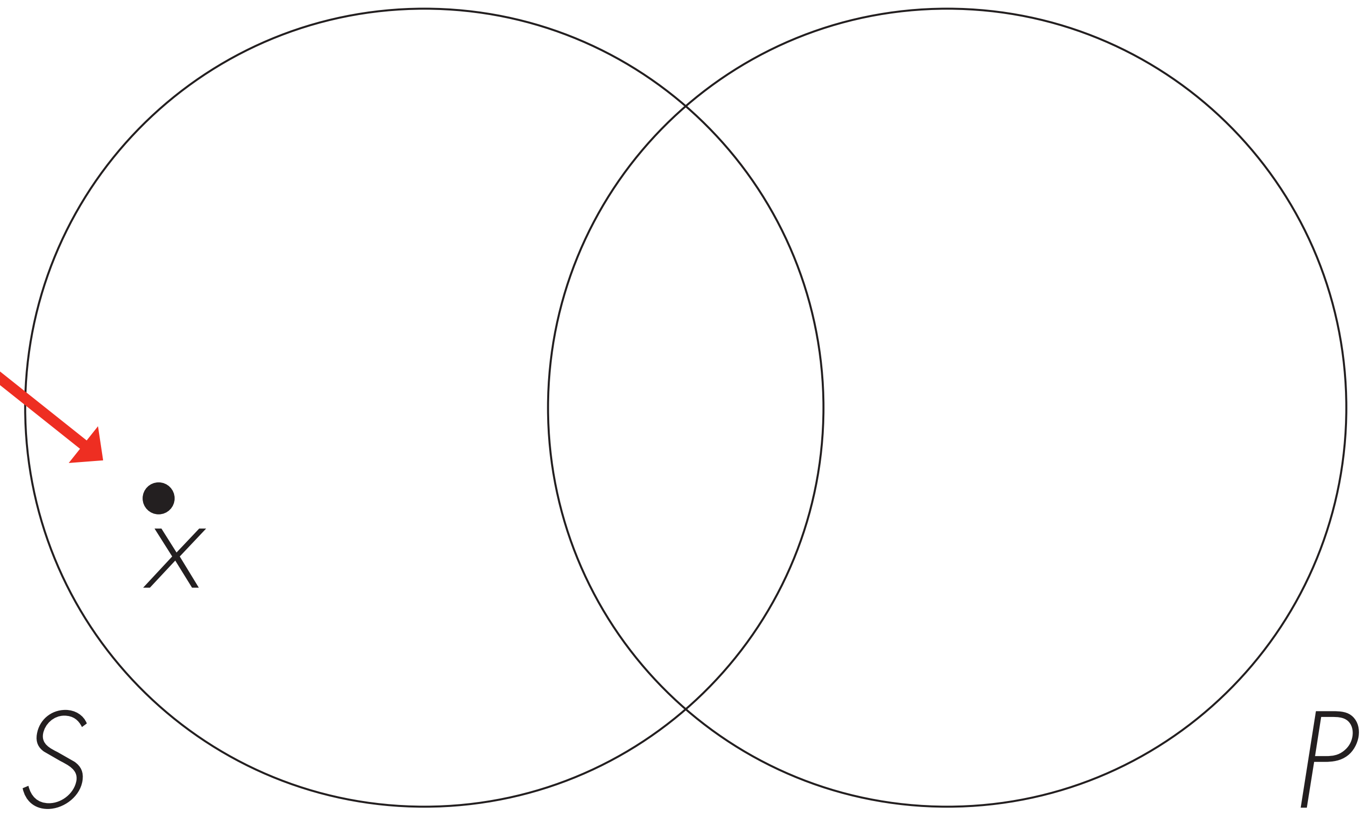
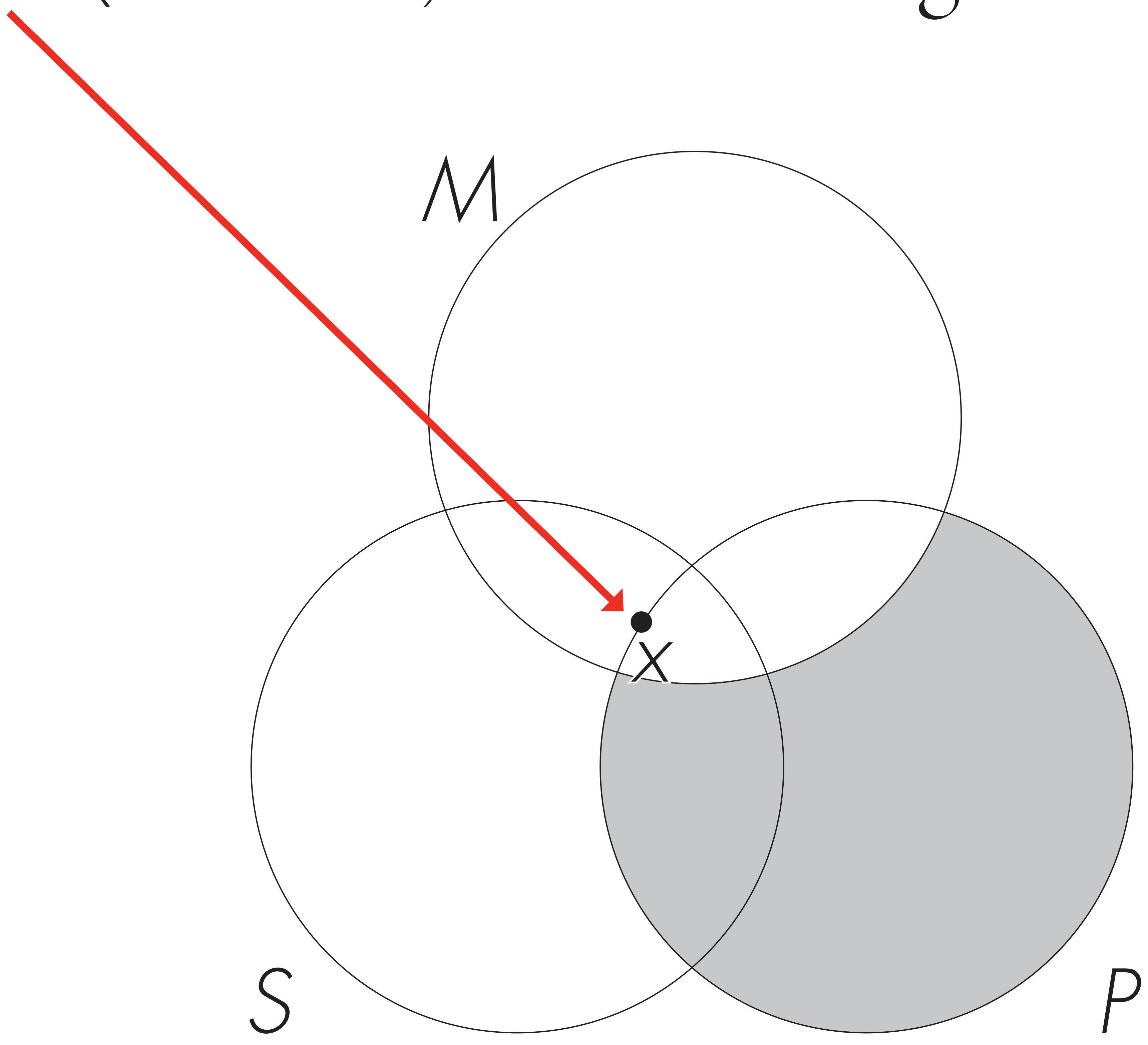


The Conclusion

Argument #2: *Comparing the Two Venn Diagrams*

The conclusion requires a dot-*x* in *S* but *outside* of *P*. The diagram of the premises, says there is an *x* in *S* (and in *M*), but that *x* might actually be *inside P*...



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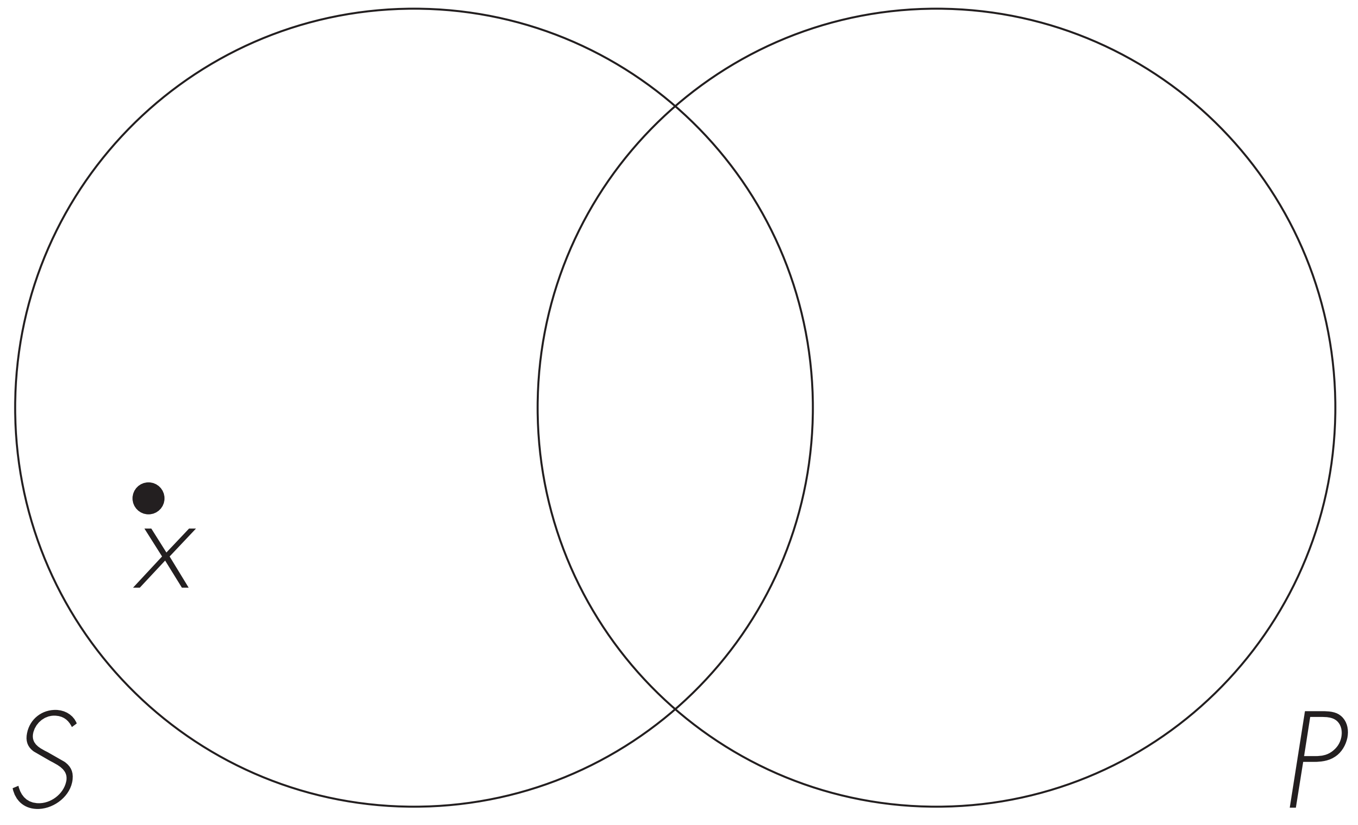
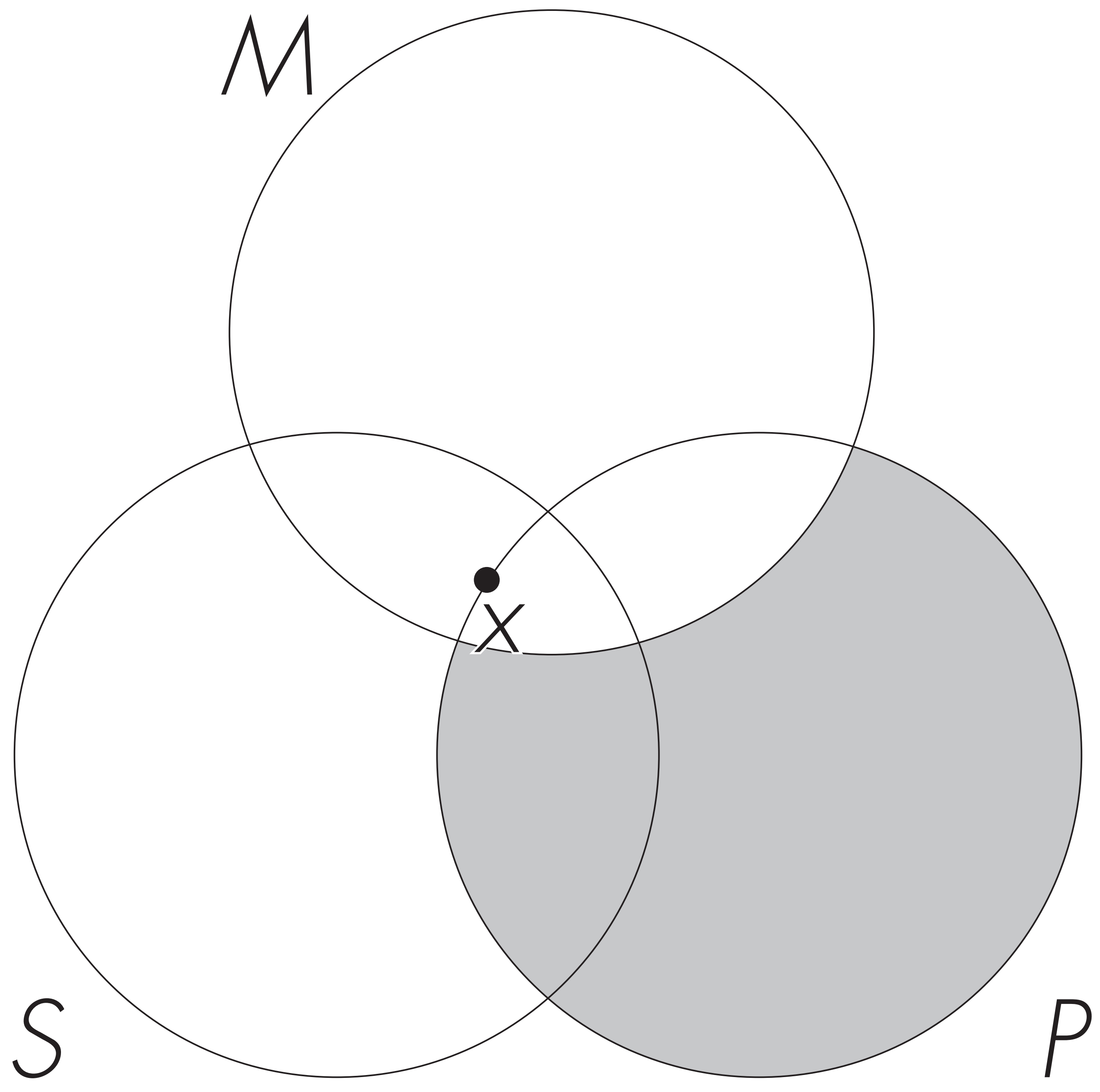


The Conclusion

Argument #2: *Comparing the Two Venn Diagrams*

The conclusion requires a dot-x in S but *outside* of P. The diagram of the premises, says there is an x in S (and in M), but that x might actually be *inside* P. So this argument is *invalid*!



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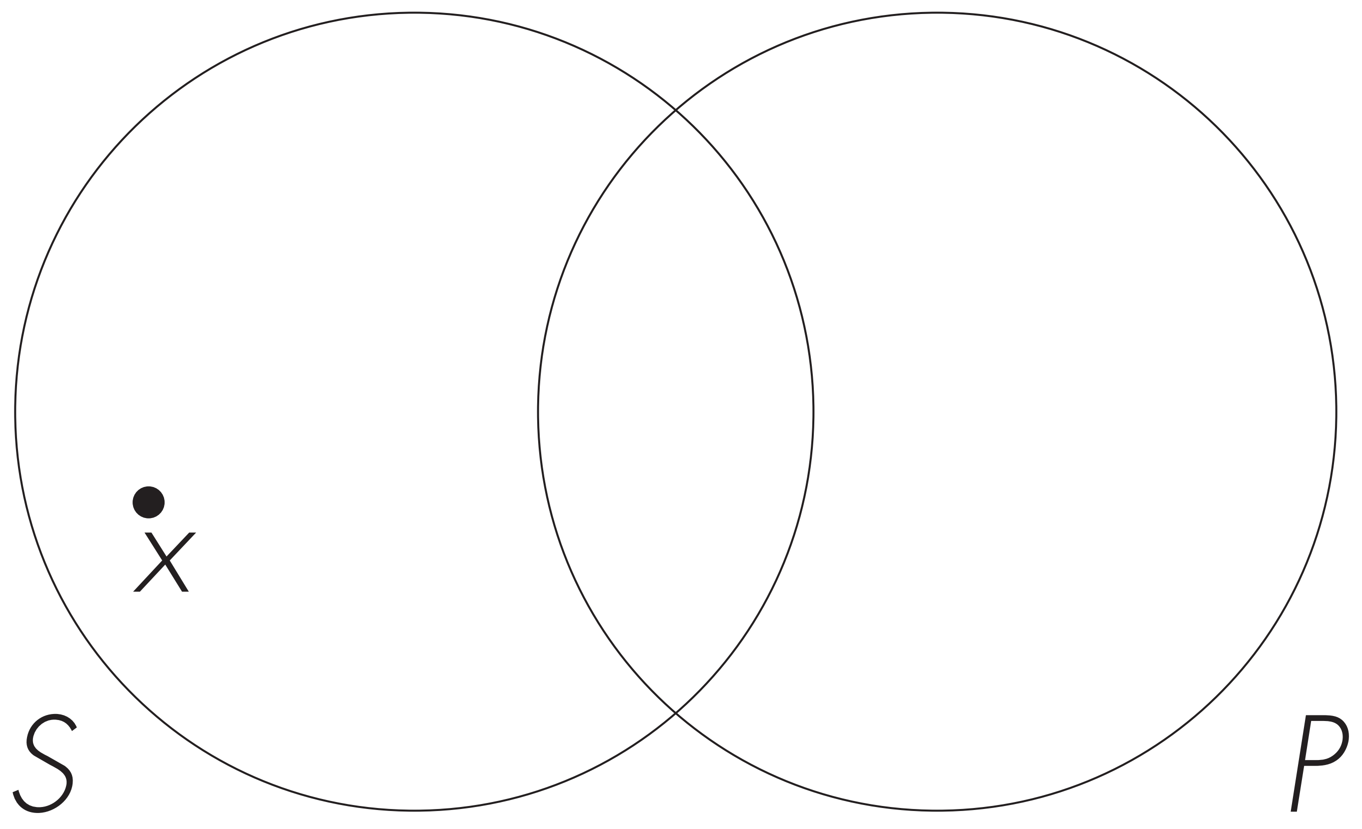

The Conclusion

Argument #3: *Parsed, Terms, & Standard Symbolic Form*

Some clever people are entrepreneurs, and all clever people work hard. Therefore, $\boxed{\text{some entrepreneurs work hard.}}$

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Major term (*P*): Hard workers.

Minor term (*S*): Entrepreneurs.

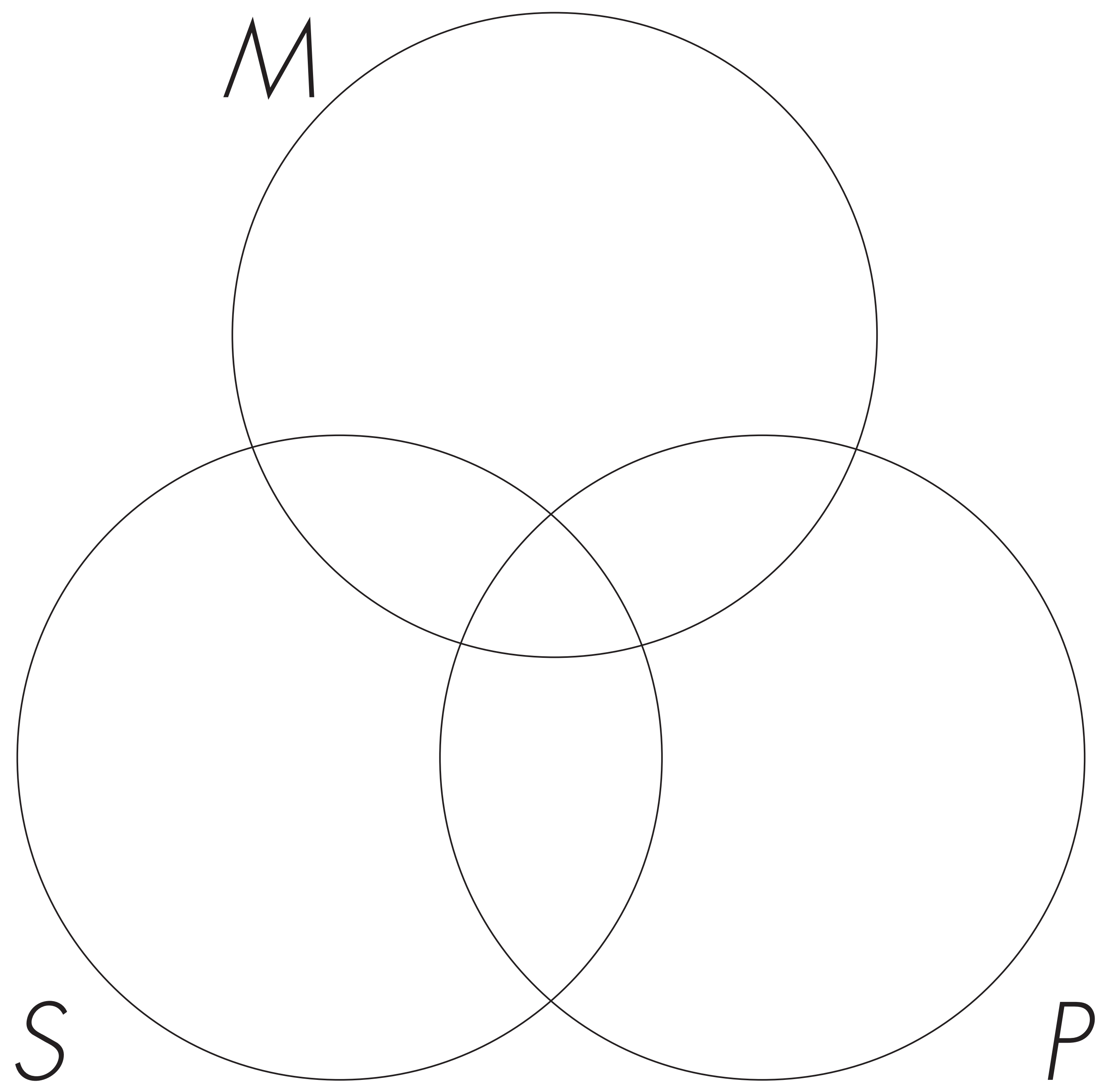
Middle term (*M*): Clever people.

1. All *M* is *P*.
2. Some *M* is *S*.

∴ Some *S* is *P*.

Argument #3: *Venn Diagram for the Premises*

Draw the three circles.

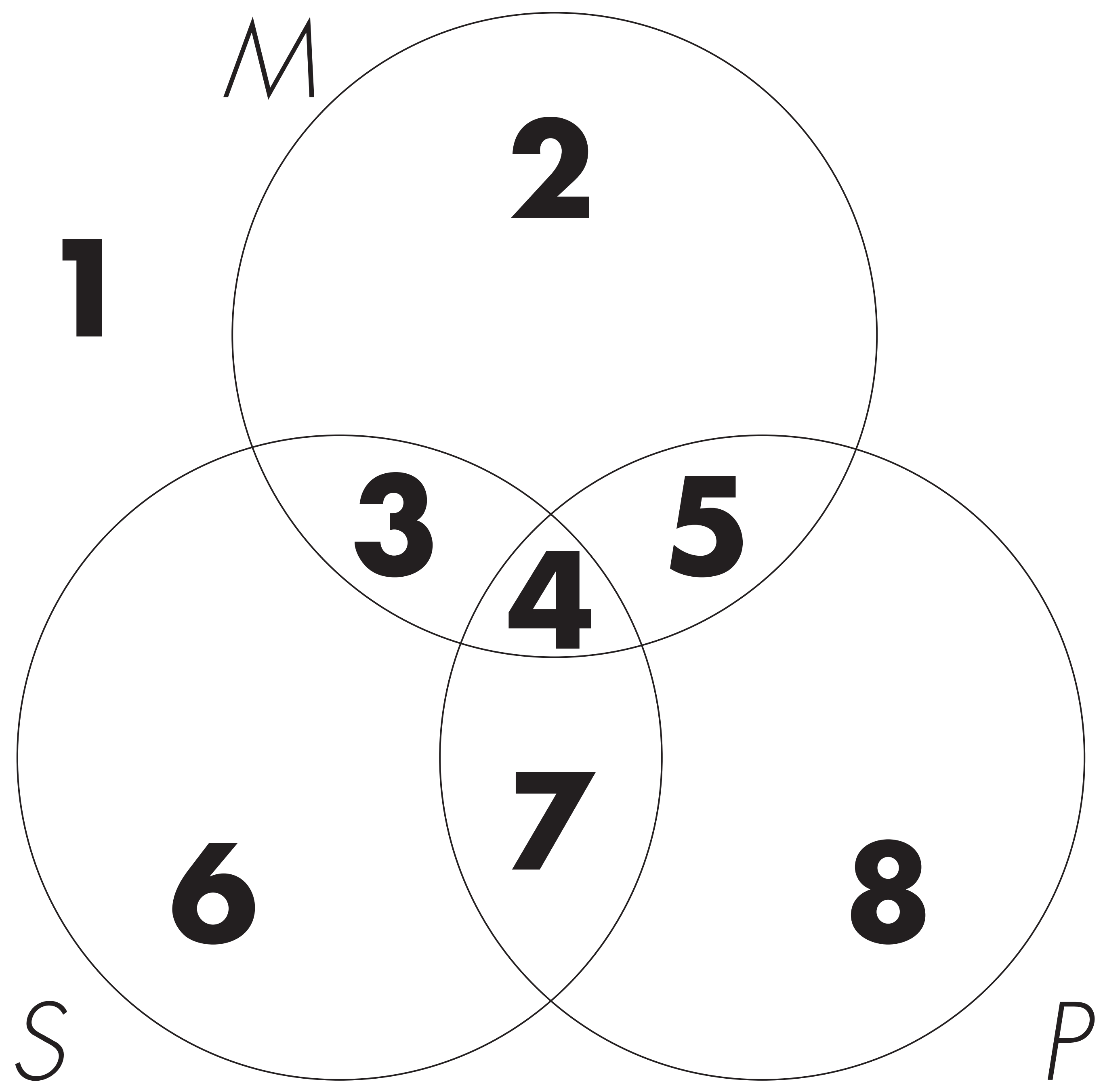


Argument #3: *Venn Diagram for the Premises*

As usual, look at the premises and diagram any universal ones first.

1. All *M* is *P*.
2. Some *M* is *S*.

∴ Some *S* is *P*.



Argument #3: *Venn Diagram for the Premises*

Premise 1 is a universal statement (**A**: All *M* is *P*), so diagram that premise first.

1. All *M* is *P*.
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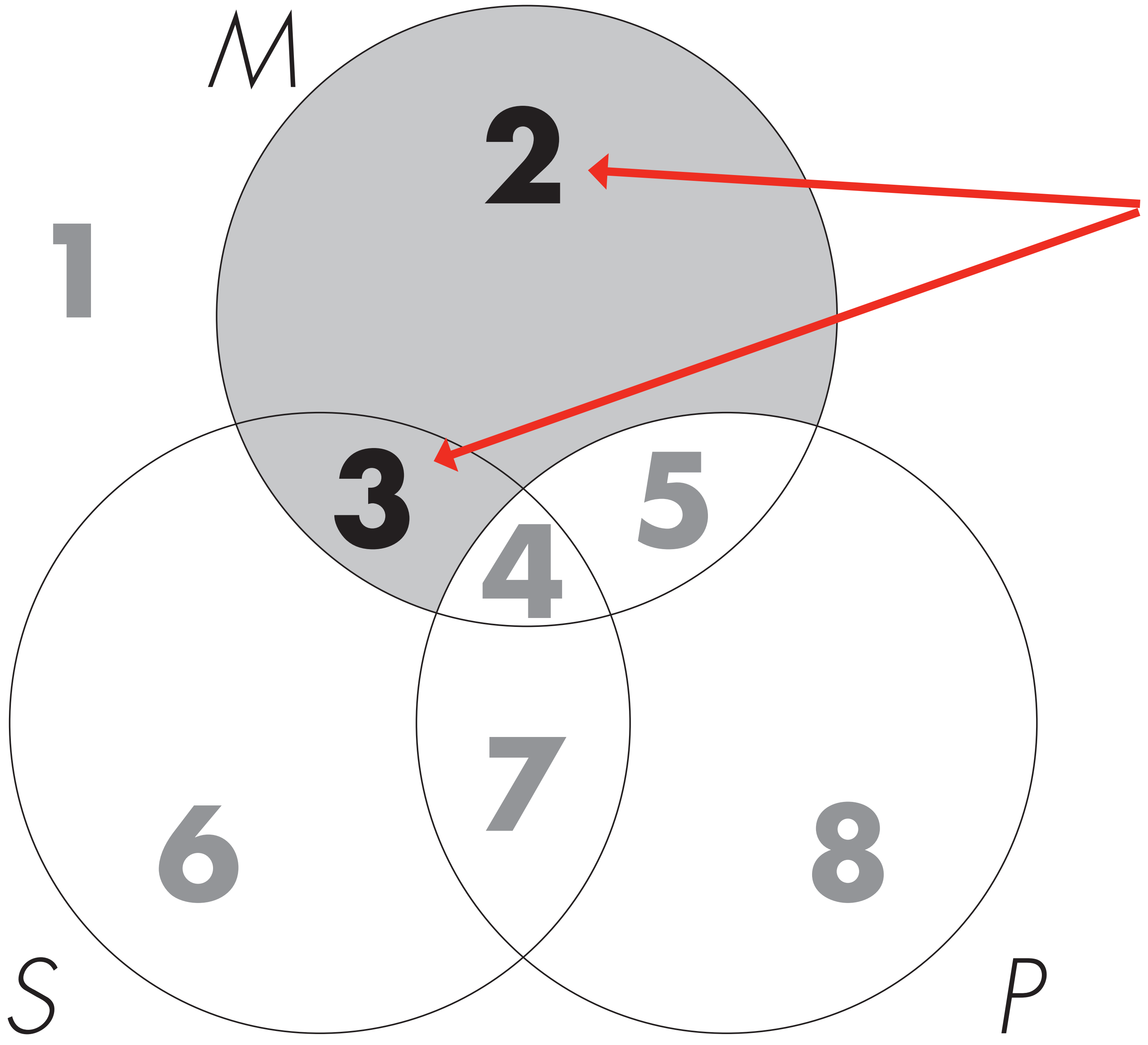
∴ Some *S* is *P*.



Remember: The rule for **A** statements says to shade the area of *X* that is *not* shared with *Y*. In this case, *X* = *M* and *Y* = *P*. So we must shade in the area of *M* that is not shared with *P*, and that is zones 2 and 3.

Argument #3: *Venn Diagram for the Premises*

Now add any particular statements, like premise 2 (**I**: Some *M* is *S*):

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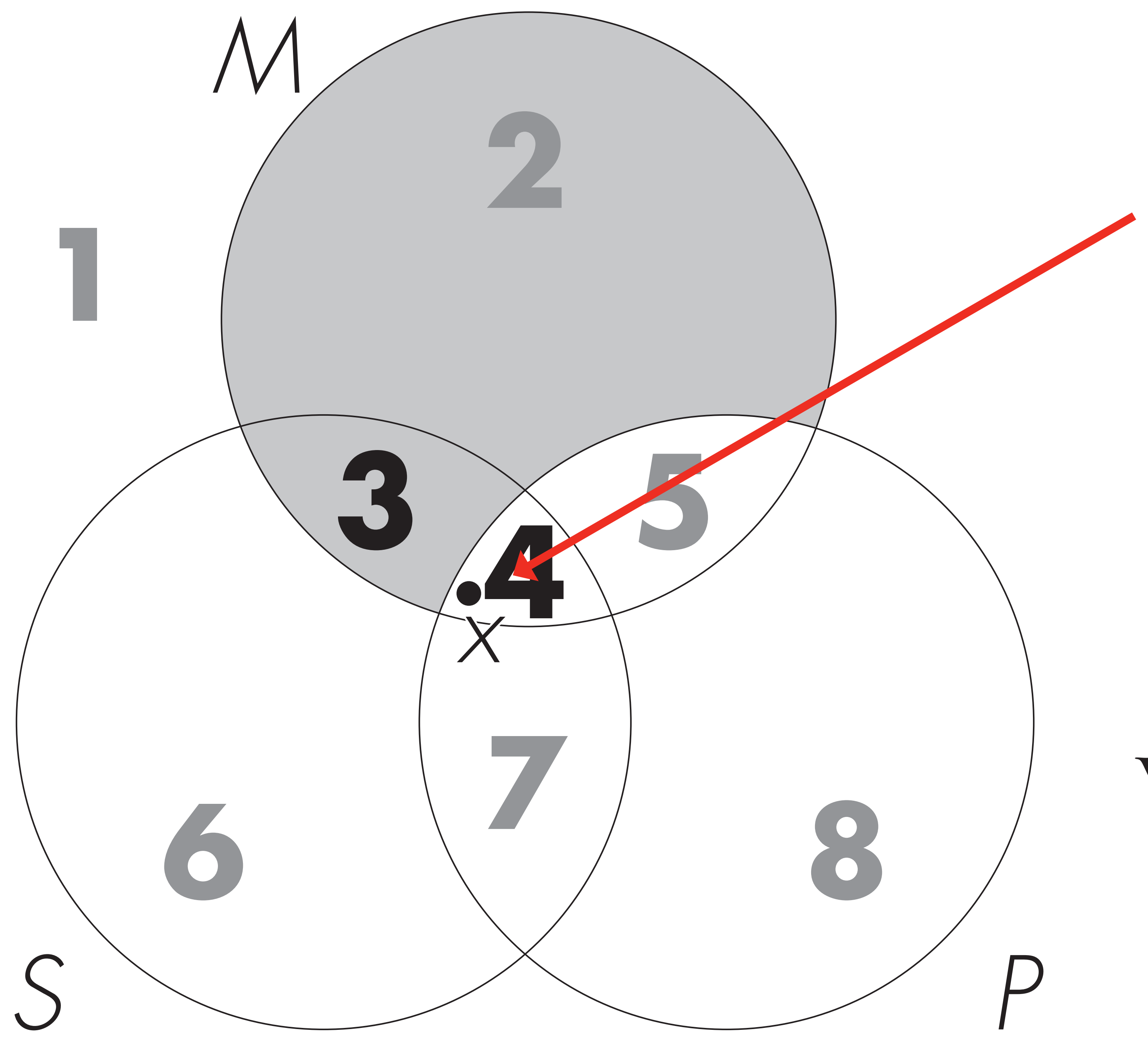


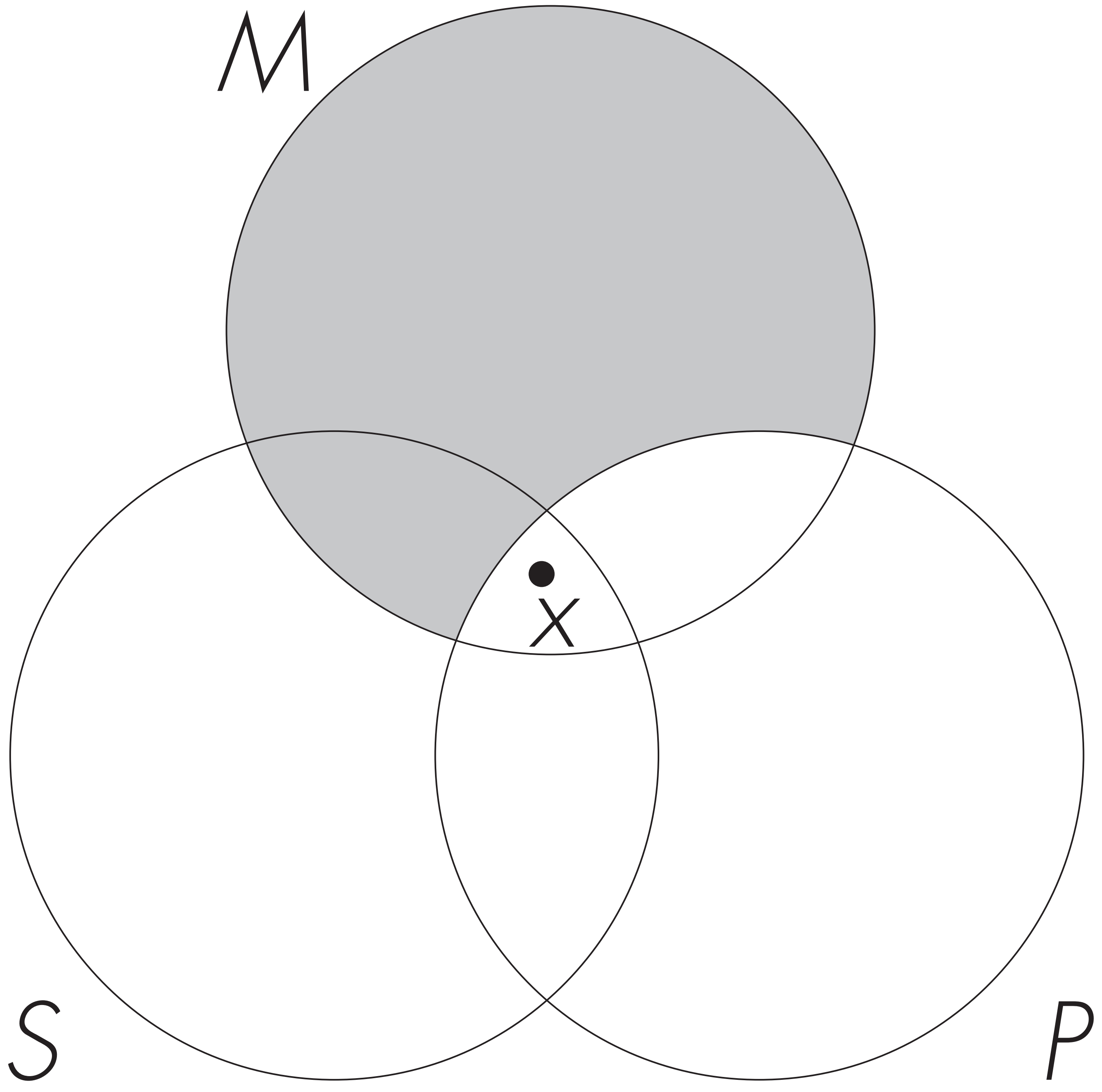
Remember: The rule for **I** statements says a dot-*x* goes in the area that the two categories have in common. For *M* and *S*, those are zones 3 and 4. However, the dot-*x* *cannot* be in zone 3. Why? Because zone 3 is empty (it is shaded in). So the dot-*x* must be put in zone 4.

Argument #3: *Venn Diagram for the Premises*

The Venn diagram of the premises is done!

1. All M is P.
2. Some M is S.

∴ Some S is P.



Argument #3: *Venn Diagram for the Conclusion*

Now we can make the *second* Venn diagram showing the argument's conclusion.

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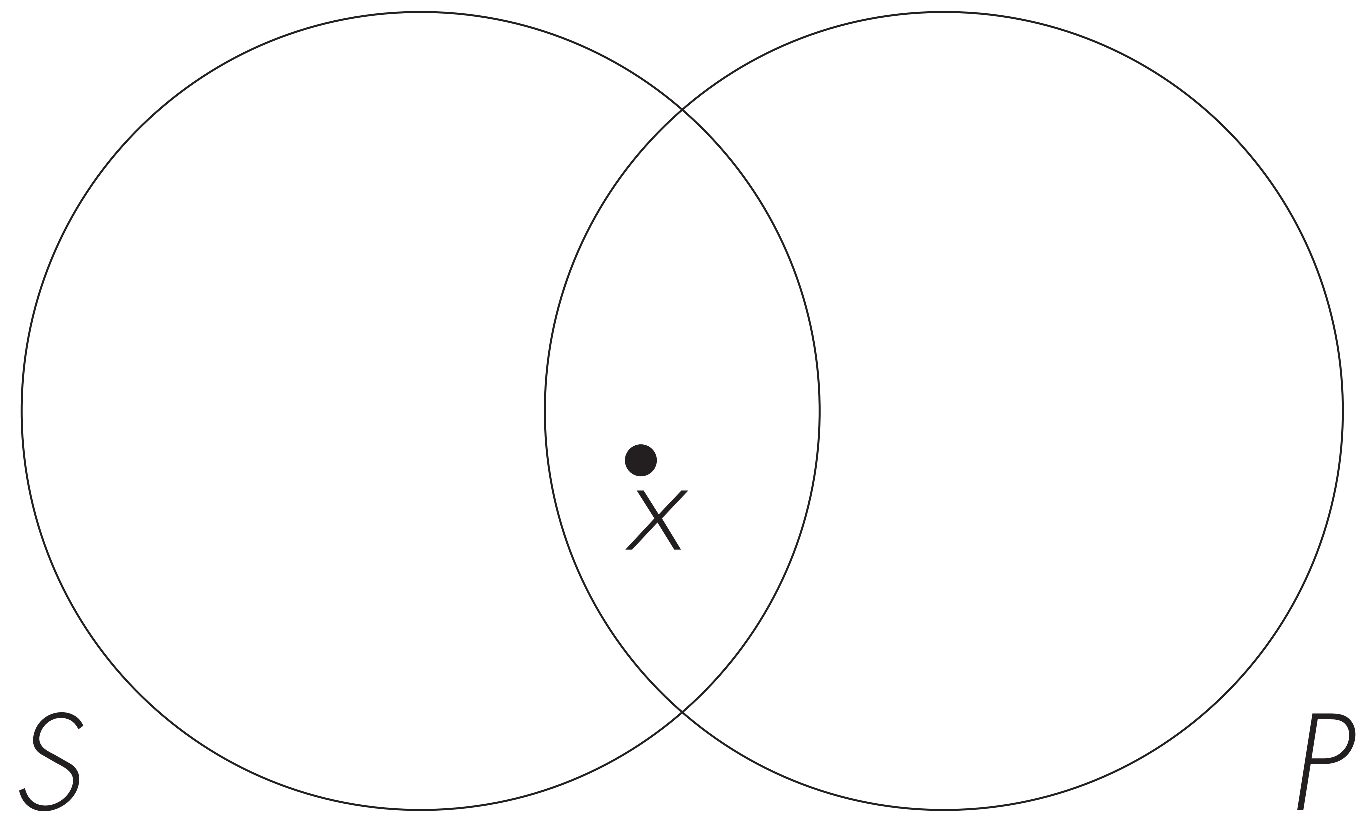
∴ Some *S* is *P*.



Argument #3: *Comparing the Two Venn Diagrams*

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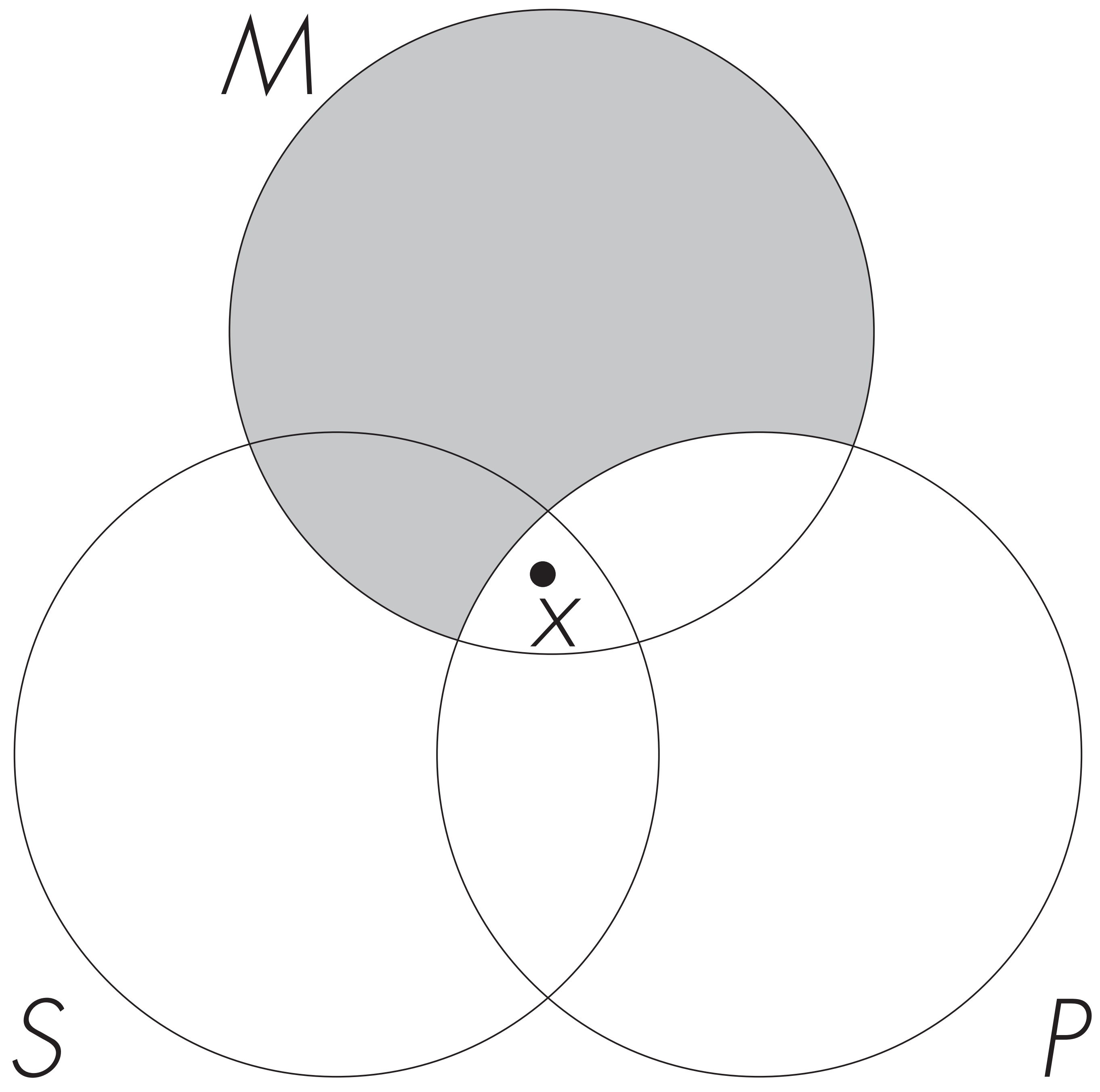
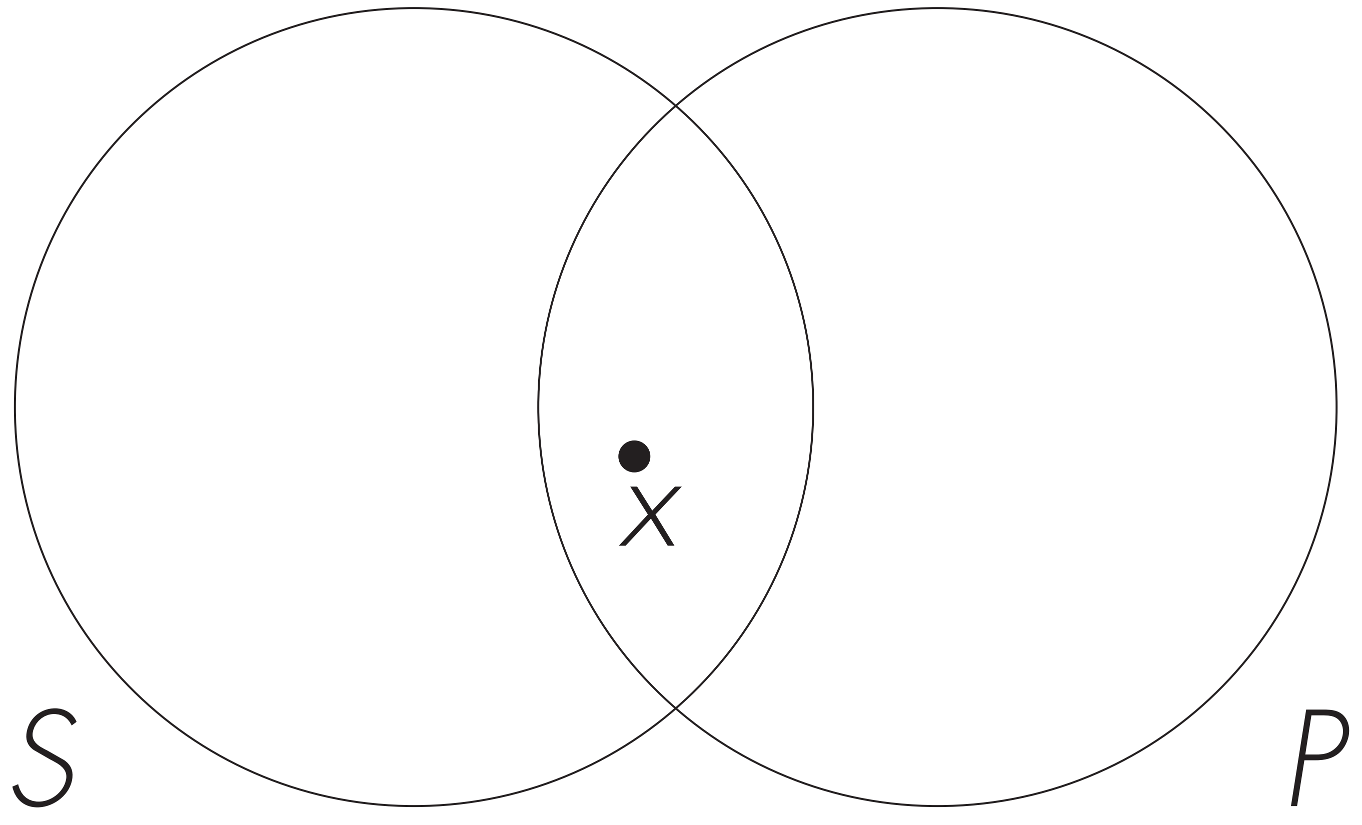


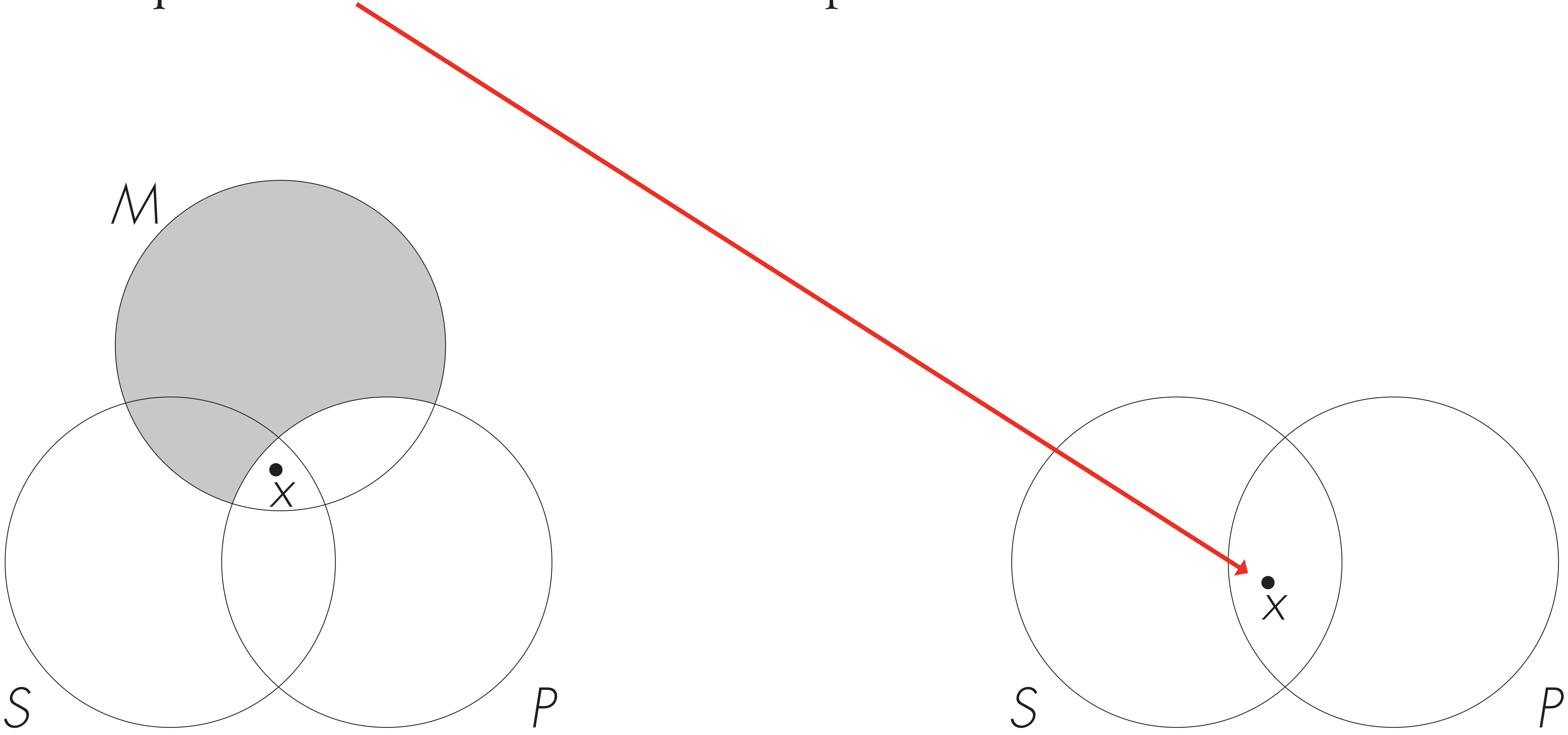
The Premises



The Conclusion

Argument #3: *Comparing the Two Venn Diagrams*

The conclusion requires a dot-*x* in the area of overlap between *S* and *P*…

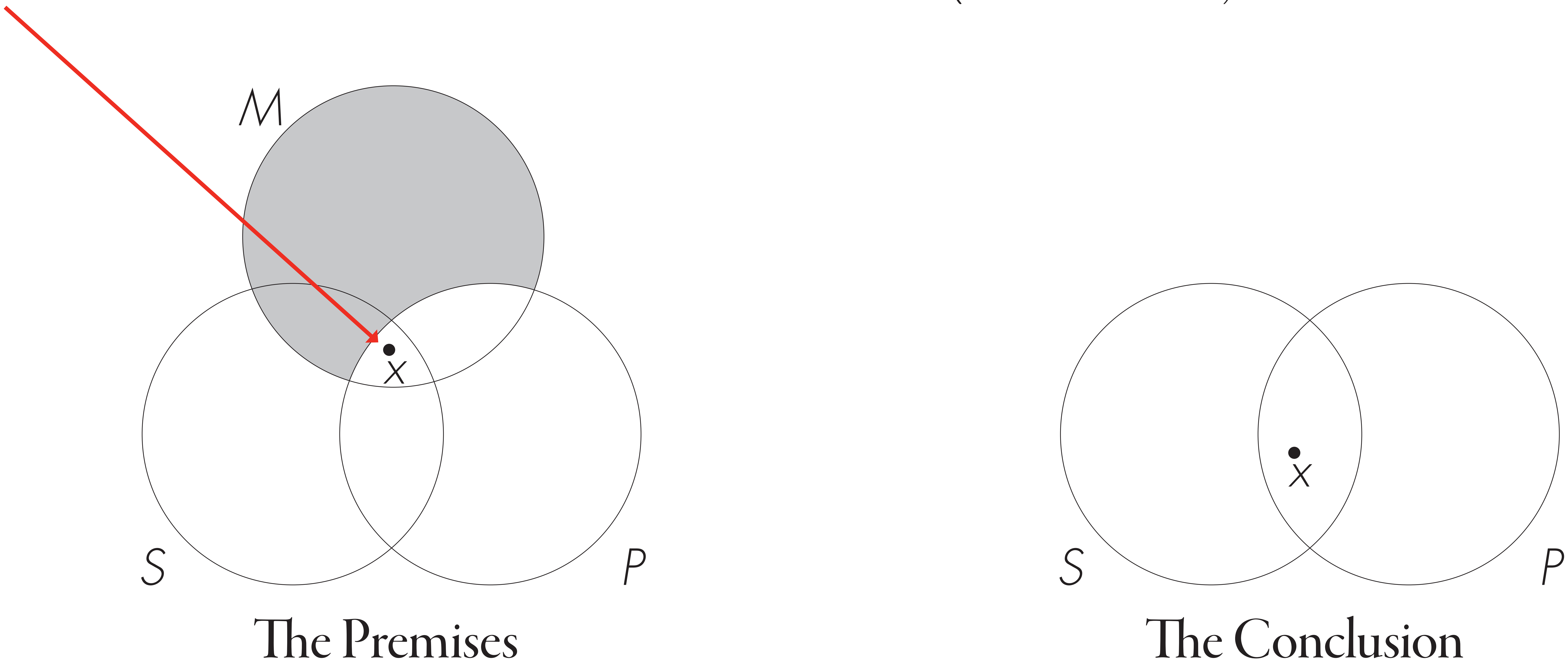


The Premises

The Conclusion

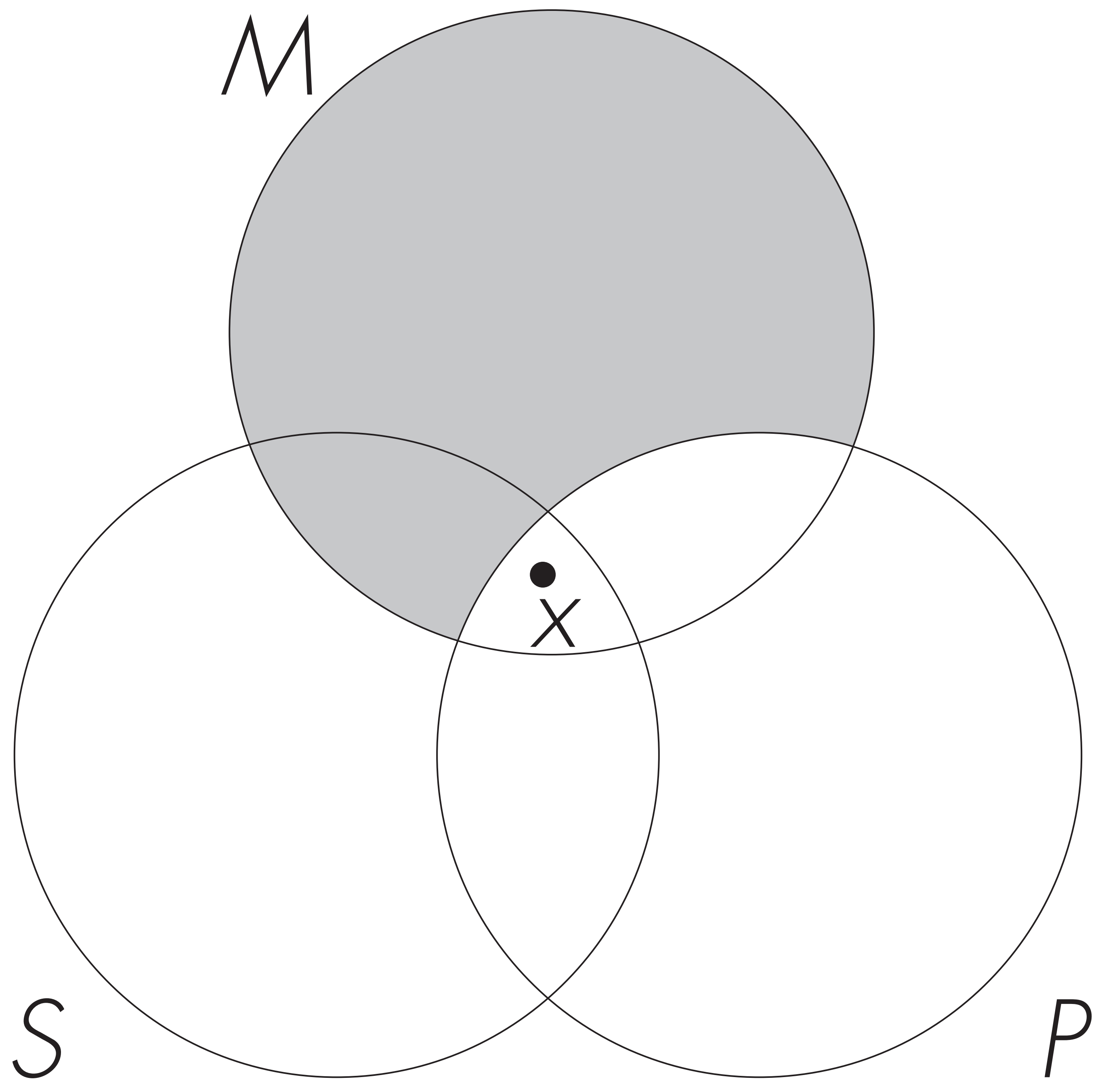
Argument #3: *Comparing the Two Venn Diagrams*

The conclusion requires a dot-*x* in the area of overlap between *S* and *P*. The diagram of the premises show that there is indeed a dot-*x* in that area (and also in *M*)...

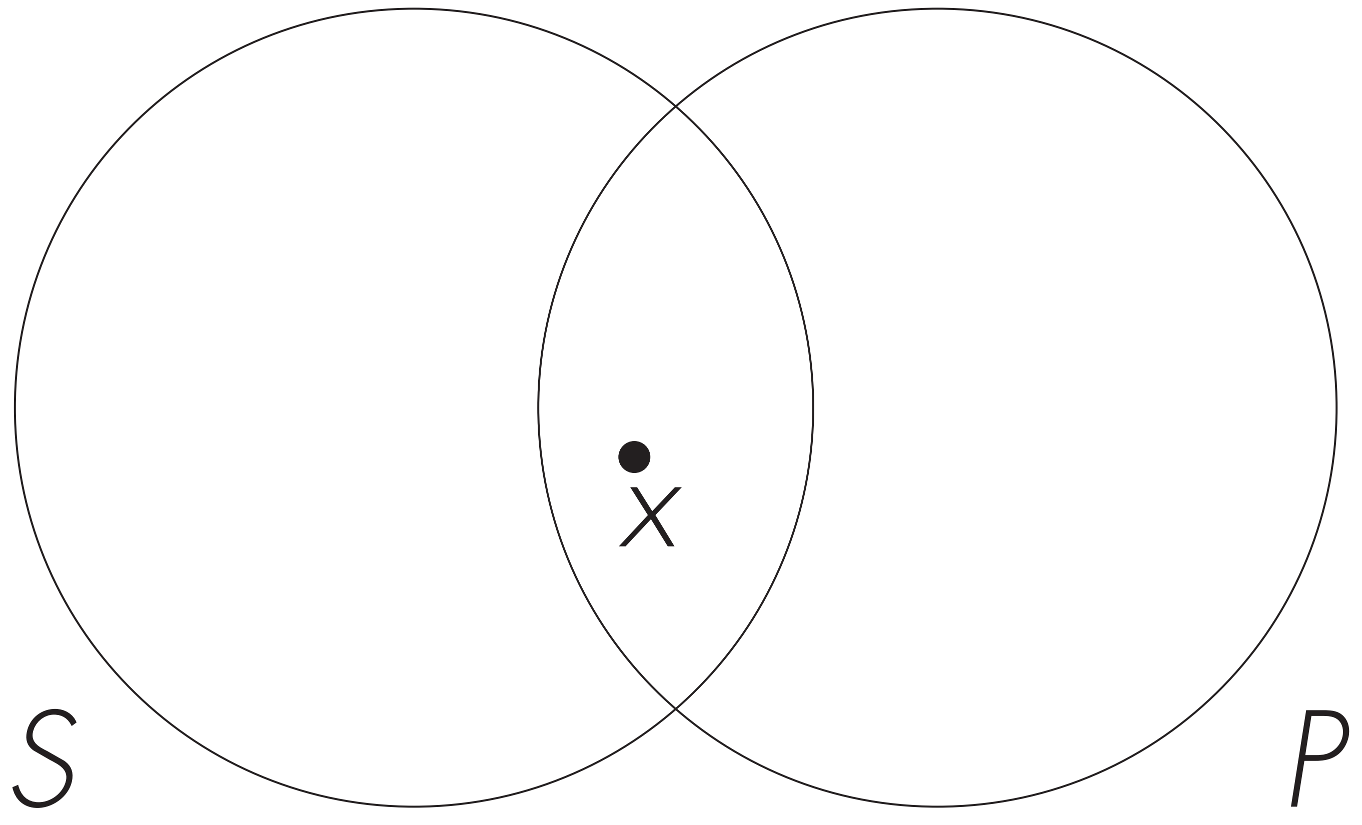


Argument #3: *Comparing the Two Venn Diagrams*

The conclusion requires a dot-*x* in the area of overlap between *S* and *P*. The diagram of the premises show that there is indeed a dot-*x* in that area (and also in *M*). So this argument is *valid*!



The Premises



The Conclusion

Next Class…

We will have a workshop on assessing the validity of categorical syllogisms by using the Venn diagram method.