Complete the following from Appendix B.

Lemma B.0.7 $(l+m)+n = l+(m+n)$.

Proof. By induction on n.

For $n = 1$:

$(l+m)+1$	$=$	$(l+m)'$	by	B.0.1 i
	$=$	$l+m'$	by	B.0.1 ii
	$=$	$l+(m+1)$.	by	B.0.1 i

Induction Hypothesis: $(l+m)+n = l+(m+n)$.

$(l+m)+n'$	$=$	$((l+m)+n)'$	by	B.0.1 ii
	$=$	$(l+(m+n))'$	by	Ind. Hyp.
	$=$	$l+(m+n)'$	by	B.0.1 ii
	$=$	$l+(m+n')$.	by	B.0.1 ii

Lemma B.0.12 $l\cdot(m+n) = (l\cdot m)+(l\cdot n)$.

Proof. By induction on n.

For $n = 1$:

$l\cdot(m+1)$	$=$	$l\cdot m'$	by	B.0.1 i
	$=$	$(l\cdot m)+l$	by	B.0.8 ii
	$=$	$(l\cdot m)+(l\cdot 1)$.	by	B.0.8 i

Induction Hypothesis: $l\cdot(m+n) = (l\cdot m)+(l\cdot n)$.

$l\cdot(m+n')$	$=$	$l\cdot(m+n)'$	by	B.0.1 ii
	$=$	$(l\cdot(m+n))+l$	by	B.0.8 ii
	$=$	$((l\cdot m)+(l\cdot n))+l$	by	Ind. Hyp.
	$=$	$(l\cdot m)+((l\cdot n)+l)$	by	B.0.7
	$=$	$(l\cdot m)+(l\cdot n')$.	by	B.0.8 ii

Lemma B.0.16 $a^{m+n} = a^m\cdot a^n$.

Proof. By induction on n. For $n = 1$:

a^{m+1}	$=$	$a^{m'}$	by	B.0.1 i
	$=$	$a^m\cdot a$	by	B.0.15 ii
	$=$	$a^m\cdot a^1$.	by	B.0.15 i

Induction Hypothesis: $a^{m+n} = a^m\cdot a^n$.

$a^{m+n'}$	$=$	$a^{(m+n)'}$	by	B.0.1 ii
	$=$	$a^{m+n}\cdot a$	by	B.0.15 ii
	$=$	$(a^m\cdot a^n)\cdot a$	by	Ind. Hyp.
	$=$	$a^m\cdot(a^n\cdot a)$	by	B.0.14
	$=$	$a^m\cdot a^{n'}$.	by	B.0.15 ii

Six Syllogisms

(1) All S is M.
Some M is P.

Some S is P.

(2) All M is P.
Some S is M.

Some S is P.

(3) Some M is not P.
No M is S.

Some S is not P.

(4) Some S is M.
No P is M.

Some S is not P.

(5) All S is M.
Some M is P.

Some P is S.

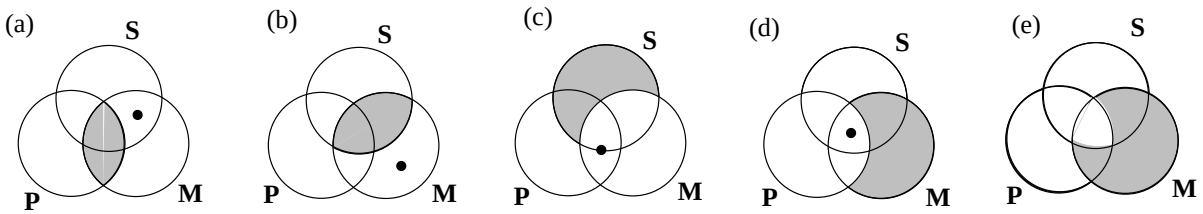
(6) All M is S.
All M is P.

Some S is P.

For each of the above syllogisms find the **figure** and the **mood**, and determine if it is valid under Aristotle's Convention (AC) for the empty class, and if it is valid under the Modern Convention (MC) for the empty class.

	Figure	Mood	Valid under (AC)	Valid under (MC)
1	1	IAI		
2	1	AII	√	√
3	3	OEO		
4	2	EIO	√	√
5	4	AII		
6	3	AAI	√	

Five Venn Diagrams



For each of the six syllogisms at the top find the Venn diagram for its premisses from the above and enter the answers in the empty boxes below:

Syllogism	1	2	3	4	5	6
Venn Diagram	c	d	b	a	c	e