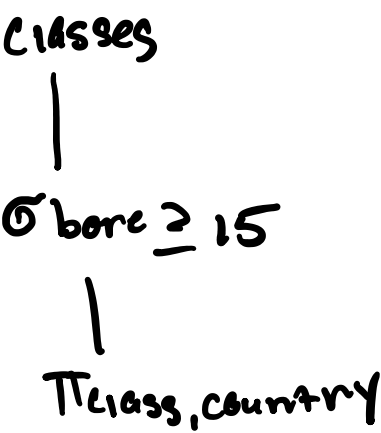


1)

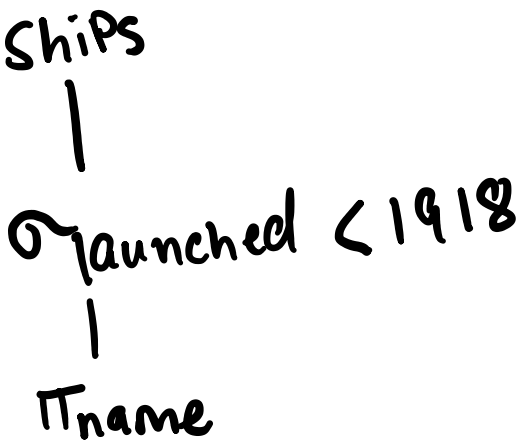
$\pi_{class, country}(\sigma_{bore \geq 15}(classes))$



	Classes						$\sigma_{bore \geq 15}$						$R=\pi_{class, country}$
Schema	Class, type, country, numGuns, bore, displacement						Class, type, country, numGuns, bore, displacement						Class, country
Tuple	<i>class</i>	<i>type</i>	<i>country</i>	<i>numGuns</i>	<i>bore</i>	<i>displacement</i>	<i>class</i>	<i>type</i>	<i>country</i>	<i>numGuns</i>	<i>bore</i>	<i>displacement</i>	Bismarck, Germany Iowa, USA North Carolina, USA Renown, Britain Revenge, Britain Yamamoto, Japan
	Bismarck	bb	Germany	8	15	42,000	Bismarck	bb	Germany	8	15	42,000	
	Iowa	bb	USA	9	16	46,000	Iowa	bb	USA	9	16	46,000	
	Kongo	bc	Japan	8	14	32,000	<del>Kongo</del>	<del>bc</del>	<del>Japan</del>	<del>8</del>	<del>14</del>	<del>32,000</del>	
	North Carolina	bb	USA	9	16	37,000	North Carolina	bb	USA	9	16	37,000	
	Renown	bc	Britain	6	15	32,000	Renown	bc	Britain	6	15	32,000	
	Revenge	bb	Britain	8	15	29,000	Revenge	bb	Britain	8	15	29,000	
	Tennessee	bb	USA	12	14	32,000	<del>Tennessee</del>	<del>bb</del>	<del>USA</del>	<del>12</del>	<del>14</del>	<del>32,000</del>	
	Yamato	bb	Japan	9	18	65,000	Yamato	bb	Japan	9	18	65,000	

2)

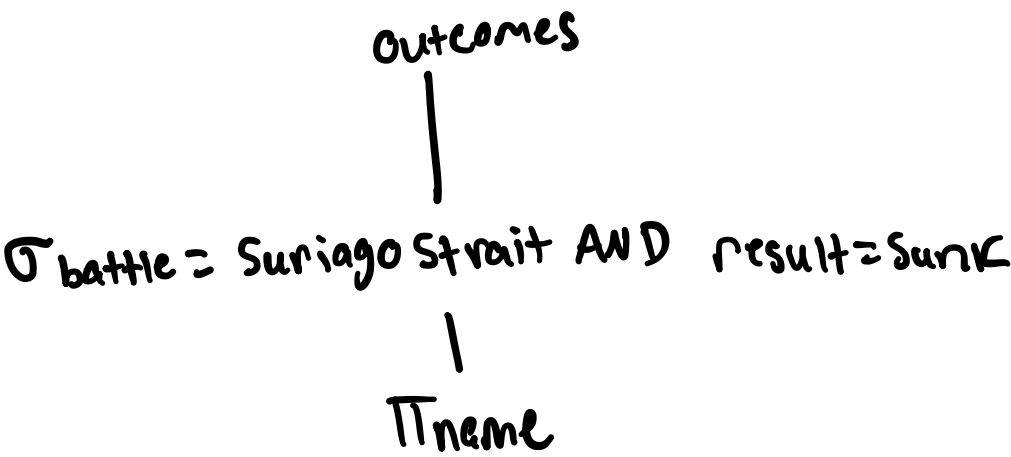
$\Pi_{name}(\sigma_{launched < 1918}(ships))$



	Ships			$\sigma_{launched < 1918}$			$R=\pi_{name}$
Schema	Name, Class, Launched			Name, Class, Launched			Name
Tuple	<i>name</i>	<i>class</i>	<i>launched</i>	<i>name</i>	<i>class</i>	<i>launched</i>	
	California	Tennessee	1915	California	Tennessee	1915	
	Haruna	Kongo	1915	Haruna	Kongo	1915	Haruna
	Hiei	Kongo	1915	Hiei	Kongo	1915	Hiei
	Iowa	Iowa	1933	<del>Iowa</del>	<del>Iowa</del>	<del>1933</del>	Kirishima
	Kirishima	Kongo	1915	Kirishima	Kongo	1915	Kongo
	Kongo	Kongo	1913	Kongo	Kongo	1913	Ramillies
	Missouri	Iowa	1935	<del>Missouri</del>	<del>Iowa</del>	<del>1935</del>	Renown
	Musashi	Yamato	1942	<del>Musashi</del>	<del>Yamato</del>	<del>1942</del>	Repulse
	New Jersey	Iowa	1936	<del>New Jersey</del>	<del>Iowa</del>	<del>1936</del>	Resolution
	North Carolina	North Carolina	1941	<del>North Carolina</del>	<del>North Carolina</del>	<del>1941</del>	Revenge
	Ramillies	Revenge	1917	Ramillies	Revenge	1917	Royal Oak
	Renown	Renown	1916	Renown	Renown	1916	Royal Sovereign
	Repulse	Renown	1916	Repulse	Renown	1916	Tennessee
	Resolution	Revenge	1916	Resolution	Revenge	1916	
	Revenge	Revenge	1916	Revenge	Revenge	1916	
	Royal Oak	Revenge	1916	Royal Oak	Revenge	1916	
	Royal Sovereign	Revenge	1916	Royal Sovereign	Revenge	1916	
	Tennessee	Tennessee	1915	Tennessee	Tennessee	1915	
	Washington	North Carolina	1941	<del>Washington</del>	<del>North Carolina</del>	<del>1941</del>	
	Wisconsin	Iowa	1940	<del>Wisconsin</del>	<del>Iowa</del>	<del>1940</del>	
	Yamato	Yamato	1941	<del>Yamato</del>	<del>Yamato</del>	<del>1941</del>	

3)

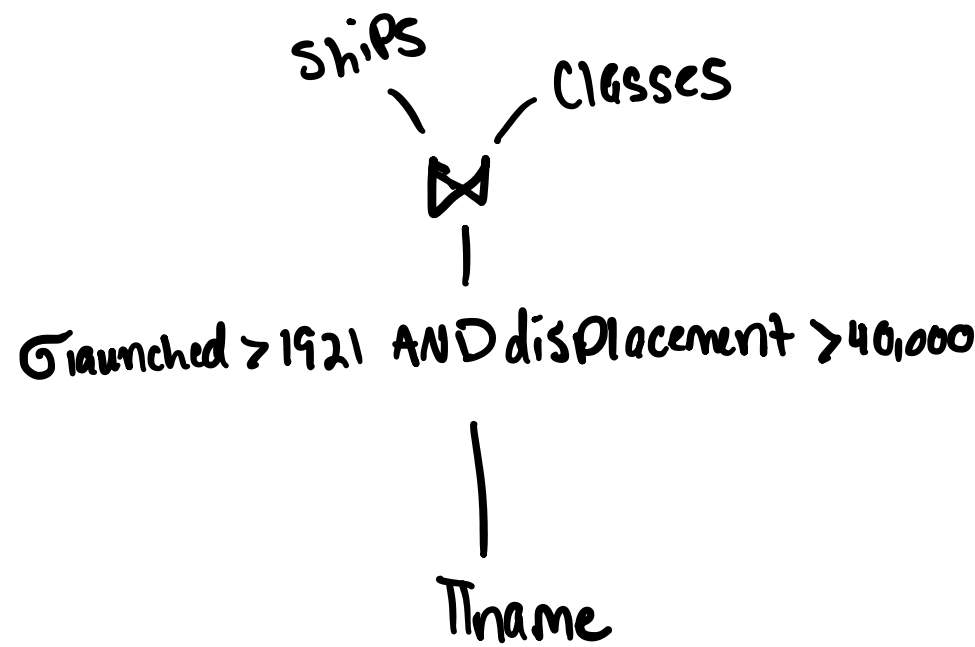
$\Pi_{name}(\sigma_{battle = Suriago\ strait \wedge result = sunk}(outcomes))$



	Outcomes			$\sigma_{battle=Suriago\ strait \wedge result=sunk}$			R= $\pi_{name}$
Schema	Ship, battle, result			Name, Class, Launched			Name
Tuple	<i>ship</i>	<i>battle</i>	<i>result</i>	<i>ship</i>	<i>battle</i>	<i>result</i>	Yamato
	California	Surigao Strait	ok	<del>California</del>	<del>Surigao Strait</del>	<del>ok</del>	
	Kirishima	Guadalcanal	sunk	<del>Kirishima</del>	<del>Guadalcanal</del>	<del>sunk</del>	
	Resolution	Denmark Strait	ok	<del>Resolution</del>	<del>Denmark Strait</del>	<del>ok</del>	
	Wisconsin	Guadalcanal	damaged	<del>Wisconsin</del>	<del>Guadalcanal</del>	<del>damaged</del>	
	Tennessee	Surigao Strait	ok	<del>Tennessee</del>	<del>Surigao Strait</del>	<del>ok</del>	
	Washington	Guadalcanal	ok	<del>Washington</del>	<del>Guadalcanal</del>	<del>ok</del>	
	New Jersey	Surigao Strait	ok	<del>New Jersey</del>	<del>Surigao Strait</del>	<del>ok</del>	
	Yamato	Surigao Strait	sunk	Yamato	Surigao Strait	sunk	
	Wisconsin	Surigao Strait	damaged	<del>Wisconsin</del>	<del>Surigao Strait</del>	<del>damaged</del>	

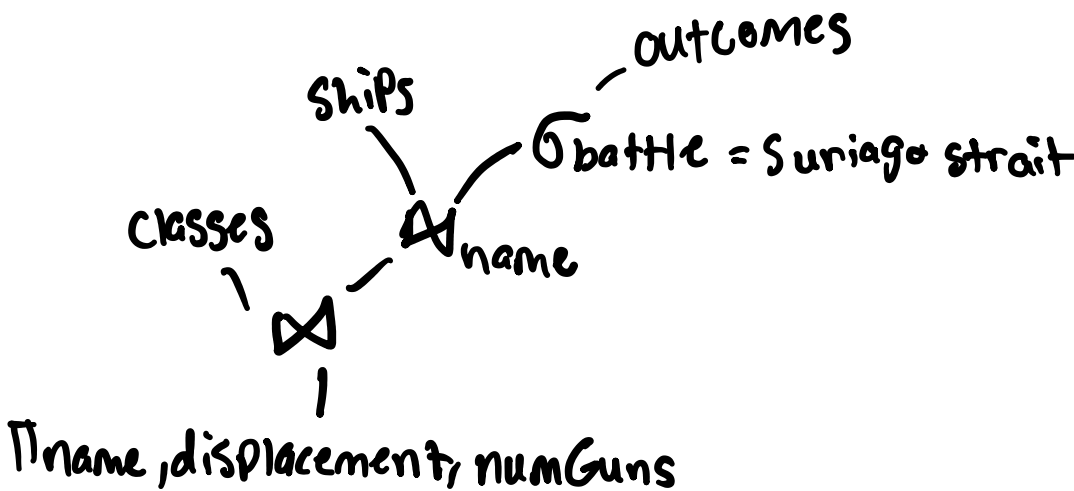
4)

$\pi_{name} (displacement > 40,000 \text{ AND launched} > 1921 (classes \bowtie ships))$



	Classes, Ships						$\sigma$ launched > 1921 AND displacement > 40,000						R= $\pi$ name
Schema	Class, type, country, numGuns, bore, displacement, name, class, launched						Class, type, country, numGuns, bore, displacement, name, class, launched						Name
Tuple	<i>class</i>	<i>type</i>	<i>country</i>	<i>numGuns</i>	<i>bore</i>	<i>displacement</i>	<i>class</i>	<i>type</i>	<i>country</i>	<i>numGuns</i>	<i>bore</i>	<i>displacement</i>	Iowa Missouri Musashi New Jersey Wisconsin Yamato
	Bismarck	bb	Germany	8	15	42,000	Bismarck	bb	Germany	8	15	42,000	
Iowa	bb	USA	9	16	46,000	Iowa	bb	USA	9	16	46,000		
Kongo	bc	Japan	8	14	32,000	Kongo	bc	Japan	8	14	32,000		
North Carolina	bb	USA	9	16	37,000	North Carolina	bb	USA	9	16	37,000		
Renown	bc	Britain	6	15	32,000	Renown	bc	Britain	6	15	32,000		
Revenge	bb	Britain	8	15	29,000	Revenge	bb	Britain	8	15	29,000		
Tennessee	bb	USA	12	14	32,000	Tennessee	bb	USA	12	14	32,000		
Yamato	bb	Japan	9	18	65,000	Yamato	bb	Japan	9	18	65,000		
<i>name</i>		<i>class</i>		<i>launched</i>		<i>name</i>		<i>class</i>		<i>launched</i>			
California		Tennessee		1915		California		Tennessee		1915			
Haruna		Kongo		1915		Haruna		Kongo		1915			
Hiei		Kongo		1915		Hiei		Kongo		1915			
Iowa		Iowa		1933		Iowa		Iowa		1933			
Kirishima		Kongo		1915		Kirishima		Kongo		1915			
Kongo		Kongo		1913		Kongo		Kongo		1913			
Missouri		Iowa		1935		Missouri		Iowa		1935			
Musashi		Yamato		1942		Musashi		Yamato		1942			
New Jersey		Iowa		1936		New Jersey		Iowa		1936			
North Carolina		North Carolina		1941		North Carolina		North Carolina		1941			
Ramillies		Revenge		1917		Ramillies		Revenge		1917			
Renown		Renown		1916		Renown		Renown		1916			
Repulse		Renown		1916		Repulse		Renown		1916			
Resolution		Revenge		1916		Resolution		Revenge		1916			
Revenge		Revenge		1916		Revenge		Revenge		1916			
Royal Oak		Revenge		1916		Royal Oak		Revenge		1916			
Royal Sovereign		Revenge		1916		Royal Sovereign		Revenge		1916			
Tennessee		Tennessee		1915		Tennessee		Tennessee		1915			
Washington		North Carolina		1941		Washington		North Carolina		1941			
Wisconsin		Iowa		1940		Wisconsin		Iowa		1940			
Yamato		Yamato		1941		Yamato		Yamato		1941			

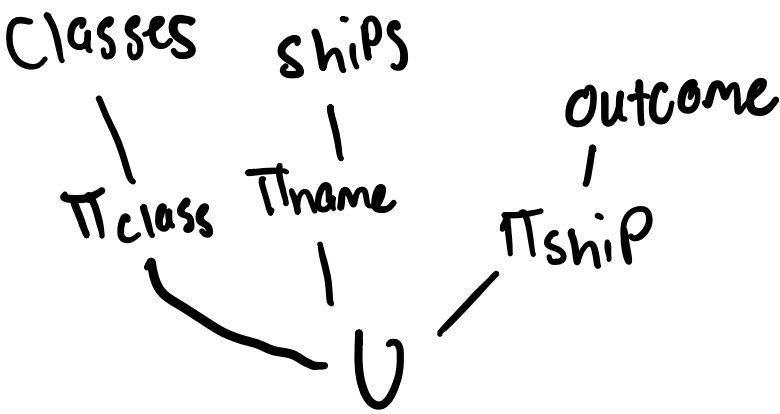
$\Pi_{name, displacement, numGuns} (\sigma_{battle = Suriago Strait} (outcomes) \bowtie (ships) \bowtie (classes))$



	Classes, Ships, Outcomes						$\sigma$ battle = Suriago Strait						R= $\pi$ name, displacement, numGuns																																																																																																																																																																																																																																																																																																		
Schema	Class, type, country, numGuns, bore, displacement, name, class, launched, Ship, battle, result						Class, type, country, numGuns, bore, displacement, name, class, launched, Ship, battle, result						Name, displacement, numGuns																																																																																																																																																																																																																																																																																																		
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Carolina</del>	bb	<del>USA</del>	<del>9</del>	<del>16</del>	<del>37,000</del>	<del>Renown</del>	bc	<del>Britain</del>	<del>6</del>	<del>15</del>	<del>32,000</del>	<del>Revenge</del>	bb	<del>Britain</del>	<del>8</del>	<del>15</del>	<del>29,000</del>	Tennessee	bb	USA	12	14	32,000	Yamato	bb	Japan	9	18	65,000	name	class	launched	California	Tennessee	1915	<del>Haruna</del>	<del>Kongo</del>	<del>1915</del>	<del>Hiei</del>	<del>Kongo</del>	<del>1915</del>	<del>Iowa</del>	<del>Iowa</del>	<del>1933</del>	<del>Kirishima</del>	<del>Kongo</del>	<del>1915</del>	<del>Kongo</del>	<del>Kongo</del>	<del>1913</del>	<del>Missouri</del>	<del>Iowa</del>	<del>1935</del>	<del>Musashi</del>	<del>Yamato</del>	<del>1942</del>	New Jersey	Iowa	1936	<del>North Carolina</del>	<del>North Carolina</del>	<del>1941</del>	<del>Ramillies</del>	<del>Revenge</del>	<del>1917</del>	<del>Renown</del>	<del>Renown</del>	<del>1916</del>	<del>Repulse</del>	<del>Renown</del>	<del>1916</del>	<del>Resolution</del>	<del>Revenge</del>	<del>1916</del>	<del>Revenge</del>	<del>Revenge</del>	<del>1916</del>	<del>Royal Oak</del>	<del>Revenge</del>	<del>1916</del>	<del>Royal Sovereign</del>	<del>Revenge</del>	<del>1916</del>	Tennessee	Tennessee	1915	<del>Washington</del>	<del>North Carolina</del>	<del>1941</del>	<del>Wisconsin</del>	<del>Iowa</del>	<del>1940</del>	Yamato	Yamato	1941	ship	battle	result	California	Surigao Strait	ok	<del>Kirishima</del>	<del>Guadalcanal</del>	<del>sunk</del>	<del>Resolution</del>	<del>Denmark Strait</del>	<del>ok</del>	<del>Wisconsin</del>	<del>Guadalcanal</del>	<del>damaged</del>	Tennessee	Surigao Strait	ok	<del>Washington</del>	<del>Guadalcanal</del>	<del>ok</del>	New Jersey	Surigao Strait	ok	Yamato	Surigao Strait	sunk	Wisconsin	Surigao Strait	damaged	California 32000 12 New Jersey 46000 9 Tennessee 32000 12 Wisconsin 46000 9 Yamato 65000 9
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Kongo	bc	Japan	8	14	32,000																																																																																																																																																																																																																																																																																																										
North Carolina	bb	USA	9	16	37,000																																																																																																																																																																																																																																																																																																										
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<del>Bismarck</del>	bb	<del>Germany</del>	<del>8</del>	<del>15</del>	<del>42,000</del>																																																																																																																																																																																																																																																																																																										
Iowa	bb	USA	9	16	46,000																																																																																																																																																																																																																																																																																																										
<del>Kongo</del>	bc	<del>Japan</del>	<del>8</del>	<del>14</del>	<del>32,000</del>																																																																																																																																																																																																																																																																																																										
<del>North Carolina</del>	bb	<del>USA</del>	<del>9</del>	<del>16</del>	<del>37,000</del>																																																																																																																																																																																																																																																																																																										
<del>Renown</del>	bc	<del>Britain</del>	<del>6</del>	<del>15</del>	<del>32,000</del>																																																																																																																																																																																																																																																																																																										
<del>Revenge</del>	bb	<del>Britain</del>	<del>8</del>	<del>15</del>	<del>29,000</del>																																																																																																																																																																																																																																																																																																										
Tennessee	bb	USA	12	14	32,000																																																																																																																																																																																																																																																																																																										
Yamato	bb	Japan	9	18	65,000																																																																																																																																																																																																																																																																																																										
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<del>Hiei</del>	<del>Kongo</del>	<del>1915</del>																																																																																																																																																																																																																																																																																																													
<del>Iowa</del>	<del>Iowa</del>	<del>1933</del>																																																																																																																																																																																																																																																																																																													
<del>Kirishima</del>	<del>Kongo</del>	<del>1915</del>																																																																																																																																																																																																																																																																																																													
<del>Kongo</del>	<del>Kongo</del>	<del>1913</del>																																																																																																																																																																																																																																																																																																													
<del>Missouri</del>	<del>Iowa</del>	<del>1935</del>																																																																																																																																																																																																																																																																																																													
<del>Musashi</del>	<del>Yamato</del>	<del>1942</del>																																																																																																																																																																																																																																																																																																													
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<del>North Carolina</del>	<del>North Carolina</del>	<del>1941</del>																																																																																																																																																																																																																																																																																																													
<del>Ramillies</del>	<del>Revenge</del>	<del>1917</del>																																																																																																																																																																																																																																																																																																													
<del>Renown</del>	<del>Renown</del>	<del>1916</del>																																																																																																																																																																																																																																																																																																													
<del>Repulse</del>	<del>Renown</del>	<del>1916</del>																																																																																																																																																																																																																																																																																																													
<del>Resolution</del>	<del>Revenge</del>	<del>1916</del>																																																																																																																																																																																																																																																																																																													
<del>Revenge</del>	<del>Revenge</del>	<del>1916</del>																																																																																																																																																																																																																																																																																																													
<del>Royal Oak</del>	<del>Revenge</del>	<del>1916</del>																																																																																																																																																																																																																																																																																																													
<del>Royal Sovereign</del>	<del>Revenge</del>	<del>1916</del>																																																																																																																																																																																																																																																																																																													
Tennessee	Tennessee	1915																																																																																																																																																																																																																																																																																																													
<del>Washington</del>	<del>North Carolina</del>	<del>1941</del>																																																																																																																																																																																																																																																																																																													
<del>Wisconsin</del>	<del>Iowa</del>	<del>1940</del>																																																																																																																																																																																																																																																																																																													
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<del>Kirishima</del>	<del>Guadalcanal</del>	<del>sunk</del>																																																																																																																																																																																																																																																																																																													
<del>Resolution</del>	<del>Denmark Strait</del>	<del>ok</del>																																																																																																																																																																																																																																																																																																													
<del>Wisconsin</del>	<del>Guadalcanal</del>	<del>damaged</del>																																																																																																																																																																																																																																																																																																													
Tennessee	Surigao Strait	ok																																																																																																																																																																																																																																																																																																													
<del>Washington</del>	<del>Guadalcanal</del>	<del>ok</del>																																																																																																																																																																																																																																																																																																													
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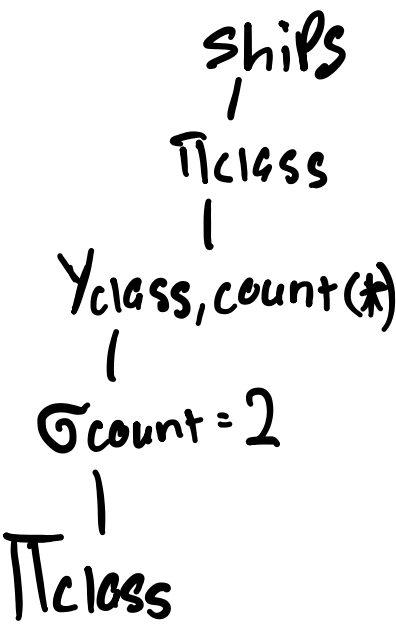


$\pi_{name, class, ship} ((ships) \cup (outcomes) \cup (classes))$



	Classes, Ships, Outcomes							R= $\pi$ name					
Schema	Class, type, country, numGuns, bore, displacement, name, class, launched, Ship, battle, result						Class, type, country, numGuns, bore, displacement, name, class, launched, Ship, battle, result						Name
Tuple	<i>class</i>	<i>type</i>	<i>country</i>	<i>numGuns</i>	<i>bore</i>	<i>displacement</i>	<i>class</i>	<i>type</i>	<i>country</i>	<i>numGuns</i>	<i>bore</i>	<i>displacement</i>	California    California    Tennessee Kirishima    Kirishima    Kongo New Jersey    New Jersey    Iowa Resolution    Resolution    Revenge Tennessee    Tennessee    Tennessee Washington    Washington    North Carolina Wisconsin    Wisconsin    Iowa Wisconsin    Wisconsin    Iowa Yamato    Yamato    Yamato
	Bismarck	bb	Germany	8	15	42,000	Bismarck	bb	Germany	8	15	42,000	
	Iowa	bb	USA	9	16	46,000	Iowa	bb	USA	9	16	46,000	
	Kongo	bc	Japan	8	14	32,000	Kongo	bc	Japan	8	14	32,000	
	North Carolina	bb	USA	9	16	37,000	North Carolina	bb	USA	9	16	37,000	
	Renown	bc	Britain	6	15	32,000	Renown	bc	Britain	6	15	32,000	
	Revenge	bb	Britain	8	15	29,000	Revenge	bb	Britain	8	15	29,000	
	Tennessee	bb	USA	12	14	32,000	Tennessee	bb	USA	12	14	32,000	
	Yamato	bb	Japan	9	18	65,000	Yamato	bb	Japan	9	18	65,000	
	<i>name</i>	<i>class</i>	<i>launched</i>							<i>name</i>	<i>class</i>	<i>launched</i>	
	California	Tennessee	1915							California	Tennessee	1915	
	Haruna	Kongo	1915							Haruna	Kongo	1915	
	Hiei	Kongo	1915							Hiei	Kongo	1915	
	Iowa	Iowa	1933							Iowa	Iowa	1933	
	Kirishima	Kongo	1915							Kirishima	Kongo	1915	
	Kongo	Kongo	1913							Kongo	Kongo	1913	
	Missouri	Iowa	1935							Missouri	Iowa	1935	
	Musashi	Yamato	1942							Musashi	Yamato	1942	
	New Jersey	Iowa	1936							New Jersey	Iowa	1936	
	<i>ship</i>	<i>battle</i>	<i>result</i>							<i>ship</i>	<i>battle</i>	<i>result</i>	
	California	Surigao Strait	ok							California	Surigao Strait	ok	
	Kirishima	Guadalcanal	sunk							Kirishima	Guadalcanal	sunk	
	Resolution	Denmark Strait	ok							Resolution	Denmark Strait	ok	
	Wisconsin	Guadalcanal	damaged							Wisconsin	Guadalcanal	damaged	
	Tennessee	Surigao Strait	ok							Tennessee	Surigao Strait	ok	
	Washington	Guadalcanal	ok							Washington	Guadalcanal	ok	
	New Jersey	Surigao Strait	ok							New Jersey	Surigao Strait	ok	
	Yamato	Surigao Strait	sunk							Yamato	Surigao Strait	sunk	
	Wisconsin	Surigao Strait	damaged							Wisconsin	Surigao Strait	damaged	

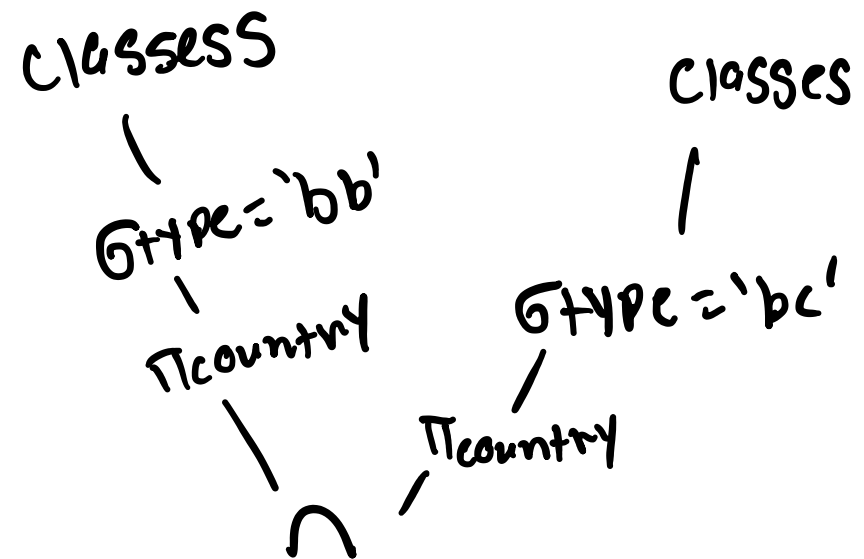
$$r = \gamma_{class}(\text{count}(\ast) = 2(\text{ships}))$$



	Classes, Ships						y count = 2						R=π class	
Schema	Class, type, country, numGuns, bore, displacement, name, class, launched						Class, type, country, numGuns, bore, displacement, name, class, launched						class	
Tuple	<i>class</i>	<i>type</i>	<i>country</i>	<i>numGuns</i>	<i>bore</i>	<i>displacement</i>	<i>class</i>	<i>type</i>	<i>country</i>	<i>numGuns</i>	<i>bore</i>	<i>displacement</i>	North Carolina Renown Tennessee Yamato	
	Bismarck	bb	Germany	8	15	42,000	<del>Bismarck</del>	<del>bb</del>	<del>Germany</del>	<del>8</del>	<del>15</del>	<del>42,000</del>		
	Iowa	bb	USA	9	16	46,000	<del>Iowa</del>	<del>bb</del>	<del>USA</del>	<del>9</del>	<del>16</del>	<del>46,000</del>		
	Kongo	bc	Japan	8	14	32,000	<del>Kongo</del>	<del>bc</del>	<del>Japan</del>	<del>8</del>	<del>14</del>	<del>32,000</del>		
	North Carolina	bb	USA	9	16	37,000	North Carolina	bb	USA	9	16	37,000		
	Renown	bc	Britain	6	15	32,000	Renown	bc	Britain	6	15	32,000		
	Revenge	bb	Britain	8	15	29,000	<del>Revenge</del>	<del>bb</del>	<del>Britain</del>	<del>8</del>	<del>15</del>	<del>29,000</del>		
	Tennessee	bb	USA	12	14	32,000	Tennessee	bb	USA	12	14	32,000		
	Yamato	bb	Japan	9	18	65,000	Yamato	bb	Japan	9	18	65,000		
	<i>name</i>	<i>class</i>	<i>launched</i>								<i>name</i>	<i>class</i>	<i>launched</i>	
	California	Tennessee	1915								California	Tennessee	1915	
	Haruna	Kongo	1915								<del>Haruna</del>	<del>Kongo</del>	<del>1915</del>	
	Hiei	Kongo	1915								<del>Hiei</del>	<del>Kongo</del>	<del>1915</del>	
	Iowa	Iowa	1933								<del>Iowa</del>	<del>Iowa</del>	<del>1933</del>	
	Kirishima	Kongo	1915								<del>Kirishima</del>	<del>Kongo</del>	<del>1915</del>	
	Kongo	Kongo	1913								<del>Kongo</del>	<del>Kongo</del>	<del>1913</del>	
	Missouri	Iowa	1935								<del>Missouri</del>	<del>Iowa</del>	<del>1935</del>	
	Musashi	Yamato	1942								Musashi	Yamato	1942	
	New Jersey	Iowa	1936								<del>New Jersey</del>	<del>Iowa</del>	<del>1936</del>	
	North Carolina	North Carolina	1941								North Carolina	North Carolina	1941	
	Ramillies	Revenge	1917								<del>Ramillies</del>	<del>Revenge</del>	<del>1917</del>	
	Renown	Renown	1916								Renown	Renown	1916	
	Repulse	Renown	1916								Repulse	Renown	1916	
	Resolution	Revenge	1916								<del>Resolution</del>	<del>Revenge</del>	<del>1916</del>	
	Revenge	Revenge	1916								<del>Revenge</del>	<del>Revenge</del>	<del>1916</del>	
	Royal Oak	Revenge	1916								<del>Royal Oak</del>	<del>Revenge</del>	<del>1916</del>	
	Royal Sovereign	Revenge	1916								<del>Royal Sovereign</del>	<del>Revenge</del>	<del>1916</del>	
	Tennessee	Tennessee	1915								Tennessee	Tennessee	1915	
	Washington	North Carolina	1941								Washington	North Carolina	1941	
	Wisconsin	Iowa	1940								<del>Wisconsin</del>	<del>Iowa</del>	<del>1940</del>	
	Yamato	Yamato	1941								Yamato	Yamato	1941	

8)

$$\pi_{\text{country}}(\sigma_{\text{type}='bb'}(\text{classes})) \cap \pi_{\text{country}}(\sigma_{\text{type}='bc'}(\text{classes}))$$



	Classes						$\sigma$ type='bb' AND type='bc'						R= $\pi$ country
Schema	Class, type, country, numGuns, bore, displacement						Class, type, country, numGuns, bore, displacement						country
Tuple	<i>class</i>	<i>type</i>	<i>country</i>	<i>numGuns</i>	<i>bore</i>	<i>displacement</i>	<i>class</i>	<i>type</i>	<i>country</i>	<i>numGuns</i>	<i>bore</i>	<i>displacement</i>	Britain  Japan
	Bismarck	bb	Germany	8	15	42,000	<del>Bismarck</del>	<del>bb</del>	<del>Germany</del>	<del>8</del>	<del>15</del>	<del>42,000</del>	
	Iowa	bb	USA	9	16	46,000	<del>Iowa</del>	<del>bb</del>	<del>USA</del>	<del>9</del>	<del>16</del>	<del>46,000</del>	
	Kongo	bc	Japan	8	14	32,000	Kongo	bc	Japan	8	14	32,000	
	North Carolina	bb	USA	9	16	37,000	<del>North Carolina</del>	<del>bb</del>	<del>USA</del>	<del>9</del>	<del>16</del>	<del>37,000</del>	
	Renown	bc	Britain	6	15	32,000	Renown	bc	Britain	6	15	32,000	
	Revenge	bb	Britain	8	15	29,000	Revenge	bb	Britain	8	15	29,000	
	Tennessee	bb	USA	12	14	32,000	<del>Tennessee</del>	<del>bb</del>	<del>USA</del>	<del>12</del>	<del>14</del>	<del>32,000</del>	
	Yamato	bb	Japan	9	18	65,000	Yamato	bb	Japan	9	18	65,000	

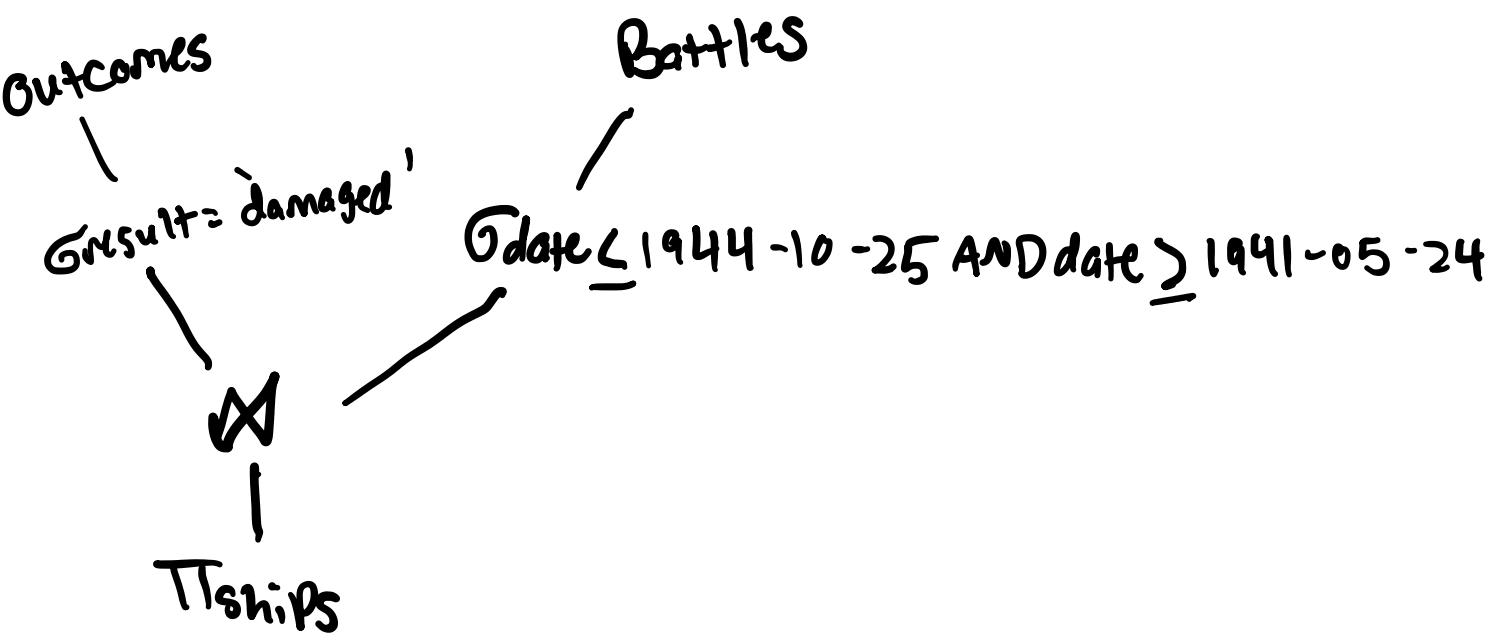


$S_1(ship, battle, result) = \sigma_{result='damaged'}(outcomes(s, b, r))$

$S_2(n, d, S, b, r) = Battles(n, d) \Join S_1(s, b, r)$   
 $\sigma_{date \leq 1944-10-25 \text{ AND } date \geq 1941-05-24}$

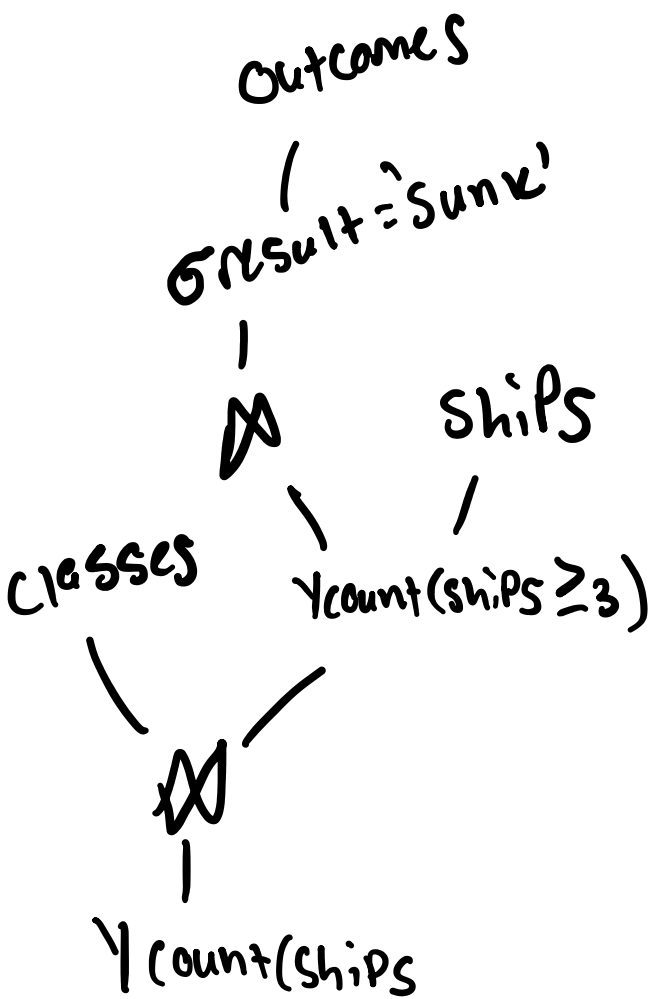
$R(ship) = \pi_{ship}(S_2(n, d, S, b, r))$

$Q(ship) = \pi_{ship}(Battles \Join \sigma_{result='damaged'}(outcomes))$



	Ships, battles, outcomes			$\sigma \text{ result} = \text{'damaged'} \text{ AND data} \leq 1944-10-25 \text{ AND date} \geq 1941-05-24$			R= $\pi$ name																																																											
Schema	Name, class, launched, name, data, ship, battle, result			Name, class, launched, name, data, ship, battle, result			name																																																											
Tuple	<i>name</i>	<i>class</i>	<i>launched</i>	<i>name</i>	<i>class</i>	<i>launched</i>	Wisconsin																																																											
	California	Tennessee	1915	<del>California</del>	<del>Tennessee</del>	<del>1915</del>																																																												
	Haruna	Kongo	1915	<del>Haruna</del>	<del>Kongo</del>	<del>1915</del>																																																												
	Hiei	Kongo	1915	<del>Hiei</del>	<del>Kongo</del>	<del>1915</del>																																																												
	Iowa	Iowa	1933	<del>Iowa</del>	<del>Iowa</del>	<del>1933</del>																																																												
	Kirishima	Kongo	1915	<del>Kirishima</del>	<del>Kongo</del>	<del>1915</del>																																																												
	Kongo	Kongo	1913	<del>Kongo</del>	<del>Kongo</del>	<del>1913</del>																																																												
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	Musashi	Yamato	1942	<del>Musashi</del>	<del>Yamato</del>	<del>1942</del>																																																												
	New Jersey	Iowa	1936	<del>New Jersey</del>	<del>Iowa</del>	<del>1936</del>																																																												
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	Ramillies	Revenge	1917	<del>Ramillies</del>	<del>Revenge</del>	<del>1917</del>																																																												
Renown	Renown	1916	<del>Renown</del>	<del>Renown</del>	<del>1916</del>																																																													
Repulse	Renown	1916	<del>Repulse</del>	<del>Renown</del>	<del>1916</del>																																																													
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Royal Sovereign	Revenge	1916	<del>Royal Sovereign</del>	<del>Revenge</del>	<del>1916</del>																																																													
Tennessee	Tennessee	1915	Tennessee	Tennessee	1915																																																													
Washington	North Carolina	1941	<del>Washington</del>	<del>North Carolina</del>	<del>1941</del>																																																													
Wisconsin	Iowa	1940	<del>Wisconsin</del>	<del>Iowa</del>	<del>1940</del>																																																													
Yamato	Yamato	1941	<del>Yamato</del>	<del>Yamato</del>	<del>1941</del>																																																													
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$\pi_{\text{count}(\text{classes})} \bowtie_{\gamma(\text{count}(\text{ships}) \geq 3)(\text{class} = \text{class})(\text{ships})} \sigma_{(\text{name} = \text{ships})} \sigma_{(\text{result} = \text{'sunk'})} (\text{outcomes})$



	Classes, Ships, Outcomes						y count(ships) >= 3 AND σ result = 'sunk'						R=π class, number of ships
Schema	Class, type, country, numGuns, bore, displacement, name, class, launched, ship, battle, result						Class, type, country, numGuns, bore, displacement, name, class, launched, ship, battle, result						Class, number of ships
Tuple	<i>class</i>	<i>type</i>	<i>country</i>	<i>numGuns</i>	<i>bore</i>	<i>displacement</i>	<i>class</i>	<i>type</i>	<i>country</i>	<i>numGuns</i>	<i>bore</i>	<i>displacement</i>	Kongo 1
	Bismarck	bb	Germany	8	15	42,000	<del>Bismarck</del>	<del>bb</del>	<del>Germany</del>	<del>8</del>	<del>15</del>	<del>42,000</del>	
	Iowa	bb	USA	9	16	46,000	<del>Iowa</del>	<del>bb</del>	<del>USA</del>	<del>9</del>	<del>16</del>	<del>46,000</del>	
	Kongo	bc	Japan	8	14	32,000	Kongo	bc	Japan	8	14	32,000	
	North Carolina	bb	USA	9	16	37,000	<del>North Carolina</del>	<del>bb</del>	<del>USA</del>	<del>9</del>	<del>16</del>	<del>37,000</del>	
	Renown	bc	Britain	6	15	32,000	<del>Renown</del>	<del>bc</del>	<del>Britain</del>	<del>6</del>	<del>15</del>	<del>32,000</del>	
	Revenge	bb	Britain	8	15	29,000	<del>Revenge</del>	<del>bb</del>	<del>Britain</del>	<del>8</del>	<del>15</del>	<del>29,000</del>	
	Tennessee	bb	USA	12	14	32,000	<del>Tennessee</del>	<del>bb</del>	<del>USA</del>	<del>12</del>	<del>14</del>	<del>32,000</del>	
	Yamato	bb	Japan	9	18	65,000	<del>Yamato</del>	<del>bb</del>	<del>Japan</del>	<del>9</del>	<del>18</del>	<del>65,000</del>	
	<i>name</i>	<i>class</i>	<i>launched</i>	<i>name</i>	<i>class</i>	<i>launched</i>	<i>name</i>	<i>class</i>	<i>launched</i>	<i>name</i>	<i>class</i>	<i>launched</i>	
California	Tennessee	1915	<del>California</del>	<del>Tennessee</del>	<del>1915</del>	Kirishima	Kongo	1915	<del>California</del>	<del>Tennessee</del>	<del>1915</del>		
Haruna	Kongo	1915	<del>Haruna</del>	<del>Kongo</del>	<del>1915</del>	Kongo	Kongo	1913	<del>Haruna</del>	<del>Kongo</del>	<del>1915</del>		
Hiei	Kongo	1915	<del>Hiei</del>	<del>Kongo</del>	<del>1915</del>	Missouri	Iowa	1935	<del>Hiei</del>	<del>Kongo</del>	<del>1915</del>		
Iowa	Iowa	1933	<del>Iowa</del>	<del>Iowa</del>	<del>1933</del>	Musashi	Yamato	1942	<del>Iowa</del>	<del>Iowa</del>	<del>1936</del>		
Kirishima	Kongo	1915	<del>Kirishima</del>	<del>Kongo</del>	<del>1915</del>	New Jersey	Iowa	1936	<del>Musashi</del>	<del>Yamato</del>	<del>1942</del>		
Kongo	Kongo	1913	<del>Kongo</del>	<del>Kongo</del>	<del>1913</del>	North Carolina	North Carolina	1941	<del>New Jersey</del>	<del>Iowa</del>	<del>1936</del>		
Missouri	Iowa	1935	<del>Missouri</del>	<del>Iowa</del>	<del>1935</del>	Ramillies	Revenge	1917	<del>North Carolina</del>	<del>North Carolina</del>	<del>1941</del>		
Musashi	Yamato	1942	<del>Musashi</del>	<del>Yamato</del>	<del>1942</del>	Renown	Renown	1916	<del>Ramillies</del>	<del>Revenge</del>	<del>1917</del>		
New Jersey	Iowa	1936	<del>New Jersey</del>	<del>Iowa</del>	<del>1936</del>	Repulse	Renown	1916	<del>Renown</del>	<del>Renown</del>	<del>1916</del>		
North Carolina	North Carolina	1941	<del>North Carolina</del>	<del>North Carolina</del>	<del>1941</del>	Resolution	Revenge	1916	<del>Repulse</del>	<del>Renown</del>	<del>1916</del>		
Ramillies	Revenge	1917	<del>Ramillies</del>	<del>Revenge</del>	<del>1917</del>	Revenge	Revenge	1916	<del>Resolution</del>	<del>Revenge</del>	<del>1916</del>		
Renown	Renown	1916	<del>Renown</del>	<del>Renown</del>	<del>1916</del>	Royal Oak	Revenge	1916	<del>Revenge</del>	<del>Revenge</del>	<del>1916</del>		
Repulse	Renown	1916	<del>Repulse</del>	<del>Renown</del>	<del>1916</del>	Royal Sovereign	Revenge	1916	<del>Royal Oak</del>	<del>Revenge</del>	<del>1916</del>		
Resolution	Revenge	1916	<del>Resolution</del>	<del>Revenge</del>	<del>1916</del>	Tennessee	Tennessee	1915	<del>Royal Sovereign</del>	<del>Revenge</del>	<del>1916</del>		
Revenge	Revenge	1916	<del>Revenge</del>	<del>Revenge</del>	<del>1916</del>	Washington	North Carolina	1941	<del>Tennessee</del>	<del>Tennessee</del>	<del>1915</del>		
Royal Oak	Revenge	1916	<del>Royal Oak</del>	<del>Revenge</del>	<del>1916</del>	Wisconsin	Iowa	1940	<del>Washington</del>	<del>North Carolina</del>	<del>1941</del>		
Royal Sovereign	Revenge	1916	<del>Royal Sovereign</del>	<del>Revenge</del>	<del>1916</del>	Yamato	Yamato	1941	<del>Wisconsin</del>	<del>Iowa</del>	<del>1940</del>		
Tennessee	Tennessee	1915	<del>Tennessee</del>	<del>Tennessee</del>	<del>1915</del>				<del>Yamato</del>	<del>Yamato</del>	<del>1941</del>		
Washington	North Carolina	1941				<i>ship</i>	<i>battle</i>	<i>result</i>	<i>ship</i>	<i>battle</i>	<i>result</i>		
Wisconsin	Iowa	1940	California	Surigao Strait	ok	California	Surigao Strait	ok	<del>California</del>	<del>Surigao Strait</del>	<del>ok</del>		
Yamato	Yamato	1941	Kirishima	Guadalcanal	sunk	Kirishima	Guadalcanal	sunk	<del>Kirishima</del>	<del>Guadalcanal</del>	<del>sunk</del>		
			Resolution	Denmark Strait	ok	Resolution	Denmark Strait	ok	<del>Resolution</del>	<del>Denmark Strait</del>	<del>ok</del>		
			Wisconsin	Guadalcanal	damaged	Wisconsin	Guadalcanal	damaged	<del>Wisconsin</del>	<del>Guadalcanal</del>	<del>damaged</del>		
			Tennessee	Surigao Strait	ok	Tennessee	Surigao Strait	ok	<del>Tennessee</del>	<del>Surigao Strait</del>	<del>ok</del>		
			Washington	Guadalcanal	ok	Washington	Guadalcanal	ok	<del>Washington</del>	<del>Guadalcanal</del>	<del>ok</del>		
			New Jersey	Surigao Strait	ok	New Jersey	Surigao Strait	ok	<del>New Jersey</del>	<del>Surigao Strait</del>	<del>ok</del>		
			Yamato	Surigao Strait	sunk	Yamato	Surigao Strait	sunk	<del>Yamato</del>	<del>Surigao Strait</del>	<del>sunk</del>		
			Wisconsin	Surigao Strait	damaged	Wisconsin	Surigao Strait	damaged	<del>Wisconsin</del>	<del>Surigao Strait</del>	<del>damaged</del>		