**IMP14  
Not-Notting**

## Symbolic Logic

(from Budden p.63)

A and B are two sets; A' is the complement of A (i.e. the ¬A, or 'not A'). So (A')' = A.

∩ means intersection; U means union; Φ means empty set; for this session, Σ stands for the universal set which strictly speaking should be defined as 'the set of all .....', or we should be told: A U A' = Σ .

Do the operations ∩ and U have identities and inverses?

Explore various cases, e.g. (A' ∩ B)' U C, including any special cases.

Explore the behaviour of: (A' ∩ B) U (A ∩ B'). Does this operation have an identity and inverses? This called 'the symmetric difference'.

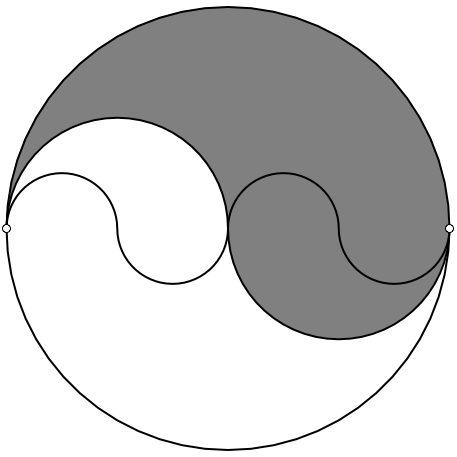
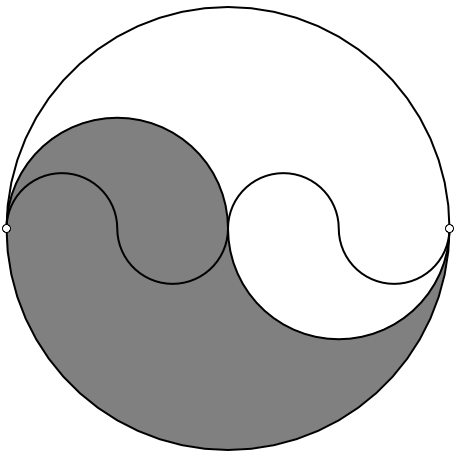
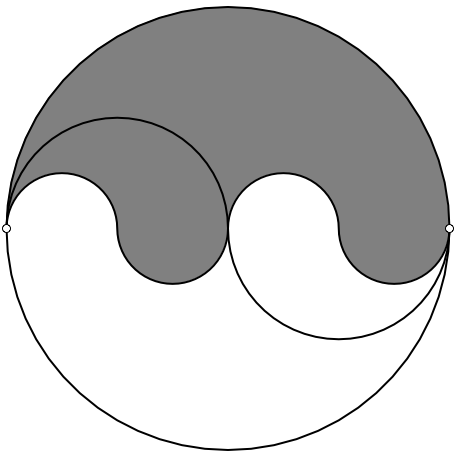
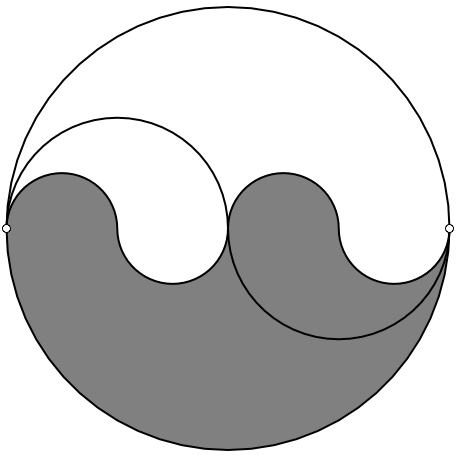
We are going to give this operation a symbol: Δ so that A Δ B **=** (A' ∩ B) U (A ∩ B')

Find, and illustrate in Venn diagrams: A Δ (A ∩ B); A Δ (A U B); A Δ B Δ C

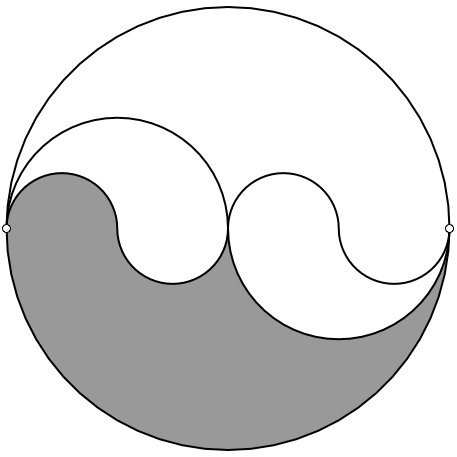
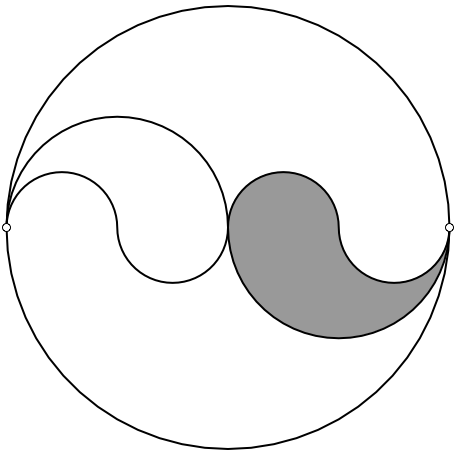
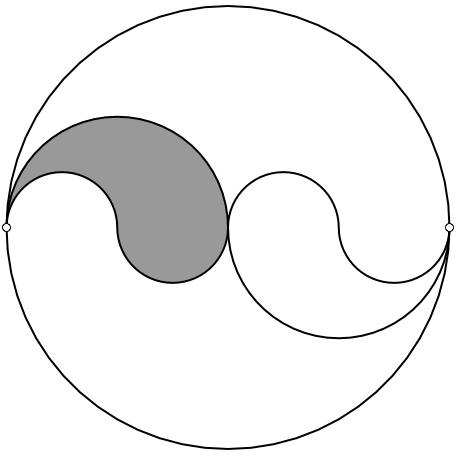
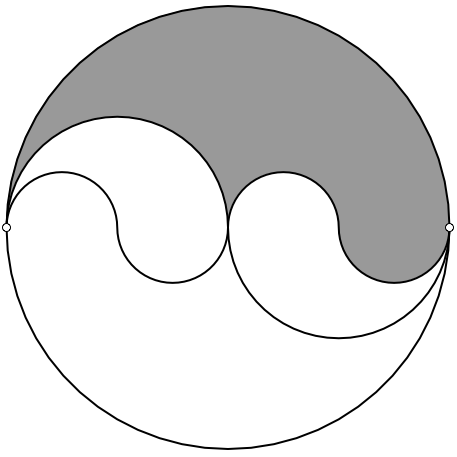
Explore special cases.

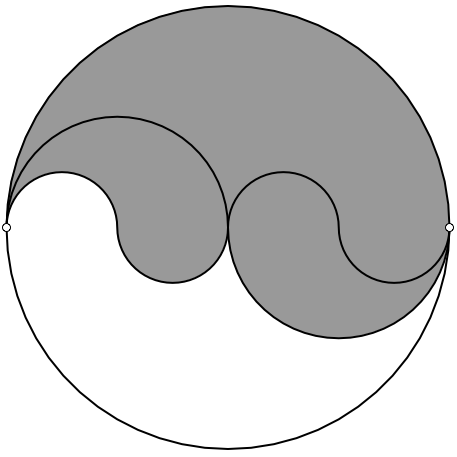
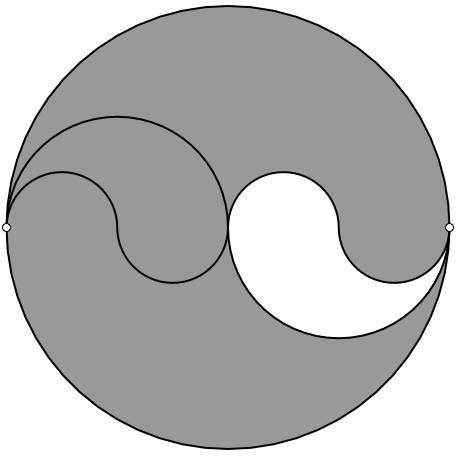
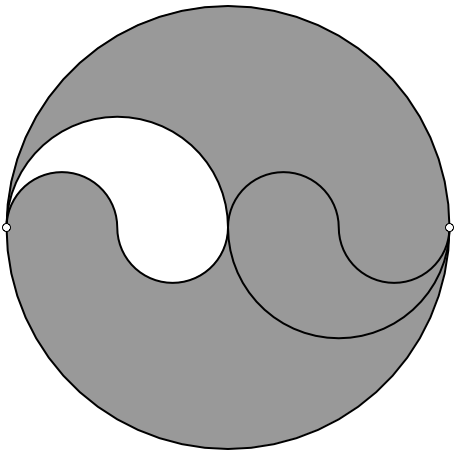
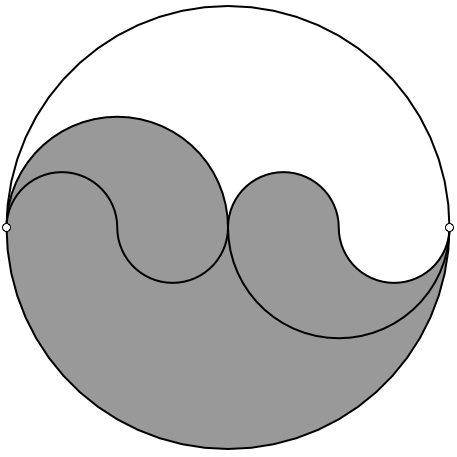
## Two Sets

Here are two sets and their complements

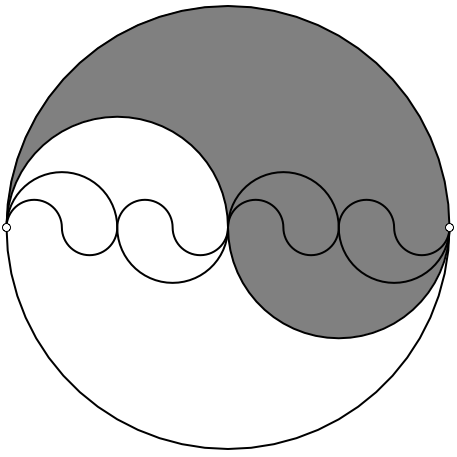
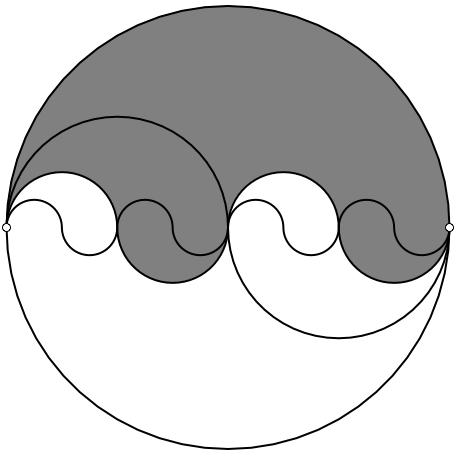
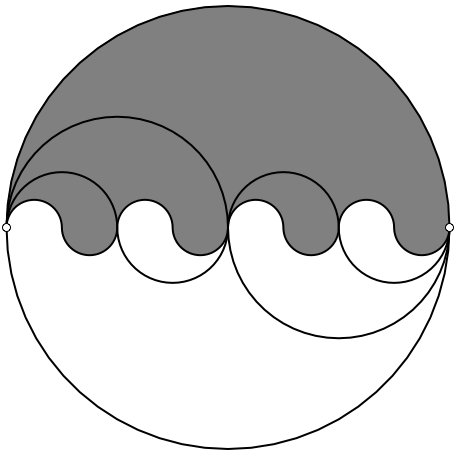
Identify each of the following sets in terms of unions, intersections and symmetric differences of the two sets and their complements. See applet *Yin-Yang Sets*

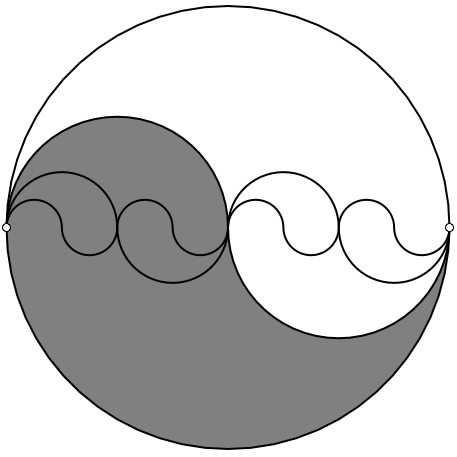
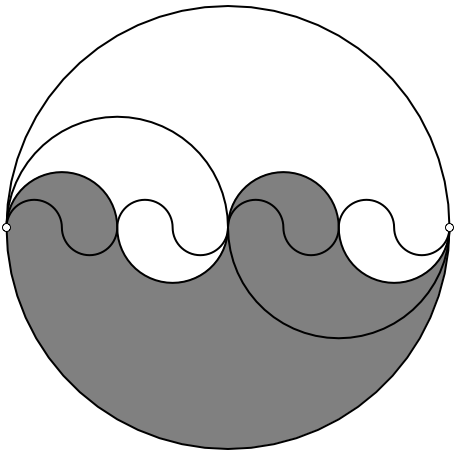
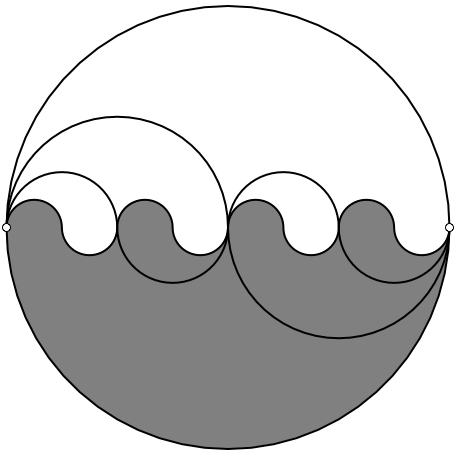
   

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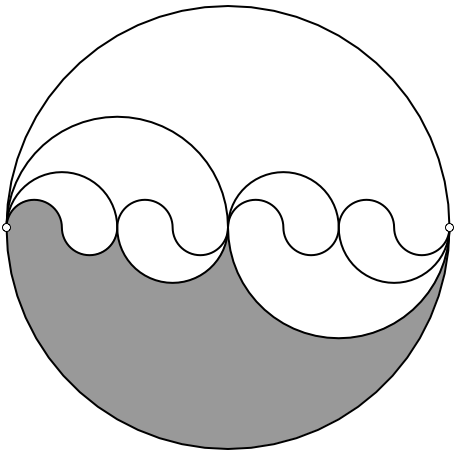
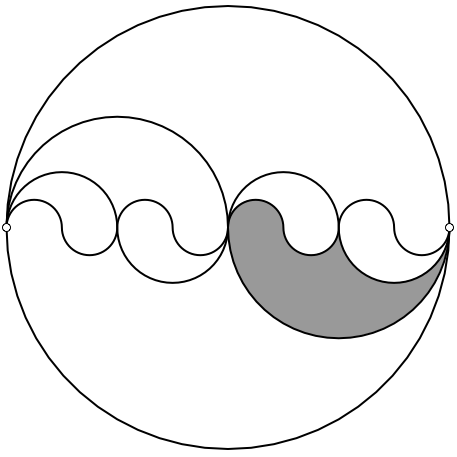
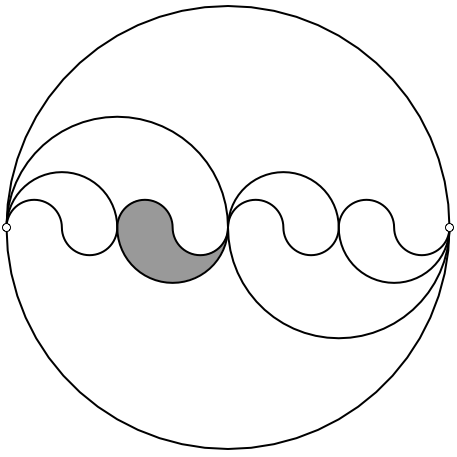
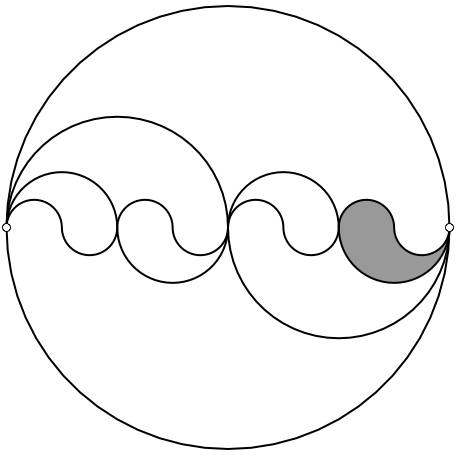
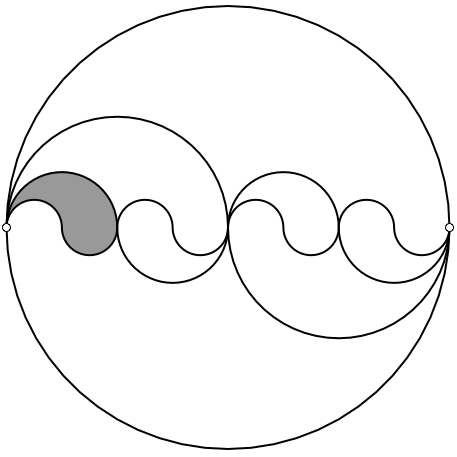
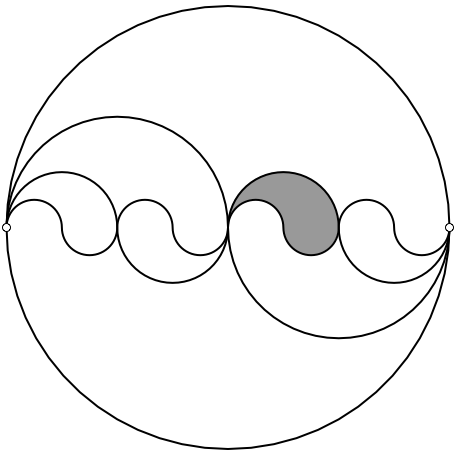
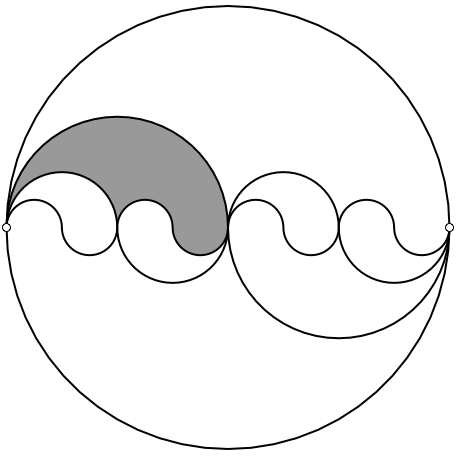
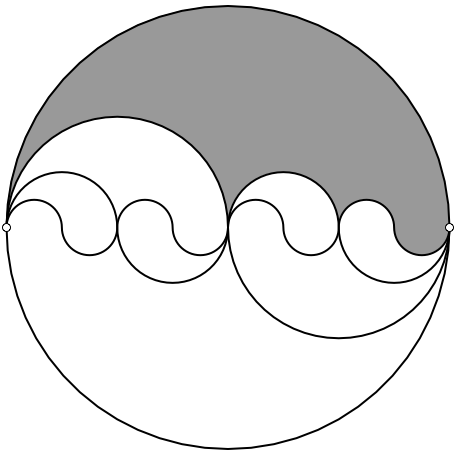
## Three Sets

Here are three sets and their complements

Identify each of the following sets in terms of intersections of the three sets and their complements. Why might they be presented in this order? How many different ways can you present each using intersections, unions, symmetric differences and complements? How many different subsets are there? See applet *Yin-Yang Sets*

**True/false (Four Doors: an example of a class of problems)**

There are four doors: X,Y, Z, W. At least one of them leads you to safety but the others lead to a devouring dragon. Eight priests give you advice, A, B, C, D, E, F, G, H. Each of them is either a truth teller or a liar. They tell you:

A: X is a good door

B: At least one of the doors Y and Z is good

C: A and B are both telling the truth

D: X and Y are both good doors

E: X and Z are both good doors

F: Either D or E is telling you the truth

G: If C is telling you the truth, then so is F

H: If G and I are both telling you the truth, then so is A.