GY302 Crystallography & Mineralogy Lab

Lab 1: Recognizing Symmetry Elements

Problem 1: In Figure 1.1 that displays alphanumeric and special characters indicate:

a. Indicate a mirror line by drawing a straight (use a straight edge) pencil line through the center of the character.
b. Indicate if a 2-, 3-, 4-, or 6-fold axis exists in the center of the character by using one of the special symbols discussed in the lab lecture.

Note that some characters may have more than one symmetry element, and some may have none. In the space provided below each character list the symmetry elements separated by coma- rotation symmetry listed first, then mirror planes, then a center of symmetry (i). For example, a character with a 4-fold rotation axis and two mirror planes would be: 4-fold, 2m.

Problem 2: For Figure 1.2 find all symmetry elements that exist for the geometry of the object in the figure. Use the same rules as in Problem 1.

Problem 3: Figure 1.3 depicts 3-dimensional objects that have more complex symmetry elements. Try to find actual objects to test for the symmetry. Use the same rules as in Problems 1 and 2 but try to sketch the mirror planes and rotational axes in 3D perspective. Because these are 3D objects you need to consider whether an object has a center of symmetry (i) and/or roto-inversion axes. Use the proper symbol for rotation axis at the ends of the axis. There is no symbol for a center of symmetry so just list it (i) if it exists

EXERCISE 1

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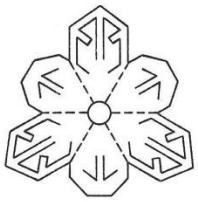
FIGURE 1.1 Letters of the alphabet (and some other symbols) and their symmetry content as a function of type style.

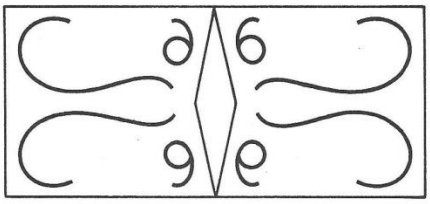
A	B	C	D	E	F	G
H	I	J	K	K	L	M
M	N	N	O	O	P	Q
R	S	T	U	V	W	X
Y	Y	Z	!	:	$	¢

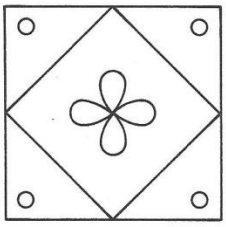
EXERCISE 1

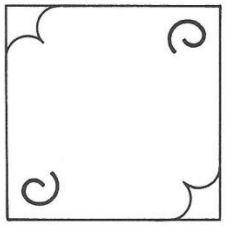
Student Name

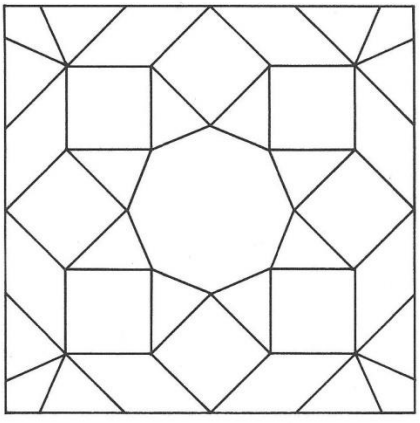
FIGURE 1.2 The symmetry content of several patterns.

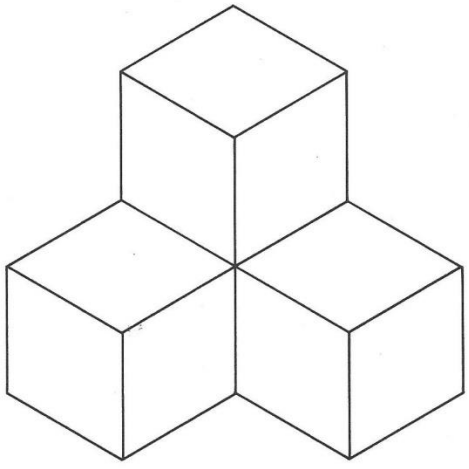












EXERCISE 1

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FIGURE 1.3 The symmetry content of some common objects.

Unsharpened pencil

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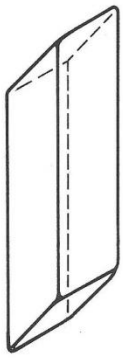
Rubber eraser



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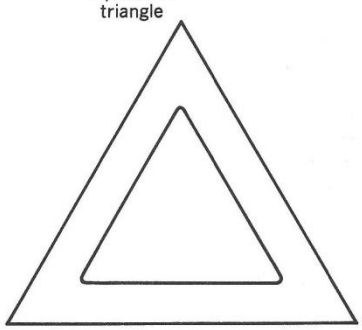
Equilateral triangle



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Chair

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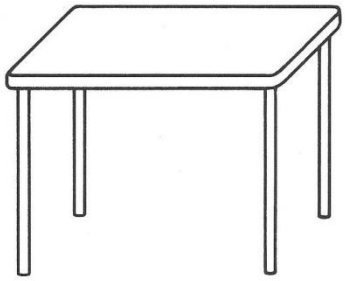
Card table



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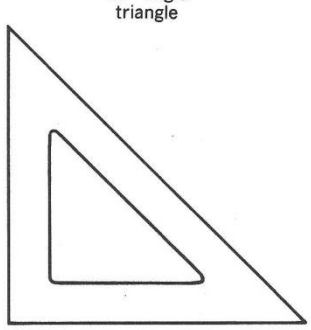
45° angle triangle



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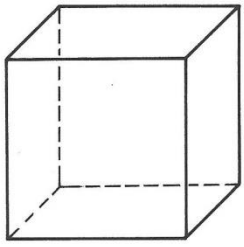
Cube



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Baseball (or tennis ball)

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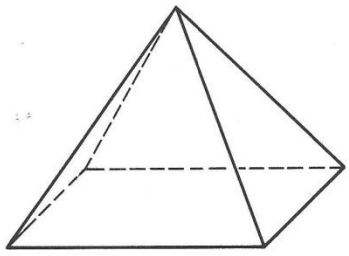
Pyramid



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