Online HW 6: Symmetry

Bart Snapp and Brad Findell

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Symmetry

Short-answer questions about symmetry.

Question 1 *Categorize the capital letters of the alphabet by their symmetries. Use the following font:*

ABCDEFGHIJKLMNOPQRSTUVWXYZ

Question 2 *Write the words COKE and PEPSI in capital letters so that they read vertically. Use a mirror to look at a reflection of the words. What is different about the reflections of the two words? Explain.*

Author(s): Bart Snapp and Brad Findell

Question 3 *Indicate the number of symmetries of the following figures:*

- (a) *An equilateral triangle* $\boxed{?}$
- (b) *An isosceles triangle that is not equilateral* $\boxed{?}$
- (c) *A square* $\boxed{?}$
- (d) *A rectangle that is not a square* $\boxed{?}$
- (e) *A rhombus that is not a square* $\boxed{?}$
- (f) *A (non-special) parallelogram* $\boxed{?}$
- (g) *A regular* $n-$*gon* $\boxed{?}$

Question 4 *Describe all of the symmetries of the following figures:*

- (a) *An equilateral triangle*
- (b) *An isosceles triangle that is not equilateral*
- (c) *A square*
- (d) *A rectangle that is not a square*
- (e) *A rhombus that is not a square*
- (f) *A (non-special) parallelogram*
- (g) *A regular* n*-gon*

Question 5 *We often say a figure is "symmetric" when we notice that it has symmetry, but now we want to be more precise:*

A ***symmetry*** *of a figure is a* (reflection/rotation/transformation/translation) *that maps a figure* (to its opposite/onto itself/to another figure).

Question 6 *Explain why a sequence of two symmetries of a figure must also be a symmetry of that figure.*

Question 7 *Explain why the identity transformation should be considered a symmetry of* any *figure.*

Symmetries of polygons.

Question 8 *Suppose that quadrilateral $ABCD$ has exactly one rotation symmetry (other than the identity transformation) and no reflection symmetry. What kind(s) of quadrilateral could it be? Explain your reasoning.*

Question 9 *Suppose that quadrilateral $ABCD$ has exactly one reflection symmetry and no rotation symmetry (other than the identity transformation). What kind(s) of quadrilateral could it be? Explain your reasoning.*

Question 10 *What are the symmetries of a circle?*

Question 11 *How can you use the symmetries of a circle to determine whether a figure is indeed a circle?*

Question 12 *What are the symmetries of a line?*

(a) *Describe all translation symmetries.*

(b) *Describe all rotation symmetries.*

(c) *Describe two types of reflection symmetries.*

(d) *Given a line, describe a rotation symmetry and a reflection symmetry that have the same effect on a line. How do the corresponding transformations differ in what they do to the surrounding space?*

Question 13 *How can you use the symmetries of a line to determine whether a figure is indeed a line?*

Question 14 *Find some tessellations. For each tessellation, describe all of its symmetries.*