Section 2

(1) 3, 6, 3, 6 uses two regular polygons → this is a semiregular tiling.

(3) If you translate the square in a direction, you could tell it had moved → no symmetry.

(4) All strip patterns have translational symmetry along the direction of the strip.

(5) Commutativity is not required for a group.

(6) For ~~ecample~~ example, pppp does not have glide reflection symmetry.

(7) $\frac{81}{3} = 27$ with a remainder of 0, so $81 \bmod 3 = 0$.

(8) Under addition, 3 has inverse −3, (for example) so all integers have an inverse that is in the group.

(9) monohedral uses only ~~only~~ one size and shape of tile.

(10) regular tiling is an edge-to-edge tiling that uses only one kind of regular polygon.

Section 3

(1) horizontal translation → yes (all strip patterns have this)
horizontal reflection → no.
glide reflection → yes
vertical reflection → no.

(2) (I) has a vertical reflection symmetry.

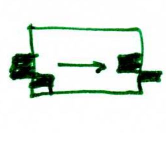
(3) All triangles can tile the plane.

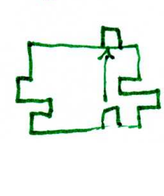
(4) Part of 10-gon:

$\frac{360}{10} = 36°$

interior angle = 180 − 36 = 144°

(5) The tile is created from a rectangle with translations, so it will tile using only translations.





(6) Groups "shuffle" the elements in the rows, so missing element is d. This is also true of the column.

(7) Identity leaves top row unchanged. So a is identity.

(8) Answer is d, since $\begin{array}{c|c} \circ & c \\ \hline d & a \end{array}$ ← a is identity. $\boxed{c \circ d = a}$

(9) $b \circ b \circ c = (b \circ b) \circ c$

$= a \circ c$ or use

$= c$ a is identity.

$\begin{array}{c|c} \circ & b \\ \hline b & a \end{array} \Rightarrow b \circ b = a$

$\begin{array}{c|c} \circ & a \\ \hline c & c \end{array} \Rightarrow a \circ c = c$

Section 4

(1) Identity leaves top row unchanged. So e is identity.

(2) $\begin{array}{c|c} \circ & a \\ \hline a & e \end{array}$ $a^{-1} = a$.

(3) $(a \circ b) \circ d = f \circ d$

$= e$

$\begin{array}{c|c} \circ & a \\ \hline b & f \end{array} \Rightarrow a \circ b = f$

$\begin{array}{c|c} \circ & f \\ \hline d & e \end{array} \Rightarrow f \circ d = e$

(4) $(a \circ a) = e$

(5) f^{-1} is element with identity, $f^{-1} \circ f = e$

$\begin{array}{c|c} \circ & d \\ \hline f & e \end{array} \Rightarrow f^{-1} = d$.

(8)