

1

Solutions of the Math Problems on pages 124/125 in your textbook

① Consider the spatial attributes of time listed on pages 120/121 in your textbook.

The line _____

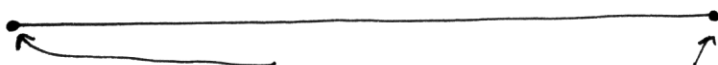
has all of the attributes, since we can think of the line as the real line (or the line of real numbers) and the attributes of time are actually rephrased properties of the real numbers

Note: we have to pick a direction of moving in order to specify before and after:

Say, we pick the direction of moving to be from left to right (\longrightarrow) and for any point on the line there are points before and points after it, the line is continuous and obviously the line has all attributes of time.

If consider a closed interval on the line,

i.e.,



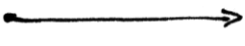
if there is a beginning and an end,

then the point representing "beginning" doesn't have before
and the one representing "end" doesn't have after

and then some of the attributes of time are no longer valid (at those points)

⇒ we don't want a beginning and an end on the line.


Similarly for an arrow:

if start at a point  and go on forever, then we have a problem at the starting point - there is no before for it.

The spiral is "the same" as the (real) line, just "put" in a slightly different way in space, and all attributes of time are valid for it.

The circle could be thought of as a projection of a spiral onto a plane (a flat surface): you can convince yourself as follows:

imagine you go to the movie theatre to see a movie, but instead above your head

there is a big spiral 

and light coming in the direction of the screen through the spiral

then what you will see on the screen is just a circle (Not a very interesting movie, isn't it?)

The point is that the circle has the attributes of time as well:

If you look at the circle close up, any

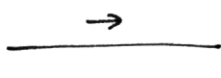
continuous part of the circle 

is actually an open interval on the (real) line

and thus has all attributes of time.

Note: an open interval is the one for which the end points are not included

② In order to talk about before and after, we have to specify (or have in mind at least) a direction:

say,
for the line  from left to right;

for the circle  clockwise

for the spiral 

Note: if we choose the opposite directions of the above,

then the "before" will become "after" and
"after" will become "before"

but in either case, before and after shows the continuity of the flow of time (you can draw the figures without lifting your pen from the paper for each figure)

③ As written in your textbook,

time repeats in the circle (i.e., has cycles),
time is linear on the line,
the spiral is a 3-dimensional object,
representing time and carrying the information both
from the circle and from the line -
it looks like circles repeating in time but with
different repetition;
in that context,

I would say that the spiral is a better representation
of time in the sense that it combines the info
carried by the circle and the line.

(... OOO ...)

Of course, you are welcome to think of more additional
attributes.

④ This is an excellent brainstorm question.
It doesn't feel right to spoil it with an answer
right away.

Please, attack the question yourself and
you will be amazed how creative you are.

(more on this later)