Do you use dial or digital clocks? Isaac Asimov believes there are reasons to prefer one kind of clock to the other. Read why he is concerned about the use of digital clocks. Then answer the questions that follow.

Dial Versus Digital

Isaac Asimov

There seems no question but that the clock dial, which has existed in its present form since the seventeenth century and in earlier forms since ancient times, is on its way out. More and more common are the digital clocks that mark off the hours, minutes, and seconds in ever-changing numbers. This certainly appears to be an advance in technology. You will no longer have to interpret the meaning of “the big hand on the eleven and the little hand on the five.” Your digital clock will tell you at once that it is 4:55. And yet there will be a loss in the conversion of dial to digital, and no one seems to be worrying about it.

When something turns, it can turn in just one of two ways, clockwise or counterclockwise, and we all know which is which. Clockwise is the normal turning direction of the hands of a clock and counterclockwise is the opposite of that. Since we all stare at clocks (dial clocks, that is), we have no trouble following directions or descriptions that include those words. But if dial clocks disappear, so will the meaning of those words for anyone who has never stared at anything but digitals. There are no good substitutes for clockwise and counterclockwise. The nearest you can come is by a consideration of your hands. If you clench your fists with your thumbs pointing at your chest and then look at your fingers, you will see that the fingers of your right hand curve counterclockwise from knuckles to tips while the fingers of your left hand curve clockwise. You could then talk about a “right-hand twist” and a “left-hand twist,” but people don’t stare at their hands the way they stare at a clock, and this will never be an adequate replacement.

Nor is this a minor matter. Astronomers define the north pole and south pole of any rotating body in such terms. If you are hovering above a pole of rotation and the body is rotating counterclockwise, it is the north pole; if the body is rotating clockwise, it is the south pole. Astronomers also speak of “direct motion” and “retrograde motion,” by which they mean counterclockwise and clockwise, respectively.

Here is another example. Suppose you are looking through a microscope at some object on a slide or through a telescope at some view in the sky. In either case, you might wish to point out something to a colleague and ask him or her to look at it, too. “Notice that object
at eleven o’clock,” you might say—or five o’clock or two o’clock. Everyone knows exactly
where two, five, or eleven—or any number from one to twelve—is located on the clock
dial, and can immediately look exactly where he is told. (In combat, pilots may call attention
to the approach of an enemy plane or the location of antiaircraft bursts or the target, for
that matter, in the same way.)

Once the dial is gone, location by “o’clock” will also be gone, and we have nothing
to take its place. Of course, you can use directions instead: “northeast,” “southwest by south,” and so
on. However, you will have to know which
direction is north to begin with. Or, if you are
arbitrary and decide to let north be straight ahead
or straight up, regardless of its real location, it still
remains true that very few people are as familiar
with a compass as with a clock face.

Here’s still another thing. Children learn to count
and once they learn the first few numbers, they quickly get the whole idea. You go from
0 to 9, and 0 to 9, over and over again. You go from 0 to 9, then from 10 to 19, then
from 20 to 29, and so on till you reach 90 to 99, and then you pass on to 100. It is
a very systematic thing and once you learn it, you never forget it. Time is different! The
early Sumerians couldn’t handle fractions very well, so they chose 60 as their base because
it can be divided evenly in a number of ways. Ever since, we have continued to use the
number 60 in certain applications, the chief one being the measurement of time. Thus, there
are 60 minutes in an hour.

If you are using a dial, this doesn’t matter. You simply note the position of the hands
and they automatically become a measure of time: “half past five,” “a quarter past three,”
a quarter to ten,” and so on. You see time as space and not as numbers. In a digital clock,
however, time is measured only as numbers, so you go from 1:01 to 1:59 and then move
directly to 2:00. It introduces an irregularity into the number system that is going to insert
a stumbling block, and an unnecessary one, into education. Just think: 5.50 is halfway between
5 and 6 if we are measuring length or weight or money or anything but time. In time, 5:50
is nearly 6, and it is 5:30 that is halfway between 5 and 6.

What shall we do about all this? I can think of nothing. There is an odd conservatism
among people that will make them fight to the death against making time decimal and having
a hundred minutes to the hour. And even if we do convert to decimal time, what will we
do about “clockwise,” “counterclockwise,” and locating things at “eleven o’clock”? It will be
a pretty problem for our descendants.
Mark your answer choices for multiple-choice questions 11 through 14 in the spaces provided.

11. The Sumerians chose 60 as the base for their number system because
   ○ there are 60 minutes in an hour.
   ○ they invented dial clocks.
   ○ 60 can be divided easily.
   ○ there were six sacred directions on the Sumerian compass.

12. The author says that using dial references when viewing objects under a microscope helps to show the
   ○ position of an object.
   ○ time that the object is observed.
   ○ frequency of appearance of the object.
   ○ duration of time that the object is evident.

13. Which feature of a dial clock do astronomers use to define Earth’s rotation?
   ○ its numbering system
   ○ its direction of hand movement
   ○ its relationship to a compass
   ○ its movement over time

14. The author concludes that in the future
   ○ only scientists will use dial clocks.
   ○ new clock terms will be invented.
   ○ the clock problem will continue.
   ○ children will learn to count differently.
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   Primary Academic Expectation: 1.2 “Students make sense of the variety of materials they read.”
   Primary Core Content Code: 3.0.009 “Reflect on and evaluate what is read.”

   Secondary Academic Expectation: 1.2 “Students make sense of the variety of materials they read.”
   Secondary Core Content Code: 3.0.006 “Scan to find key information.”

   Percentage of test takers who answered this item correctly in 2000: 82

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Percentage of test takers who answered this item correctly in 2000: 50

14. The author concludes that in the future
- only scientists will use dial clocks.
- new clock terms will be invented.
- the clock problem will continue.
- children will learn to count differently.

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   **Primary Core Content Code:** 3.0.012 “Identify an author’s opinion about a subject.”

   Percentage of test takers who answered this item correctly in 2000: 47
15. Discuss three arguments that the author uses in trying to convince the reader that dial clocks are better than digital clocks.

**Primary Academic Expectation:** 1.2 “Students make sense of the variety of materials they read.”

**Primary Core Content Code:** 3.0.015 “Identify the argument and supporting evidence.”

**Secondary Academic Expectation:** 1.2 “Students make sense of the variety of materials they read.”

**Secondary Core Content Code:** 3.0.016 “Identify commonly used persuasive techniques (e.g., expert opinion, statistics, testimonial, bandwagon).”

Percentage of test takers in 2000 who received

- a score of 4: 11
- a score of 3: 28
- a score of 2: 36
- a score of 1: 21
- a score of 0: 4

Percentage of blank responses: 1
Scoring Guide

<table>
<thead>
<tr>
<th>SCORE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Student clearly discusses three of the arguments the author uses to try to convince the reader that dial clocks are better than digital.</td>
</tr>
<tr>
<td>3</td>
<td>Student generally discusses two or three of the arguments that the author uses to try to convince the reader that dial clocks are better than digital. <strong>OR</strong> Student clearly discusses one of the arguments that the author uses to try to convince the reader that dial clocks are better than digital.</td>
</tr>
<tr>
<td>2</td>
<td>Student discusses in a limited way two arguments that the author uses to try to convince the reader that dial clocks are better than digital. <strong>OR</strong> Student generally discusses one of the arguments that the author uses to try to convince the reader that dial clocks are better than digital.</td>
</tr>
<tr>
<td>1</td>
<td>Student demonstrates minimal understanding (e.g., student provides limited discussion about clocks or one of the arguments the author uses to try to convince the reader that dial clocks are better than digital).</td>
</tr>
<tr>
<td>0</td>
<td>Student's response is totally incorrect or irrelevant.</td>
</tr>
<tr>
<td>Blank</td>
<td>No student response.</td>
</tr>
</tbody>
</table>

Some of the arguments the author uses to try to convince the reader that dial clocks are better than digital:
- Following directions of clockwise and counterclockwise
- Defining north pole and south pole
- Describing location (i.e., object at five o’clock)
- Giving logic to Sumerians’ 60-minute measurement of time
- Showing time as space