Calendar moves   *P014 scoring rubric*

Math Domain

☑ Number/Quantity	☐ Shape/Space	☑ Function/Pattern
☐ Chance/Data	☐ Arrangement	

Math Actions (possible weights: 0 through 4)

☐0☐ Modeling/Formulating	☐1☐ Manipulating/Transforming
☐3☐ Inferring/Drawing Conclusions	☐3☐ Communicating

Math Big Ideas

☐ Scale	☐ Reference Frame	☑ Representation
☐ Continuity	☐ Boundedness	☐ Invariance/Symmetry
☐ Equivalence	☐ General/Particular	☐ Contradiction
☐ Use of Limits	☐ Approximation	☐ Other

1. $3\downarrow$ is 10, $11\downarrow$ is 18, and $24\downarrow$ is 31. The $\downarrow$ represents "moving down" or "the same day next week" or "adding 7." This means that $26\downarrow$ can be interpreted several different ways. Justifiable answers include 33 (by extending the numerical pattern), 2 (from recognizing that the same day next week will be the 2nd of the following month), or an argument that there is no answer at all because there is no such day on the calendar.

2. $5\leftarrow$ is 4, $23\leftarrow$ is 22, and $30\leftarrow$ is 29. The $\leftarrow$ represents "moving left" or "yesterday" or "subtracting 1." This means that $14\leftarrow$ can be interpreted several different ways. Justifiable answers include 13 (the preceding day, or the number obtained by subtracting 1), 20 (by wrapping around to the right side of the calendar but staying on the same row), or an argument that there is no answer at all because the arrow points beyond the edge of the calendar.

3. $23\uparrow$ is 16, $27\uparrow$ is 20, $18\rightarrow$ is 19, and $9\rightarrow$ is 10. The $\uparrow$ represents "moving up" or "the same day last week" or "subtracting 7." The $\rightarrow$ represents "moving right" or "tomorrow" or "adding 1."

4. $22\uparrow\uparrow$ is 8, $4\rightarrow\rightarrow$ is 6, $21\downarrow\uparrow$ is 21, and $13\uparrow\downarrow$ is 13. Note that the sequences $\downarrow\uparrow$ and $\uparrow\downarrow$ just return to the original day (perhaps with exceptions at the edges of the calendar).

    $14\uparrow\rightarrow$ is 8, $6\downarrow\leftarrow$ is 12, $26\uparrow\leftarrow$ is 18, $11\downarrow\rightarrow$ is 19, and $11\rightarrow\downarrow$ is 19. Note that going $\downarrow$ and then $\rightarrow$ leads to the same day as going $\rightarrow$ and then $\downarrow$,

5. Answers will vary depending on the calendar used, and also depending on how the arrow operations are interpreted at the edges of the calendar. If the 23rd is a Sunday, there are different ways that $23\leftarrow$ could be interpreted (see problems **2** parts **e** and **f**). If the calendar is for a month with less than 31 days, then there are different ways that $24\downarrow$ could be interpreted (see problem **1** parts **e** and **f**). For any calendar, good answers to **5c** can be created by using days on the edges of the calendar.

	partial level (1 or 2)	full level (3)
Modeling/ Formulating (weight: 0)		
Transforming/ Manipulating (weight: 1)	Problems **1a**, **2a**, **3a**, and **4**: Some errors are made. For example, the student may handle single arrows correctly but have trouble with problems involving two arrows in succession.	Problems **1a**, **2a**, **3a**, and **4**: All arrow problem computations are done correctly, including those involving multiple arrows. No arithmetic errors are made.
Inferring/ Drawing Conclusions (weight: 3)	Problems **1ef** and **2ef**: For these arrow problems involving the edge of the calendar, students are able to conceive of only one possible answer (answering **e** but not **f**). Problems **4b**, **4d**, and **5c**: Correct conclusions are reached on some but not all of these problems.	Problems **1ef** and **2ef**: For these arrow problems involving the edge of the calendar, students are able to conceive of more than one possible answer. Problems **4b** and **4d**: Correct conclusions are drawn about multi-arrow sequences. Problem **5c**: The arrow problem invented by the student meets the stated requirement.
Communicating (weight: 3)	The full credit criteria are met on some problems but not others. For example, the student might show a weakness in utilizing calendar vocabulary.	Problems **1bcd**, **2bcd**, and **3b**: Students choose appropriate words to describe the behavior of the arrows. Problems **1ef**, **2ef**, **4bd**, and **5**: Reasons and explanations are well-written.