2013 MARI GAMES PERSONAL ATTRIBUTES (PAs)

The table below describes all Personal Attributes (PAs) available for the 2013 MARI GAMES Competition. All of the competition PAs shall be reported with an observed value between 0.0 and 1.0, indicating the probability (as evaluated by the Game) that the Player can demonstrate the PA. The Game must also report its confidence (a value between 0.0 and 1.0) in its evaluation of the Player's PA value.

A PA may be reported having a value of empty string (`""`); this indicates that the Game did attempt, but did not have an opportunity to observe the PA during game play. In this case, the reported PA will be considered "unknown" and no confidence value should be provided.

A PA may be reported with an explicit `timeOfObservation`. If this time is not provided, LDNA will use the system time of when the data submission was received. Timestamps returned and supplied shall be encoded as ISO 8601 UTC time:

```
YYYY-MM-DDTHH:MM:SS.sZ  (example 2013-02-22T13:45:00.0Z)
```

During the development period, Games will be provided a Sandbox (test) API key that will allow all of the PAs described in this document to be utilized. During judging, the official set of PAs reported by a Game must be established in advance. Once the Game's final Data Contract is established, a final API key will be provided for use during the judging period. Completeness of data reporting against the Game's Data Contract will be a factor in during judging.

EXAMPLES OF REPORTING PA'S

```
[
   {
      "attributeID" : "7",
      "value" : "0.75",
      "confidence" : "0.9",       # reporting 'confidence' is required when a value is reported
      "observation" : "direct",   # reporting the type of 'observation' is optional
      "timeOfObservation" : "2013-02-22T13:35:00.0Z"
   },
   {
      "attributeID" : "19",
      "value" : "0.60",
      "confidence" : "0.65",      # reporting 'confidence' is required when a value is reported
      "timeOfObservation" : "2013-02-22T13:40:00.0Z"
   },
   {
      "attributeID" : "21",
      "value" : "0.9",
      "confidence" : "0.99"       # reporting 'confidence' is required when a value is reported
   },
   {
      "attributeID" : "2",
      "value" : ""                # reporting '' indicates unknown or not observed
   }                              # confidence cannot be reported with an 'unknown' value
]
```

Attribute ID	PA	Description	Rubric
2	Determine what fraction (unit fractions and proper fractions) a given graphical representation shows; construct a graphical representation for a fraction given symbolically	Knowing that the numerator is the top number in the fraction; knowing that the numerator corresponds to shaded sections in circles/rectangles, or to the number of sections between 0 and the dot in number lines	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
3	Determine the total number of available shares that a whole has been divided into in a graphical representation; construct a graphical representation of a whole with the proper number of equal divisions for a fraction given symbolically	Knowing that the denominator is the bottom number in the fraction; knowing that the denominator corresponds to the total number of sections in circles/rectangles, or to the number of sections between 0 and 1 in number lines	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
4	Compare fractions given a graphical representation and the corresponding symbolic fraction (using circle diagrams, rectangles, and number lines)	Knowing that the larger the denominator, the smaller the fraction (given equal numerators)	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
5	Given any fraction (unit fraction or proper fraction), reconstruct the unit of the fraction (using circle diagrams, rectangles, and number lines)	Knowing that if the goal is to reconstruct the unit of a given proper fraction n/m, the first step is to divide the given fraction into n unit fractions of 1/m	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).

6	Given any unit fraction, reconstruct the unit of the fraction (using circle diagrams, rectangles, and number lines)	Knowing that if the goal is to reconstruct the unit of a unit fraction 1/n, the unit is n * 1/n	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
7	Demonstrate that the numerator of an improper fraction is the number of all shaded sections in circle/rectangle, or the number of sections between 0 and the dot in number lines	Determine what improper fraction a given graphical representation shows (using circle diagrams, rectangles, and number lines)	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
8	Equate the denominator of an improper fraction to the number of sections in the unit in circle/rectangle, or the number of sections between 0 and 1 in number lines	Determine what improper fraction a given graphical representation shows (using circle diagrams, rectangles, and number lines)	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
9	Equate the whole number of an improper fraction written as a mixed fraction to the number of units that fit into the given fraction	Determine what improper fraction a given graphical representation shows (using circle diagrams, rectangles, and number lines)	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
10	Equate the denominator of an improper fraction written as a mixed fraction to the number of sections in the unit in circle/rectangle, or the number of sections between 0 and 1 in number lines	Determine what improper fraction a given graphical representation shows (using circle diagrams, rectangles, and number lines)	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).

11	Equate the numerator of an improper fraction n/m written as a mixed number with the whole number l to n - m * l	Determine what improper fraction a given graphical representation shows (using circle diagrams, rectangles, and number lines)	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
12	Manipulate a unit fraction 1/m to expand it such that the new numerator n1 = x and the new denominator m1 = m*x	Properly multiply a unit fraction (1/m) by (x/x) to create the expanded fraction x/(m*x). For example: 1/3 * 2/2 = 2/6, and 1/3 = 2/6	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
13	Demonstrate that given a fraction n1/m1, if m1 is a multiple of n1, the fraction can be reduced by computing the new denominator as m = m1/n1, and the reduced fraction is 1/m.	Properly simplify a fraction (n1/m1) where the denominator is a multiple of the numerator into a unit fraction by setting the new denominator to m1/n1. For example: for 2/6 = 1/m where m = 6/2 = 3; or 2/6 = 1/3	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
14	Expand a given fraction n/m to an equivalent fraction by multiplying the numerator and denominator by the same number x so that n1/m1 where n1 = n*x and m1 as m1 = m*x	Properly expand a proper fraction (n/m) by multiplying by x/x to get the expanded fraction (n*x)/(m*x). For example: 2/3 * 2/2 = 4/6; so 2/3 = 4/6	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
15	Reduce a given fraction n1/m1, by finding a number x as the common multiple of n1 and m1, and using that multiple (x) to reduce the fraction by dividing numerator and denominator by x; computing the new numerator as n = n1/x and the new denominator as m = m1/x.	Properly reduce a proper fraction (n1/m1) by dividing the numerator and denominator by a common multiple (x). For example: given the fraction 4/6, a common multiple of 4 & 6 is 2; therefore, 4/6 = (4/2) / (6/2) = 2/6; so 4/6 = 2/3	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).

16	Compare two fractions f1 and f2 by comparing each to a common fraction b1. If f1 is smaller than b1 and f2 is larger than b1, f1 < f2. If f1 is larger than b1 and f2 is smaller than b1, f1 > f2.	Given two fractions, use common benchmarks (e.g., ½, ¼) to compare them. For example: which is larger, 3/8 or 4/6? Since 3/8 < 1/2 (or 4/8) and 4/6 > 1/2 (or 3/6), then 3/8 < 4/6	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
17	Compare two fractions f1 and f2 by comparing each to a common fraction b1 along a number line.	Compare two fractions f1 and f2 by comparing each to a common fraction b1. If f1 is closer to b1 than f2, and both are smaller than b1, then f1 > f2. If f2 is closer to b1 than f2, and both are smaller than b1, then f2 > f1. If f1 is closer to b1 than f2, and both are larger than b1, then f1 < f2. If f2 is closer to b1 than f2, and both are larger than b1, then f2 < f1.	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
18	Given two fractions where one denominator is a multiple of then other denominator, use equivalent fractions to convert them to the same denominator to reason that one is larger than the other	Knowing that if I have to compare two given fractions n1/m1 and j1/k1 and if there is a whole number x such that m1 = x * k1, then I should convert n1/m1 to an equivalent fraction n1*x/m1*x = n2/m2. If n2 > j1, then n1/m1 > j1/k1.	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
19	Given two fractions, use equivalent fractions to convert them to the same denominator to reason that one is larger than the other	Knowing that if I have to compare two given fractions n1/m1 and j1/k1, then I should expand both fractions to equivalent fractions n2/m2 and j2/k2 so that m2 = k2. If n2 > j2, n1/m1 > j1/k1.	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
20	Add two given fractions with the same denominators	Knowing that if I have to add two fractions n1/m1 and j1/k1 and m1 = k1, then the numerator of the sum fraction is l1 = n1+j1 and the sum fraction is l1/m1	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).

21	Add two given fractions with different denominators where one denominator is a multiple of the other denominator	Knowing that if I have to add two fractions n1/m1 and j1/k1 and if there is a whole number x such that m1 = x*k1, then expand j1/k1 to j2/k2 by computing j2 = j1*x and k2 = k1*x and find the numerator of the sum fraction as l1 = n1 + j2 and the sum fraction as l1/m1	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
22	Add two given fractions with the different denominators	Knowing that if I have to add two fractions n1/m1 and j1/k1, then I should expand both fractions to equivalent fractions n2/m2 and j2/k2 such that m2 = k2 and find the numerator of the sum fraction as l1 = n2 + j2 and the sum fraction as l1/m2	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
23	Subtract two given fractions with the same denominators	Knowing that if I have to subtract two fractions n1/m1 and j1/k1 and m1 = k1, then the numerator of the difference fraction is l1 = n1-j1 and the difference fraction is l1/m1	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
24	Subtract two given fractions with the different denominators where one denominator is a multiple of the other denominator	Knowing that if I have to subtract two fractions n1/m1 and j1/k1 and if there is a whole number x such that m1 = x*k1, then expand j1/k1 to j2/k2 by computing j2 = j1*x and k2 = k1*x and find the numerator of the difference fraction as l1 = n1 - j2 and the difference fraction as l1/m1	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
25	Subtract two given fractions with the different denominators	Knowing that if I have to subtract two fractions n1/m1 and j1/k1, then I should expand both fractions to equivalent fractions n2/m2 and j2/k2 such that m2 = k2 and find the numerator of the difference fraction as l1 = n2 - j2 and the difference fraction as l1/m2	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).

26	Convert a given fraction to its decimal equivalent	Given a fraction (n/m), divide the numerator (n) by the denominator (m) to produce the decimal equivalence of the fraction	Given a fraction (n/m), divide the numerator (n) by the denominator (m) to produce the decimal equivalence of the fraction
27	Convert a given non-repeating decimal number into its fractional equivalent	Given a non-repeating decimal number less than 1.0, use the digits to the right of the decimal point as the numerator and construct the denominator by placing a "1" in front of a sequence of zeroes composed of one zero for each digit in the numerator. Then simplify that fraction. For example: 0.25 = 25/100, which simplifies to 1/4, or 0.125 = 125/1000 = 1/8	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
28	Convert a given repeating decimal number into its fractional equivalent	Given a repeating decimal number less than 1.0, use the set digits to the right of the decimal point as the numerator and construct the denominator with a sequence of digits composed of one "9" for each digit in the numerator. Then simplify that fraction. For example: 0.333 = 3/9, which simplifies to 1/3, or 0.153153 = 153/999 = 17/111	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
29	Convert a given repeating decimal number whose leading digits do not repeat into its fractional equivalent	Given a repeating decimal number less than 1.0, of the form 0.yyyxxx where yyy is any number of non-repeating digits and xxx is a repeating sequence of any length, normalize the non-repeating digits and combine the resulting fractions. Then simplify that fraction. For example: given 0.825555, note that 82 = 27 + 55. So 27/100 + 5/9 = 743/900	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).

30	The ability to determine the needed outcome for a problem presented during an educational mathematics game concerning fractions	Problem Solving Process – Understanding the Problem	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
31	The ability to recognize when the presentation of a problem does not include all of the information needed to solve it during an educational mathematics game concerning fractions	Problem Solving Process – Understanding the Problem	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
32	The ability to identify what missing information or data is needed to solve a described problem during an educational mathematics game concerning fractions	Problem Solving Process – Understanding the Problem	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
33	The ability to filter out extraneous information or data in solving a problem during an educational mathematics game concerning fractions	Problem Solving Process – Understanding the Problem	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
34	The ability to develop a successful strategy for solving a presented problem during an educational mathematics game concerning fractions	Problem Solving Process – Devising a Plan	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).

35	The ability to execute a problem solution without error during an educational mathematics game concerning fractions	Problem Solving Process – Carrying out a Plan	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).
36	The ability to apply a problem solving result to the solution of another problem during an educational mathematics game concerning fractions	Problem Solving Process – Reviewing and Extending	Decimal Number indicating the probability that the user can demonstrate this skill. Range is between 0.0 (observed attempt, but no proficiency) to 1.0 (full proficiency).