G11 Functions and Applications
The Dragon Academy
Term 1 Test 1

Name:

November 3, 2018

Questions and Problems all weigh the same towards the mark. **Passing requires** 60% **and 1 Problem solved**.

1 Questions

1. (Ktica) You are reading your Math book and you find a mathematical expression of the form $S = \{a, b, c\}$.

   1.1. What type of object is S?

   A) A function **B)** An arrow **C)** A set
   D) A number or an element **E)** A relation **F)** A Domain

   1.2. Not knowing any more details about S and its contents, how do we call any of a, b, or c?

   A) A number **B)** An arrow **C)** A set **D)** An element.

   1.3. Now you are given more details about S, namely that $S = \{(-1, 0), (0, -1), (0, 3)\}$. What type of objects would we say now that S contains?

   A) Numbers **B)** Ordered pairs, arrows or points, depending how you want to look at them **C)** Sets of numbers or ordered pairs, it's the same. **D)** Elements or images

   1.4. Ok, now we have $M = \{(1, 2), (2, 4), (3, 8), (4, 16)\}$ and $S = \{(-1, 0), (0, -1), (0, 3)\}$. What can we say about **both,** M **and** S? Be as specific as possible. They both are

   A) Functions **B)** Arrows **C)** Sets
   D) Numbers, also called, elements. **E)** Relations **F)** Domains or Ranges, it depends.

2. (Ktica) Consider figure 1.

   2.1. How do we call those ovals?

   A) Functions **B)** Arrows **C)** Sets
   D) Numbers, also called, elements. **E)** Relations

   2.2. How do we call those blue segments between the ovals?

   A) Functions **B)** Arrows **C)** Sets
   D) Numbers, also called, elements. **E)** Relations

   2.3. Consider now only case a) of figure 1. What does the diagram a) represent? **Be as generic as possible**

   A) A function **B)** An arrow **C)** A set
   D) A number, also called, element **E)** A relation

   2.4. The same question, but now **be as specific as possible in your answer**. What does the diagram a) represent?

   A) A function **B)** An arrow **C)** A set
   D) A number, also called, element **E)** A relation

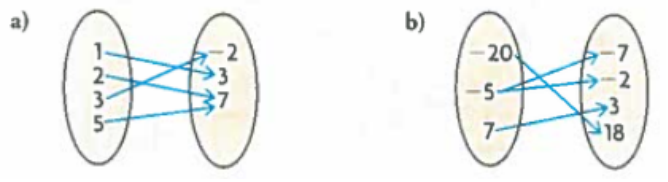

Figure 1:

3. (Ktica) Consider again figure 1

3.1. What is the correct mathematical way of writing/describing the diagram a)

A) $a = \{(3,1),(7,2),(-2,3),(7,5)\}$ **B)** $a = \{1,-2,5,7\}$ **C)** $a = \{-2,3,7\}$

D) $a = \{(1,3),(2,7),(3,-2),(5,7)\}$ **E)** $a = \{20,-5,7\}$

3.2. What is the correct mathematical way of writing/describing **the domain of a)**

A) $Da = \{-7,-2,3,18\}$ **B)** $Da = \{(-20,-18),(-5,-7),(-5,-2),(7,3)\}$

C) $Da = \{1,2,3,5\}$ **D)** $Da = \{(1,3),(2,7),(3,-2),(5,7)\}$

E) $Da = \{-2,3,7\}$ **F)** $Da = \{20,-5,7\}$

3.3. What is the correct mathematical way of writing/describing **the range of b)**

A) $Da = \{-7,-2,3,18\}$ **B)** $Da = \{(-20,-18),(-5,-7),(-5,-2),(7,3)\}$

C) $Da = \{1,2,3,5\}$ **D)** $Da = \{(1,3),(2,7),(3,-2),(5,7)\}$

E) $Da = \{-2,3,7\}$ **F)** $Da = \{20,-5,7\}$

3.4. Does diagram a) represent a function?

A) Yes, because each element of the domain has one unique arrow

B) Yes, because each element of the domain has a different arrow

C) No, because there are elements of the domain that have more than one arrow

D) Yes, because each arrow ends on a different element

E) Yes, because such kind of diagrams represents exactly that, namely a function

3.5. Does diagram b) represent a function?

A) Yes, because each element of the domain has one unique arrow

B) Yes, because each element of the domain has a different arrow

C) No, because there are elements of the domain that have more than one arrow

D) Yes, because each arrow ends on a different element

E) Yes, because such kind of diagrams represents exactly that, namely a function

3.6. According to relation a), what is the image of 3?

A) 1 **B)** 7 **C)** -2 **D)** 5

3.7. Write relation b) as a table of values. Label its domain x and its range y.

2 Problems

1. (KtiCa) The equation $f(x) = 2x^2 + 3x - 1$ represents a quadratic function. Fill in the blanks and evaluate:

   1.1. $f(3) = 2\,(\_\_\_\_\_)^2 + 3\,(\_\_\_\_\_) - 1 =$

   1.2. $f(\frac{1}{2}) = 2\,(\_\_\_\_\_)^2 + 3\,(\_\_\_\_\_) - 1 =$

   1.3. $f(5) - f(4) =$

2. (kTIcA) We are on a bridge over a river and throw a stone. The equation $h(t) = 19.6 - 4.9t^2$ models the height in meters above the river of the falling stone as a function of time.

   2.1. Evaluate $h(0)$. What does it represent?

   2.2. Calculate the time when the stone hits the water.

3. (KtiCa) Determine if the following data follow a linear or a quadratic relation

   3.1.

x	**y**
0	-1
2	5
4	11
6	17

   3.2.

x	**y**
0	-1
2	11
4	47
6	107