## Unit 7 Lesson 21: Sums and Products of Rational and Irrational Numbers

### 1 Operations on Integers (Warm up)

#### Student Task Statement

Here are some examples of integers:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| -25 | -10 | -2 | -1 | 0 | 5 | 9 | 40 |

1. Experiment with adding any two numbers from the list (or other integers of your choice). Try to find one or more examples of two integers that:
   1. add up to another integer
   2. add up to a number that is *not* an integer
2. Experiment with multiplying any two numbers from the list (or other integers of your choice). Try to find one or more examples of two integers that:
   1. multiply to make another integer
   2. multiply to make a number that is *not* an integer

### 2 Sums and Products of Rational Numbers

#### Student Task Statement

1. Here are a few examples of adding two rational numbers. Is each sum a rational number? Be prepared to explain how you know.
   1. is an integer:
2. Here is a way to explain why the sum of two rational numbers is rational.

* Suppose and are fractions. That means that and are integers, and and are not 0.
  1. Find the sum of and . Show your reasoning.
  2. In the sum, are the numerator and the denominator integers? How do you know?
  3. Use your responses to explain why the sum of is a rational number.

1. Use the same reasoning as in the previous question to explain why the product of two rational numbers, , must be rational.

### 3 Sums and Products of Rational and Irrational Numbers

#### Student Task Statement

1. Here is a way to explain why is irrational.
   * Let be the sum of and , or .
   * Suppose is rational.
   1. Would be rational or irrational? Explain how you know.
   2. Evaluate . Is the sum rational or irrational?
   3. Use your responses so far to explain why cannot be a rational number, and therefore cannot be rational.
2. Use the same reasoning as in the earlier question to explain why is irrational.

### 4 Equations with Different Kinds of Solutions (Optional)

#### Student Task Statement

1. Consider the equation . Find a value of so that the equation has:
   1. 2 rational solutions
   2. 2 irrational solutions
   3. 1 solution
   4. no solutions
2. Describe all the values of that produce 2, 1, and no solutions.
3. Write a new quadratic equation with each type of solution. Be prepared to explain how you know that your equation has the specified type and number of solutions.
   1. no solutions
   2. 2 irrational solutions
   3. 2 rational solutions
   4. 1 solution



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