

<p>Task Model 1</p> <p>Response Type: Matching Tables</p> <p>DOK Level 1</p> <p>8.NS.A.1 Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion, which repeats eventually into a rational number.</p> <p>Evidence Required: 1. The student classifies real numbers as rational or irrational.</p> <p>Tools: None</p>	<p>Prompt Features: The student classifies numbers as rational or irrational.</p> <p>Stimulus Guidelines: Item difficulty can be adjusted via these methods:</p> <ul style="list-style-type: none"> Rational numbers are positive; irrational numbers are pi or $\sqrt{2}$. Rational numbers can be positive or negative; irrational numbers are in the form \sqrt{x}, where x is less than 90. Rational numbers can be positive or negative; they can be expressed as mixed numbers, fractions, decimals, or repeating decimals; irrational numbers include numerical expressions with pi and radicals. <p>TM1 Stimulus: The student is presented with a table of four to five rational and irrational numbers.</p> <p>Example Stem: Determine for each number whether it is a rational or irrational number.</p> <table border="1" style="margin: 10px auto; text-align: center;"> <thead> <tr> <th>Number</th> <th>Rational</th> <th>Irrational</th> </tr> </thead> <tbody> <tr> <td>$\frac{4}{7}$</td> <td></td> <td></td> </tr> <tr> <td>$\sqrt{30}$</td> <td></td> <td></td> </tr> <tr> <td>$\frac{21}{\sqrt{4}}$</td> <td></td> <td></td> </tr> <tr> <td>π</td> <td></td> <td></td> </tr> <tr> <td>-27</td> <td></td> <td></td> </tr> </tbody> </table> <p>Rubric: (1 point) The student correctly classifies each number (e.g., irrational numbers are $\sqrt{30}$ and π, all others are rational).</p> <p>Response Type: Matching Tables</p>	Number	Rational	Irrational	$\frac{4}{7}$			$\sqrt{30}$			$\frac{21}{\sqrt{4}}$			π			-27		
Number	Rational	Irrational																	
$\frac{4}{7}$																			
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<p>Task Model 2</p> <p>Response Type: Equation/Numeric</p> <p>DOK Level 1</p> <p>8.NS.A.1 Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion, which repeats eventually into a rational number.</p> <p>Evidence Required: 2. The student converts repeating decimals to fractions.</p> <p>Tools: None</p>	<p>Prompt Features: The student converts a repeating decimal to a fraction.</p> <p>Stimulus Guidelines: Item difficulty can be adjusted via these methods:</p> <ul style="list-style-type: none"> Decimals with one repeating digit in the tenths place. Decimals with multiple repeating digits starting in the tenths place (e.g., $0.\overline{24}$, $8.\overline{125}$), the hundredths place, or the thousandths place (e.g., $0.0\overline{42}$, $3.07\overline{6}$). <p>TM2 Stimulus: The student is presented with a decimal with a repeating bar over the last digit(s).</p> <p>Example Stem: Enter a fraction equivalent to $0.\overline{2}$. Use only whole numbers for numerators and denominators.</p> <p>Rubric: (1 point) Student enters an equivalent fraction to the repeating decimal (e.g., $2/9$).</p> <p>Response Type: Equation/Numeric</p>
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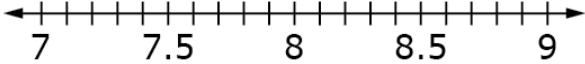
<p>Task Model 3</p> <p>Response Type: Multiple Choice, single correct response</p> <p>DOK Level 1</p> <p>8.NS.A.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2).</p> <p>Evidence Required: 3. The student writes approximations of irrational numbers as rational numbers.</p> <p>Tools: None</p>	<p>Prompt Features: The student approximates the value of an irrational number to the nearest whole number.</p> <p>Stimulus Guidelines:</p> <ul style="list-style-type: none"> • Irrational numbers should involve square roots, cube roots, or pi (π). • The expression could include addition, subtraction, multiplication, and division operations. • Item difficulty can be adjusted via these methods: <ul style="list-style-type: none"> ○ An irrational number between $\sqrt{2}$ and $\sqrt{100}$. ○ An irrational number or expression and the degree of precision is to the whole number. ○ An irrational expression and the degree of precision is to the tenths. <p>TM3a</p> <p>Stimulus: The student is presented with an irrational number.</p> <p>Example Stem: Which number is the closest approximation to $\sqrt{167}$?</p> <p>A. 12 B. 13 C. 83 D. 84</p> <p>Answer Choices: Distractors include incorrect rounding up or down and misinterpreting the square root sign as “divide by 2”.</p> <p>Rubric: (1 point) The student correctly identifies the closest approximation (e.g., B).</p> <p>Response Type: Multiple Choice, single correct response</p>
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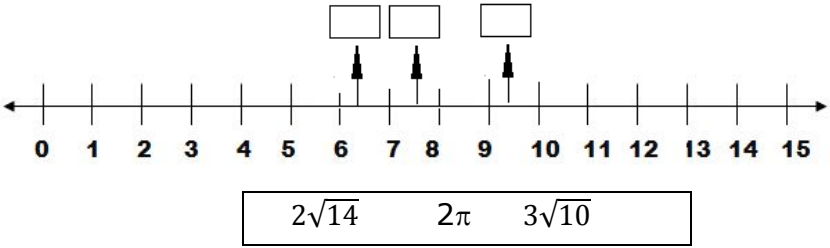
<p>Task Model 3</p> <p>Response Type: Equation/Numeric</p> <p>DOK Level 2</p> <p>8.NS.A.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2).</p> <p>Evidence Required: 3. The student writes approximations of irrational numbers as rational numbers.</p> <p>Tools: None</p>	<p>Prompt Features: The student provides a decimal approximation of a numerical expression whose value is irrational.</p> <p>Stimulus Guidelines:</p> <ul style="list-style-type: none"> • Irrational numbers should involve square roots or pi (π). • The expression could include the operations of addition, subtraction, multiplication, and division. • Item difficulty can be adjusted via these methods: <ul style="list-style-type: none"> ○ The numerical expression is a single irrational number between $\sqrt{2}$ and $\sqrt{100}$ (including pi). ○ The numerical expression is a single number or a more complex expression and the approximation is to the nearest whole number. ○ The numerical expression is more complex than a single number and the approximation is to the nearest tenth. <p>TM3b Stimulus: The student is presented with an expression whose value is irrational.</p> <p>Example Stem: Enter the approximate value of $2\sqrt{47}$ to the nearest tenth.</p> <p>Rubric: (1 point) Student gives the correct approximation at the specified degree of approximation (e.g., 13.6 or 13.7).</p> <p>Response Type: Equation/Numeric</p>
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<p>Task Model 3</p> <p>Response Type: Multiple Choice, single correct response</p> <p>DOK Level 2</p> <p>8.NS.A.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2).</p> <p>Evidence Required: 3. The student writes approximations of irrational numbers as rational numbers.</p> <p>Tools: None</p>	<p>Prompt Features: The student identifies the range in which the value of a numerical expression whose value is irrational falls.</p> <p>Stimulus Guidelines:</p> <ul style="list-style-type: none"> • Irrational numbers should involve square roots, cube roots, or pi (π). • The expression could include the operations of addition, subtraction, multiplication, and division. • Item difficulty can be adjusted via these methods: <ul style="list-style-type: none"> ○ The numerical expression is a single irrational number between $\sqrt{2}$ and $\sqrt{100}$ (including pi). ○ The numerical expression is a single number or a more complex expression and the approximation is to the nearest whole number. ○ The numerical expression is more complex than a single number and the approximation is to the nearest tenth <p>TM3c Stimulus: The student is presented with a numerical expression whose value is irrational.</p> <p>Example Stem: Which range contains the value of $\sqrt{(16 + 9 + 20)}$?</p> <p>A. between 6.6 and 6.8 B. between 7.5 and 7.7 C. between 16.8 and 17.0 D. between 22.4 and 22.6</p> <p>Answer Choices: Ranges may be whole numbers or decimals to the tenths. The distractors are ranges that are produced by errors in order of operations, errors in rounding, trying to remove perfect squares from the addends, or interpreting the square root as “divide by 2.”</p> <p>Rubric: (1 point) Student selects the correct range (e.g., A).</p> <p>Response Type: Multiple Choice, single correct response</p>
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<p>Task Model 4</p> <p>Response Type: Multiple Choice, multiple correct response</p> <p>DOK Level 2</p> <p>8.NS.A.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2).</p> <p>Evidence Required: 4. The student compares the sizes of irrational numbers by using rational approximations of irrational numbers.</p> <p>Tools: None</p>	<p>Prompt Features: The student compares the sizes of irrational numbers.</p> <p>Stimulus Guidelines:</p> <ul style="list-style-type: none"> • Four or five expressions are to be given as options. • At least two of the options must be correct responses. • Item difficulty can be adjusted by varying the complexity of the stem and answer choices: <ul style="list-style-type: none"> ○ They are simple numerical expressions with rational or irrational values such as integers, fractions, decimals to the tenths, radicals up to $\sqrt{30}$, integers with a fractional exponent, or multiples of pi (π). ○ They are more complex expressions with rational or irrational values involving one operation (including exponentiation) with integers, fractions, decimals to the hundredths place, radicals up to $\sqrt{120}$, and multiples of pi. ○ They are more complex expressions with rational or irrational values involving one or more operations (including exponentiation) with integers, fractions, decimals, radicals, exponents, multiples of pi. <p>TM4a Stimulus: The student is presented with a list of numerical expressions some of which have irrational values.</p> <p>Example Stem: Select all expressions that have a value greater than 5.</p> <p style="margin-left: 40px;">A. 2π B. $\frac{10}{\sqrt{3}}$ C. $3 + \sqrt{2}$ D. $5.7 - \frac{6}{\sqrt{20}}$</p> <p>Rubric: (1 point) Student selects all the appropriate expressions (e.g., A and B).</p> <p>Response Type: Multiple Choice, multiple correct response</p>
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<p>Task Model 4</p> <p>Response Type: Matching Tables</p> <p>DOK Level 1</p> <p>8.NS.A.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2).</p> <p>Evidence Required: 4. The student compares the sizes of irrational numbers by using rational approximations of irrational numbers.</p> <p>Tools: None</p>	<p>Prompt Features: The student selects true statements about the comparison of two numerical expressions, one or both of which has an irrational value.</p> <p>Stimulus Guidelines: Item difficulty can be adjusted via these methods:</p> <ul style="list-style-type: none"> Expressions being compared may be single numbers written as fractions, decimals to the tenths, radicals up to $\sqrt{30}$, integers with a fractional exponent, or multiples of pi (π). Expressions being compared may be more complex, involving one operation with fractions, decimals to the tenths, radicals up to $\sqrt{120}$, integers with a fractional exponent, or multiples of pi (π). <p>TM4b Stimulus: The student is presented with an inequality involving an irrational number.</p> <p>Example Stem: Select True or False to indicate whether each comparison is true.</p> <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;"></th> <th style="width: 25%; text-align: center;">True</th> <th style="width: 25%; text-align: center;">False</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">$\frac{4}{7} > \sqrt{19}$</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">$\sqrt{40} > 7$</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">$\frac{20}{\sqrt{30}} > \frac{2}{3}$</td> <td></td> <td></td> </tr> </tbody> </table> <p>Rubric: (1 point) Student selects True or False correctly (e.g., F, F, T). In each inequality, one of the sides must contain an irrational number.</p> <p>Response Type: Matching Tables</p>		True	False	$\frac{4}{7} > \sqrt{19}$			$\sqrt{40} > 7$			$\frac{20}{\sqrt{30}} > \frac{2}{3}$		
	True	False											
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<p>Task Model 5</p> <p>Response Type: Graphing</p> <p>DOK Level 1</p> <p>8.NS.A.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2).</p> <p>Evidence Required: 5. The student approximates the locations of irrational numbers on the number line by using rational approximations of irrational numbers.</p> <p>Tools: None</p> <p>Accessibility Note: Graphing items are not currently able to be Brailled. Minimize the number of items developed to this TM.</p> <p>Version 3 Update: Retired TM5a</p>	<p>Prompt Features: The student is prompted to plot the approximate value of an irrational number onto a number line.</p> <p>Stimulus Guidelines:</p> <ul style="list-style-type: none"> • Irrational numbers should involve square roots or pi (π). • Item difficulty can be adjusted via these methods: <ul style="list-style-type: none"> ○ approximation is to the nearest whole number ○ approximation is to the nearest tenth. <p>TM5b Stimulus: The student is presented with a number line and an irrational number.</p> <p>Example Stem: Use the Add Point tool to approximate the value of $\sqrt{78}$ to the nearest tenth on the number line.</p> <div style="text-align: center; margin: 10px 0;">  </div> <p>Interaction: Student will use the Add Point tool to graph a point on a number line containing snap-to regions at every tic mark. Add Point and Delete tools should be provided.</p> <p>Rubric: (1 point) Student plots a point at the correct approximation (e.g., 8.8).</p> <p>Response Type: Graphing</p>
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<p>Task Model 5</p> <p>Response Type: Drag and Drop</p> <p>DOK Level 1</p> <p>8.NS.A.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2).</p> <p>Evidence Required: 5. The student approximates the locations of irrational numbers on the number line by using rational approximations of irrational numbers.</p> <p>Tools: None</p> <p>Accessibility Note: Drag and Drop items are not currently able to be Brailled. Minimize the number of items developed to this TM.</p>	<p>Prompt Features: The student is prompted to drag numerical expressions whose value is irrational onto a number line to show the approximate locations of the values.</p> <p>Stimulus Guidelines:</p> <ul style="list-style-type: none"> • Irrational numbers should involve square roots, cube roots, or π. • The expression could involve any of the four operations. • Items difficulty can be adjusted via these methods: <ul style="list-style-type: none"> ○ Expressions are π or in the form of \sqrt{x} where x is a positive integer less than 30. ○ Expressions involve addition, subtraction, or multiplication of π or \sqrt{x} where x is a positive integer less than 30. ○ Expressions involve division or more than one operation, including taking radicals. <p>TM5c Stimulus: The student is presented with a number line and three expressions containing irrational numbers.</p> <p>Example Stem: Drag each expression to the number line to show the approximate value.</p> <div style="text-align: center; margin: 10px 0;">  </div> <p>Interaction: A palette on the bottom should be given for the three one-time use irrational expressions. Students should drag the expressions into the appropriate boxes on the number line. There should be an arrow from the number line to the box indicating exactly at which tic mark the expression should be placed.</p> <p>Rubric: (1 point) Student places all three expressions in the correct location (e.g., 2π, $2\sqrt{14}$, $3\sqrt{10}$).</p> <p>Response Type: Drag and Drop</p>
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