

Task Model 1	Prompt Feature	es: The stu	dent classifi	es numbers a	as rational or
Response Type:	irrational.				
Matching Tables	Stimulus Guide	lines: Item	u difficulty c	an be adjust	ed via these
	methods:				
DOK Level 1	• Rational r $\sqrt{2}$.	numbers are	e positive; i	rrational num	nbers are pi or
8.NS.A.1	 Rational n 	numbers ca	n be positiv	e or negative	; irrational
Know that numbers				ere x is less t	
that are not rational are called irrational.					e; they can be
Understand				actions, decin Imbers incluc	
informally that every			nd radicals.		
number has a		I			
decimal expansion;	TM1				
for rational numbers show that the	Stimulus: The st rational and irrat	•		th a table of i	four to five
decimal expansion			ers.		
repeats eventually,	Example Stem:	Determine	for each nu	umber wheth	er it is a rational
and convert a	or irrational num	ber.			
decimal expansion, which repeats					1
eventually into a		Number	Rational	Irrational	
rational number.		$\frac{4}{7}$			
Evidence		$\sqrt{30}$			
Required:		21			
1. The student classifies real		$\overline{\sqrt{4}}$			
numbers as rational		π			
or irrational.		-27			
Tools: None	irrational number				ch number (e.g., nal).
	Response Type	: Matching	Tables		



Task Model 2	Prompt Features: The student converts a repeating decimal to a
	fraction.
Response Type:	
Equation/Numeric	Stimulus Guidelines: Item difficulty can be adjusted via these
	methods:
DOK Level 1	 Decimals with one repeating digit in the tenths place.
	• Decimals with multiple repeating digits starting in the tenths
8.NS.A.1	place (e.g., $0.\overline{24}$, $8.\overline{125}$), the hundredths place, or the
Know that numbers	thousandths place (e.g., $0.0\overline{42}$, $3.07\overline{6}$).
that are not rational	
are called irrational.	ТМ2
Understand	Stimulus: The student is presented with a decimal with a repeating
informally that every	bar over the last digit(s).
number has a	
decimal expansion;	Example Stem: Enter a fraction equivalent to $0.\overline{2}$. Use only whole
for rational numbers	numbers for numerators and denominators.
show that the	numbers for numerators and denominators.
decimal expansion	Derived (1 a sight) Churd and an transformer and the structure for string to the
-	Rubric: (1 point) Student enters an equivalent fraction to the
repeats eventually, and convert a	repeating decimal (e.g., 2/9).
decimal expansion,	Response Type: Equation/Numeric
which repeats	
eventually into a	
rational number.	
Evidence	
Required:	
2. The student	
converts repeating	
decimals to fractions.	
Tools: None	



Task Model 3	Prompt Features: The student approximates the value of an	
	irrational number to the nearest whole number.	
Response Type:		
Multiple Choice,	Stimulus Guidelines:	
single correct	• Irrational numbers should involve square roots, cube roots,	
response	or pi (π).	
	 The expression could include addition, subtraction, 	
DOK Level 1	multiplication, and division operations.	
DOK LEVEL I	 Item difficulty can be adjusted via these methods: 	
8.NS.A.2	• An irrational number between $\sqrt{2}$ and $\sqrt{100}$.	
Use rational	\circ An irrational number or expression and the degree of	
approximations of	precision is to the whole number.	
irrational numbers to	\circ An irrational expression and the degree of precision is	
compare the size of	to the tenths.	
irrational numbers,		
locate them	ТМЗа	
approximately on a	Stimulus: The student is presented with an irrational number.	
number line		
diagram, and	Example Stem: Which number is the closest approximation to	
estimate the value of	$\sqrt{167}$?	
expressions (e.g.,	V107:	
π^2).		
<i>n</i>):	A. 12	
Evidence	B. 13	
Evidence	C. 83	
Required:	D. 84	
3. The student writes		
approximations of	Answer Choices: Distractors include incorrect rounding up or down	
irrational numbers as	and misinterpreting the square root sign as "divide by $2''$.	
rational numbers.		
	Rubric: (1 point) The student correctly identifies the closest	
Tools: None	approximation (e.g., B).	
	Response Type: Multiple Choice, single correct response	
	Response Type. Multiple Choice, single contect response	



Task Model 3Prompt Features: The student provides a decimal approximation of a numerical expression whose value is irrational.Response Type: Equation/NumericStimulus Guidelines: • Irrational numbers should involve square roots or pi (π).DOK Level 2Stimulus Guidelines: • Irrational numbers should include the operations of addition, subtraction, multiplication, and division.B.NS.A.2 Use rational approximations of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2).TM3b Stimulus: The student is presented with an expression whose value of the numerical expression is a single number and the approximation is to the nearest tenth.Evidence Required: 3. The student writes approximations of irrational numbers.Example Stem: Enter the approximate value of $2\sqrt{47}$ to the nearest tenth.Evidence Required: 3. The student writes approximations of irrational numbers.Example Stem: Enter the approximate value of $2\sqrt{47}$ to the nearest tenth.Rubric: (1 point) Student gives the correct approximation at the specified degree of approximation (e.g., 13.6 or 13.7).Response Type: Equation/Numeric			
 Response Type: Equation/Numeric DOK Level 2 Stimulus Guidelines: 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: 	Task Model 3		
Equation/Numeric DOK Level 2Stimulus Guidelines: 		a numerical expression whose value is irrational.	
Equation/Numeric DOK Level 2Stimulus Guidelines: 	Response Type:		
 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: The numerical expression is a single irrational number between √2 and √100 (including pi). The numerical 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 whole number. The numerical expression is more complex than a single number and the approximation is to the nearest tenth. TM3b Stimulus: The student is presented with an expression whose value is irrational. Evidence Required: The student writes approximations of irrational numbers as rational numbers. Response Type: Equation/Numeric 		Stimulus Guidelines:	
 DOK Level 2 The expression could include the operations of addition, subtraction, multiplication, and division. Item difficulty can be adjusted via these methods: The numerical expression is a single irrational number between √2 and √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. TM3b Stimulus: The student is presented with an expression whose value is irrational numbers approximations of irrational numbers arational numbers. Evidence Required: 3. The student writes approximations of irrational numbers. 	•	• Irrational numbers should involve square roots or pi (π) .	
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 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., π²). Evidence Required: 3. The student writes approximations of irrational numbers. Evidence Required: 3. The student writes approximations of irrational numbers. Evidence Required: 3. The student writes approximations of irrational numbers. Example Stem: Enter the approximate value of 2√47 to the nearest tenth. Rubric: (1 point) Student gives the correct approximation at the specified degree of approximation (e.g., 13.6 or 13.7). Response Type: Equation/Numeric 			
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Required: 3. The student writes approximations of irrational numbers as rational numbers.Example Steam Enter the approximate value of 2V17 to the hearest tenth.Rubric: (1 point) Student gives the correct approximation at the specified degree of approximation (e.g., 13.6 or 13.7).Response Type: Equation/Numeric			
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irrational numbers as rational numbers. Response Type: Equation/Numeric			
rational numbers. Response Type: Equation/Numeric			
Response Type: Equation/Numeric		specified degree of approximation (e.g., 13.6 or 13.7).	
	rational numbers.		
		Response Type: Equation/Numeric	
Tools: None	Tools: None		



Task Model 3	Prompt Features: The student identifies the range in which the	
Idsk Model S	value of a numerical expression whose value is irrational falls.	
Response Type: Multiple Choice, single correct response	 Stimulus Guidelines: Irrational numbers should involve square roots, cube roots, or pi (π). The expression could include the operations of addition, 	
DOK Level 2	• The expression could include the operations of addition, subtraction, multiplication, and division.	
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	 Item difficulty can be adjusted via these methods: The numerical expression is a single irrational number between √2 and √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 TM3c Stimulus: The student is presented with a numerical expression 	
expressions (e.g., π^2).	whose value is irrational.	
Evidence	Example Stem: Which range contains the value of $\sqrt{(16 + 9 + 20)}$?	
Required: 3. The student writes approximations of irrational numbers as rational numbers.	A. between 6.6 and 6.8B. between 7.5 and 7.7C. between 16.8 and 17.0D. between 22.4 and 22.6	
Tools: None	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."	
	Rubric: (1 point) Student selects the correct range (e.g., A).	
	Response Type: Multiple Choice, single correct response	



Task Model 4	Prompt Features: The student compares the sizes of irrational numbers.	
Response Type:	numbers.	
Multiple Choice,	Stimulus Guidelines:	
multiple correct	 Four or five expressions are to be given as options. 	
response	 At least two of the options must be correct responses. 	
response	 Item difficulty can be adjusted by varying the complexity of 	
DOK Level 2	the stem and answer choices:	
	• They are simple numerical expressions with rational or	
8.NS.A.2	irrational values such as integers, fractions, decimals	
Use rational	to the tenths, radicals up to $\sqrt{30}$, integers with a	
approximations of	fractional exponent, or multiples of pi (π) .	
irrational numbers to	 They are more complex expressions with rational or 	
compare the size of	irrational values involving one operation (including	
irrational numbers,	exponentiation) with integers, fractions, decimals to	
locate them	the hundredths place, radicals up to $\sqrt{120}$, and	
approximately on a	multiples of pi.	
number line	• They are more complex expressions with rational or	
diagram, and	irrational values involving one or more operations	
estimate the value of	(including exponentiation) with integers, fractions,	
expressions (e.g.,	decimals, radicals, exponents, multiples of pi.	
π^{2}).		
F uidemee	TM4a Stimulus: The student is presented with a list of numerical	
Evidence Required:	expressions some of which have irrational values.	
4. The student	expressions some of which have inational values.	
compares the sizes	Example Stem: Select all expressions that have a value greater	
of irrational numbers	than 5.	
by using rational		
approximations of	Α. 2π	
irrational numbers.	B. $\frac{10}{\sqrt{3}}$	
	D. $\sqrt{3}$	
Tools: None	C. $3 + \sqrt{2}$	
	D. 5.7 - $\frac{6}{\sqrt{20}}$	
	γ20	
	Rubric: (1 point) Student selects all the appropriate expressions	
	(e.g., A and B).	
	Response Type: Multiple Choice, multiple correct response	



Task Model 4 Response Type:	Prompt Features: The student selects true statements about the comparison of two numerical expressions, one or both of which has an irrational value.
Matching Tables DOK Level 1 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).	 Stimulus Guidelines: Item difficulty can be adjusted via these methods: Expressions being compared may be single numbers written as fractions, decimals to the tenths, radicals up to √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 √120, integers with a fractional exponent, or multiples of pi (π). TM4b Stimulus: The student is presented with an inequality involving an irrational number. Example Stem: Select True or False to indicate whether each comparison is true.
Evidence	True False
Required: 4. The student compares the sizes of irrational numbers	$\frac{4}{7} > \sqrt{19}$ $\sqrt{40} > 7$
by using rational approximations of irrational numbers.	$\frac{20}{\sqrt{30}} > \frac{2}{3}$
Tools: None	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.
	Response Type: Matching Tables



	ATICS ITEM Specification CLITA Assessment Consortium
Task Model 5	Prompt Features: The student is prompted to plot the approximate value of an irrational number onto a number line.
Response Type:	
Graphing	Stimulus Guidelines:
	• Irrational numbers should involve square roots or pi (π) .
DOK Level 1	 Item difficulty can be adjusted via these methods:
	 approximation is to the nearest whole number
8.NS.A.2	 approximation is to the nearest tenth.
Use rational	
approximations of	TM5b
irrational numbers to	Stimulus: The student is presented with a number line and an
compare the size of irrational numbers,	irrational number.
locate them	Example Stem: Use the Add Point tool to approximate the value of
approximately on a	$\sqrt{78}$ to the nearest tenth on the number line.
number line diagram, and	
estimate the value of	
expressions	7 7.5 8 8.5 9
(e.g., π^2).	Takene stiens Chudent will use the Add Deint teel to supply a neint on
	Interaction: Student will use the Add Point tool to graph a point on
Evidence	a number line containing snap-to regions at every tic mark. Add Point and Delete tools should be provided.
Required:	
5. The student	Rubric: (1 point) Student plots a point at the correct approximation
approximates the	(e.g., 8.8).
locations of irrational	
numbers on the number line by using	Response Type: Graphing
rational	
approximations of	
irrational numbers.	
Tools: None	
Accessibility Note:	
Graphing items are	
not currently able to	
be Brailled. Minimize	
the number of items	
developed to this	
TM.	
Version 3 Update:	
Retired TM5a	



Grade 8 Mather	matics Item Specification C1 TA Assessment Consortium
Task Model 5	Prompt Features: The student is prompted to drag numerical
	expressions whose value is irrational onto a number line to show the
Response Type:	approximate locations of the values.
Drag and Drop	
	Stimulus Guidelines:
DOK Level 1	• Irrational numbers should involve square roots, cube roots, or π .
8.NS.A.2	 The expression could involve any of the four operations. Items difficulty can be adjusted via these methods:
Use rational	
approximations of	• Expressions are π or in the form of \sqrt{x} where x is a positive integer less than 30.
irrational numbers	 Expressions involve addition, subtraction, or
to compare the	multiplication of π or \sqrt{x} where x is a positive integer less
size of irrational	than 30.
numbers, locate	 Expressions involve division or more than one operation,
them	including taking radicals.
approximately on	
a number line	ТМ5с
diagram, and	Stimulus: The student is presented with a number line and three
estimate the value	expressions containing irrational numbers.
of expressions (e.g., π^2).	
(e.g., <i>n</i>).	Example Stem: Drag each expression to the number line to show the
Evidence	approximate value.
Required:	
5. The student	
approximates the	
locations of	• • • • • • • • • • • • • • • • •
irrational numbers	
on the number line	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
by using rational approximations of	
irrational numbers.	$2\sqrt{14}$ 2π $3\sqrt{10}$
in adonar numbers.	
Tools: None	Interaction: A palette on the bottom should be given for the three
	one-time use irrational expressions. Students should drag the
Accessibility	expressions into the appropriate boxes on the number line. There
Note: Drag and	should be an arrow from the number line to the box indicating exactly
Drop items are not	at which tic mark the expression should be placed.
currently able to	
be Brailled. Minimize the	Rubric: (1 point) Student places all three expressions in the correct
number of items	location (e.g., 2π , $2\sqrt{14}$, $3\sqrt{10}$).
developed to this	Bechange Type, Drag and Dran
TM.	Response Type: Drag and Drop