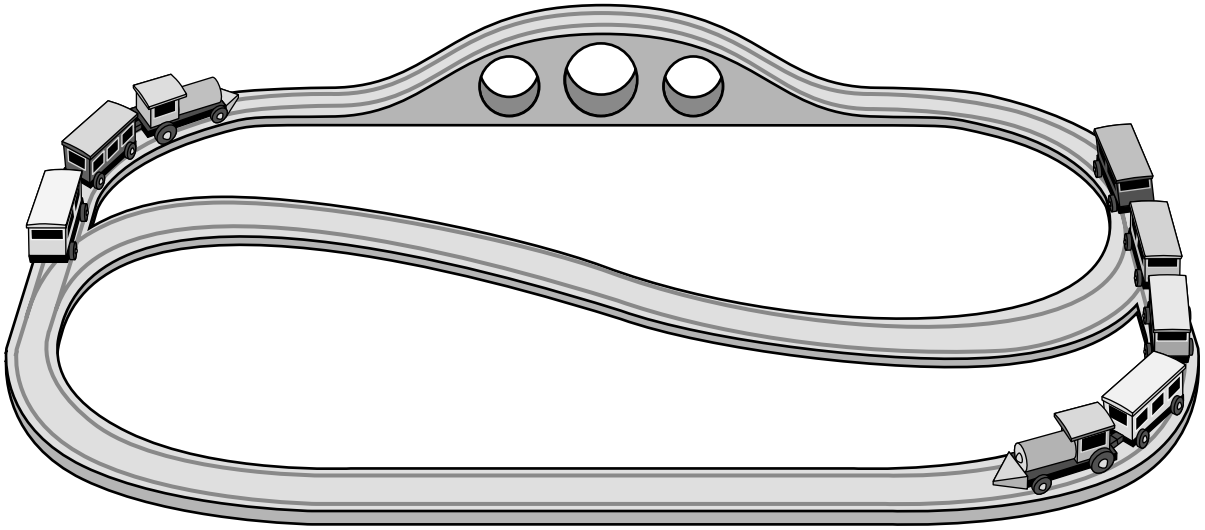
Kentucky Summative Assessments

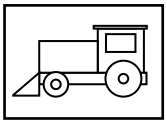
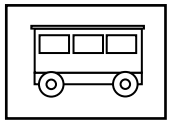
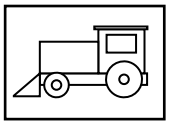
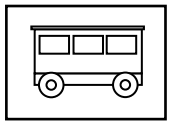
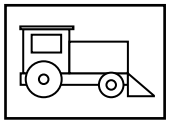
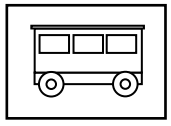
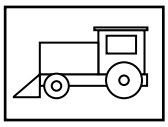
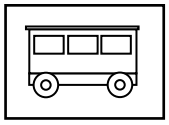
Grade 4 Science
Released Items
2023

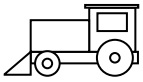
Sam collects toy trains. Several of his trains operate using invisible forces such as gravity, magnetism, and electricity.

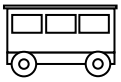


Sam invites his new friend, Ben, over to play with his magnetic train set. As Sam starts to create a train, Ben asks him how he knows how to put the cars together so they will stay together when the train is pulled. Sam says it is all about invisible forces! Ben decides to investigate. He begins by taking two train pieces with magnets on both ends and arranges them in different patterns to see if they will connect. His observations are recorded in the chart below.

Sam's Magnet Investigation

		Connect	Did Not Connect
A	T1: N  S T2: N  S	✓	
B	T2: N  S T1: N  S	✓	
C	T1: S  N T2: N  S		✓
D	T2: N  S T1: S  N		✓

 = engine

 = last car

N = North pole

S = South pole

1

SC041603_01_4

Based on Ben's observations of engine combinations, what one question could **most likely** be answered?

A Does the number of engines matter?

B Does the mass of the engines matter?

C Does where the magnet is placed on the engine matter?

D Does the direction in which the engines are placed matter?

Released Item Performance

Kentucky Summative Assessments

Spring 2023
Grade 4
Science

Item: SC041603_01
Book Question Number: 1

Standard: 3-PS2-1

Item Type: MC
Key: D

Student Group	Number of Students	Percent Correct	Average Item Score	Item Breakout Statistics - Answer Choice Options			
				A (%)	B (%)	C (%)	D (%)
All Students	**35,700**	42%	0.42	9%	12%	37%	42%
Gender							
Female	**17,340**	42%	0.42	9%	12%	37%	42%
Male	**18,357**	42%	0.42	9%	12%	37%	42%
Ethnicity							
African American	**3,803**	33%	0.33	12%	16%	39%	33%
American Indian or Alaska Native	**45**	40%	0.40	4%	20%	36%	40%
Asian	**783**	50%	0.50	5%	6%	39%	50%
Hispanic or Latino	**3,188**	38%	0.38	9%	13%	40%	38%
Native Hawaiian or Pacific Islander	**76**	43%	0.43	5%	13%	38%	43%
White (non-Hispanic)	**25,825**	44%	0.44	8%	12%	36%	44%
Two or more races	**1,977**	40%	0.40	10%	13%	37%	40%
Migrant	**178**	37%	0.37	6%	13%	44%	37%
English Learner	**2,998**	36%	0.36	10%	13%	40%	36%
Economically Disadvantaged	**22,173**	39%	0.39	10%	14%	37%	39%
Students with Disabilities	**6,190**	40%	0.40	11%	13%	36%	40%

SC041603_00a

Ben notices that when he tries to pull his train fast, the engine separates from the cars. He thought about the forces acting on his train.

2

SC041603_02_4

Which one of the statements **best** explains what Ben observed?

A The pulling force of the engine is less than the force slowing the cars down.

B The pulling force of the engine is greater than the force slowing the cars down.

C The pulling force of the engine is less than the magnetic force between the cars.

D The pulling force of the engine is greater than the magnetic force between the cars.

Released Item Performance

Kentucky Summative Assessments

Spring 2023
Grade 4
Science

Item: SC041603_02
Book Question Number: 2

Standard: 3-PS2-1

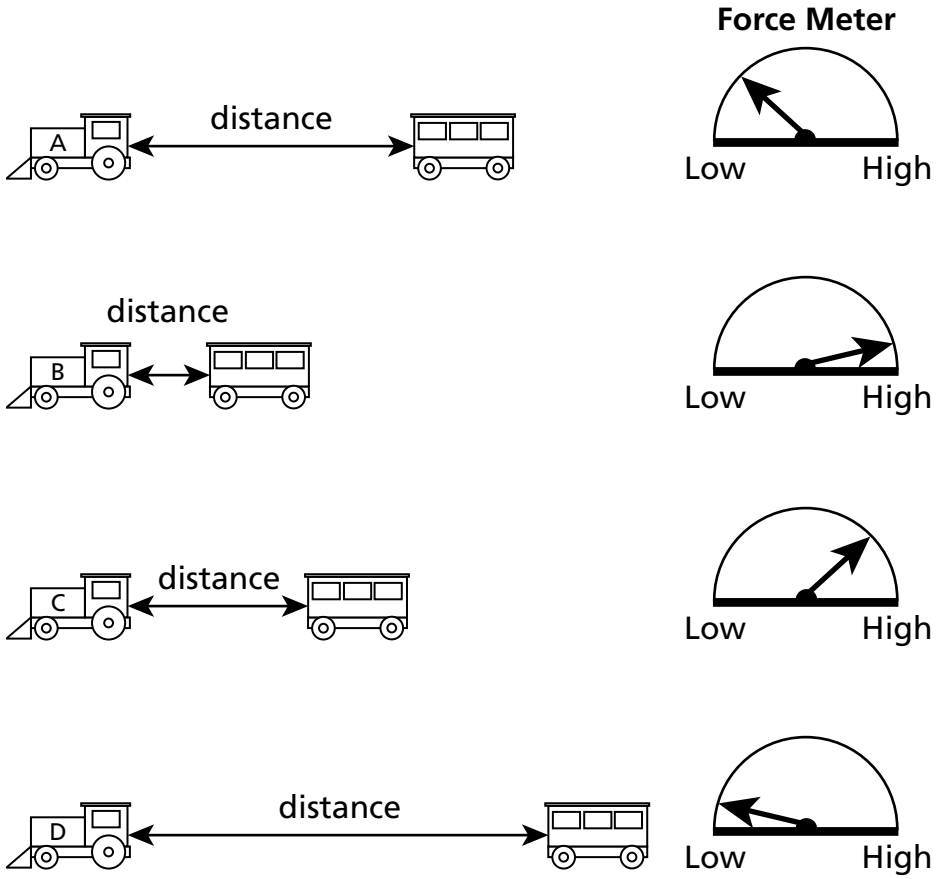
Item Type: MC
Key: D

Student Group	Number of Students	Percent Correct	Average Item Score	Item Breakout Statistics - Answer Choice Options			
				A (%)	B (%)	C (%)	D (%)
All Students	**35,698**	39%	0.39	15%	22%	24%	39%
Gender							
Female	**17,342**	38%	0.38	15%	22%	25%	38%
Male	**18,353**	41%	0.41	14%	22%	24%	41%
Ethnicity							
African American	**3,803**	28%	0.28	19%	26%	28%	28%
American Indian or Alaska Native	**45**	40%	0.40	20%	20%	20%	40%
Asian	**783**	51%	0.51	11%	17%	21%	51%
Hispanic or Latino	**3,188**	32%	0.32	16%	24%	28%	32%
Native Hawaiian or Pacific Islander	**76**	38%	0.38	14%	22%	25%	38%
White (non-Hispanic)	**25,823**	42%	0.42	14%	21%	23%	42%
Two or more races	**1,977**	34%	0.34	14%	24%	28%	34%
Migrant	**178**	32%	0.32	9%	25%	34%	32%
English Learner	**2,998**	31%	0.31	17%	24%	28%	31%
Economically Disadvantaged	**22,175**	35%	0.35	16%	23%	25%	35%
Students with Disabilities	**6,192**	38%	0.38	15%	22%	25%	38%

SC041603_00b

Ben wants to build a different train that will stay together. As he places an engine on the track near some other train cars, he notices that the engine and cars come together without his help. He wants to know if the same thing would happen with each of his engines.

He conducts another investigation and records his findings. The following diagram shows the relationship between the strength of the magnetic force (shown on the force meter) and the distance between the engine and the car (shown by the double-arrowhead distance lines).



GO ON▶

3

SC041603_03_2

Which one of these statements **best** summarizes the relationship shown in this model?

A The lower the distance, the lower the magnetic force.

B The lower the distance, the greater the magnetic force.

C The greater the distance, the greater the magnetic force.

D Distance and magnetic force aren't related.

Released Item Performance

Kentucky Summative Assessments

Spring 2023
Grade 4
Science

Item: SC041603_03
Book Question Number: 3

Standard: 3-PS2-1, 3-PS2-3

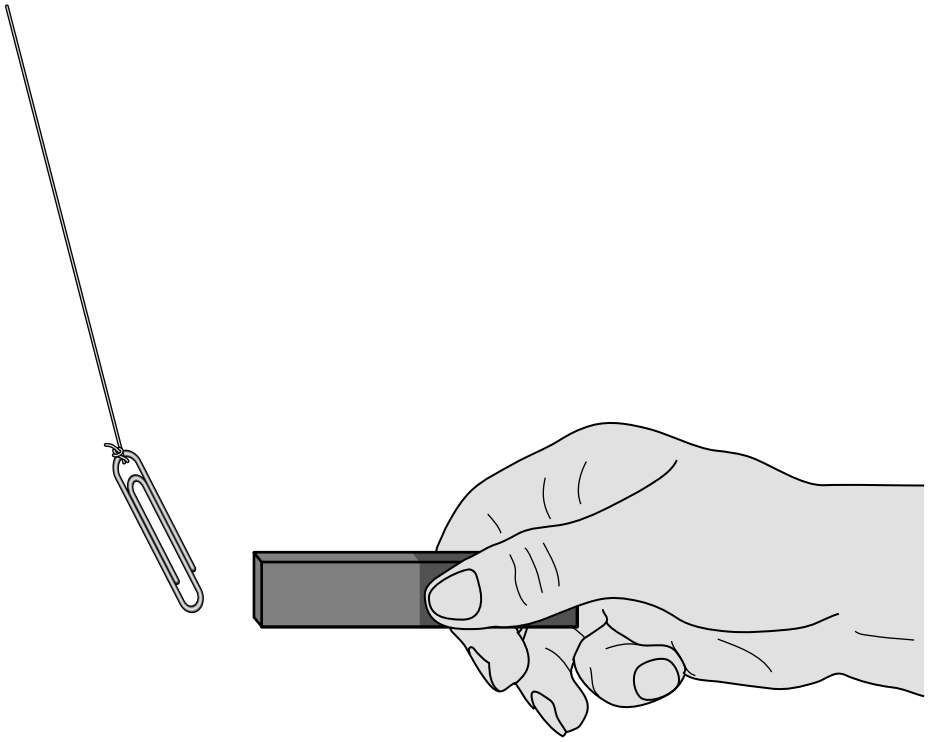
Item Type: MC
Key: B

Student Group	Number of Students	Percent Correct	Average Item Score	Item Breakout Statistics - Answer Choice Options			
				A (%)	B (%)	C (%)	D (%)
All Students	**35,702**	57%	0.57	17%	57%	20%	7%
Gender							
Female	**17,345**	54%	0.54	18%	54%	21%	6%
Male	**18,354**	59%	0.59	17%	59%	18%	7%
Ethnicity							
African American	**3,804**	44%	0.44	20%	44%	26%	10%
American Indian or Alaska Native	**45**	53%	0.53	9%	53%	31%	7%
Asian	**783**	67%	0.67	14%	67%	14%	4%
Hispanic or Latino	**3,187**	48%	0.48	18%	48%	25%	9%
Native Hawaiian or Pacific Islander	**76**	49%	0.49	24%	49%	26%	1%
White (non-Hispanic)	**25,827**	59%	0.59	17%	59%	18%	6%
Two or more races	**1,977**	54%	0.54	18%	54%	21%	7%
Migrant	**178**	47%	0.47	17%	47%	24%	12%
English Learner	**2,999**	45%	0.45	18%	45%	28%	9%
Economically Disadvantaged	**22,176**	52%	0.52	18%	52%	22%	8%
Students with Disabilities	**6,192**	47%	0.47	19%	47%	24%	11%

SC041603_00c

Sam asks if changing the magnet would help keep the train cars together. He gathers several different magnets and conducts the following investigation.

He hangs a paper clip from a piece of string. Next, he holds each of the different magnets in the same spot and observes the paper clip.



4

SC041603_04_4

What one thing is Sam **most likely** trying to measure with this investigation?

A Strength of gravity

B Position of the poles

C Mass of the paper clip

D Strength of the magnets

Released Item Performance

Kentucky Summative Assessments

Spring 2023
Grade 4
Science

Item: SC041603_04
Book Question Number: 4

Standard: 3-PS2-4

Item Type: MC
Key: D

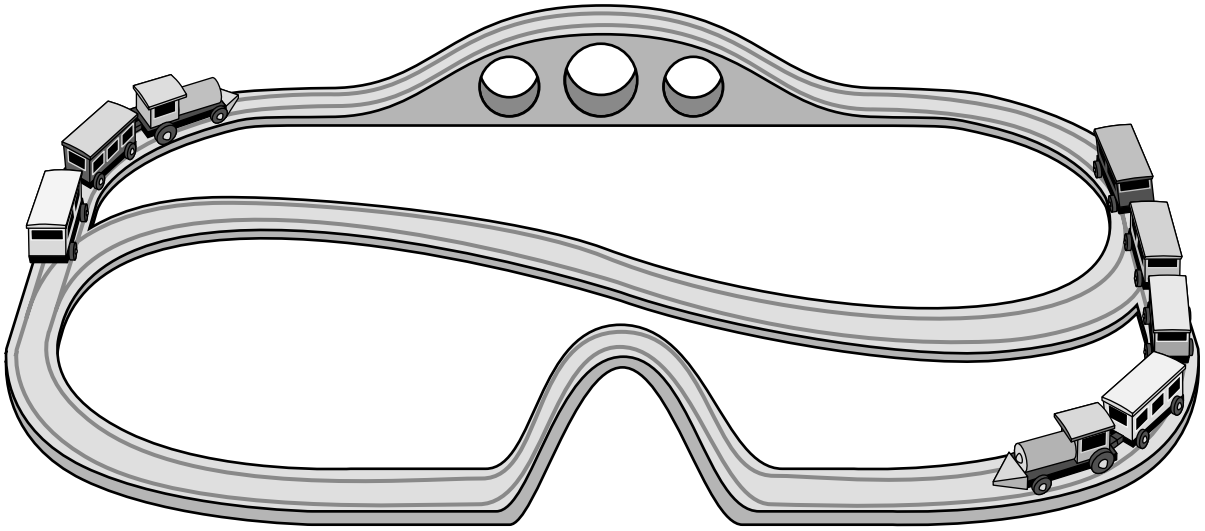
Student Group	Number of Students	Percent Correct	Average Item Score	Item Breakout Statistics - Answer Choice Options			
				A (%)	B (%)	C (%)	D (%)
All Students	**35,697**	68%	0.68	14%	7%	11%	68%
Gender							
Female	**17,343**	66%	0.66	15%	7%	12%	66%
Male	**18,351**	70%	0.70	13%	8%	9%	70%
Ethnicity							
African American	**3,805**	54%	0.54	19%	10%	17%	54%
American Indian or Alaska Native	**45**	69%	0.69	16%	4%	11%	69%
Asian	**783**	74%	0.74	10%	7%	8%	74%
Hispanic or Latino	**3,187**	60%	0.60	17%	9%	14%	60%
Native Hawaiian or Pacific Islander	**76**	63%	0.63	16%	7%	14%	63%
White (non-Hispanic)	**25,821**	71%	0.71	13%	7%	9%	71%
Two or more races	**1,977**	64%	0.64	16%	8%	12%	64%
Migrant	**178**	66%	0.66	10%	8%	16%	66%
English Learner	**2,999**	56%	0.56	18%	11%	16%	56%
Economically Disadvantaged	**22,172**	64%	0.64	15%	8%	13%	64%
Students with Disabilities	**6,189**	63%	0.63	15%	8%	14%	63%

SC041603_00d

Sam's train allows him to add more magnets to all the cars, including the engine. He has 10 magnets and 4 cars.

SC041603_00e

Sam and Ben add a tall hill to the train track. The boys notice that the trains that used to hold together on a flat track now come apart when going over the hill.



5

SC041603_09_2

Sam created a table to collect data for an experiment using his train as shown below. He was pulling the train over the hill portion of the track.

What experimental question was Sam trying to answer?

	Did the entire train make it over the hill?	
Number of train cars	Yes	No

A Does the strength of the magnet on the engine affect whether the train will make it over the hill?

B How many cars can be included in the train for the engine to pull the train successfully?

C How high can the hill be and still have the engine pull the train successfully?

D Does the order of cars matter for the engine to pull the train successfully?

Released Item Performance

Kentucky Summative Assessments

Spring 2023
Grade 4
Science

Item: SC041603_09
Book Question Number: 5

Standard: 3-PS2-3

Item Type: MC
Key: B

Student Group	Number of Students	Percent Correct	Average Item Score	Item Breakout Statistics - Answer Choice Options			
				A (%)	B (%)	C (%)	D (%)
All Students	**35,692**	28%	0.28	42%	28%	21%	8%
Gender							
Female	**17,343**	28%	0.28	43%	28%	22%	8%
Male	**18,346**	29%	0.29	42%	29%	21%	8%
Ethnicity							
African American	**3,804**	29%	0.29	41%	29%	21%	9%
American Indian or Alaska Native	**45**	27%	0.27	36%	27%	24%	13%
Asian	**783**	30%	0.30	42%	30%	21%	7%
Hispanic or Latino	**3,186**	27%	0.27	40%	27%	23%	10%
Native Hawaiian or Pacific Islander	**76**	29%	0.29	42%	29%	25%	4%
White (non-Hispanic)	**25,818**	29%	0.29	42%	29%	21%	8%
Two or more races	**1,977**	27%	0.27	44%	27%	22%	8%
Migrant	**178**	34%	0.34	35%	34%	20%	11%
English Learner	**2,998**	27%	0.27	38%	27%	23%	12%
Economically Disadvantaged	**22,171**	28%	0.28	41%	28%	22%	9%
Students with Disabilities	**6,191**	28%	0.28	36%	28%	21%	14%

6

SC041603_06_2

Which one reason **best** explains why adding the hill caused this change?

A Gravity and the engine are pulling in the same direction, and gravity is stronger.

B Gravity and the engine are pulling in different directions, and gravity is stronger.

C Gravity and the engine are pulling in the same direction, and the engine is stronger.

D Gravity and the engine are pulling in different directions, and the engine is stronger.

Released Item Performance

Kentucky Summative Assessments

Spring 2023
Grade 4
Science

Item: SC041603_06
Book Question Number: 6

Standard: 3-PS2-3

Item Type: MC
Key: B

Student Group	Number of Students	Percent Correct	Average Item Score	Item Breakout Statistics - Answer Choice Options			
				A (%)	B (%)	C (%)	D (%)
All Students	**35,696**	48%	0.48	24%	48%	16%	13%
Gender							
Female	**17,341**	45%	0.45	24%	45%	17%	14%
Male	**18,352**	50%	0.50	24%	50%	15%	12%
Ethnicity							
African American	**3,806**	37%	0.37	25%	37%	22%	16%
American Indian or Alaska Native	**45**	47%	0.47	20%	47%	13%	20%
Asian	**783**	53%	0.53	23%	53%	13%	11%
Hispanic or Latino	**3,187**	42%	0.42	23%	42%	19%	16%
Native Hawaiian or Pacific Islander	**76**	46%	0.46	21%	46%	17%	16%
White (non-Hispanic)	**25,819**	50%	0.50	24%	50%	14%	12%
Two or more races	**1,977**	45%	0.45	25%	45%	17%	13%
Migrant	**178**	38%	0.38	21%	38%	24%	17%
English Learner	**2,999**	35%	0.35	24%	35%	22%	19%
Economically Disadvantaged	**22,173**	43%	0.43	25%	43%	18%	14%
Students with Disabilities	**6,191**	39%	0.39	22%	39%	19%	19%

7

SC041603_07_2

Which one of these factors is **least likely** to affect the chance of the train coming apart as it travels over the hill?

A Speed of train

B Location of hill

C Number of cars

D Location of magnets

Released Item Performance

Kentucky Summative Assessments

Spring 2023
Grade 4
Science

Item: SC041603_07
Book Question Number: 7

Standard: 3-PS2-1

Item Type: MC
Key: B

Student Group	Number of Students	Percent Correct	Average Item Score	Item Breakout Statistics - Answer Choice Options			
				A (%)	B (%)	C (%)	D (%)
All Students	**35,701**	34%	0.34	23%	34%	24%	19%
Gender							
Female	**17,346**	34%	0.34	24%	34%	23%	19%
Male	**18,352**	34%	0.34	22%	34%	25%	18%
Ethnicity							
African American	**3,806**	25%	0.25	28%	25%	24%	23%
American Indian or Alaska Native	**45**	27%	0.27	22%	27%	31%	20%
Asian	**783**	38%	0.38	19%	38%	25%	19%
Hispanic or Latino	**3,188**	27%	0.27	25%	27%	25%	23%
Native Hawaiian or Pacific Islander	**76**	26%	0.26	24%	26%	30%	20%
White (non-Hispanic)	**25,823**	37%	0.37	22%	37%	24%	18%
Two or more races	**1,977**	33%	0.33	24%	33%	24%	19%
Migrant	**179**	20%	0.20	30%	20%	24%	26%
English Learner	**3,000**	24%	0.24	25%	24%	25%	26%
Economically Disadvantaged	**22,175**	30%	0.30	25%	30%	24%	21%
Students with Disabilities	**6,191**	26%	0.26	23%	26%	26%	25%

SC041603_00f

Ben wants to use an engine to back a three-car train onto the parking area as he finishes playing with it. Sam challenges him to keep the engine from touching the cars but still back them into the parking area.

8

SC041603_08

Explain how Ben could use magnetic forces to move the train cars into the train parking area without touching them.

Released Item Performance

Kentucky Summative Assessments

Spring 2023
Grade 4
Science

Item: SC041603_08
Book Question Number: 8

Standard: 3-PS2-3

Item Type: ER
Key: Rubric

Student Group	Number of Students	Percent Correct	Average Item Score	Item Breakout Statistics - Score Percentages				
				Score 0 (%)	Score 1(%)	Score 2 (%)	Score 3 (%)	Score 4 (%)
All Students	**34,816**	16.8%	0.67	45%	46%	6%	2%	1%
Gender								
Female	**17,037**	16.5%	0.66	45%	47%	5%	2%	1%
Male	**17,776**	17.1%	0.69	45%	45%	7%	2%	1%
Ethnicity								
African American	**3,616**	11.8%	0.47	59%	37%	3%	1%	0%
American Indian or Alaska Native	**44**	13.6%	0.55	59%	32%	7%	0%	2%
Asian	**776**	22.5%	0.90	35%	49%	9%	4%	2%
Hispanic or Latino	**3,084**	13.3%	0.53	54%	41%	4%	1%	0%
Native Hawaiian or Pacific Islander	**76**	17.8%	0.71	46%	41%	11%	1%	1%
White (non-Hispanic)	**25,302**	17.9%	0.72	42%	48%	7%	2%	1%
Two or more races	**1,915**	15.5%	0.62	48%	44%	6%	1%	0%
Migrant	**173**	11.4%	0.46	62%	33%	3%	1%	1%
English Learner	**2,900**	11.8%	0.47	59%	37%	3%	1%	0%
Economically Disadvantaged	**21,491**	14.8%	0.59	51%	42%	5%	1%	1%
Students with Disabilities	**5,857**	12.2%	0.49	59%	34%	5%	1%	0%

	Kentucky Academic Standards Science Rubric
Score Point	**Description**
4	There is evidence in this response that the student has a complete and thorough understanding of the multi-dimensional question as evidenced by their explanation of the phenomenon and/or solution to the problem. The response is complete, thorough and correct and based on appropriate knowledge and skills The response does not contain errors or flaws in logical thinking or those flaws are irrelevant to the accuracy of the answer The response reflects complete synthesis and understanding of complex ideas The response is completely coherent and based on effective application of relevant dimensions (SEP and/or DCI and/or CC) The response integrates a solution that is completely correct and based on the principles of engineering design (if applicable)
3	There is evidence in this response that the student has a general understanding of the multi-dimensional question as evidenced by their explanation of the phenomenon and/or solution to the problem. The response is generally complete and the question is answered using appropriate knowledge and skills The response may contain minor errors or flaws in logical thinking and those flaws may or may not be irrelevant to the accuracy of the answer The response reflects a general synthesis and understanding of complex ideas The response is generally coherent and based on application of relevant dimensions (SEP and/or DCI and/or CC) The response integrates a solution that is generally correct and mostly based on the principles of engineering design (if applicable).
2	There is evidence in this response that the student has a limited understanding of the multi-dimensional question as evidenced by their explanation of the phenomenon and/or solution to the problem. The response is partially complete and/or the question is answered using limited understanding of knowledge and skills The response may contain significant errors or flaws in logical thinking The response reflects a limited synthesis and understanding of complex ideas The response may or may not be coherent and based on some application of relevant dimensions (SEP and/or DCI and/or CC) The response integrates a solution that is partly correct and may or may not be based on the principles of engineering design (if applicable).
1	There is evidence in this response that the student has a minimal understanding of the multi-dimensional question as evidenced by their explanation of the phenomenon and/or solution to the problem. The response is minimal and/or the question is answered using minimal understanding of knowledge and skills The response may contain major significant errors or flaws in logical thinking The response reflects a minimal synthesis and understanding of complex ideas The response is not coherent or is not based on application of relevant dimensions (SEP and/or DCI and/or CC) The response integrates a solution that is minimally correct and may or may not be based on the principles of engineering design (if applicable).
0	There is no evidence that the student has an understanding of the material related to the question being asked in terms of science content and logical thinking skills. The response is blank, entirely incorrect and/or irrelevant.

Anchor Set

A1

He can lift the train track that can make the cars go in the train parking.

Anchor Annotation, Paper 1
Score Point 0

There is no evidence that the student has an understanding of how magnetic forces act upon objects. The response attempts to address how Ben can use magnetic forces to move the train without touching it, but the information provided is irrelevant (lift the train track). The explanation offered does not contain any relevant details (can make the cars go in the train parking).

A2

Engine could have a different force than the three cars. So the Engine will not touch the cars.

Anchor Annotation, Paper 2
Score Point 0

There is no evidence that the student has an understanding of how magnetic forces act upon objects. The response attempts to address how Ben can use magnetic forces to move the train without touching it, but the information provided is incorrect (Engine could have a different force) since all forces would be magnetic forces. The explanation offered does not contain any relevant details (the Engine will not touch the cars).

A3

Ben couldn't use magnetic forces to move the train cars into the train parking area without touching them because it needs a lot or a little bit of force to move because magnets only keep them together but he could use magnettic foce by not making them fall a part.

Anchor Annotation, Paper 3
Score Point 0

There is no evidence that the student has an understanding of how magnetic forces act upon objects. The response incorrectly claims that Ben cannot use magnetic forces to move the train without touching it (couldn't use magnetic forces to move the train). The explanation offered does not contain any relevant details (because it needs a lot or a little bit of force to move) and shows no understanding of the concepts of the question.

A4

I predict that he could stick a magnet on the train parking area and then all of the train cars with magnets on them will come back and stick to it and then it parks it.

Anchor Annotation, Paper 4
Score Point 1

There is evidence in this response that the student has minimal understanding of how magnetic forces act upon objects. The response minimally addresses how Ben can use magnetic forces to move the train without touching it (stick a magnet on the train parking . . . cars with magnets on them will come back and stick to it). The student identifies that the train will "stick to it" or **attract** using magnets. No identification is given of the poles that student is using, so this response provides that magnets attract which is correct and minimally shows an understanding of how magnetic forces work.

A5

You could make them north to north or south to south because the push.

Anchor Annotation, Paper 5
Score Point 1

There is evidence in this response that the student has minimal understanding of how magnetic forces act upon objects. The response minimally addresses how Ben can use magnetic forces to move the train without touching it by identifying correct like poles and providing a minimal explanation of what like poles will do (north to north or south to south because the push). Without greater specificity of the use of magnetic forces or further elaboration, this response does not earn a higher score.

A6

Ben could use magnets to park cars but do not touch them by switching the magnets around so they push instead of pull.

Anchor Annotation, Paper 6
Score Point 1

There is evidence in this response that the student has minimal understanding of how magnetic forces act upon objects. The response minimally addresses how Ben can use magnetic forces to move the train without touching it (switching the magnets around so they push instead of pull). While the response is correct that magnets need to push instead of pull, no details or elaboration is given for how the pushing happens; the student only provides this happens "by switching the magnets around", which does not explain what poles would be used. Greater explanation of the poles that repel or additional details are needed to move to a higher score point.

A7

How Ben could use magnetic force to move the trains is if you have north pole facing north pole it will not bond and go together it will reject each other and push away.

Anchor Annotation, Paper 7
Score Point 2

There is evidence in this response that the student has limited understanding of how magnetic forces act upon objects. The response is partially complete (north pole facing north pole) and reflects limited synthesis of the information in the stimulus regarding magnetic forces (it will not bond . . . it will reject each other and push away). The response lacks specific information regarding the experiment and elaboration needed to achieve a higher score, yet correct identification of the poles that repel, and the correct understanding that "not bonding . . . rejecting . . . push away" is an equivalent way to express a magnetic force of repelling, which is sufficient to demonstrate partial understanding.

A8

He could have a magnet in front of the purple car. Then you would put N and N and the cars would repel to the train parking.

Anchor Annotation, Paper 8
Score Point 2

There is evidence in this response that the student has limited understanding of how magnetic forces act upon objects. The response is partially complete (have a magnet in front . . . you would put N and N) and reflects limited synthesis of the information in the stimulus regarding magnetic forces (and the cars would repel to the train parking). The response lacks specific information regarding the experiment and elaboration needed to achieve a higher score, yet correct identification of the poles that repel, and the correct understanding that pushing is equivalent to a magnetic force of repelling is sufficient to demonstrate partial understanding.

A9

Ben could first find which two sides repel from each other. Then, start slowly backing up the engine until they get to where they need to park. You can finally turn the engine around and conect it to the three other cars.

Anchor Annotation, Paper 9
Score Point 2

There is evidence in this response that the student has limited understanding of how magnetic forces act upon objects. The response is partially complete (find which two sides repel from each other. Then, start slowly backing up the engine) and reflects limited synthesis of the information in the stimulus regarding a magnetic force of repelling. The response lacks specific information regarding the experiment and elaboration needed to achieve a higher score, specifically no integration of poles is given, yet this is sufficient to a demonstrate limited understanding.

A10

My claim is that he should use the same sideof the magnet as the last car there to repel the trains to train parking. My evidence is that when a magnet is meets with the same side as it it will repell from it. My reasoning is when two of the same forces go aginst eachother they will repel and the train's will go right to parking.

Anchor Annotation, Paper 10
Score Point 3

There is evidence in this response that the student has a general understanding of how magnetic forces act upon objects. The response provides a generally complete explanation of magnetic poles by referencing the use of the same poles (he should use the same sideof the magnetas the last car) and reflects general synthesis of the information in the stimulus regarding a repelling magnetic force (to repel the trains to train parking. My evidence is that when a magnet is meets with the same side as it it will repell from it … and the train's will go right to parking). Integrating additional specifics about the orientation of the poles, such as north to north or south or south, would help this response show additional understanding.

A11

Ben could use magnetic forces to move the train cars into the parking area without touching them by using either a negative-negative, or positive-positive magnetic force. Only when a magnetic force is positive-negative, or vise-versa, will the magnets connect. There fore using negative force on negative, or positive-positive force, the engine will push the other train cars away into the parking area without touching them verbally. This, show I think Ben could use magnetic forces to put the train cars into the parking area without touching them with the engine.

Anchor Annotation, Paper 11
Score Point 3

There is evidence in this response that the student has a general understanding of how magnetic forces act upon objects. The response provides a generally complete explanation of magnetic poles by referencing the use of same forces (using either a negative-negative, or positive-positive magnetic force), but references the poles as "negative-negative" or "positive-positive" which is considered a relevant minor error. Magnetic fields are associated with two magnetic poles, north and south, and while magnetic fields can be produced by the moving charges of positive and negative electrons creating a positive and a negative field in every magnet, the stimulus in this item is clearly referencing north and south. The response reflects a general synthesis of the information in the stimulus regarding magnetic forces (Only when a magnetic force is positive-negative, or vise-versa, will the magnets connect . . . using negative force on negative, or positive-positive force, the engine will push the other train cars away into the parking area without touching them). The minor error of reference to positive and negative, without relating it to north and south as shown in the stimulus, keeps this response from showing the additional understanding needed to move to a score point 4.

A12

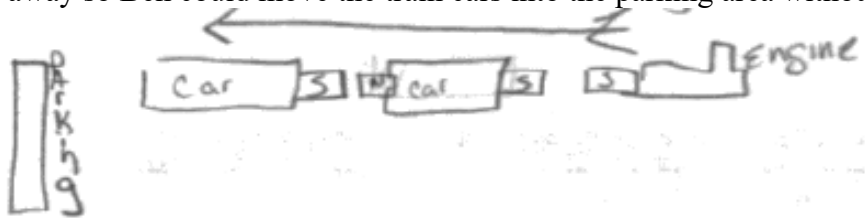
To make the trains move without touching the enigine to them, Ben can hover the engine in front of the last car on the trains. The two poles that are facing each other **have** to be the same. This is because if they aren't the engine and the car willl stick together. If both the poles are the same, the last car will bounce of the engine and push the entire train.

Anchor Annotation, Paper 12
Score Point 3

There is evidence in this response that the student has a general understanding of how magnetic forces act upon objects. The response provides a generally complete explanation of magnetic poles by referencing the use of the same poles (The two poles that are facing each other **have** to be the same) and reflects general synthesis of the information in the stimulus regarding a repelling magnetic force (Ben can hover the engine in front of the last car on the trains. The two poles that are facing each other **have** to be the same. This is because if they aren't the engine and the car willl stick together. If both the poles are the same, the last car will bounce of the engine and push the entire train.). Integrating additional specifics about the orientation of the poles, such as north to north or south or south, would help this response show additional understanding.

A13

Ben should put the magnets and cars so that the poles of the magnets that face each other are the same. Poles that are the same push away so Ben could move the train cars into the parking area without touching them.



Anchor Annotation, Paper 13
Score Point 4

There is evidence in this response that the student has a complete and thorough understanding of how magnetic forces act upon objects. The explanation, along with the provided diagram provides a thorough and complete understanding of like poles repelling (put the magnets and cars so that the poles of the magnets that face each other are the same . . . [diagram shows, Engine-S facing train car-S, and train car –N facing train car-S]), and reflects complete a synthesis of the information in the stimulus regarding the use of a magnetic force to repel (Poles that are the same push away . . . move the train cars into the parking area without touching them). The diagram helps provide clarity to this response by providing a through picture of the correct orientation of poles and the arrow indicating the movement of the train due to repelling forces.

Well, ben could use a north and a north magnet or a south and a south magnet, then he would get either sides that are alike, place them like you are going to put the magnets together,(remember there not going to go together) And then he is going to keep on putting one magnet to a like pole. Sinece they repel the force of the magnet will keep on pushing and pushing the like magnet until the train is finnaly in its parking place. he could do this because like poles repel and if he tried to put them to gether they wouldnt touch and they would back away from each other. If he did theis for a while the train would be in it parking place.

Anchor Annotation, Paper 14
Score Point 4

There is evidence in this response that the student has a complete and thorough understanding of how magnetic forces act upon objects. The explanation, along with the provided diagram provides a thorough and complete understanding of like poles repelling (ben could use a north and a north magnet or a south and a south magnet, then he would get either sides that are alike … then he is going to keep on putting one magnet to a like pole), and reflects complete a synthesis of the information in the stimulus regarding the use of a magnetic force to repel (place them like you are going to put the magnets together,(remember there not going to go together) … Sinece they repel the force of the magnet will keep on pushing and pushing the like magnet until the train is finnaly in its parking place). The response is well integrated and provides a thorough explanation of the science concepts of the question.

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