What is a Transportation Engineer?

Draw and label a picture of a transportation engineer at work.

Explain your drawing of a transportation engineer:

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What is a Transportation Engineer?

Draw a picture of a transportation engineer at work. Label your picture.
What is a Transportation Engineer?

Which of the following would a transportation engineer do for his or her job? Mark ALL that apply:

- [ ] drive subway trains
- [ ] repair city buses when they break down
- [ ] decide where to put stop signs and traffic lights
- [ ] construct and repair roads and bridges
- [ ] figure out how to make a highway safer
- [ ] improve how well a subway system works
- [ ] drive machines to construct train tracks
- [ ] figure out what kinds of train tracks to use
Directions: For each question below, circle the BEST answer.

1. Which of the following statements is true?
   A. Some magnets have only one pole.
   B. Magnets always repel other magnets.
   C. Magnets always attract other magnets.
   D. Poles that are the same repel each other.

2. A boy accidentally knocks everything off the top of his desk. He decides to use a magnet to collect some of the items. Which of these can he pick up with a magnet?
   A. papers   C. a marker
   B. staples   D. crayons

3. The nail is attracted to the horseshoe magnet pictured here but the penny is not. What does this tell us about the nail and the penny?
   A. The nail weighs less than the penny.
   B. A flat object is more magnetic than a round object.
   C. The nail and penny are made of the same material.
   D. The nail and the penny are made of different materials.

Question 3: adapted from Virginia Standards of Learning Assessments, Spring 2001 - Science q. 38, Grade 3.
A boy stacked 2 ring magnets on a peg as shown in the picture.

He made Ring Magnet A float over Ring Magnet B and measured the distance between them. Draw what will happen if he wraps Ring Magnet B in cloth.

Explain your drawing: __________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________
Directions: For each question below, circle the BEST answer.

1. A girl found a box containing 2 magnets. Only one magnet has markings showing its North and South poles. How could she identify the North and South poles of the unmarked magnet?

   A. stick both magnets together 
   B. stick both magnets to a refrigerator 
   C. sprinkle iron filings on both magnets 
   D. check to see if aluminum foil sticks to both magnets

2. A student places 2 magnets on a table exactly 4 inches apart. After she lets go, the magnets slide towards each other until they meet in the middle. If she places the 2 magnets 4 inches apart again, but this time with a book between them, what will happen to the magnets when she lets go?

   A. They will not move. 
   B. They will slide away from each other. 
   C. They will slide around the book, towards each other. 
   D. They will slide towards each other until they hit the sides of the book.
A boy is testing the properties of magnets. He slides a magnet towards a paperclip and measures the distance at which the paperclip starts moving towards the magnet. He records his results in a table shown below.

<table>
<thead>
<tr>
<th>Magnet Type</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bar Magnet</td>
<td>10 cm</td>
</tr>
<tr>
<td>Ring Magnet</td>
<td>5 cm</td>
</tr>
<tr>
<td>Disc Magnet</td>
<td>15 cm</td>
</tr>
<tr>
<td>Strip magnet</td>
<td>20 cm</td>
</tr>
</tbody>
</table>

Use this information to answer questions 1 and 2.

1. Based on the table, which magnet has the strongest magnetic field?

   ___________________________________________________________
   ___________________________________________________________
   ___________________________________________________________
   ___________________________________________________________

2. If he repeats his experiment using a larger and heavier paperclip, what will happen to the distance that the larger and heavier paperclip travels to stick to the magnets? Explain your answer.

   ___________________________________________________________
   ___________________________________________________________
   ___________________________________________________________
   ___________________________________________________________
   ___________________________________________________________
The diagram shows 2 bar magnets.

A girl moves the 2 magnets closer together. Draw and label 2 things that could happen in the space below.

Explain your drawing:________________________________________
_________________________________________________________
_________________________________________________________
_________________________________________________________

Question adapted from MCAS 2004 –Grade 5.
The diagram shows 2 bar magnets.

A girl moves the 2 magnets closer together. Draw and label 1 thing that could happen in the space below.

Question adapted from MCAS 2004 –Grade 5.
A group of students in a class designed a maglev transportation system to transport packages along a track. A diagram of their design is shown here. Use the diagram to answer questions 1 and 2.

1. The system was working well when the students tried to transport 5 packages, but when they tried to transport 6 packages, the vehicle did not levitate anymore. Which of the following changes to their system would NOT help them carry more packages? Circle the BEST answer below.

A. Add magnets to the track to increase the force of repulsion.
B. Flip the poles of the magnets on the track.
C. Replace the magnets on the vehicle with magnets that are not as heavy.
D. Replace the magnets on the vehicle with stronger magnets.

Turn over for question 2
2. The class decided to collect some data about how their maglev system was working with different numbers of magnets. The data are shown in the table below.

<table>
<thead>
<tr>
<th>Design</th>
<th>Trial A</th>
<th>Trial B</th>
<th>Trial C</th>
<th>Trial D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of magnets on vehicle</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Number of magnets on track</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Number of packages the vehicle can carry</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
</tbody>
</table>

Circle each statement below as TRUE (T) or FALSE (F).

- The vehicle can carry more packages if more magnets are added to the vehicle. T F
- The vehicle can carry more packages if more magnets are added to the track. T F
- To carry more packages, it is better to add an extra magnet to the track than to the vehicle. T F
A group of students are designing a Maglev transportation system to transport packages. They need to make the vehicle levitate as it is pushed along the track. The students created a design, made a plan, and built the model shown below.

They tested it, but it didn’t levitate. What could they do to solve this problem? Explain your answer.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Draw and label your improved design below.
A group of students are designing a Maglev transportation system to transport packages. They need to make the vehicle levitate as it is pushed along the track. The students created a design, made a plan, and built the model shown below. They tested it, but it didn’t levitate.

Directions: How would you change their Maglev transportation system so that it will levitate? Draw your design in the box below. Label the parts.
What is a Transportation Engineer?

Draw and label a picture of a transportation engineer at work.

A good picture would show someone working to design or improve a system that moves objects or people from place to place.

Examples include: someone working on the placement of stop signs and traffic lights on roads or highways, someone designing subway systems to make them safer or more efficient, etc.

Explain your drawing of a transportation engineer:

Answers will vary, but may include: someone who uses what he or she knows about science, math, safety, and efficiency to design systems that move objects or people from place to place.
What is a Transportation Engineer?

Draw a picture of a transportation engineer at work. Label your picture.

A good picture would show someone working to design or improve a system that moves objects or people from place to place.

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What is a Transportation Engineer?

Which of the following would a transportation engineer do for his or her job? Mark ALL that apply:

- [ ] drive subway trains
- [ ] repair city buses when they break down
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- [X] figure out how to make a highway safer
- [X] improve how well a subway system works
- [ ] drive machines to construct train tracks
- [X] figure out what kinds of train tracks to use
Directions: For each question below, circle the BEST answer.

1. Which of the following statements is true?
   A. Some magnets have only one pole.
   B. Magnets always repel other magnets.
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   D. Poles that are the same repel each other.

2. A boy accidentally knocks everything off the top of his desk. He decides to use a magnet to collect some of the items. Which of these can he pick up with a magnet?
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Question 3: adapted from Virginia Standards of Learning Assessments, Spring 2001 - Science q. 38, Grade 3.
A boy stacked 2 ring magnets on a peg as shown in the picture.

He made Ring Magnet A float over Ring Magnet B and measured the distance between them. Draw what will happen if he wraps Ring Magnet B in cloth.

Explain your drawing:

*Nothing should change because cloth will not block a magnetic field.*
Directions: For each question below, circle the BEST answer.

1. A girl found a box containing 2 magnets. Only one magnet has markings showing its North and South poles. How could she identify the North and South poles of the unmarked magnet?

A. stick both magnets together
B. stick both magnets to a refrigerator
C. sprinkle iron filings on both magnets
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Use this information to answer questions 1 and 2.

1. Based on the table, which magnet has the strongest magnetic field?

   The strip magnet because it pulls the paperclip the longest distance away.

2. If he repeats his experiment using a larger and heavier paperclip, what will happen to the distance that the larger and heavier paperclip travels to stick to the magnets? Explain your answer.

   The most likely answer is that all distances travelled will be smaller due to the larger paperclip having more weight and friction. However, students may also say that the larger paperclip has more magnetic material and thus the distance travelled will be larger. They may also think that these factors (the weight, friction, and amount of magnetic material) will cancel each other out and thus the distances will be the same. All of these answers are acceptable as long as the logic is explained. You may even wish to test this out with your students to see what results they obtain.

Question 2: adapted from NYSED Regents 2006-Grade 4.
The diagram shows 2 bar magnets.

A girl moves the 2 magnets closer together. Draw and label 2 things that could happen in the space below.

Examples:

Explain your drawing:

The two magnets will move together such that opposite poles are touching because opposite poles attract.

Question adapted from MCAS 2004 –Grade 5.
The diagram shows 2 bar magnets.

A girl moves the 2 magnets closer together. Draw and label 1 thing could happen in the space below.

Examples:

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<td><strong>Number of magnets</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>on vehicle</td>
<td>1</td>
<td>2</td>
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<td></td>
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<td>on track</td>
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A group of students are designing a Maglev transportation system to transport packages. They need to make the vehicle levitate as it is pushed along the track. The students created a design, made a plan, and built the model shown below.

They tested it, but it didn’t levitate. What could they do to solve this problem? Explain your answer.

Answers will vary, but may include: Attach the ring magnets to the bottom side of the vehicle with the south poles facing down.

Draw and label your improved design below.

The new drawing should show either the ring magnets or the strip magnet reversed, so that similar poles are adjacent. Putting the ring magnets on the bottom of the vehicle is optional.
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Example: