What is an Industrial Engineer?

Draw and label a picture of an industrial engineer at work.

Explain your drawing of an industrial engineer:

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What is an Industrial Engineer?

Draw a picture of an industrial engineer at work. Label your picture.
What is an Industrial Engineer?

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

- [ ] build a new bridge to replace an old one
- [ ] help a toy factory make more toys each day
- [ ] construct and repair roads and bridges
- [ ] improve how well people move through an airport
- [ ] clean up oil that was spilled by a factory
- [ ] improve the efficiency of a subway system
- [ ] make potato chips taste really good
- [ ] build new machines out of new metals
- [ ] figure out how to make a factory run better
- [ ] fix machines that are broken in a factory
Directions: Draw a line from the name of each simple machine to the picture that shows an example of it in use.

Inclined Plane

Lever

Pulley

Screw

Wedge

Wheel and Axle
Factory workers use the following steps when making a bookcase:

1. cut the wood
2. sand the wood
3. paint the wood
4. put the bookcase together
5. put the bookcase in a box

Each step is carried out at a different station in the factory.

The diagram on the back of this page shows a top-down view of a factory that makes bookcases. The wood used to make the bookcases is delivered through the delivery door. The finished bookcases leave the factory through the shipping doors.

1. Where would you put each of the five stations listed above in order to make the factory most efficient? Decide where you would put each station and write the number of the station at that location on the diagram on the back of this page.

2. Explain how you chose where to put each station in the factory and describe how this design helps to make the factory efficient.

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_______________________________________________________
Once you decide where you would put the 5 stations so that the factory is most efficient, write the number of each station on the diagram below.
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Directions: Decide where you would put each station. Cut out the pictures of the stations and paste them onto the diagram on the next page.
Decide where you would put the 5 stations so that the factory is most efficient. Paste the pictures of the stations on the diagram below.
1. A boy is using a rope and fixed single pulley to lift a weight. Draw an arrow on the picture below that shows the direction in which he is applying force to the rope.

![Diagram of a boy using a rope and fixed single pulley to lift a weight]

2. Circle ALL the pictures below that show a simple machine that could decrease the force needed to move the box in the direction of the arrow.

- Wheel and axle
- Fixed single pulley
- Inclined plane
- Lever
1. Look at the picture below and decide whether each statement is TRUE (T) or FALSE (F). Circle your answer below.

- More force is needed to move the box up the long inclined plane. 
  - T  F
- More force is needed to move the box up the short inclined plane. 
  - T  F
- The same amount of force is needed to move the box up both inclined planes. 
  - T  F

2. The diagram on the right shows 2 ways to lift the same object. Which would require LESS force to lift the object? Circle the BEST answer.

- A. using fixed a single pulley
- B. lifting it by hand
- C. both would require the same force
- D. it is impossible to tell
1. Describe 2 ways to use simple machines to decrease the force needed to push a box up an inclined plane.

(1) ____________________________________________________

_____________________________________________________________________________________________________

(2)_____________________________________________________

_____________________________________________________________________________________________________

2. A boy used the lever shown below to lift a box. The force required to lift the box was 7 Newtons.

How could he improve his lever to make it easier to lift the box?

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3. Draw a picture of your improved lever in the box below.
A group of students is designing 2 subsystems to move heavy boxes up onto a table. The 2 subsystems are shown in the image below. Subsystem 1 will move the box from Position 1 to Position 2, next to the table. Subsystem 2 will lift the box up to Position 3, on the table.

1. Give 1 example of a simple machine that could be used for Subsystem 1 to make work easier.

____________________________________________________________________________________

____________________________________________________________________________________

2. Give 1 example of a simple machine that could be used for Subsystem 2 to make work easier.

____________________________________________________________________________________

____________________________________________________________________________________

3. Give 1 example of a simple machine that could be used to move the box from Position 1 to Position 3 while making work easier.

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____________________________________________________________________________________
A group of students designed the system shown below to move boxes onto a table.

Directions: Improve the system so that the students will use LESS force to move the boxes. You can sketch your ideas on the back of this page, but draw your final design in the box below.

1. Draw your final improved system in the box below. Label the parts.

2. Explain how your system has reduced the amount of force needed to lift the box onto the table.

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________________________________________________________________________
A group of students designed the system shown below to move boxes onto a table.

Directions: Improve the system so that the students will use LESS force to move the boxes. You can sketch your ideas on the back of this page, but draw your final design in the box below.

1. Draw your final improved system in the box below. Label the parts.
What is an Industrial Engineer?

Draw and label a picture of an industrial engineer at work.

A good picture would show someone working to improve a process or system to make it easier, faster, safer, cheaper, and/or more efficient. They may be shown in a number of different settings (factory, hospital, airport, amusement park, etc.) drawing or discussing plans to solve a particular problem, such as determining the best use of space, employees, or equipment, or to help determine the most inexpensive and efficient way to make a product.

Examples include: designing a subway system so that it is more efficient, improving how people move through an airport, helping a toy factory make more toys each day, etc.

Explain your drawing of an industrial engineer:

Answers will vary, but may include: Someone who combines his or her creativity and understanding of science and math to improve industrial systems and make work easier, faster, and safer.
What is an Industrial Engineer?

Draw a picture of an industrial engineer at work. Label your picture.

A good picture would show someone working to improve a process or system to make it easier, faster, safer, cheaper, and/or more efficient. They may be shown in a number of different settings (factory, hospital, airport, amusement park, etc.) drawing or discussing plans to solve a particular problem, such as determining the best use of space, employees, or equipment, or to help determine the most inexpensive and efficient way to make a product.

Examples include: designing a subway system so that it is more efficient, improving how people move through an airport, helping a toy factory make more toys each day, etc.
What is an Industrial Engineer?

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

- [ ] build a new bridge to replace an old one
- [x] help a toy factory make more toys each day
- [ ] construct and repair roads and bridges
- [x] improve how well people move through an airport
- [ ] clean up oil that was spilled by a factory
- [x] improve the efficiency of a subway system
- [ ] make potato chips taste really good
- [ ] build new machines out of new metals
- [x] figure out how to make a factory run better
- [ ] fix machines that are broken in a factory
Directions: Draw a line from the name of each simple machine to the picture that shows an example of it in use.
Factory workers use the following steps when making a bookcase:

1. cut the wood
2. sand the wood
3. paint the wood
4. put the bookcase together
5. put the bookcase in a box

Each step is carried out at a different station in the factory.

The diagram on the back of this page shows a top-down view of a factory that makes bookcases. The wood used to make the bookcases is delivered through the delivery door. The finished bookcases leave the factory through the shipping doors.

1. Where would you put each of the five stations listed above in order to make the factory most efficient? Decide where you would put each station and write the number of the station at that location on the diagram on the back of this page.

2. Explain how you chose where to put each station in the factory and describe how this design helps to make the factory efficient.

   Examples will vary but may include: the first step (cut the wood) should be closest to the delivery door, the last step (put the bookcase in a box) should be closest to the shipping door, stations should be set up so that a station is close to the station that comes before and after it in the process, etc.
Once you decide where you would put the 5 stations so that the factory is most efficient, write the number of each station on the diagram below.

Example:

Materials are delivered here

Finished bookcases exit here

Delivery Door

Shipping Doors

Example:

1 5

2 3 4
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1. cut the wood
2. sand the wood
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Directions: Decide where you would put each station. Cut out the pictures of the stations and paste them onto the diagram on the next page.
Decide where you would put the 5 stations so that the factory is most efficient. Paste the pictures of the stations on the diagram below.

Materials are delivered here

Finished bookcases exit here

Example:

1. cut the wood
2. sand the wood
3. paint the wood
4. put the bookcase together
5. put the bookcase in a box
1. A boy is using a rope and fixed single pulley to lift a weight. Draw an arrow on the picture below that shows the direction in which he is applying force to the rope.

2. Circle ALL the pictures below that show a simple machine that could decrease the force needed to move the box in the direction of the arrow.
1. Look at the picture below and decide whether each statement is TRUE (T) or FALSE (F). Circle your answer below.

More force is needed to move the box up the long inclined plane.  

More force is needed to move the box up the short inclined plane.  

The same amount of force is needed to move the box up both inclined planes.

2. The diagram on the right shows 2 ways to lift the same object. Which would require LESS force to lift the object? Circle the BEST answer.

A. using a fixed single pulley
B. lifting it by hand
C. both would require the same force
D. it is impossible to tell
1. Describe 2 ways to use simple machines to decrease the force needed to push a box up an inclined plane.

*Answers will vary, but may include:*

*Make the inclined plane longer, put the box on a cart with wheels and axels and pull it up the inclined plane, attach the box to a double pulley and pull it up the inclined plane, etc.*

2. A boy used the lever shown below to lift a box. The force required to lift the box was 7 Newtons.

How could he improve his lever to make it easier to lift the box?

*Answers will vary, but may include: move the fulcrum closer to the box, extend the other side of the lever, etc.*

3. Draw a picture of your improved lever in the box below.
A group of students is designing 2 subsystems to move heavy boxes up onto a table. The 2 subsystems are shown in the image below. Subsystem 1 will move the box from Position 1 to Position 2, next to the table. Subsystem 2 will lift the box up to Position 3, on the table.

1. Give 1 example of a simple machine that could be used for Subsystem 1 to make work easier.
   
   wheel and axle or double pulley

2. Give 1 example of a simple machine that could be used for Subsystem 2 to make work easier.
   
   double pulley

3. Give 1 example of a simple machine that could be used to move the box from Position 1 to Position 3 while making work easier.
   
   inclined plane
A group of students designed the system shown below to move boxes onto a table.

Directions: Improve the system so that the students will use LESS force to move the boxes. You can sketch your ideas on the back of this page, but draw your final design in the box below.

1. Draw your final improved system in the box below. Label the parts.

2. Explain how your system has reduced the amount of force needed to lift the box onto the table.

Answers should be consistent with above drawing, but may include: a double pulley will reduce the amount of force needed to lift the box, while the single pulley only changes the direction that force is applied; using a wheel and axle (by putting the box on a cart) will reduce the amount of force needed to move the box up the inclined plane; the longer the inclined plane the less force is needed to move the box to the top; etc.
A group of students designed the system shown below to move boxes onto a table.

Directions: Improve the system so that the students will use LESS force to move the boxes. You can sketch your ideas on the back of this page, but draw your final design in the box below.

1. Draw your final redesigned system in the box below. Label the parts.

A good picture might show: replacing the single pulley with a double pulley, putting the box on a cart to push it up the inclined plane, making the inclined plane longer, etc.
A group of students designed the system shown below to move boxes onto a table.

Directions: Improve the system so that the students will use LESS force to move the boxes. You can sketch your ideas on the back of this page, but draw your final design in the box below.

A good picture might show: replacing the single pulley with a double pulley, putting the box on a cart to push it up the inclined plane, making the inclined plane longer, etc.