Name: _____ Group: _____ Date: _____

Tech labs

TECH 6

Standards and representations

PROGRAM:	AST
LAB TYPE:	Technological analysis
CONCEPT:	Standards and representations (diagrams, symbols)
STUDENT BOOK:	Chapter 12, page 408
TOOLBOX:	Pages 75–79

GOAL

Study the utility, operation and construction of a pair of locking pliers to complete a design plan and a technical diagram.

MATERIALS

- locking pliers
- piece of scrap wood

WHAT IS THE PURPOSE OF THE TECHNICAL OBJECT?

1. What are locking pliers used for?

_____

_____

2. Name at least three constraints that could be included among the specifications for this object.

_____

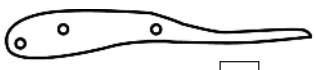
_____

_____

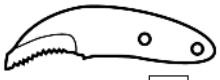
_____

HOW DOES THE TECHNICAL OBJECT WORK?

3. Locate the parts below on the locking pliers. Check off the parts as you identify them.

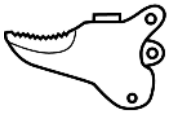


Lower handle ☐

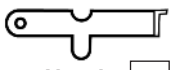


Upper jaw ☐

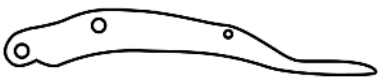
Spring ☐



Lower jaw ☐

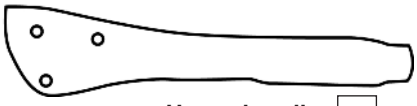


Notch ☐



Release lever ☐

Adjustment screw ☐



Upper handle ☐

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4. Grip the pliers with one hand. Gently squeeze the lower handle and observe what happens to the spring. Then, release the pressure.

a) What happens to the spring?

_____

_____

b) Note the two points that anchor the spring. Does the spring tend to pull them together, hold them apart or twist them?

_____

c) What type of spring is it? Check the correct answer.

- ☐ a compression spring, because it tends to hold its anchor points apart
- ☐ a tension (or *extension*) spring, because it tends to pull its anchor points together
- ☐ a torsion spring, because it tends to twist its anchor points

d) Which symbol is used to represent this type of spring? Check the correct answer.

A ☐ **B** ☐ **C** ☐ **D** ☐

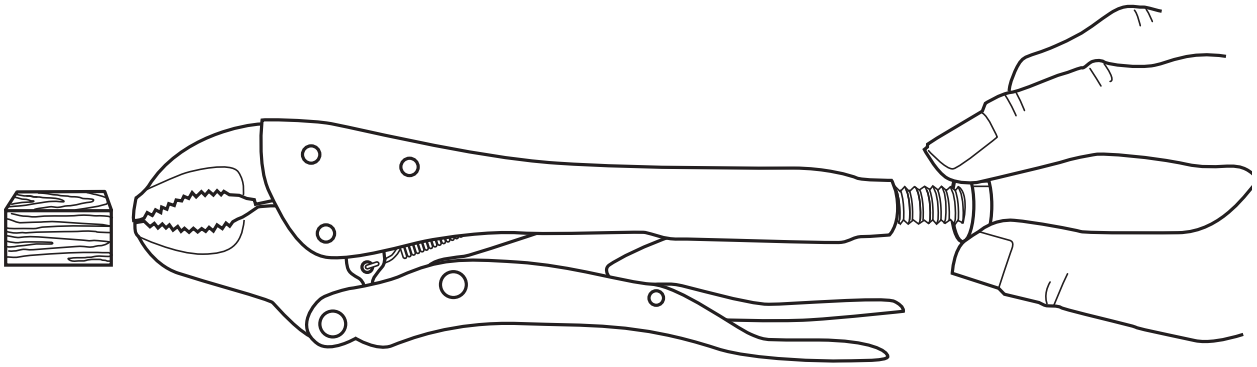
5. Perform the following procedure to adjust the jaws of the locking pliers:

– Grasp both handles of the locking pliers so that the jaws close and stay closed even when the pressure is released.

– Bring the jaws close to the piece of scrap wood.

– Use the adjustment screw to adjust the opening between the jaws so that it is slightly smaller than the thickness of the piece of wood.

– While you adjust the opening, observe the motions of the adjustment screw, the lower handle, the lower jaw and the notch.



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Name: _____ Group: _____ Date: _____

a) Which symbol represents the force needed to turn the adjustment screw? Check the correct answer.

A ☐ 

B ☐ 

C ☐ 

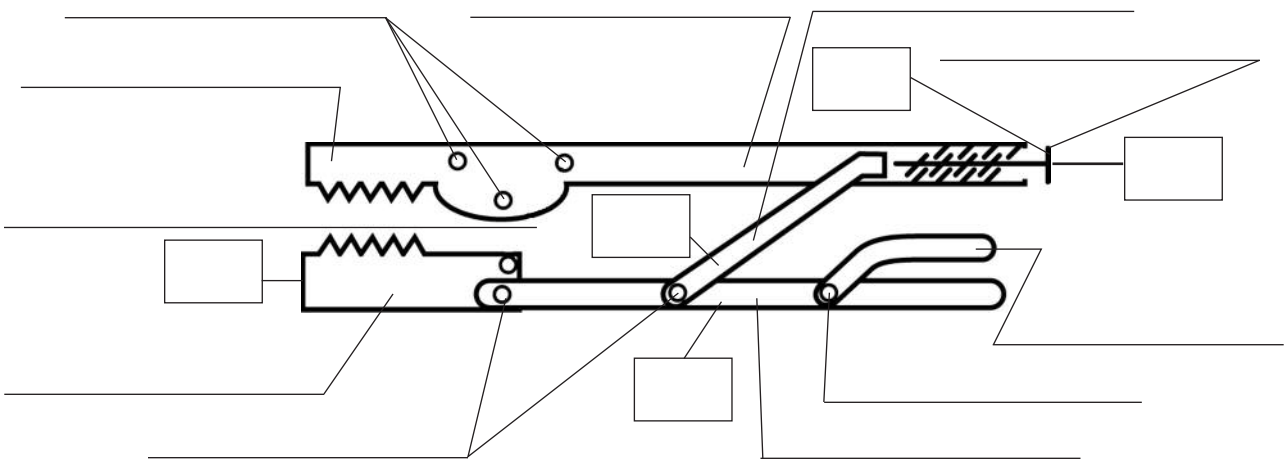
D ☐ 

b) For each of the parts in the table below, indicate:
- the type of motion involved (translational, rotational or helical)
- whether the motion is unidirectional or bidirectional (Keep in mind that the jaws can be opened or closed.)
- the symbol for the type of motion

Part	Type of motion	Unidirectional or bidirectional motion?	Symbol
Adjustment screw			
Lower handle			
Lower jaw			
Notch			

6. Use your answers to questions 3 to 5 to complete the design plan below for the locking pliers during resetting. The plan should indicate the following:
- the point where force is applied to reset the locking pliers (Draw the appropriate symbol.)
- the symbol for the spring, in the correct place
- the motions of the parts during resetting
- the names of the various parts

Design plan for resetting locking pliers



Name: _____ Group: _____ Date: _____

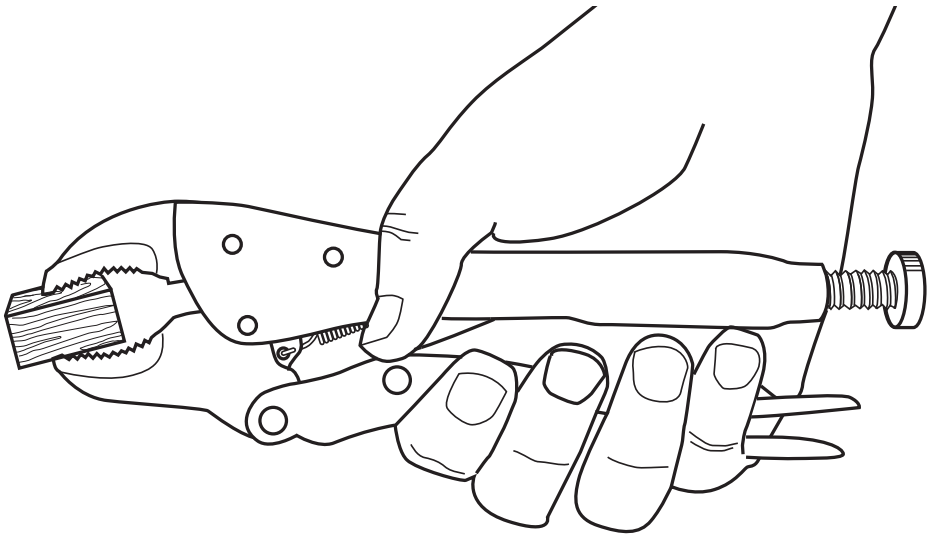
7. Perform the following procedure to grip an object:

– Spread the handles of the locking pliers.

– Place the piece of scrap wood between the jaws.

– Squeeze the handles together to grip the wood between the jaws.

– While you squeeze the handles, note where you have applied force and observe the motions of the lower jaw, the lower handle and the notch.



a) Which symbol represents the force applied to the handles of the locking pliers? Check the correct answer.

A ☐ 

B ☐ 

C ☐ 

D ☐ 

b) For each of the parts in the table below, indicate:

– the type of motion involved (translational, rotational or helical)

– whether the motion is unidirectional or bidirectional, considering only the motion of squeezing the handles

– the symbol for the type of motion

Part	Type of motion	Unidirectional or bidirectional motion?	Symbol
Lower jaw			
Lower handle			
Notch			

Name: _____ Group: _____ Date: _____

8. Use your answers to questions 3, 4 and 7 to complete the design plan below for the locking pliers during tightening. The plan should indicate the following:

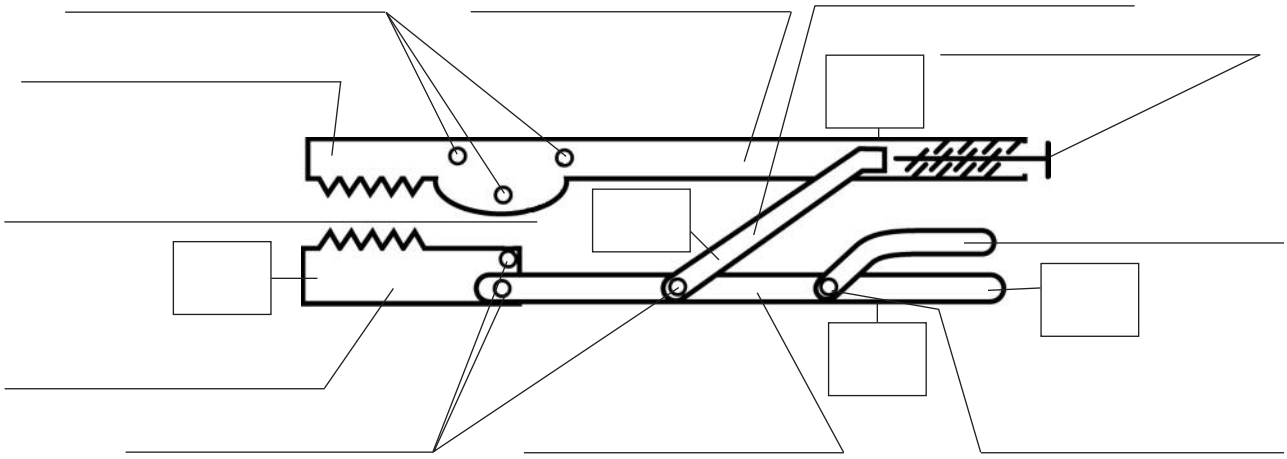
– the point where force is applied to close the jaws of the locking pliers (Draw the appropriate symbols.)

– the symbol for the spring, in the correct place

– the motions of the parts during tightening

– the names of the various parts

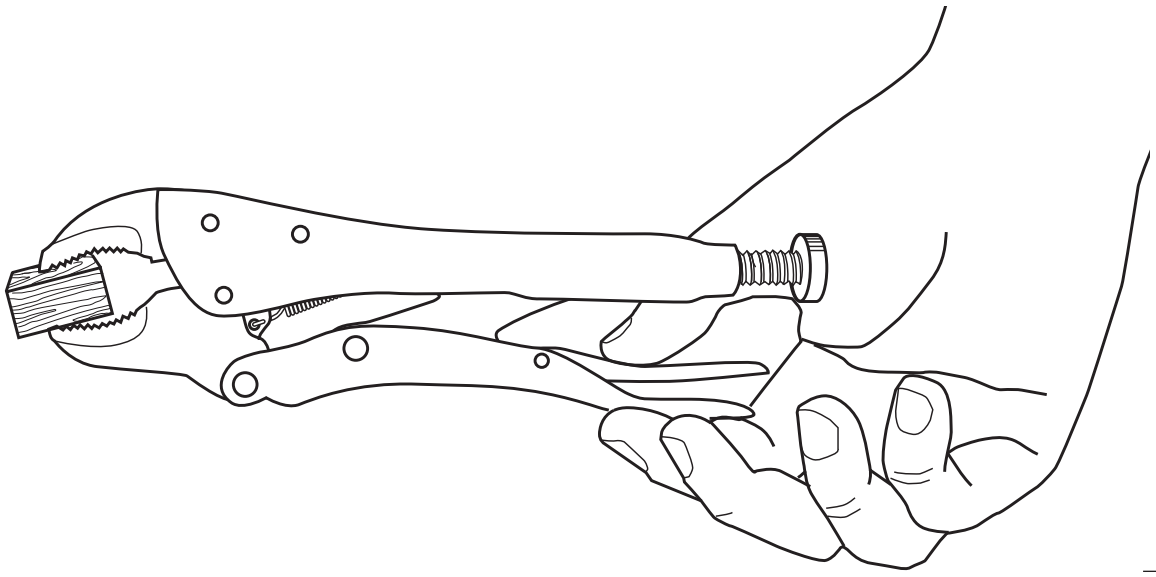
Design plan for tightening locking pliers



9. Perform the following procedure to release the locking pliers:

– Squeeze the release lever and the lower handle together between your thumb and fingers.

– Note where you have applied force to the release lever and observe the motions of the release lever, the lower jaw, the lower handle and the notch.



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a) Which symbol represents the force applied to the release lever on the locking pliers? Check the correct answer.

A ☐ 

B ☐ 

C ☐ 

D ☐ 

b) For each of the parts in the table below, indicate:

– the type of motion involved (translational, rotational or helical)

– whether the motion is unidirectional or bidirectional, considering only the motion of releasing the jaws of the pliers

– the symbol for the type of motion

Part	Type of motion	Unidirectional or bidirectional motion?	Symbol
Release lever			
Lower jaw			
Lower handle			
Notch			

10. Use your answers to questions 3, 4 and 9 to complete the design plan below for the locking pliers during release. The plan should indicate the following:

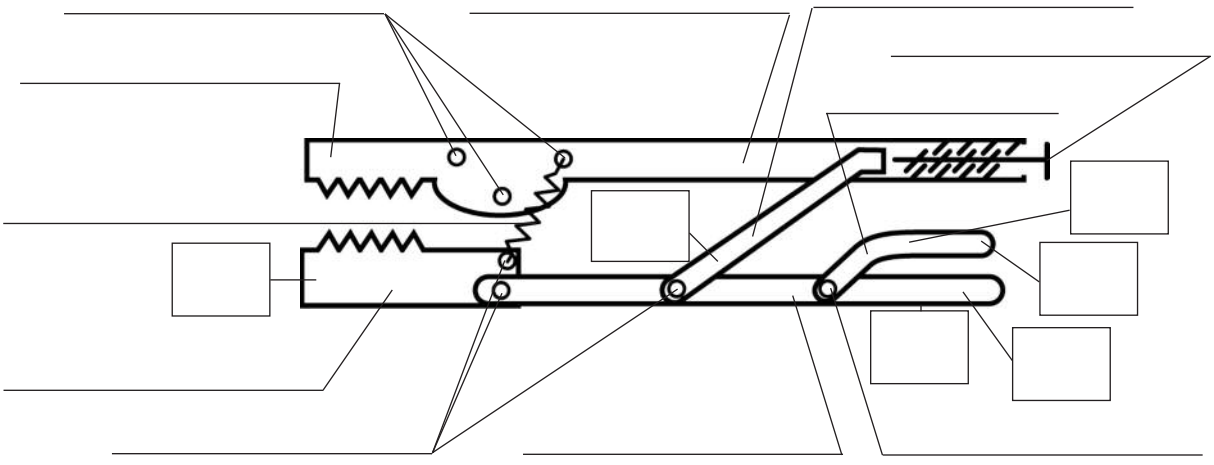
– the point where force is applied to release the jaws of the locking pliers (Draw the appropriate symbols.)

– the symbol for the spring, in the correct place

– the motions of the parts during release

– the names of the various parts

Design plan for releasing locking pliers



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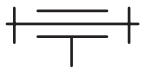
HOW IS THE TECHNICAL OBJECT BUILT?

11. Check the type of material used to manufacture the locking pliers.

- ☐ wood
- ☐ modified wood
- ☐ metal or alloy
- ☐ ceramic
- ☐ composite

12. Look at the illustrations below. Which symbol represents a complete link? a translational guiding control? a rotational guiding control? Write the answers under the appropriate symbols.

a)



_____

_____

b)

_____

_____

c)

_____

_____

13. Look at the two rivets that attach the lower jaw to the upper and lower handles.

a) Do these rivets provide a complete link or a partial link between the lower jaw and the handles? Explain your answer.

_____

_____

b) Do these two rivets act as guiding controls for the lower jaw? If so, what type of guiding do they ensure?

_____

14. Look at the two rivets that attach the upper jaw to the upper handle.

a) Do these rivets provide a complete link or a partial link between the upper jaw and the handle? Explain your answer.

_____

_____

b) Do these two rivets act as guiding controls for the upper jaw? If so, what type of guiding do they ensure?

_____

15. Look at the rivet that attaches the release lever to the lower handle.

a) Does this rivet provide a complete link or a partial link between the release lever and the lower handle? Explain your answer.

_____

_____

b) Does this rivet act as a guiding control for the release lever? If so, what type of guiding does it ensure?

_____

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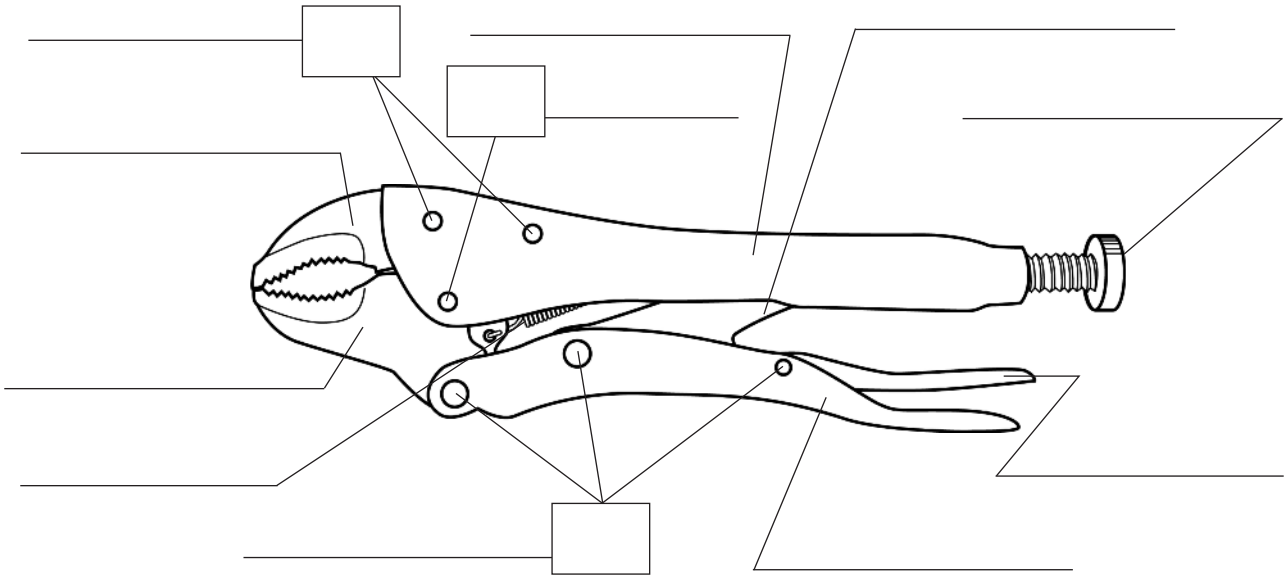
16. Use your answers to questions 11 to 15 to complete the technical diagram below for the locking pliers. The diagram should indicate the following:

– the type of material used to manufacture the pliers

– the names of the various parts

– whether the rivets ensure complete links or any guiding (Draw the appropriate symbols.)

Technical diagram for locking pliers



Material used: _____