

Name \_\_\_\_\_

Date \_\_\_\_\_

### Chapter 3 Review Sheet

#### Test 12/18

#### Define Vocabulary

Work: Force exerted on an object that causes it to move.

Joule: The unit for work. The amount of work you do when you exert a force of 1N to move an object a distance of 1m.

Power: The rate at which one form of energy is transformed into another. The rate at which work is done.

Watt: The unit of power when one joule of work is done in one second.

Machine: A device that changes the amount of force exerted, the distance over which force is exerted, or the direction in which force is exerted.

Simple Machine: The most basic device for making work easier, these are the smaller building blocks for complex machines.

Inclined Plane: An inclined plane is a simple machine that is a flat, sloped surface. Used to bring objects from one level to another.

Examples of an Inclined Plane: slide, ramp

Wedge: A simple machine that is an inclined plane that moves. used to cut through things.

Examples of a Wedge: Knife, axe, zipper

Screw: A simple machine that is an inclined plane wrapped around a central cylinder to form a spiral.

Examples of a Screw: spiral staircase,

Lever: A simple machine that consists of a rigid bar that pivots about a fixed point.

Examples of a Lever: seesaw, hammer claw, hammer, baseball bat

Fulcrum: The fixed point around which a lever pivots.

Pulley: A simple machine that consists of a grooved wheel with a rope or cable wrapped around it.

Examples of a Pulley: flag pole, sails, blinds

Wheel and Axle: A simple machine that consists of two attached circular or cylindrical objects that rotate about a common axis, each one with a different radius.

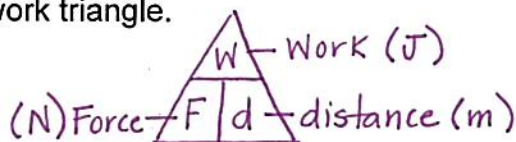
Example of a Wheel and Axle: car, skateboard, roller skates

Compound Machine: A device that combines two or more simple machines.

Examples of Compound Machines: bike, wheel barrow, scissors.

### Work

1. Draw the work triangle.



2. What is the unit for work?

Joules or J

3. What is the formula for work?  $Work = Force \times distance$   
 $W = F \times d$

**Solve**

4. You must exert a force of  $4.5 \text{ N}$  on a book to slide it across a table. If you do  $2.7 \text{ J}$  of work in the process, how far have you moved the book?

Formula	$d = \frac{W}{F}$
Substitution	$d = \frac{2.7 \text{ J}}{4.5 \text{ N}}$
Final Answer	$d = 0.6 \text{ m}$

5. A child pulls a sled up a snow-covered hill. The child does  $405 \text{ J}$  of work on the sled. If the child walks  $15 \text{ m}$  up the hill, how large of a force must the child exert?

Formula	$F = \frac{W}{d}$
Substitution	$F = \frac{405 \text{ J}}{15 \text{ m}}$
Final Answer	$F = 27.0 \text{ N}$

6. If  $16,700 \text{ J}$  of work is done to shoot a cannonball down a  $3.05 \text{ m}$  barrel, then how much force is applied to the person to fire them out the cannon?

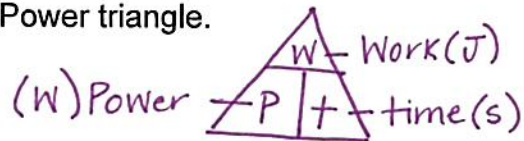
Formula	$F = \frac{W}{d}$
Substitution	$F = \frac{16,700 \text{ J}}{3.05 \text{ m}}$
Final Answer	$F = 5,475.4 \text{ N}$

7. An elephant pushes with  $2000\text{ N}$  on a load of trees. It then pushes these trees for  $150\text{ m}$ . How much work did the elephant do?

Formula	$W = F \times d$
Substitution	$W = 2000\text{ N} \times 150\text{ m}$
Final Answer	$W = 300,000.0\text{ J}$

### Power

8. Draw the Power triangle.



9. What is the formula to calculate power?

$$P = \frac{W}{t}$$

10. What is the metric unit for power? *Watts or W*

### Solve

11. An  $190,000\text{ W}$  engine can accelerate from rest to a top speed in  $9\text{ s}$ . How much work did the engine do?

Formula	$W = P \times t$
Substitution	$W = 190,000\text{ W} \times 9\text{ s}$
Final Answer	$W = 1,710,000.0\text{ J}$

12. If a runner exerts 350<sup>W</sup> J of work to make 125<sup>P</sup> W of power, then how long did it take the runner to do the work?

Formula	$t = \frac{W}{P}$
Substitution	$t = \frac{350\text{ J}}{125\text{ W}}$
Final Answer	$t = 2.8\text{ s}$

13. A horse performs 15000<sup>W</sup> joules of work pulling a wagon for 20<sup>+</sup> seconds. What is the horse's power?

Formula	$P = \frac{W}{t}$
Substitution	$P = \frac{15000\text{ J}}{20\text{ s}}$
Final Answer	$P = 750.0\text{ W}$

### Two Step Word Problems

14. A student who weighs 500<sup>F</sup> Newtons climbed the stairs from the first floor to the third floor, 15 meters above, in 20 seconds. How much power did the student generate? d +

Formula	$W = F \times d$	$P = \frac{W}{t}$
Substitution	$W = 500\text{ N} \times 15\text{ m}$	$P = \frac{7,500.0\text{ J}}{20\text{ s}}$
Final Answer	$W = 7,500.0\text{ J}$	$P = 375.0\text{ W}$

15. A box is pushed across the floor for a distance of  $\overset{d}{5}$  meters with a force of  $\overset{F}{50}$  Newtons in  $\overset{t}{5}$  seconds. How much power was used?

Formula	$W = F \times d$	$P = \frac{W}{t}$
Substitution	$W = 50\text{N} \times 5\text{m}$	$P = \frac{250.0\text{J}}{5\text{s}}$
Final Answer	$W = 250.0\text{J}$	$P = 50.0\text{W}$

16. If it takes 50 seconds to lift 10 Newtons of books to a height of 7 meters, calculate the power required.

Formula	$W = F \times d$	$P = \frac{W}{t}$
Substitution	$W = 10\text{N} \times 7\text{m}$	$P = \frac{70.0\text{J}}{50\text{s}}$
Final Answer	$W = 70.0\text{J}$	$P = 1.4\text{W}$

17. A cart is pushed with a  $\overset{F}{75}$  N force a distance of  $\overset{d}{3.6}$  m in  $\overset{t}{1.3}$  seconds. Calculate the power required.

Formula	$W = F \times d$	$P = \frac{W}{t}$
Substitution	$W = 75\text{N} \times 3.6\text{m}$	$P = \frac{270.0\text{J}}{1.3\text{s}}$
Final Answer	$W = 270.0\text{J}$	$P = 207.7\text{W}$

Simple Machines:

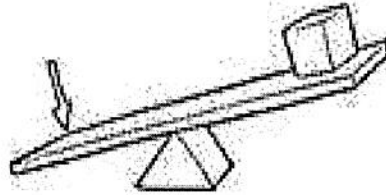
Label the Simple Machines below. (Pulley, Inclined Plane, Lever, Wheel and Axle, Screw and Wedge)



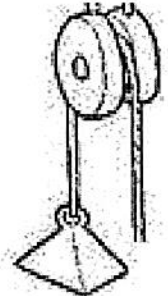
18. lever



19. inclined plane



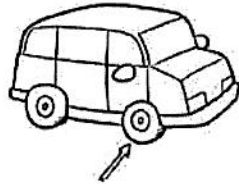
20. lever



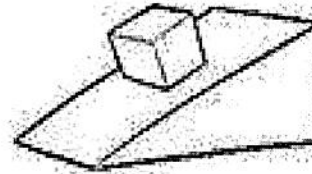
21. pulley



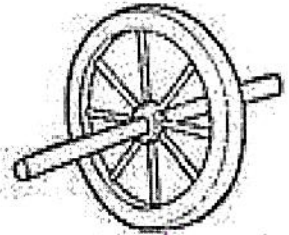
22. screw



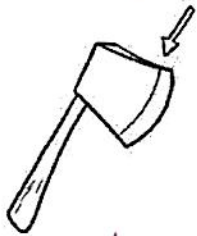
23. wheel + axle



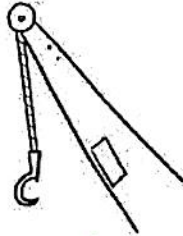
24. inclined plane



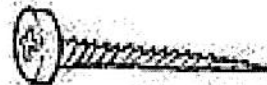
25. wheel + axle



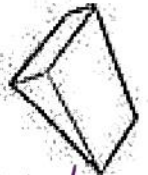
26. wedge



27. pulley

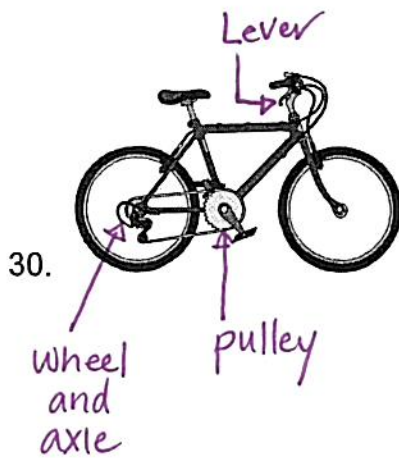


28. screw

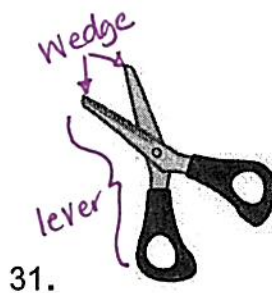


29. wedge

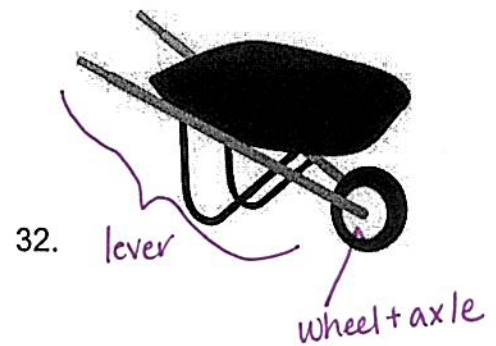
Write the simple machines that make up the compound machine.



30.



31.



32.

