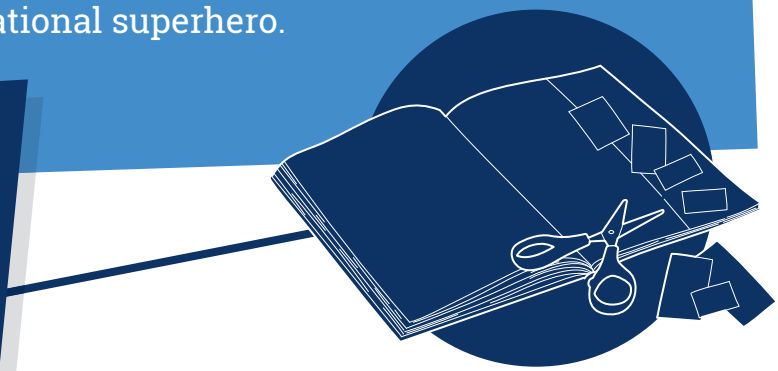
GAME: PENNYWORTH

Up to 3 players work together to complete chores in the secret hideout of a busy international superhero.



MATERIALS

You will need:

- The schedule and cut-out chore cards on page 27
- A small, flat table to play on

1-3 players

GOAL: Your picky superhero boss has a secret hideout with lots of chores that need attending to. The hideout gets its power from solar panels between 10 am and 2 pm. The goal is to complete as many points worth of chores as possible while there is enough power and with the following restrictions:

- No more than 2 appliances can run at any time.
- The total watts used at any time cannot be more than the watts provided by the solar panels as shown on the schedule.

GAMEPLAY: Cut out and place all of the chore cards face-down. Players take turns selecting a chore card and placing it on the schedule. Each chore fits on the schedule according to the time it takes. Once a chore is placed on the schedule, it cannot be moved.

The game ends when a chore is selected that cannot be added to the schedule.

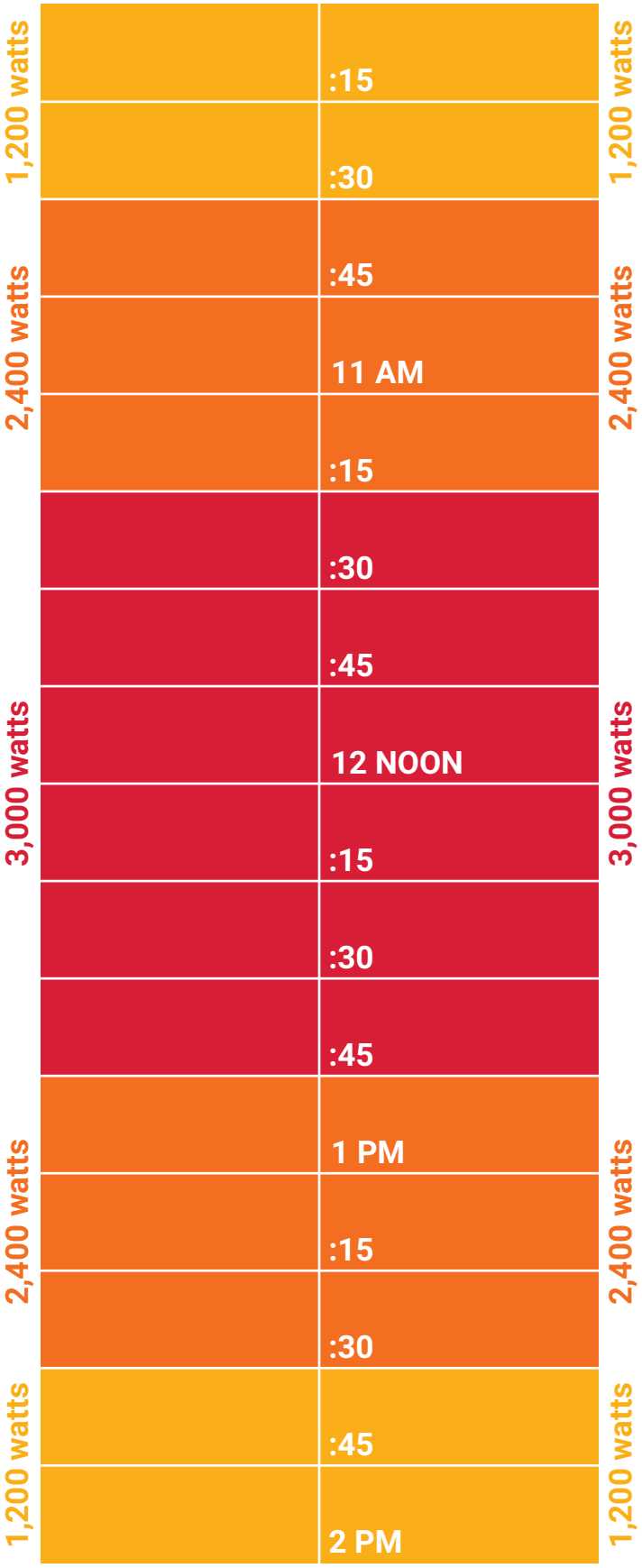
Players tally their points to see how high a score they can achieve.

RATING:
Under 150 points: Try again.

150+ points: ★	Amateur
175+ points: ★★	Adequate
200+ points: ★★★	Adept
225+ points: ★★★★	Admirable
250+ points: ★★★★★	Astounding

APPLIANCE	TIME	WATTS
Dishwasher	90 Minutes	1200 W
Clothes Dryer	60 Minutes	3000 W
Oven	60 Minutes	1600 W
Clothes Washer	60 Minutes	800 W
Stovetop	60 Minutes	600 W
Leaf Blower	30 Minutes	1800 W
Vacuum	30 Minutes	1500 W
Iron	30 Minutes	1200 W
Toaster	15 Minutes	1200 W
Drill	15 Minutes	1000 W
Coffeepot	15 Minutes	800 W
Blender	15 Minutes	600 W

CHORE SCHEDULE



CHORE CARDS (CUT OUT)

CLOTHES DRYER *80 pts*

3000 watts
(60 minutes)

Dry assorted bulletproof socks.

OVEN *50 pts*

1,600 watts
(60 minutes)

Bake cake for Captain Crusher's birthday party.

CLOTHES WASHER *24 pts*

800 watts
(60 minutes)

Wash stained tights and capes.

STOVETOP *20 pts*

600 watts
(60 minutes)

Cook a two-alarm chili. Not too spicy!

DISHWASHER *60 pts*

1,200 watts
(90 mins)

Keep adamantium knife blades pointed down!

VACUUM *20 pts*

1,500 watts
(30 minutes)

Diagonal stripes.

LEAF BLOWER *24 pts*

1,800 watts
(30 minutes)

Clear secret entry.

IRON *16 pts*

1,200 watts
(30 minutes)

No creases!

COFFEEPOT *4 pts*

800w *(15 min)*

TOASTER *6 pts*

1,200w *(15 min)*

BLENDER *3 pts*

600w *(15 min)*

DRILL *5 pts*

1,000w *(15 min)*

Find printable boards and cards in the Printables section of the Science 4B book page at BeastAcademy.com.

POWER AND ENERGY

The total amount of energy a device uses depends on both its power and how long it is used.

For example, a 1,200-watt toaster uses energy 10 times faster than a 120-watt ceiling fan. But, the fan might stay on for hours at a time, while the toaster is only used for a few minutes. If the fan is on for 10 times longer than the toaster, then the two will consume about the same total amount of energy.

PRACTICE:

Use the power given in watts for each appliance to answer the questions below.

Blender
600 watts

Coffeepot
800 watts

Clothes washer
800 watts

Toaster
1,200 watts

Heater
2,400 watts

26 Which device uses energy twice as fast as the toaster? Check one.

- ○ Blender
- ○ Coffeepot
- ○ Washer
- ○ Heater

27 Which of these uses more energy? Check one.

- ○ Blending for 10 minutes
- ○ Toasting for 5 minutes
- ○ They're equal

28 Which of these uses more energy? Check one.

- ○ Washing for 60 minutes
- ○ Heating for 30 minutes
- ○ They're equal

29 How many minutes would you use each of these appliances for to use the same amount of energy needed to power the heater for 20 minutes?

Toaster _____ min

Washer _____ min

Blender _____ min

DISCUSSION:

30 A washer doesn't ***always*** need 800 watts; that's just a typical power usage during a wash cycle. What factors affect how many watts a washer needs at any given time?

TOTAL ENERGY

The units for total energy used are a combination of the units for power (watts) and time (hours). For example, when you use an 800-watt washer for 1 hour, the total amount of energy used is 800 watt-hours (800 Wh). If you use the same washer for just 30 minutes (half an hour), you will use half as much energy:

$$800 \text{ watts} \times \frac{1}{2} \text{ hour} = 400 \text{ watt-hours (400 Wh)}.$$

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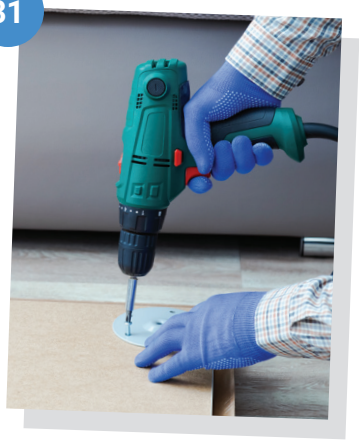

A drill that needs 1000 watts to operate uses 1000 watt-hours (1000 Wh) of energy in 1 hour of use. How many watt-hours of energy will a drill use in each amount of time given below?

- 120 minutes (2 hours) ____ Wh
- 30 minutes ($\frac{1}{2}$ hour) ____ Wh
- 15 minutes ($\frac{1}{4}$ hour) ____ Wh
- 12 minutes ($\frac{1}{5}$ hour) ____ Wh

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How many watt-hours of energy will a 1500-watt vacuum use in each amount of time given below?

- 20 minutes ____ Wh
- 40 minutes ____ Wh
- 10 minutes ____ Wh
- 90 minutes ____ Wh

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A strong recreational cyclist can produce about 250 watts of power for 30 minutes. If the total energy they produce could be used to power a 1500-watt vacuum, how long would the vacuum run? Explain your calculations.