LESSON MAKER PRO

Power in Action

Connect work, power, and time.

HIGH SCHOOL · P.3.a

P.3.a "Use mathematical and computational thinking to explain the relationships among work, power, and time."

NAME _____ DATE _____

THE BIG IDEA

Power tells you how quickly work is done. Divide work by time to find average power: power = work / time. Work is measured in joules (J), time in seconds (s), and power in watts (W), where 1 W = 1 J/s.

WORKED EXAMPLE

A motor does 462 J of work in 14 s. What is its average power?

1. Use power = work / time.
2. Substitute: power = 462 J / 14 s.
3. Divide: power = 33 J/s.

Answer: 33 W

PRACTICE 6 problems

1 A motor does 160 J of work in 8 s. Find its average power.

ANSWER _____

2 A motor runs at 25 W for 4 s. How much work does it do?

ANSWER _____

3 A motor does 360 J of work in 9 s. Find its average power.

ANSWER _____

4 A motor runs at 18 W for 5 s. How much work does it do?

ANSWER _____

5 A motor does 480 J of work at an average power of 12 W. How long does it run?

ANSWER _____

6 A motor does 600 J of work in 2 minutes. Find its average power in watts.

ANSWER _____

APPLY IT Show your work

1 A robot built for a school competition lifts supplies onto a platform. Its motor delivers an average power of 24 W for 50 s. How much work does the motor do?

WORK SPACE

ANSWER _____

2 Two electric skateboards climb the same hill. Board A's motor does 900 J of work in 45 s. Board B's motor does 1,200 J of work in 40 s. Which motor has greater average power, and by how much?

WORK SPACE

ANSWER _____

CHALLENGE One step up

During a robotics test, a motor does 240 J of work in the first 4 s and 360 J in the next 12 s. Find its average power for the whole test. Explain why averaging the power from the two time intervals gives the wrong result.

WORK SPACE AND ANSWER

Power in Action

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A motor does 160 J of work in 8 s. Find its average power.	**20 W**
2	A motor runs at 25 W for 4 s. How much work does it do?	**100 J**
3	A motor does 360 J of work in 9 s. Find its average power.	**40 W**
4	A motor runs at 18 W for 5 s. How much work does it do?	**90 J**
5	A motor does 480 J of work at an average power of 12 W. How long does it run?	**40 s**
6	A motor does 600 J of work in 2 minutes. Find its average power in watts.	**5 W**

PART 2 · APPLY IT

1. **1,200 J** Work = power × time = 24 W × 50 s = 1,200 J.
2. **Board B, by 10 W** Board A averages 900 J / 45 s = 20 W. Board B averages 1,200 J / 40 s = 30 W, which is 10 W greater.

CHALLENGE

The motor does 600 J of work in 16 s, so its average power is 600 J / 16 s = 37.5 W. The intervals last different amounts of time, so their powers of 60 W and 30 W cannot be averaged equally.

Accept equivalent forms such as 37 1/2 W for the challenge. For the challenge explanation, students should use total work divided by total time or note that the intervals have different lengths.