G4 Basic

G5 Advanced

Helping With Math

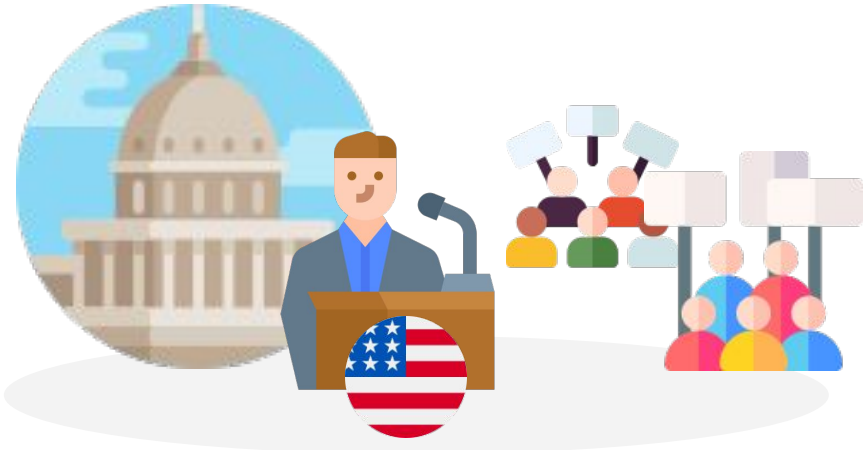
GRADES

Measuring Skill
Measuring Power

Suitable for students
aged 8-10

This pack is suitable for learners aged 8-10 years old or 4th to 5th grades. The content covers fact files and relevant basic and advanced activities of measuring power topics that aim to develop and strengthen the learners' measuring skills.

Today is Inauguration Day!



Inauguration Day *happens every four years on January 20. The inauguration is being held at the U.S. Capitol building in Washington, DC. On this federal day, the elected president and vice-president are sworn in and take office.*

- Inauguration Day takes place at noon of January 20 except when it fell on Sunday. Instead, Inauguration Day will be held the next day, January 21.
- The first inauguration took place on April 30, 1789, when George Washington served as the first president of America.
- It was then in 1937 that Inauguration Day was moved to January 20.

MEASUREMENT

Measurement describes and compares concrete and mathematical objects by associating numbers and units of measurement. In other words, it shows the size or amount of something.

Measurement helps us identify how large or small a physical quantity is compared to the unit of measure in mathematics.

What are some properties of measurement?

- Length
- Mass
- Weight
- Time
- Money
- Temperature
- Perimeter
- Area
- Surface Area
- Volume

LEARNING MEASUREMENT...

- It strengthens your understanding of numbers.
- It helps you compare, approximate, and count accurately.
- It helps you sort objects by size, how big or small it is.
- It allows you to know the exact size of a thing.

- There are five primary disciplines of mathematics, namely: number sense, algebra, geometry, data analysis and probability, and measurement.
- These aforementioned disciplines must be transferred effectively to the students through a holistic approach in teaching.

MEASURING SKILL

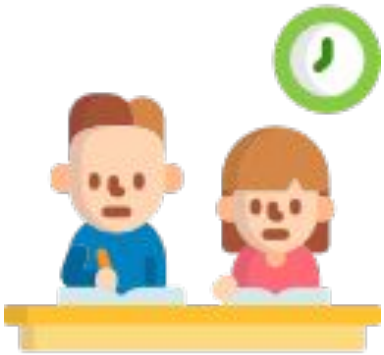
As mentioned, measurement is one of the vital disciplines. Thus, measuring skills play an important role in the development of a child's learning.

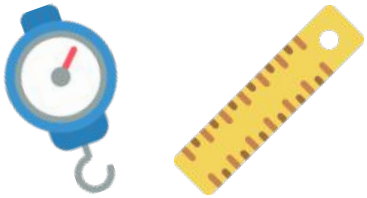
Measuring skills…

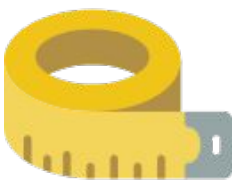
- cover the skills needed for a learner to effectively do the measuring.
- are the processes of how to measure physical attributes of objects appropriately and accurately using measurement tools and techniques.

During their early education, children developed these measuring skills. They learn to...

- compare objects by size (big, bigger, biggest)
- compare objects by length, height, and weight
- compare groups of objects and understand that a lesser number is also a lesser quantity
- understand basic concepts of time, such as this morning or yesterday, or in a minute
- use non-standard forms of measurement and eventually the standard forms.







POWER

- **Power** (P) is the rate at which energy is transferred or converted.
- It is defined as the work done per unit of time.
- Power equals work divided by time (P = W / t).
- The SI unit of power is the **watt** (W), named after its Scottish inventor James Watt (1736 - 1819).
- The most commonly used units of power in the United States customary units are horsepower (hp) and foot-pound per second (ft-lb/s).

UNITS OF POWER

Because knowledge is power, here are the important things that you know about the different units of power.

1. Watt

- James Watt (1736 - 1819) was a Scottish inventor who coined the term Watt as a unit of power. It is being used widely as an SI unit or metric unit of power.
- In terms of electrical power, Watt is equal to volt (V) times one ampere (A). In mechanical, Watt is equal to Joules per second (J/s).
- Watt indicates the power of an electrical appliance. It measures the amount of energy an item needs to function.

UNITS OF POWER

2. Horsepower (mechanical)

- The term was used by James Watt when he was figuring out the mathematical equation of using a horse to run a steam engine.
- He calculated the capability of a big horse to pull a 150-pound load while walking at 2.5 miles per hour. He found out that a horse can work out 33,000 foot-pounds per minute or 550 foot-pounds per second.

3. Foot-Pound per Second (ft-lb/s)

- This is an old unit of power. unit of work or energy equal to the work done when a force of 1 pound moves the through a distance of 1 foot

Conversion Table for Power

1 W = approx 0.001341 hp

1000 W = 1.34 hp

1 W = 0.7376 ft-lb/s

1000 W = 1 kW (kilowatts)

1 kW = 1.34 hp

1 hp = 746 W

1 hp = 550 ft-lb/s

1 ft-lb/s = approx 1.356 W

Example:

How many hp are there in 3500 W?

Since 1000 W = 1.34 hp,

$$\frac{3500\ W}{1000\ W} = 3.5$$

3.5 x 1.34 hp = 4.69 hp

Thus,

3500 W is equal to 4.69 hp.

PROBLEMS RELATED TO POWER

1. Calculating the amount of power

A. How much power does a light bulb contain if it does 800 J of work in 8 seconds?

$$P = \frac{W}{t} \rightarrow P = \frac{800\ J}{8\ s} = \mathbf{100\ W}$$

B. If a car has 900 W of power and does 3000 J of work, how much time was involved?

Solving for time. $t = \frac{W}{P} \rightarrow t = \frac{3000\ J}{900\ W} = \mathbf{3.33\ s}$

C. A toy car uses two 1.5-V batteries in series to create a current of 0.5 A. What is the power rating of the bulb?

Solving for Watt $W = Volts \times Amp \rightarrow W = 1.5\ V \times 0.5\ A$

$W = 1.5\ V \times 0.5\ A = 0.75\ W$

But since there are two batteries,

0.75 W x 2 batteries = **1.5 W**

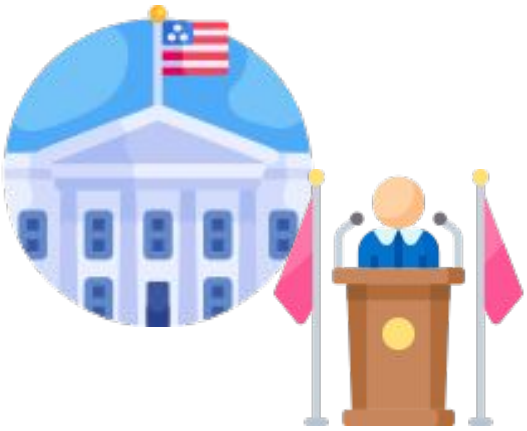
Practice:
How much work is done if the power is 1200 and the time is 4.5 seconds?

TABLE OF ACTIVITIES

WELCOMING THE NEW US PRESIDENT

G4
Basic

Let's welcome the newly-elected president on his arrival to the Capitol by calculating the amount of power on each item. If applicable, round off your answer to the nearest tenths.



1) P = ? W = 300 J t = 4 s

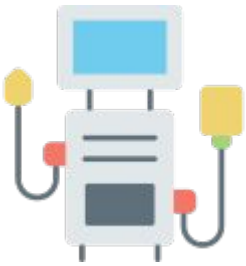
2) P = ? W = 60 J t = 12 s	3) P = ? W = 48 J t = 4 s
4) P = ? W = 75 J t = 6 s	5) P = ? W = 100 J t = 8 s
6) P = ? W = 19.5 J t = 2 s	7) P = ? W = 400 J t = 15 s

WHITE HOUSE MEDICAL UNIT

G4
Basic

The White House Medical Unit has medical machines and equipment that are vital to the needs of the first family and their visitors. Calculate the electric power that each piece of equipment is using given the amount of volts and amperes.

1) ECG monitor works at 1.2 V and 51 A.



2) ICU ventilator works at 230 V and 0.17 A.

3) Surgery lamp works at 120 V and 1.25 A.

INAUGURATION DAY PARADE

G4
Basic

The following are the power capacity of the cars that will join the Inauguration Day parade today. Use your understanding of measuring power to answer each word problem.

1) One of the participating cars uses 77,000 J to travel at 100 km per hour. How many joules does it need to a half-hour 100 km drive?

2) In reference to the previous item, what is the amount of power that the car will use in joules per second?

3) In reference to item no. 1, how much work is needed for the car to travel across a 200-km drive?

VIRTUAL INAUGURATION

G4
Basic

Because of the pandemic, a public gathering is prohibited. Thus, Inauguration Day will be done virtually. The following are the gadgets that we may use in watching the virtual inauguration. Compute what is being asked.

1. Modern TVs use, on average, 58.6 watts when in On mode and 1.3 watts in standby mode.

a) How many watts will be saved if we put our TVs in standby mode when not in use instead of letting it in on mode?

b) As a 4th grade learner, what other electrical power-saving practices do you know? Cite two practices that you do.

2. A 60-watt laptop uses 60 W in one hour. How many hours were spent on a 420 percent W usage?

THE PARADE'S ROUTE

G4
Basic

Make way for the Inauguration Day Parade by solving each problem about measuring power.

4) 2.5 kW is equal to _____ hp.

3) How many hp are there in 2200 ft-lb/s?

2) How many W are there in 3 hp?

1) How many hp are there in 2000 W?

THE SWEARING-IN CEREMONY

G5 Advanced

Make sure to witness the swearing-in ceremony this Inauguration Day! So do your homework now in converting units of power. W = hp, kW = hp

Remember:

1 W = approx 0.001341 hp (mechanical)

1000 W = 1 kW (kilowatts)

1 kW = 1.34 hp

1) 3 W = _____ hp	2) 5000 W = _____kW
3) 5 W = _____ hp	4) 8500 W = _____kW
5) 2 kW = _____ hp	6) 10 kW = _____ hp
7) 3.5 hp = _____ kW	8) 9.2 hp = _____kW
9. 75000 W = _____ hp	10) 2 hp = _____ W

LET'S PARTY THIS JANUARY 20!

G5 Advanced

Before it's too late, let us prepare the food that we need for the Inauguration Day party! Read and solve the following situations below about measuring power.

1) The fluorescent light bulb in the living room was damaged. Ben, the host of the party, is now confused about which light bulb produces a brighter light. Light bulb A is a 30 watt-bulb and the other is 60 watts. Which bulb is the better choice and why?

2) Ben and his wife, Alice, would love to prepare their favorite recipe dish. They have two choices of oven to use. First is an oven that does 24,000 joules of work in 30 s and the other one does 5000 joules of work in 5 s. Which oven will heat the same amount of food in less time? Show your solution.

FREE INAUGURATION DAY PIE

G5 Advanced

Get free Inauguration Day pie by calculating the equivalent measures of the following power reading.
W to ft lb s Hp to w

Remember:

1 W = 0.7376 ft-lb/s

1 hp = 746 W

A. Convert the following from W to ft-lb/s.

1) 7.5 W	2) 10 W
3) 11.25 W	4) 8 ⅓ W

B. Convert the following from hp to W.

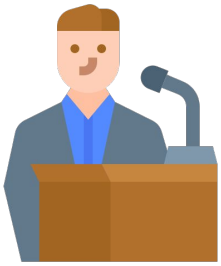
5) 0.4 hp	6) 1.85 hp
7) 10 HP	8) 25.16 hp

THE NATION'S PRESIDENT AND VP

G5 Advanced

During Inauguration Day, it's not only the US president who participated in the swearing-in ceremony. It is also the time for the Vice-President-elect to take his oath as the new Vice President of the federal.

Here are the President's and Vice President's lists of measuring power. Put a check to the measure with greater power.



- ☐ 2400 W
- ☐ 500 ft-lb/s
- ☐ 2.48 hp
- ☐ 683 ft-lb/s
- ☐ 8700 W

- ☐ 3.5 hp
- ☐ 1 kW
- ☐ 3000 W
- ☐ 0.95 hp
- ☐ 8.12 hp

KNOWLEDGE IS POWER

G5 Advanced

According to Sir Francis Bacon, knowledge is power. This Inauguration Day, show your knowledge about measuring power. Do that by answering the questions below.

1. What is power? What is the SI unit for power?

2. How much power does a toaster have if it does 3,450 joules of work in 30 seconds?

3. Joe's dad has a car with a 190-horsepower engine. How many watts of power is that? How many ft-lb/s is that?

ANSWER GUIDE

Activity 1

1. 75 W
2. 5 W
3. 12W
4. 12.5 W
5. 12.5 W
6. 9.75 W
7. 26.7 W

Activity 2

1. 61.2 W
2. 39.1 W
3. 150 W

Activity 3

1. 38500 J
2. 275000 J/s
3. 154,000

Activity 4

1. a) 57.3 W b) Possible answers: unplug the appliances when not it use, use LED lights
2. 7 hrs

Activity 5

1. 2.68 hp
2. 2238 W
3. 4 hp
4. 3.35

Activity 6

1) 0.004023 hp
2) 5 kW
3) 0.006705 hp
4) 8.5 kW
5) 2.68 hp
6) 13.4 hp
7) 3.73 kW
8) 12.328 kW
9) 100.5 hp
10) 1492 W

ANSWER GUIDE

Activity 7

1) The 60-watt bulb is the better choice because higher power means brighter bulb.
2. The second oven will heat the same amount of food in less time because it has more power than the other oven.

Activity 8

1) 5.532 ft-lb/s	2) 7.376 ft-lb/s	3) 8.298 ft-lb/s
4) 6.144 ft-lb/s	5) 298.4 W	6) 1380.1 W
7) 7460 W	8) 18769.36 W	

Activity 9

1) 3.5 hp	2) 1 kW	3) 3000 W
4) 683 ft-lb/s	5) 8700 W	

Activity 10

1) Power is the work done per unit of time. The SI unit of power is Watt.
2) 115 W 3) 141740 W , 104500 ft-lb/s

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