

Surrounded by Science and Math Session 1

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Developed and Presented by

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Activity 1: What is science?



Activity 2: Science, science, everywhere

Think about your day and make a list of the ways in which you used science today. Be specific!

Activity 3: Is There a Connection?

With your table partners, make a list of how math is used in science and “how” you currently use math when you teach science.

<i>How is math used in science?</i>	<i>How do I use math when I teach science?</i>

Activity 4: It's Just Conversion!

Science Skills: Earth and space science – using measurement

Math Skills: Measurement and conversion (formulas)

The two temperature scales most often used in the world today to record daily temperatures are the Fahrenheit temperature scale (used chiefly in the United States) and the Celsius temperature scale (used almost everywhere else).

Two benchmark temperatures on these scales are the boiling point and freezing point of water. On the Fahrenheit scale, the boiling point is 212 degrees, the freezing point is 32 degrees. On the Celsius scale, the boiling point is 100 degrees, the freezing point 0 degrees (a little easier to remember).

From these two data points, it is easy to see that as the Fahrenheit scale changes 180 total degrees between freezing and boiling, while the Celsius scale changes only 100 degrees. By reducing both numbers (divide both by 20), it can be said that for every 9 degrees change in the Fahrenheit scale, the Celsius scale changes 5 degrees. From this observation, a conversion formula can be designed.

- To convert from Fahrenheit to Celsius, the following formula is used: $C = (F - 32) \times 5/9$.
- To convert from Celsius to Fahrenheit, the following formula is used: $F = (C \times 9/5) + 32$

You can convert a temperature from **Celsius to Fahrenheit** in 3 steps:

1. Take your Celsius temperature _____ and multiply it by 9. $___ \times 9 = ___$
2. Take the answer from step one and divide it by 5. $___ \div 5 = ___$
3. Take the answer from step two and add 32 to it. $___ + 32 = ___$

Example: Let's convert 20° Celsius to Fahrenheit:

$$20^\circ \text{ Celsius} \times 9 = 180$$

$$180 \div 5 = 36$$

$$36 + 32 = 68^\circ \text{ Fahrenheit}$$

You can also convert a temperature from **Fahrenheit to Celsius** in 3 steps:

1. Take your Fahrenheit temperature _____ and subtract 32 from it. $___ - 32 = ______$
2. Take the answer from step one and multiply it by 5. $______ \times 5 = ______$
3. Take the answer from step two and divide it by 9. $______ \div 9 = ______$

Example: Let's convert 200° Fahrenheit to Celsius:

$$200^\circ \text{ Fahrenheit} - 32 = 168$$

$$168 \times 5 = 840$$

$$840 \div 9 = 93.33^\circ \text{ Celsius}$$

Let's Convert!

Temperature	Fahrenheit	Celsius
Water Boils	212°F	100°C
Water Freezes	32°F	0°C
Normal Human Body Temperature	98.6°F	37°C
Room Temperature	68°F	20°C
Absolute Zero (the lowest temperature possible, when molecules have the lowest possible energy)	-459.69°F	-273.16°C

Directions: Fill in the correct Fahrenheit or Celsius temperature in the chart below. When you are done, check your answers. Temperatures should be converted to the 100th place, e.g. 12.78°.

Fahrenheit	Celsius
0°	-17.78°
10°	
20°	
25°	
	-1.11°
32°	0°
35°	
40°	
45°	
	10°
	12.78°
60°	
	18.33°
70°	
	23.89°
80°	
	29.44°
90°	
	35°
100°	37.78°

Discussion Questions: Based on the table above, answer the following:

1) At what temperature (in degrees Celsius) would it have to be outside before you wore a winter coat? Why?

2) At what temperature (in degrees Celsius) would you want it to be outside before you went swimming? Why?

3) If it is 20 degrees Celsius outside, how would you describe the temperature - Hot, warm, cool, or cold? Why?

4) If it is 11 degrees Celsius outside, would you wear: (Explain why you would or would not wear each)

- a coat?
- mittens or gloves?
- a hat or cap?
- snow boots?

Converting Fahrenheit and Celsius – Let's Practice!

Name _____ Date _____

Convert the following from Fahrenheit to Celsius.

- | | |
|----------------------------------|----------------------------------|
| 1. $212^{\circ}\text{F} =$ _____ | 5. $26^{\circ}\text{F} =$ _____ |
| 2. $32^{\circ}\text{F} =$ _____ | 6. $105^{\circ}\text{F} =$ _____ |
| 3. $90^{\circ}\text{F} =$ _____ | 7. $74^{\circ}\text{F} =$ _____ |
| 4. $87^{\circ}\text{F} =$ _____ | 8. $61^{\circ}\text{F} =$ _____ |

Convert the following from Celsius to Fahrenheit.

- | | |
|----------------------------------|----------------------------------|
| 9. $100^{\circ}\text{C} =$ _____ | 13. $95^{\circ}\text{C} =$ _____ |
| 10. $0^{\circ}\text{C} =$ _____ | 14. $10^{\circ}\text{C} =$ _____ |
| 11. $50^{\circ}\text{C} =$ _____ | 15. $33^{\circ}\text{C} =$ _____ |
| 12. $25^{\circ}\text{C} =$ _____ | 16. $89^{\circ}\text{C} =$ _____ |

Answer the following Brain Teasers.

- | | |
|----------------------------------|----------------------------------|
| 17. $3^{\circ}\text{F} =$ _____ | 19. $15^{\circ}\text{C} =$ _____ |
| 18. $18^{\circ}\text{F} =$ _____ | 20. $5^{\circ}\text{C} =$ _____ |

Activity 5: Let's Take a Look at the Research!

Read your selected piece of research. With your table partners, discuss the ideas discussed by the writers. As a team, identify what you believe to be the five most important ideas in the article. Be prepared to share this information with the group.



Activity 6: Using the Scientific Method in Real Life

You arrive home late at night, walk up to your house door, unlock the door, reach in to the light switch just inside the front door. The light does not come on! Now what?

- **Observation:**
- **Question:**
- **Hypothesis:**
- **Prediction:**
- **Experiment:**
- **Analysis:**
- **Decision:**

Oil Spill

How will you clean up the oil spill?

Hypothesis: _____

Why? _____

	Observations
Strategy to Clean Up the Oil Spill	

What results can be drawn from this experiment?

Activity 7: Pre-Reading - Let's TIPP?

Elements	Notes
T – Title What do the title, subheadings, and layout tell me about this text?	
I – Introduction What is included in the introduction?	
P – Paragraphs What information is included in the first sentence of each paragraph?	
P – Photographs What do the photographs, maps, charts, tables, and illustrations tell me?	
?? – Questions What questions do I have about this text?	

Activity 8: During Reading - The GIST

Name of Text _____

Complete the following:

Questions	
Who?	
What?	
When?	
Where?	
Why?	
How?	

Write a GIST statement of 20 words or less that summarizes the text.

Activity 10: Myth or Reality?

1. The Earth is the largest object in the solar system.
2. The Earth is the center of the solar system.
3. Earth and Venus are identical.
4. Earth and Mars are similar in size.
5. The Sun is a burning ball of fire.
6. Spacecraft can land on the surface of Jupiter, Saturn, Uranus and/or Neptune.
7. Pluto is the most-distant and last object in the solar system.
8. Comets are composed of the same material as asteroids.
9. Meteors are falling stars.
10. Other stars and galaxies are part of the solar system.

Activity 11: Overview of Our Solar System

For thousands of years, people have gazed into the sky at the stars. Ancient astronomers observed points of light that appeared to move among the stars. They called these objects planets, meaning wanderers, and named them after Roman deities - Jupiter, king of the gods; Mars, the god of war; Mercury, messenger of the gods; Venus, the goddess of love and beauty, and Saturn, father of Jupiter and god of agriculture. The stargazers also observed comets with sparkling tails, and meteors - or shooting stars apparently falling from the sky.

Since the invention of the telescope, three more planets have been discovered in our solar system: Uranus (1781), Neptune (1846), and Pluto (1930). Pluto was reclassified as a dwarf planet in 2006. In addition, our solar system is populated by thousands of small bodies such as asteroids and comets. Most of the asteroids orbit in a region between the orbits of Mars and Jupiter, while the home of comets lies far beyond the orbit of Pluto, in the Oort Cloud.

The four planets closest to the Sun - Mercury, Venus, Earth, and Mars - are called the terrestrial planets because they have solid rocky surfaces. The four large planets beyond the orbit of Mars - Jupiter, Saturn, Uranus, and Neptune - are called gas giants. Tiny and distant Pluto has a solid but icier surface than the terrestrial planets.

Nearly every planet - and some moons - has an atmosphere. Earth's atmosphere is primarily nitrogen and oxygen. Venus has a thick atmosphere of carbon dioxide, with traces of poisonous gases such as sulfur dioxide. Mars' carbon dioxide atmosphere is extremely thin. Jupiter, Saturn, Uranus, and Neptune are primarily hydrogen and helium. When Pluto is near the Sun, it has a thin atmosphere, but when Pluto travels to the outer regions of its orbit, the atmosphere freezes and collapses to the planet's surface. In that way, Pluto acts like a comet.

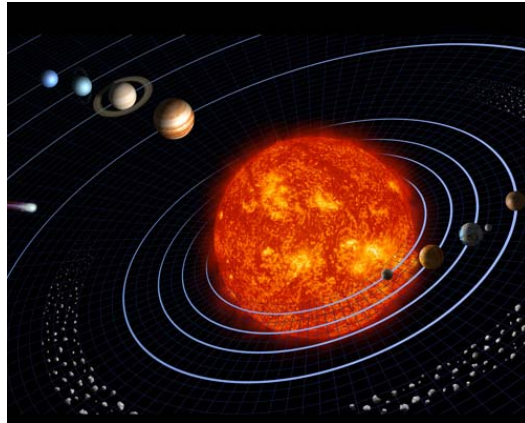
There are 144 known natural satellites (also called moons) in orbit around the planets in our solar system, ranging from bodies larger than our own moon to small pieces of debris. Many of these were discovered by planetary spacecraft. There are currently 21 recently discovered moons awaiting final approval before being added to our solar system's moon count.

Some of moons have atmospheres (Saturn's Titan); some even have magnetic fields (Jupiter's Ganymede). Jupiter's moon, Io, is the most volcanically active body in the solar system. An ocean may lie beneath the frozen crust of Jupiter's moon Europa, while images of Jupiter's moon Ganymede show historical motion of icy crustal plates. Some moons may actually be asteroids that were captured by a planet's gravity. The captured asteroids presently counted as moons may include Phobos and Deimos, several satellites of Jupiter, Saturn's Phoebe, many of Uranus' new satellites, and possibly Neptune's Nereid.

From 1610 to 1977, Saturn was thought to be the only planet with rings. We now know that Jupiter, Uranus, and Neptune also have ring systems, although Saturn's is by far the largest. Particles in these ring systems range in size from dust to boulders to house sized, and may be rocky and/or icy.

Most of the planets also have magnetic fields which extend into space and form a magnetosphere around each planet. These magnetospheres rotate with the planet, sweeping charged particles with them. The Sun has a magnetic field, the heliosphere, which envelops our entire solar system.

Ancient astronomers believed that the Earth was the center of the Universe, and that the Sun and all the other stars revolved around the Earth. Copernicus proved that Earth and the other planets in our solar system orbit our Sun. Little by little, we are charting the Universe, and an obvious question arises: Are there other planets where life might exist? Only recently have astronomers had the tools to indirectly detect large planets around other stars in nearby solar systems.



Activity 12: Space Science: Using Math to Explore Characteristics of the Solar System

The Solar System – The solar system consists of a star – the Sun – and everything that revolves around it. It’s called the solar system because solar means “of the sun.”

Directions: Use appropriate resources to complete the following graphic organizer

The Solar System		
Major Planets	General Characteristics	Planet: Distance from the Sun: Characteristics:
		Planet: Distance from the Sun: Characteristics:
		Planet: Distance from the Sun: Characteristics:
		Planet: Distance from the Sun: Characteristics:
		Planet: Distance from the Sun: Characteristics:
		Planet: Distance from the Sun: Characteristics:
		Planet: Distance from the Sun: Characteristics:
		Planet: Distance from the Sun: Characteristics:
Asteroid Belt	Definition:	Description:
Dwarf Planets	General Characteristics	Planet: Distance from the Sun: Characteristics:
		Planet: Distance from the Sun: Characteristics:
		Planet: Distance from the Sun: Characteristics:
Comets	Definition:	Description:

Activity 13: How Much Would You Weigh on Other Planets?

Science Skill: Space science – exploration of characteristics of different planets

Math Skill: Multiplication of decimals

Your weight on a planet = your Earth weight times the surface gravity of that planet. Thus, if you wish to know what your weight would be on Mars, you need to multiply your Earth weight by the surface gravity of Mars.

Example: How much does a person who weighs 130 pounds on earth weigh on Mars?

Earth weight times surface gravity of planet = weight on that planet.

130 lbs. x .38 =

Planet (includes Pluto and the moon)	Surface Gravity Compared to Earth's
Mercury	0.37
Venus	0.88
Earth	1.00
Mars	0.38
Jupiter	2.51
Saturn	1.07
Uranus	0.93
Neptune	1.23
Pluto	0.04
Earth's moon	0.17

If a person weighs 130 pounds on earth, how much would that person weigh on each of the planets/moons listed above?

Activity 14: How Far Is It?

Science Skill: Space science – exploration of characteristics of different planets

Math Skill: Conversion of measurement units from astronomical units to miles to kilometers.

Distances in our solar system are so tremendous that units of measurement, such as miles, meters, and kilometers are too small to be helpful. Thus, scientists have developed a unit of measurement based on the distance between Earth and the sun called the astronomical unit (AU). Using geometry we can see that the average distance between Earth and the sun is 93 million miles or 149,600,000 km.

1 AU = 93 million miles – 149,600,000 km.

Complete the following table to determine how many miles and how many kilometers each of the following planets are from the sun.

Planet	Distance from Sun in AU	Distance from Sun in Miles	Distance from Sun in Kilometers
Mercury	0.387		
Venus	0.723		
Earth	1.000		
Mars	1.524		
Jupiter	5.203		
Saturn	9.539		
Uranus	19.182		
Neptune	30.214		

Extension Activity: The average distance from the Earth to the Sun is 1 AU or 92,960,000 miles. How would you write this distance in scientific notation?

How would you write 149,600,000 km in scientific notation?

Can you use scientific notation to indicate the distance of each of the above planets from the sun?

Activity 15: Distances in the Solar System

Even in our own “cosmic neighborhood,” distances in space are so vast that they are difficult to imagine. In this activity, we will build a scale model of the solar system using a roll of toilet paper.

Materials

- Planetary distances table
- Roll of toilet paper
- Gel pen or felt tip pen to write on toilet paper

Doing the Activity

Take one sheet of toilet paper as a test sheet for the pens. Make sure the ink is not too wet so that the pens don't easily tear the paper. Make a dot on the seam between the first two sheets of toilet paper. This is the Sun. Write the word Sun beside the dot.

Use the table of numbers to mark off the distances to each of the planets. The number in the table is the number of sheets of toilet paper needed to reach the orbit of each planet. It is important to realize that the counts in the table are starting from the Sun, not from the previous planet. (Thus, after you get to Mercury, you need 1.7 more sheets to get to Venus.) Make a dot and write the appropriate planet name on the toilet paper at the distance indicated. Ceres, the largest asteroid, is used to represent the asteroid belt.

Note:

- Keep a running count as you work on this. Each distance is from your starting point, the Sun
- 200 sheets of toilet paper stretch out to nearly 84 feet. Make sure you have room for your model before you start.
- Use colored pens to mark the distance to the planet's orbit from the Sun and label the orbit with the planet's name on the toilet paper.

Planet	Distance from the Sun (km)	Squares of Toilet Paper from the Sun
Mercury	57,910,000 km	2.0
Venus	108,200,000 km	3.7
Earth	149,600,000 km	5.1
Mars	227,940,000 km	7.7
Ceres	414,436,363 km	14.0
Jupiter	778,330,000 km	26.4
Saturn	1,429,400,000 km	48.4
Uranus	2,870,990,000 km	97.3
Neptune	4,504,000,000 km	152.5
Pluto	5,913,520,000 km	200

Activity 16: Where in the World Am I?

Directions: Identify each of the following coordinates with a dot on your grid. Then connect them in order. If completed correctly, you will be able to identify a map of a familiar geographic location.

1. (-3, 0)
2. (-4, -2)
3. (-3, -3)
4. (-4, -4)
5. (-4, -8)
6. (0, -7)
7. (5, -7)
8. (5, -1)
9. (4, -2)
10. (2, -2)
11. (1, 0)
12. (0, 2)
13. (-1, 4)
14. (-2, 5)
15. (-2, 8)
16. (-4, 8)
17. (-4, 2)
18. (-3, 1)
19. (-3, 0)

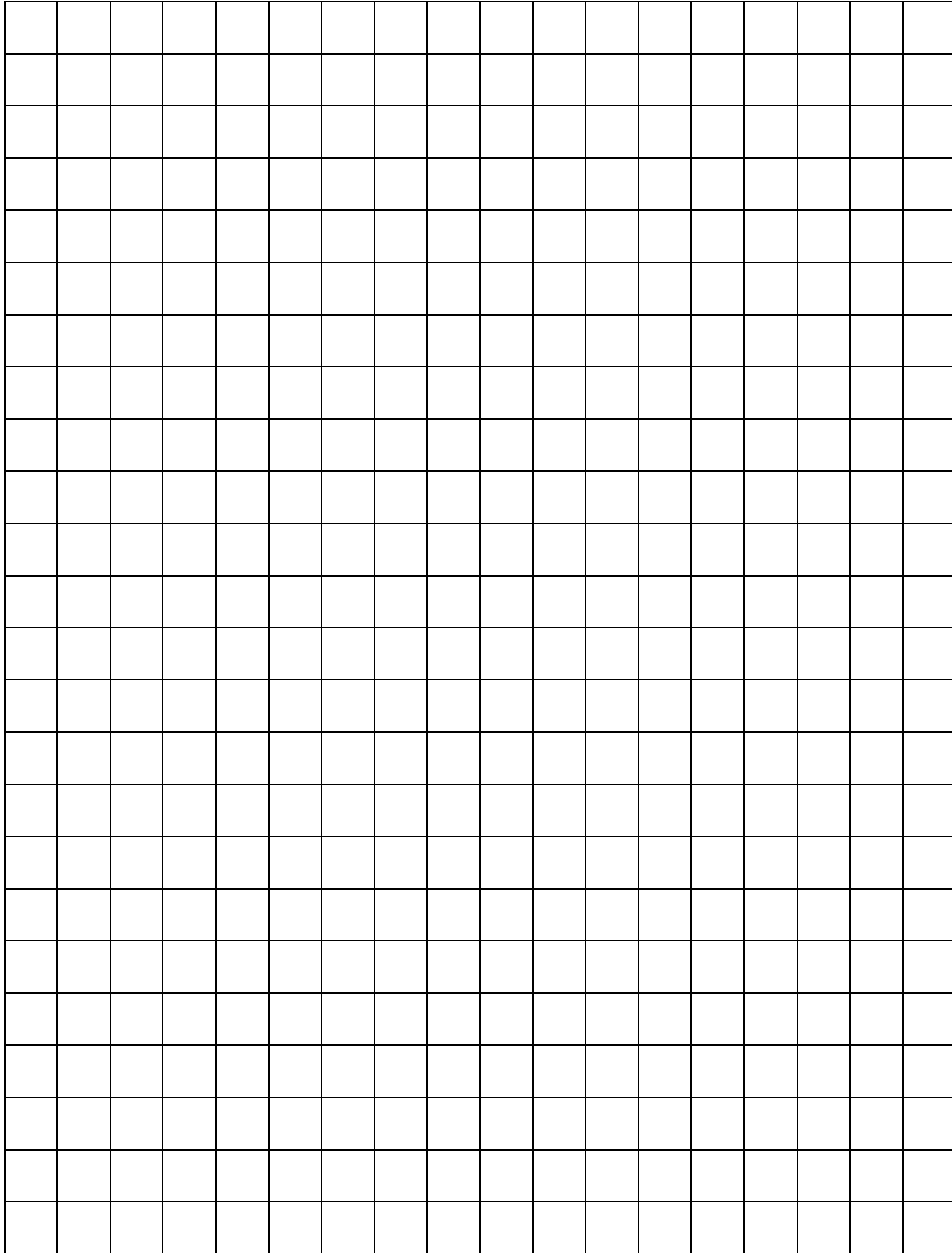
The name of the place is: _____

Let's try one more. Place each coordinate on the grid and then connect the dots.

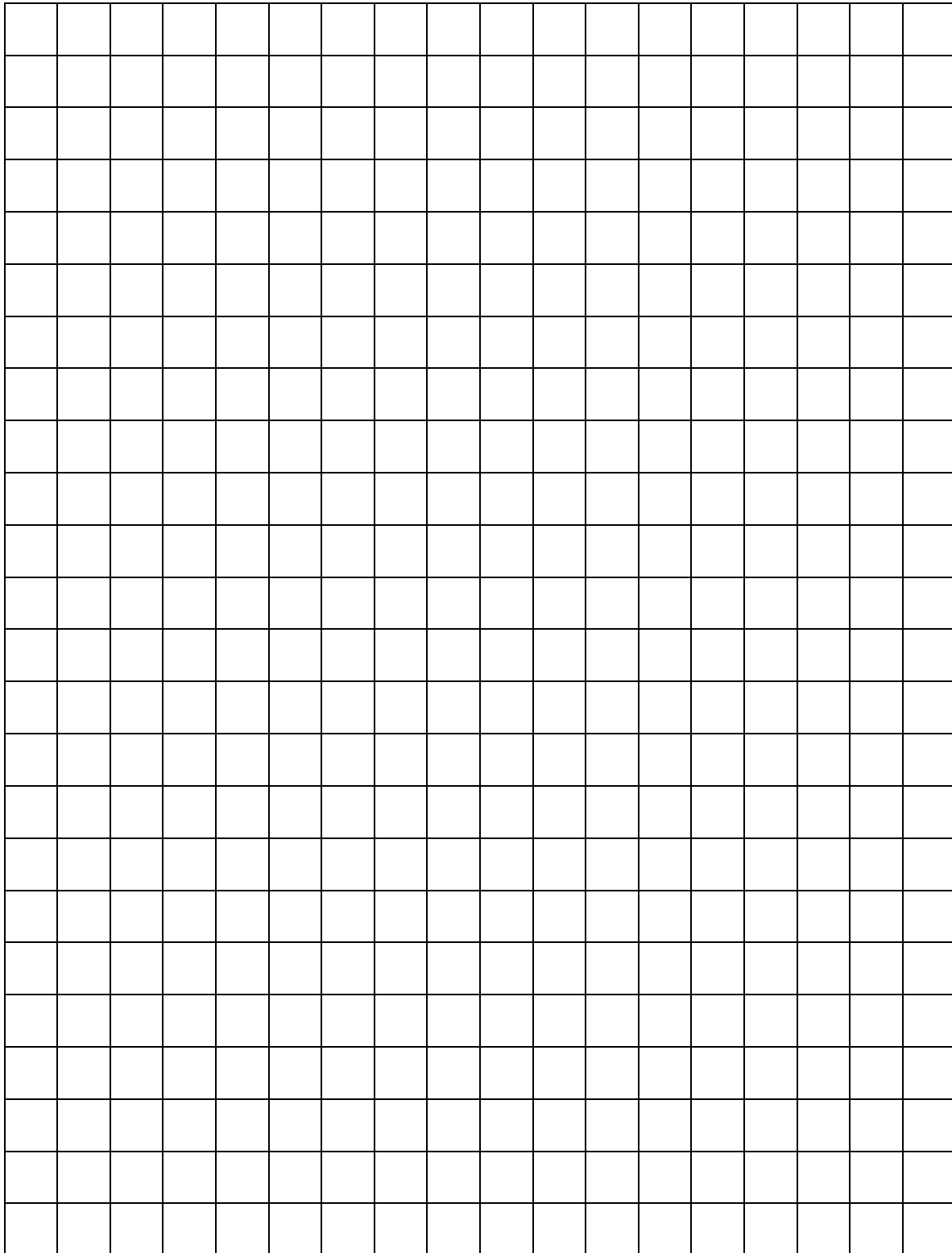
- | | |
|-------------|--------------|
| 1. (0, -3) | 18. (4, 5) |
| 2. (1, -5) | 19. (3, 5) |
| 3. (2, -6) | 20. (2, 6) |
| 4. (3, -7) | 21. (1, 6) |
| 5. (4, -7) | 22. (0, 6) |
| 6. (4, -5) | 23. (0, 9) |
| 7. (5, -3) | 24. (-4, 9) |
| 8. (7, -2) | 25. (-4, 6) |
| 9. (8, -1) | 26. (-4, 3) |
| 10. (9, -1) | 27. (-9, 3) |
| 11. (9, 0) | 28. (-6, 0) |
| 12. (8, 1) | 29. (-5, -2) |
| 13. (8, 2) | 30. (-4, -3) |
| 14. (8, 3) | 31. (-3, -1) |
| 15. (7, 5) | 32. (-2, -1) |
| 16. (6, 6) | 33. (-1, -2) |
| 17. (5, 5) | 34. (0, -3) |

The name of the place is: _____

Grid Paper



Grid Paper



Answer Keys

Fahrenheit to Celsius

Fahrenheit	Celsius
0°	-17.78°
10°	-12.22°
20°	-6.67°
25°	-3.89°
30°	-1.11°
32°	0°
35°	1.67°
40°	4.44°
45°	7.22°
50°	10°
55°	12.78°
60°	15.56°
65°	18.33°
70°	21.11°
75°	23.89°
80°	26.67°
85°	29.44°
90°	32.22°
95°	35°
100°	37.78°