Let's Learn About Climate
Unit Plan

Created by
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September 4 – October 6, 2001

and

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October 1 – 24, 2001

during
Eastern Pacific Investigation of Climate Processes
Research Cruise on
NOAA Ship R/V Ronald H. Brown
www.ogp.noaa.gov/epic

List of Lesson Plans from EPIC Research Cruise

NOAA Research Project

What are CLIVAR and EPIC?

Latitude and Longitude

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Ocean Microstructure

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Research Cruise Scavenger Hunt

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Time Zones: What time is it?

Weather Maps

Clouds

Plan a Cruise

Cruise Word Problems

EPIC Research Cruise Word Problems

How to Design a Ship

MRS. RICHARDS' EARTH SCIENCE NOAA PROJECT

Assignment: Research any topic relating to the National Oceanic and Atmospheric Administration (NOAA) research cruise that Mrs. Richards will be participating in. You can present your research in any format you choose. The lists below may help you generate ideas.

Due Date: Friday, August 31, 2001. Presentations to the class will take place August 31 and September 4.

Grading Criteria: This project is worth 100 points, allocated as follows:

IB Criteria B[1]	Rubric Score 6 * 5	30 points
IB Criteria C[1]	Rubric Score 6 * 5	30 points
Creativity and Presentation[2]		20 points
Quality of Research[3]		20 points

[1]Since the IB criteria make up most of your grade, you should consult them frequently as you work on your project. Don't forget, the criteria are located at the beginning of your Interactive Textbook.

[2]Use color, show effort, and be prepared for your presentation to the class

[3]Make sure all sources are cited and that all information is in your own words!

Research Area Ideas:

- Types of ships
- History of ocean exploration
- Types of careers represented on the ship
- Qualifications of personnel
- Layout of the ship
- Recreation opportunities on the ship
- Data collection buoys
- Types of research done by NOAA
- Navigation equipment on the ship
- Laboratory equipment on the ship
- Ship specifications (size, speed, materials used in construction, etc.)
- Intertropical Convergence Zone (ITCZ)
- Sea life near the Galapagos Islands
- Land animals on the Galapagos Islands
- Vegetation (plants) on the Galapagos Islands
- Geography and topography of the Galapagos Islands
- Desalinization process (converting salt water to fresh water)
- Culture, language and people of the Galapagos Islands
- Darwin's observations of the Galapagos Islands and how they relate to his theory of evolution
- Earth's atmosphere
- Satellite communication
- Information and data about El Niño
- What is Climate and why is it important

Presentation Format Ideas:

PowerPoint
Flash
Video
Poster
Model or diorama
Web page
Song and dance script

Mrs. Richards' Lesson Plan

What is CLIVAR and EPIC?

OBJECTIVES

1. Through internet research, students will learn about international efforts to investigate climate
2. Students will demonstrate understanding of the current Ronald H. Brown mission by mapping the EPIC2001 cruise within the CLIVAR framework
3. Through internet research, students will learn that scientific research is often a joint effort internationally, and many countries work together to improve the world's scientific understanding
4. Through independent writing, students will demonstrate understanding about why climate research is of international interest
5. Students will practice their internet search skills by determining what key words to use in a search engine

AGE

Grades 9-12

TIME ALLOWANCE

1-2 hours

MATERIALS

Internet access
Copies of student handout

INSTRUCTION:

1. Introduce the lesson by explaining that the research being conducted by the various research groups on the Ronald H. Brown are part of the EPIC program, sponsored by NOAA and the National Science Foundation. Tell students that EPIC is the United States' way of contributing to the CLIVAR program. Students will be researching CLIVAR and EPIC to understand the framework within which this cruise exists.
2. Students may work individually or in groups, depending on the number of computers available and teacher preference. Hand out the student worksheet to each student. Have the students read the questions, then as a class

What is CLIVAR and EPIC?

generate a list of appropriate internet search terms. Make sure the students copy the list onto their handout as reference.

3. Allow the students 30-45 minutes to do their research and complete the handout. Teacher should circulate among the students to ensure they are on track and making progress. If students are genuinely working, but having difficulty, allow them additional time to work.
4. Review responses as part of a class discussion.
5. As homework, or as a silent in-class activity, have students write a 1-2 page essay responding to the following question:

   "Why is climate research an international interest?"

EVALUATION / ASSESSMENT

Successful completion of student handout

Name: _____

CLIVAR and EPIC Student Handout

Use the internet, Mrs. Richards' daily logs (www.ogp.noaa.gov/epic), and any library materials you have to answer the following questions. Hint: The "C" in both terms refers to "Climate"- this will help you with your internet research.

What are some appropriate key words to search for using for favorite internet search engine?

*	*
*	*
*	*
*	*
*	*
*	*

1. What do the acronyms CLIVAR and EPIC stand for?

CLIVAR _____

EPIC _____

2. When was CLIVAR established, and by whom?

3. What are the various research components of CLIVAR?

4. What is the main goal of CLIVAR?

5. Who is in charge of the EPIC program? Is there a specific organization, or certain people that are the leaders of EPIC?

Name: _____

CLIVAR and EPIC Student Handout

6. What is the main goal of EPIC?

7. How is the Ronald H. Brown research cruise from San Diego, CA to the Galapagos Islands, from September 5, 2001 to October 6, 2001, related to EPIC?

8. What countries are participating in CLIVAR?

9. How will the research being conducted in the CLIVAR and EPIC programs help the world?

10. In some way, EPIC is imbedded in the CLIVAR framework. Diagram this relationship below.

Mrs. Richards' Lesson Plan

Latitude and Longitude

AGE LEVEL

Grades 6-9

TIME ALLOWANCE

Approximately 2 hours 45 minutes

OBJECTIVES

1. Students learn how to find latitude and longitude on a map or atlas
2. Students work in groups to create maps with the cruise route. These maps will give students practice at plotting locations given latitude and longitude coordinates, and at the same time provide maps for the classroom to reference throughout the cruise.

MATERIALS

- Latitude / Longitude handout
- Poster board
- Markers
- Atlases or maps for reference

INSTRUCTION:

1. 45 minutes. Lecture. Draw on the board two globes- one showing latitude, one showing longitude. Discuss Time Zones, Hemispheres, Prime Meridian, Equator, Arctic Circle, Antarctic Circle, Tropic of Cancer, and Tropic of Capricorn. Students copy into notes.

2. 30 minutes. Game! Everyone gets an atlas. Divide the class into teams. Ask each team to find the latitude or longitude of a certain place, or provide them with coordinates and see who can find the city at that location first.

3. 45 minutes (or homework assignment). Each student complete the Latitude / Longitude worksheet (attached).

4. 45 minutes. Student groups (4 per group) use an atlas and poster board to draw a map of the world. They must plot each cruise waypoint referenced in the Cruise Plan (excerpt attached). Save these maps so that additional

information can be plotted on each one later on (temperatures, notes from teacher while at sea, surface currents, etc.)

EVALUATION / ASSESSMENT

Game! (see above)
Homework assignment (attached).
Cruise route maps

EXTRA CREDIT

What is the significance of 23.5 degrees latitude (north and south)?

NAME: _____

LATITUDE AND LONGITUDE

Using your atlas, find the latitude and longitude of each of the following cities.

CITY	COUNTRY/STATE	LONGITUDE	LATITUDE
New York	New York		
Philadelphia	Pennsylvania		
Chicago	Illinois		
San Francisco	California		
Boston	Massachusetts		
London	England		
Paris	France		
Berlin	Germany		
Rome	Italy		
Tokyo	Japan		
Rio de Janeiro	Brazil		
Anchorage	Alaska		
Bombay	India		
Perth	Australia		

QUESTIONS:

1. Which of the cities is farthest north?

2. Which of the cities is farthest south?

3. Which of the cities is farthest east?

4. Which of the cities is farthest west?

5. How many miles are there in each degree of latitude?

6. What distance is represented by one minute of latitude (60 minutes for each degree)?

5. What distance is represented by one second of latitude (60 seconds for each minute)?

6. By using your answer to question 5, determine the circumference of the

earth.

Give the name of the largest city in the vicinity of the following latitudes and longitudes. Also give the name of the country in which each of the cities are located.

LATITUDE. & LONGITUDE.	CITY	COUNTRY
50N 123W		
34N 118W		
26N 80W		
19N 96 W		
1S 48W		
26 S 58W		
37S 175E		
38N 128E		
17N 3W		
30N 32E		
40N 33W		
51N 4E		

Find the missing component of information.

Place	Latitude	Longitude
Vancouver, Canada		
	40N	75W
	52N	0
Rome, Italy		
Bombay, India		
Cape Town, South Africa		
	38N	151E
	62N	150W
Moscow, Russia		

(excerpt from the EPIC 2001 Operation Plan, dated 7/15/01)

2.3 Cruise Way Points:

LEG 1

Way Point	Lat.	Long.	Naut. Miles	Ave. Sp	Hrs	ArrDep Date	Date	Comments
1	32.7 N	117.2 W	–	0 .0	–	9/3	9/6	San Diego
2	20.0 N	110.0 W	862	13.0	66.0	9/89/8		
3	12.0 N	95.0 W	1005	13.0	77.0	9/11	-	
4	12.0 N	95.0 W	--	0. 0	7.0	-	9/11	Repair buoy
5	10.0 N	95.0 W	120	13.0	9.0	9/12	9/12	
6	8.0 N	95.0 W	120	13.0	9.0	9/12	-	
7	8.0 N	95.0 W	--	0.0	7.0	-	9/13	Repair Buoy
8	10.0 N	95.0 W	120	13.0	9.0	9/13	-	Repair Buoy
9	10.0 N	95.0 W	--	0.0	480.0	-	10/3	ITCZ ops
10	0.0 N	95.0 W	600	9.8	61.0	10/5	10/5	CTD section
11	0.5 S	91.5 W	212	13.0	16.0	10/6	10/9	Galapagos Is.

LEG 2

Way Point	Lat.	Long.	Naut. Miles	Ave. Sp	Hrs	ArrDep Date	Date	Comments
1	0.5 S	91.5 W	–	--	70.0	10/6	10/9	Galapagos Is.
2	2.0 S	95.0 W	228	13.0	18.0	10/10	10/10	
3	8.0 S	95.0 W	360	9.8	37.0	10/11	10/11	CTD section
4	20.0 S	85.0 W	932	9.8	95.0	10/15	--	CTD section
5	20.0 S	85.0 W	–	0.0	144.0	--	10/21 mooring	IMET
6	20.0 S	72.0 W	756	9.8	77.0	10/24	10/24	CTD section
7	20.5 S	70.3 W	102	13.0	8.0	10/25	-	Arica, Chile

Mrs. Richards' Lesson Plan

Weather and Climate

OBJECTIVES

1. Students will be able to distinguish between weather and climate
2. Students will be able to give examples of weather in their town, and examples of climate in their town

AGE

Grades 7-9.

TIME ALLOWANCE

1-2 hours

MATERIALS

Copies of Jennifer Richards' daily logs for September 7 and 8 aboard the R/V Ronald H. Brown.

Copies of climate maps (usually can be found in atlases)

INSTRUCTION:

1. Have the students in the class read aloud the Science Log portions of Jennifer Richards' daily logs for September 7 and 8 aboard the R/V Ronald H. Brown. At the end of each paragraph, the teacher should ask questions of the students to assess comprehension, and provide additional explanations as necessary.
2. Each log focuses on the research efforts of one of two groups on the ship (Sept 7 – University of California at Santa Barbara, Sept 8- Colorado State University). While the nature of the experiments is quite different, they have a similar goal. Have the students get into groups of 3 or 4 and challenge the groups to determine how the two research projects have a similar goal. They should be able to state that the goal of both projects is to improve the accuracy of climate forecasting.
3. Since the goal here relates to climate, it is important for students to understand what climate is. As a class, ask the students to describe the weather and climatic conditions in their town as detailed as possible. At this point, do not ask them to distinguish between which items refer to "weather" and which items refer to "climate." The teacher, or a student recorder, should write all student responses on the board. Sample responses might

Weather and Climate

include "it's hot in the summer", "it rained yesterday", "it never snows", "it is usually cloudy."

4. The teacher should use a colored marker to circle everything on the board that relates to climate (long-term, generalized descriptions that are consistent from year to year), and with a different color, circle everything on the board that relates to weather (localized conditions on a daily basis that change frequently- a rain storm today, a tornado last month, a record low temperature tonight, etc.).
5. The students should brainstorm individually on what the difference is between weather and climate, based on how the teacher categorized the items on the board. Each student should write a hypothesis about the definitions of weather and climate.
6. The students should get back into groups once again to compare their hypotheses and come to a consensus. Ask each group to write their agreed-upon definitions of weather and climate on the board.
7. Teacher lead a discussion about how the definitions are different, and explain what the difference is between weather and climate.

EVALUATION / ASSESSMENT

Teacher will ask questions after each paragraph of the daily logs, so assess student understanding and provide additional information, if necessary.

Teacher will circulate among student groups to provide assistance and make sure they are on track

Each student group will generate a group hypothesis about the definitions of "weather" and "climate."

Mrs. Richards' Lesson Plan

Ocean Influences on Climate

OBJECTIVES

1. Students will brainstorm about the geographical factors that contribute to climate
2. Students will graph average monthly temperatures at two island groups, and analyze the data for similarities and differences.
3. Students will demonstrate comprehension of the impact of ocean currents on coastal temperatures by completing a quiz.

AGE

Grades 8-12.

TIME ALLOWANCE

2-3 hours

MATERIALS

Internet access
Graph paper
Map of ocean currents (available in most atlases)

INSTRUCTION:

1. To introduce this lesson, the teacher should ask the students "What factors affect the climate of a location?"

   If they need further prompting, ask them what the climate in Alaska is like. Even if the students have never been to Alaska, they have some idea of the climate. Why? Hopefully, they'll understand that latitude is a key factor.

   If there are mountains near your town, ask the students how the climate on the mountains is different from the climate in your town. This should remind them that elevation plays a factor in climate, which is why snow-capped mountains can been seen from temperate locations.

   If you had two cities at the same latitude, same elevation, but one was coastal and one was inland, ask the students to hypothesize about whether there would be any climate differences.

Ocean Influences on Climate

2. Have students get on the internet and research the climate of the Galapagos Islands, located in the eastern equatorial Pacific Ocean. They should record average daily temperatures each month during the year.
3. Next students will obtain the average daily temperature each month during the year for Palau, also located in the western equatorial Pacific Ocean.
4. Students will graph these temperatures on the same piece of graph paper, using different colors for each data set.
5. Students will write a "Data Analysis" explaining what they see on the graphs. They should note any similarities and differences between the temperatures of the two locations.
6. Teacher should now hand out a map of the ocean currents, or display one on an overhead. Most atlases contain this type of map.
7. Why are the climates different? What could be happening to cause two island groups, in the same ocean, at the same latitude and elevation, to have different climates? The teacher may choose to lead a class discussion, or have students brainstorm in groups. By the end of the lesson, students should understand that the temperature of large bodies of water has a large impact on the air temperatures on nearby land.

EVALUATION / ASSESSMENT

Using the same ocean current map used above, the teacher can quiz the students (formally or informally) by naming other coastal locations on Earth, and asking the students if there is a cold water current or a warm water current nearby. Students can also be asked if the coastal climate will be cooler or warmer than that of areas at similar latitude and elevation.

Temperature graphs will be assessed for completeness and accuracy

Data analysis and hypotheses will be assessed for the level of independent though shown by the student

Mrs. Richards' Lesson Plan

Correlating Atmospheric Data

OBJECTIVES

1. Students will examine data presented on several different graphs to explain anomalies and make correlations.
2. Students will make and test hypotheses about atmospheric data collected aboard the NOAA ship Ronald H. Brown research cruise.

AGE

Grades 9-12

TIME ALLOWANCE

2-3 hours

MATERIALS

Overhead transparencies of the graphs included with this lesson

INSTRUCTION:

1. Teacher will explain to students that the graphs they will be viewing show data collected aboard the NOAA ship Ronald H. Brown at 10^{o}N latitude, 95^{o} W longitude.
2. Teacher will display the solar radiation graph, and explain that measurements of incoming solar radiation were made just above the ocean surface. The numbers on the x-axis represent Julian calendar days of the year.

   Discussion question for students: Between Julian days 255 and 267 (September 12-24, 2001), are there any days with significantly different solar radiation values?

   Expected responses: Students should recognize that days 261, 262, 265 and 267 experienced significantly less incoming solar radiation compared to the other days presented on the graph.
3. Students will write 2-3 hypotheses in their notebooks that might explain why there was less solar radiation reaching the ocean surface on those particular days.
4. Teacher will display the rainfall graph for the same time period.

Correlating Atmospheric Data

Discussion question for students: Between Julian days 255 and 267 (September 12-24, 2001), are there any days with significantly more rainfall than the other days presented on the graph?

Expected responses: Students should recognize that days 260, 261, 262, 265 and 267 were the only days that experienced any significant amount of rainfall.

5. Students will write 2-3 paragraphs in their notebook describing whether viewing the rainfall graph supported or negated the hypotheses they developed previously. How do they know that their hypotheses have been supported or negated? Do they have a new hypothesis about why the solar radiation was so low on some days? Student writing should demonstrate critical thinking.
6. Teacher will display the Ocean Temperature vs. Air Temperature graph.

   Discussion question for students: Between Julian days 255 and 267 (September 12-24, 2001), are there any days with significant fluctuations in the air temperature?

   Expected responses: Students should recognize that days 259, 260, 262, 264 and 267 experienced fluctuations of at least 3-4^{o} C.
7. Based on the revised hypothesis students generated in step 5, how does air temperature data add to the overall picture of atmospheric conditions during this time period?
8. Wind speed graph included in this lesson can be used for additional correlation, if time permits. Otherwise, skip to the next step.
9. In their notebooks, students will answer the following question:

   If you were a scientist or crew member aboard the Ronald H. Brown research vessel between Julian days 255 and 267 (September 12-24, 2001), what weather and atmospheric conditions would you have observed? Specify which days you would have observed each of the conditions you list.
10. Teacher will collect student writings, and read a few selected ones to the class to generate discussion about their accuracy.

EVALUATION / ASSESSMENT

Teacher will circulate among students to provide assistance and make sure they are on track with writing assignments. Students are expected to participate in discussions, and demonstrate critical thinking on all writing.

Mrs. Richards' Lesson Plan

Cruise Conditions Graphing & Statistics

OBJECTIVES

1. Students will graph some of the weather conditions at 10N, 95W for the 18-day period when the Ronald H. Brown NOAA research vessel was stationed there.
2. Students will do basic statistical calculations using the data they plotted.
3. Students will look for trends in the data.

AGE

Grades 8-10

TIME ALLOWANCE

2 hours

MATERIALS

- Access to the daily logs posted by Jennifer Richards, Teacher at Sea (www.ogp.noaa.gov/epic)
- Graph paper
- Copies of student handout

INSTRUCTION:

1. Students will review the daily logs to find the 18 days during which the ship was stationed at 10N, 95W
2. Students will calculate the following:
    - mean temperature (air and water)
    - median temperature (air and water)
    - mode temperature (air and water)
    - percent difference between the highest temperature (air and water) and the lowest temperature recorded during this period
    - percent difference between the air and water temperatures on the day when the two were closest, and on the day when the two were farthest apart.

Cruise Conditions Graphing & Statistics

- standard deviation (air and water)
- students will construct a properly-labeled bell curve for the air and water temperature

3. On one graph, students will plot the air temperature and water temperature for each day of the trip. Note: air temperature was measured at noon each day.
    - from a science perspective, students should make a correlation between air temperature and water temperature, based on visual observations of the graph

EVALUATION / ASSESSMENT

Teacher will assess students based on accuracy of their responses to the above questions.

Name: _____

Cruise Conditions Graphing & Statistics

Using the data provided in Teacher at Sea Jennifer Richards' daily logs while aboard the Ronald H. Brown NOAA research vessel (www.ogp.noaa.gov/epic), calculate the following:

1. Mean temperature (air and water)

2. Median temperature (air and water)

3. Mode temperature (air and water)

4. Percent difference between the highest temperature (air and water) and the lowest temperature recorded during this period

Name: _____

Cruise Conditions Graphing & Statistics

5. Percent difference between the air and water temperatures on the day when the two were closest, and on the day when the two were farthest apart.

6. Standard deviation (air and water)

7. Construct a properly-labeled bell curve for the air and water temperature

On a sheet of graph paper, graph the air temperature and the water temperature during the 18 days in which the Ronald H. Brown NOAA research vessel was stationed at 10N, 95W.

8. Make a scientific correlation between air temperature and water temperature, based on your visual observations of the graph you created.

Mrs. Richards' Lesson Plan

Scientific Literacy - Lightning

OBJECTIVES

1. Students will learn how to read scientific material by reading about the research being conducted by Dr. Rob Cifelli from the Colorado State University.
2. Students will learn new scientific terminology by reading scientific material and researching definitions of new words.
3. Students will learn how radar can be used to determine lightning potential of a cloud by reading about the research being conducted on the R/V Ronald H. Brown on a research cruise from San Diego, CA to the Galapagos Islands, Ecuador.
4. Students will demonstrate comprehension of scientific writing by illustrating part of the document they will be reading.
5. Students will practice note-taking skills by summarizing each paragraph in the attached research overview.

AGE

Grades 8-12

TIME ALLOWANCE

1-2 hours (3 class periods)

MATERIALS

- Copies of the research overview for each student
- Color pencils or makers
- 2 colors of highlighter for each student
- Overhead transparency diagram of the cross section of a cloud.

INSTRUCTION:

DAY 1

1. Hand out a Research Overview to each student. They should read the article silently to themselves. With one color highlighter, students should highlight

Scientific Literacy - Lightning

all words that they don't understand (new terminology). With the second highlighter, students should highlight the key phrases and ideas in each paragraph. Allow students enough time to fully read the article.

2. For homework, students should research and document the definitions of all new words that they highlighted.

DAY 2

3. Now that each student has read the article and defined all new terminology, they will write in their notebooks a one-sentence summary of each paragraph.
4. To exercise both the left and right sides of the brain, students will draw a diagram, illustration, poem, cartoon, etc. that reflects understanding of the lightning discussion in the document. Whatever creative form they use to demonstrate understanding should be done in color, and be detailed enough to clearly show that they understood what they read. Remind students that they may have to read the article several times to achieve comprehension.

DAY 3

5. Assign the students to groups of 4-6. Each group member will share their summary sentences and drawings. Using inspiration from each other, each group will generate new summary sentences and an illustration for the research overview, which they will document on newsprint.
6. Each group will present their newsprint to the class. By viewing the work of other groups, hopefully each student will learn something that they may have missed when they read the article.
7. In their notebooks, students should write 2 things that they learned from each group presentation.
8. Finally, the teacher will present and explain the diagram included in this lesson. By doing this last, the students will have a better understanding of what it means, since they should now be intimately familiar with the research overview that pertains to the diagram.

EVALUATION / ASSESSMENT

Teacher will circulate among students to provide assistance and make sure they are on track.

Teacher will check to see that all highlighted words have been defined in writing.

Scientific Literacy - Lightning

Teacher will assess summary sentences and drawings for completeness and level of thought involved (did the student take the assignment seriously?)

RESEARCH OVERVIEW

USING RADAR TO UNDERSTAND CLOUDS AND STORMS

This article was written by Jennifer Richards, Earth Science Teacher and NOAA Teacher at Sea, during a research cruise on the Ronald H. Brown from San Diego, CA to the Galapagos Islands, Ecuador from September 5- October 6, 2001. http://www.ogp.noaa.gov/epic

INTRODUCTION

As the Teacher at Sea on a research cruise from San Diego, CA to the Galapagos Islands, Ecuador, I had the chance to meet with a wide range of scientists studying climate and ocean-atmosphere interactions. This research overview includes information about the research and data collected by three radar scientists from Colorado State University (Ft. Collins, Colorado) and a partner scientist from NASA (Huntsville, Alabama). These scientists are meteorologists who are studying the internal structure of storms over tropical oceans using radar and weather balloons. As radar scientists, they are using pretty sophisticated radar equipment and software for their research.

Although all four members of this group - Dr. Rob Cifelli, Dr. Walt Petersen, Mr. Bob Bowie and Dr. Dennis Boccippio (from NASA)- are very nice scientists with a great sense of humor, from my perspective, they are somewhat the villains on the ship. These scientists are hoping we will encounter storms- lots of them- the bigger, the better. Have any of you seen the movie "The Perfect Storm?"

RESEARCH BACKGROUND

Here's some background information that will help you understand the research this group is working on. Storms on land and storms on the ocean tend to be about the same

size vertically, but the way they function internally is quite different. On land, storms can be generated over pretty short periods of time, and can run themselves out pretty quickly. A lot of people in the mid-west are familiar with the daily rain storms that hit during summer afternoons- suddenly coming out of nowhere, and then disappearing as fast as they arrived. This is because land is full of heat pockets. You could have rivers, farms, asphalt and concrete highways, homes, and forests, and they all heat and cool at different rates. The differences in the rate of heating cause pressure gradients, which can lead to volatile weather conditions.

The ocean does not contain heat pockets the way the land does, and therefore, the air above the ocean heats more slowly. Pressure gradients in the air above the ocean are not as steep, so when storms are generated over the ocean, they grow slowly over long periods of time, and can become quite large. Do you remember hearing in the news about hurricanes? The weathermen will track hurricanes for many days to see where it is moving and how large it is getting. This is an example of an ocean storm growing slowly to a very large size.

If we can understand how storms form and behave in a certain area, it will help us understand the climate in that area. If you want to learn about the climate of San Diego, California, for example, it's not very hard. You can visit the library and find all sorts of documents about the climate and typical weather conditions. There have been weather stations in San Diego for at least a hundred years, and there is plenty of data that has been collected. There aren't too many surprises.

RESEARCH OVERVIEW

USING RADAR TO UNDERSTAND CLOUDS AND STORMS

PURPOSE OF RESEARCH

But what do we really know about climate over the oceans? Not a whole lot. Storms heat the atmosphere and affect the climate. NASA and NASDA (the Japanese Space Agency) have a satellite called TRMM (Tropical Rainfall Measuring Mission) provides data about storms from very far away, but we don't have oceans full of weather stations to show us exactly what's going on at the surface and in the troposphere. Plus, TRMM can only measure what it sees from the sky- the tops of storms. You have to be on the ocean to see the rest of the storm. And since the satellite passes over each location on earth only twice a day, the data can be up to 12 hours old. When’s the last time you heard of a storm that hadn’t changed in 12 hours?

How do the atmosphere and the ocean interact? How are storms in the tropics different from storms in the mid-latitude regions? What impact does the tropical ocean water have on the air above it? What impact does it have on storms that form over it? That’s where this group from Colorado State University comes into the picture. The R/V Ronald H. Brown is equipped with a Doppler Radar system that uses microwaves to echo off of condensed water, ice crystals, and hail. It can create 3D profiles of storms within 150 km of the ship. A satellite can only see the top of the storm, but the radar system on the ship can see the internal structure of it. And if we happen to be in the middle of a big storm, the radar can see everything going on around us for the duration of the storm (not just once every 12 hours, like the TRMM satellite). These scientists will also be launching weather balloons from the ship to gather additional atmospheric data in the sky above us.

RESEARCH OVERVIEW

USING RADAR TO UNDERSTAND CLOUDS AND STORMS

What can the world hope to learn from the research being done by this group? Well, if we have a better understanding of how storms are behaving in the tropics, we will have a better understanding of the factors affecting ocean climate. Since events such as El Nino originate in the tropical area of the Pacific Ocean, this research may help us better understand what causes seasonal climate changes and El Nino, and provide better forecasting of such events.

RESULTS

Two weeks into the cruise I checked with Dr. Cifelli to see what kind of data results his team has obtained. Preliminary results show that the clouds over the eastern Pacific Ocean are more “electrified” than clouds on the western edge of the Pacific. Let me explain...

One of the things Dr. Rob Cifelli, Dr. Walt Petersen, and Dr. Dennis Boccippio are looking at is the lightning potential in the area, and how it compares with other parts of the world. We have had some spectacular lightning shows during the trip, and the data collected by this team has shown that the clouds in this area are more electrified than clouds in the western Pacific Ocean.

What is an "electrified" cloud? It’s a cloud that is ready to produce lightning. Let’s look at cloud growth and dynamics to understand how a cloud becomes electrified.

As air moves in updrafts and rises into the sky, what happens to the air temperature? It decreases, of course. The warm tropical air, full of water vapor, rises to the point where

condensation occurs and a cloud is formed. If the drafts are strong enough, the air will eventually cool to the freezing point and colder. In this part of the world (10N, 95W) the altitude where the air temperature reaches 0 degrees Celsius is approximately 5 kilometers. Beyond this point the air temperature continues to decrease. When the moisture in the air hits the freezing point, it doesn't all instantaneously turn into ice crystals. There are complex physics that keep some of the water in liquid form, and some of it turns into ice. As the liquid water at this altitude bumps into existing ice crystals, the water freezes to the ice, forming a coating of rime. As the ice grows by this riming process, it can eventually produce particles called graupel (baby hail).

The part of the atmosphere where the temperature is between the freezing point and -40 degrees Celsius is called the "mixed phase" layer. Below -40 degrees any liquid water will spontaneously freeze. The air in the mixed phase layer contains both water and ice. This is the region of the cloud where electric charge is separated and lightning is produced. To have an active mixed phase layer, the cloud updrafts have to lift raindrops above the freezing level high enough and fast enough so the drops don't all freeze right away and they can interact with ice crystals that are already there. After raindrops are lofted into the mixed phase region and interact with the ice particles, graupel forms and descends. As the graupel falls it bumps into small ice crystals which are either moving up or moving down slower than the graupel. Most atmospheric scientists think that the collisions of graupel with small ice crystals in the presence of liquid water separates charge and produces cloud electrification. An electrified cloud that produces lightning is

one that contains an active mixed phase layer (lots of collisions between ice and liquid water above the freezing level).

How do you measure the amount of ice crystals in the clouds, so that you know whether a mixed phase layer is present? That's where the radar technicalities come into play. The radar sends out a certain amount of energy, and receives a fraction of that energy back. Water reflects more of the radar signal than ice. When your power return is greater than 30 dBZ above the freezing level, you can be pretty sure you are detecting large ice (graupel) in the cloud. By measuring the amount of time it took for the signal to bounce off the cloud and return to the radar, you can determine how far away that part of the cloud is.

From the data collected on this research cruise so far, the CSU team has been able to infer that the clouds in the tropical eastern Pacific Ocean have a more active mixed phase process relative to other regions in the Pacific, meaning there is more liquid water lifted above the freezing level and it’s there long enough to interact with ice before freezing. This, in turn, allows the charge to separate, and voilá! lightning is produced.

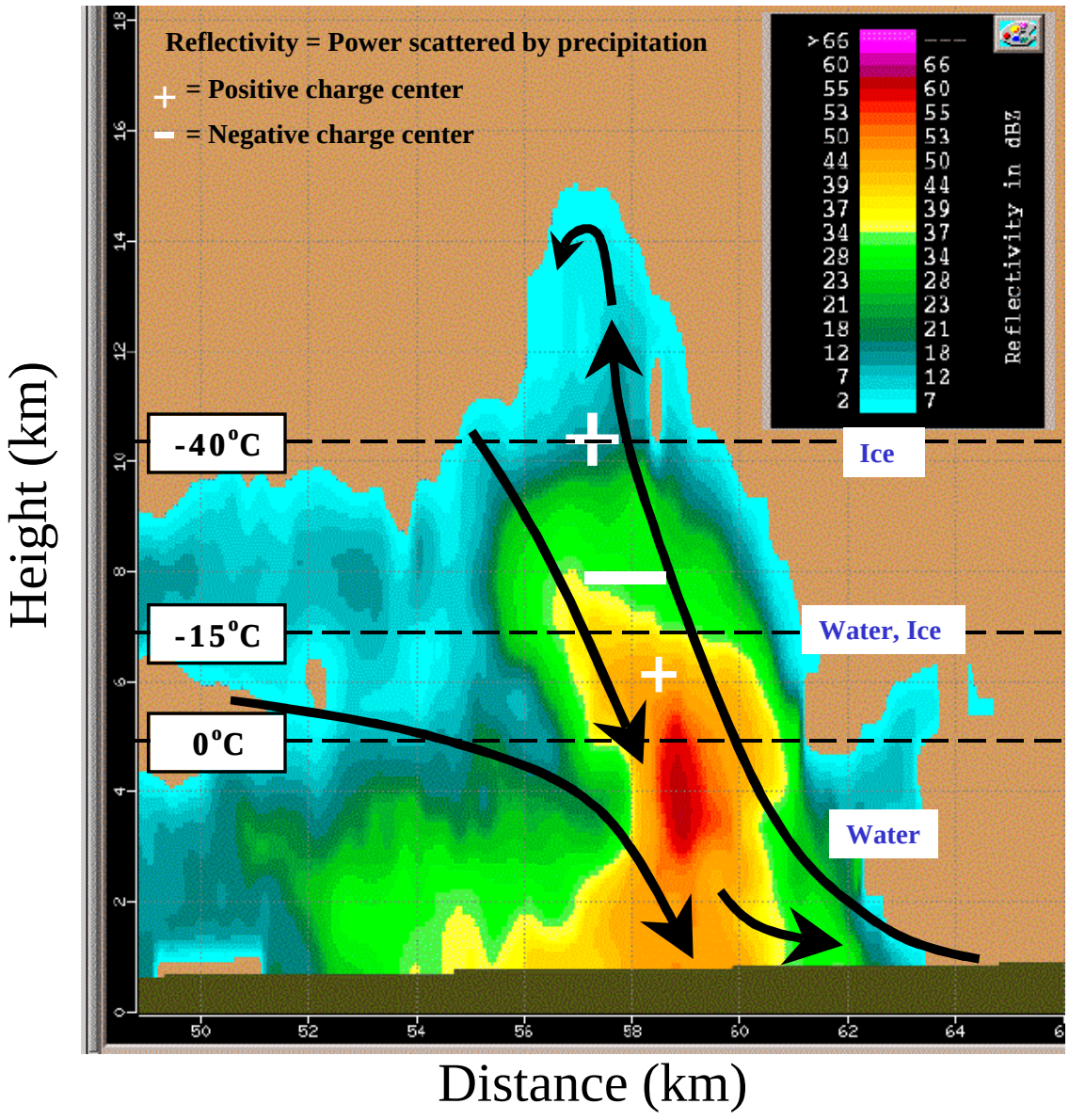
Is this information anything new and exciting? Well, yes! Satellite images have been used for a while to view the tops of clouds, and observers on the ground can view the bottoms of clouds, but you have to know the internal structure of the cloud to understand what type of weather it will produce. If you don't know the temperature and phase of the water in the cloud, you can't expect to accurately predict how it formed, how it dissipates, and how it is interacting with the rest of the atmosphere. Answers to all of these questions are

necessary for climate modeling. Most atmospheric scientists believe that electrified clouds produce a different response on the surrounding atmosphere compared to non-electrical clouds.

So, to summarize the discovery (based on preliminary data)... the clouds in this area appear to be more electrified than clouds in the western Pacific Ocean.

USING RADAR TO SEE AN ELECTRIFIED CLOUD

The diagram was created by Dr. Walt Petersen from Colorado State University. The image shows the internal structure of a cloud in the tropical eastern Pacific Ocean. The diagram uses cloud data obtained on a research cruise aboard the NOAA ship R/V Ronald H. Brown. You can see from the legend on the right that everything colored yellow or red is returning at least 30 dBZ. Below approximately 5 kilometers these values mean large raindrops (especially the red areas). Above approximately 5 kilometers these values suggest the presence of large ice (graupel). The higher the 30 dBZ line extends above the cloud level, the stronger the cloud updrafts and the more vigorous the storm.



Mrs. Richards' Lesson Plan

Ocean Microstructure

OBJECTIVES

1. Students will learn about the microstructure of the ocean by analyzing graphs created by Dr. Mike Gregg of the University of Washington Applied Physics Laboratory during the EPIC 2001 research cruise on the Ronald H. Brown NOAA vessel.
2. Students will practice critical thinking skills by fully analyzing the data presented.
3. Students will generate a better understanding of plant and animal habitats by relating ocean profile conditions to the types of sea life that may live at different depths.

AGE

Grades 9-12

TIME ALLOWANCE

1 hour

MATERIALS

Copies of student handout
Overhead transparency of the microstructure graphs

NOTE: The data provided for these graphs were obtained using a Modular Microstructure Profiler (MMP), which measures temperature, salinity, density and dissolved oxygen of the ocean at profiles down to 300 meters in the ocean. The MMP measures additional parameters that are not included in this lesson. The MMP data in this lesson was obtained from 10N latitude, 95W longitude.

INSTRUCTION:

1. Explain to the students that they will be analyzing a graph created with data obtained from the Ronald H. Brown EPIC research cruise. Draw on the board a profile view of the ocean (basically, just a simple wave shape). Ask students what kinds of animals live in the ocean, and where they think the animals live (near the surface, near the shore, deep water, etc.). Although this lesson is not focused on sea life, this introductory step of the lesson plan will help students

Ocean Microstructure

understand how the ocean conditions (heat, waves, sunlight, etc.) are different at different depths.

NOTE: The students should recognize that certain animals and all plants need sunlight, and are therefore found close to the surface. As you go deeper in the ocean, the amount of sunlight disappears, and the animals that live there must be adapted to those living conditions.

2. Students will respond to the following prompt in their notebooks:
   "I think the water near the surface is different from the deep ocean water in the following ways:" (list 5 items)

   Students should reference things like: amount of sunlight, temperature, turbulence from waves, and salinity. This is an opportunity for students to use their common sense and brainstorm about a topic that may be new to them, but about which they can make reasonable hypotheses based on past knowledge.

3. Display the ocean profile graph on the overhead projector. There are three items plotted on the graph- temperature of the water, salinity of the water, and density of the water.

   NOTE: The units on the y-axis are megapascals, a unit of pressure. One megapascal is equivalent to 100 meters of depth in the ocean. There are three separate x-axes. The red axis displays temperature (degrees Celcius), the green axis displays salinity (parts per thousand) and the blue axis displays density (kilograms per cubic meter).

4. Ask students to answer the following questions (also included in the Student Worksheet):

   - What temperature is the water at the surface?
   - What temperature is the water at 300 meters deep?
   - At what depth does temperature drastically decrease?
   - What is the major source of heat for the ocean?
   - What is the salinity of the water at the surface?
   - What is the salinity of the water at 300 meters deep?
   - At what depth does salinity drastically increase?
   - Why do you think ocean salinity is lowest at the ocean surface? What types of atmospheric events would alter the salinity at the surface?
   - What density is the water at the surface?
   - What density is the water at 300 meters deep?

Ocean Microstructure

- At what depth does density drastically increase?
- Given the information presented, how is density of ocean water related to temperature and salinity?
- How much dissolved oxygen is present at the surface?
- How much dissolved oxygen is present at 300 meters deep?
- At what depth does dissolved oxygen drastically decrease?
- What is the major source of dissolved oxygen in the ocean?
- Do you see any pockets where dissolved oxygen does not have a consistent trend with depth? Where?
- If you were an animal that eats kelp, at what approximate depth would you live?
- If you were a species of animal that didn't have eyes, at what approximate depth would you live?
- If you were an animal that can tolerate low salinity conditions, at what approximate depth would you live?

5. Students will write a 2-3 paragraph data analysis based on the graphs presented. As with any data analysis, students should report trends in the data, and provide insight to try to explain those trends. They should generate new hypotheses to follow-up this research, and provide suggestions and questions that would guide further research. They can use the questions above to help guide them through their analysis, but the analysis should extend beyond those questions to present "why" they think those trends exist.

EVALUATION / ASSESSMENT

Teacher will assess students based on the attention they give this exercise, especially the data analysis that each student wrote. Did the student give serious thought to the data, or did they rush to finish the assignment without showing any independent thought?

Name: _____

Ocean Microstructure- Student Worksheet

I think the water near the surface is different from the deep ocean water in the following ways:

-
-
-
-
-

1. What temperature is the water at the surface?

2. What temperature is the water at 300 meters deep?

3. At what depth does temperature drastically decrease?

4. What is the major source of heat for the ocean?

5. What is the salinity of the water at the surface?

6. What is the salinity of the water at 300 meters deep?

7. At what depth does salinity drastically increase?

8. Why do you think ocean salinity is lowest at the ocean surface? What types of atmospheric events would alter the salinity at the surface?

9. What density is the water at the surface?

10. What density is the water at 300 meters deep?

Name: _____

Ocean Microstructure- Student Worksheet

11. At what depth does density drastically increase?

12. Given the information presented, how is density of ocean water related to temperature and salinity?

13. How much dissolved oxygen is present at the surface?

14. How much dissolved oxygen is present at 300 meters deep?

15. At what depth does dissolved oxygen drastically decrease?

16. What is the major source of dissolved oxygen in the ocean?

17. Do you see any pockets where dissolved oxygen does not have a consistent trend with depth? Where?

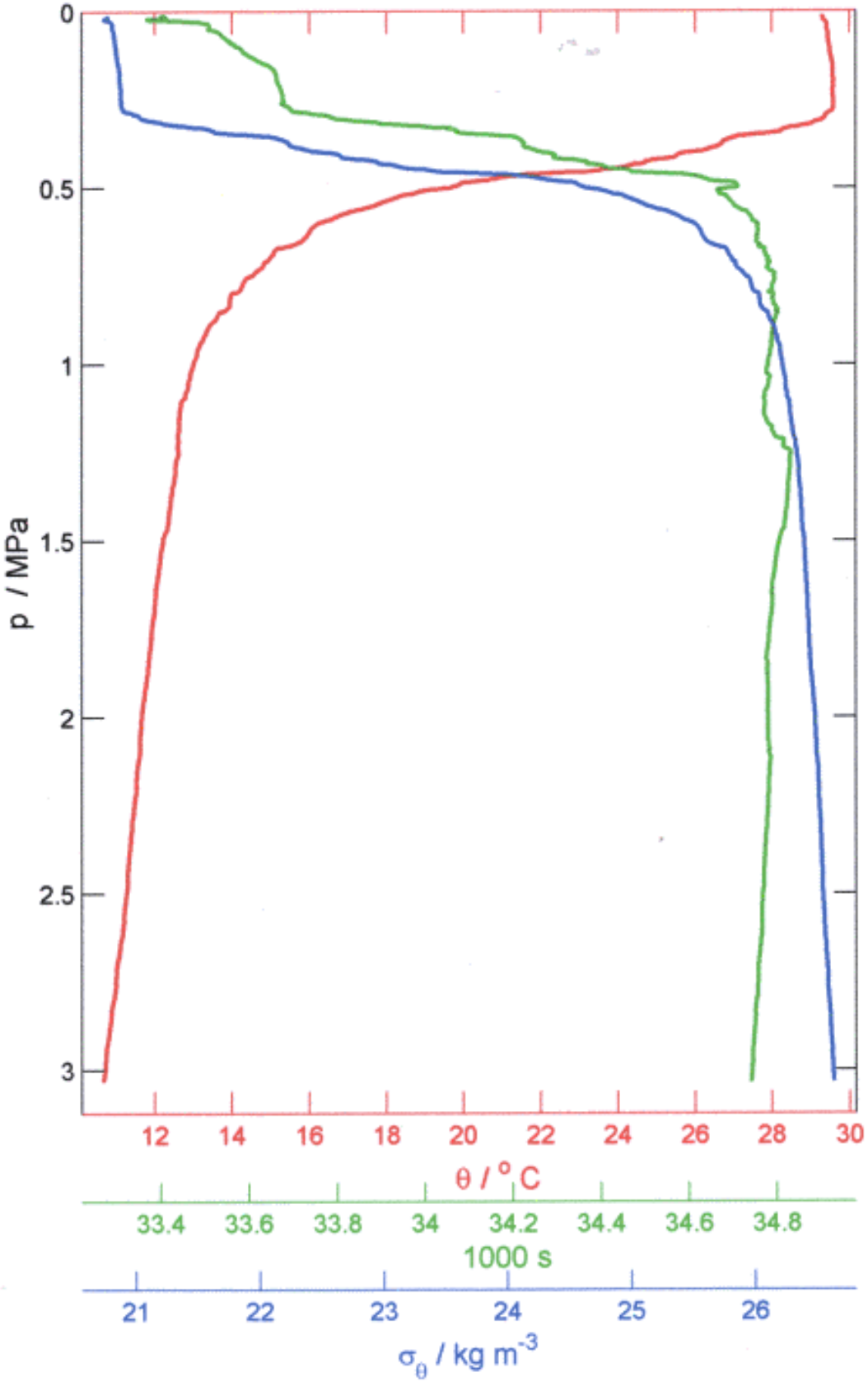
18. If you were an animal that eats kelp, at what approximate depth would you live?

19. If you were a species of animal that didn't have eyes, at what approximate depth would you live?

20. If you were an animal that can tolerate low salinity conditions, at what approximate depth would you live?

DATA ANALYSIS

Write a 2-3 paragraph data analysis based on the graphs presented. As with any data analysis, report trends in the data, and provide insight to try to explain those trends. Generate new hypotheses to follow-up this research, and provide suggestions and questions that would guide further research. You may use the questions above to help guide your analysis, but the analysis should extend beyond those questions to present "why" you think those trends exist.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0.5
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1.5
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2.5
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p / MPa
12
14
16
18
20
22
24
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θ / °C
33.4
33.6
33.8
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34.2
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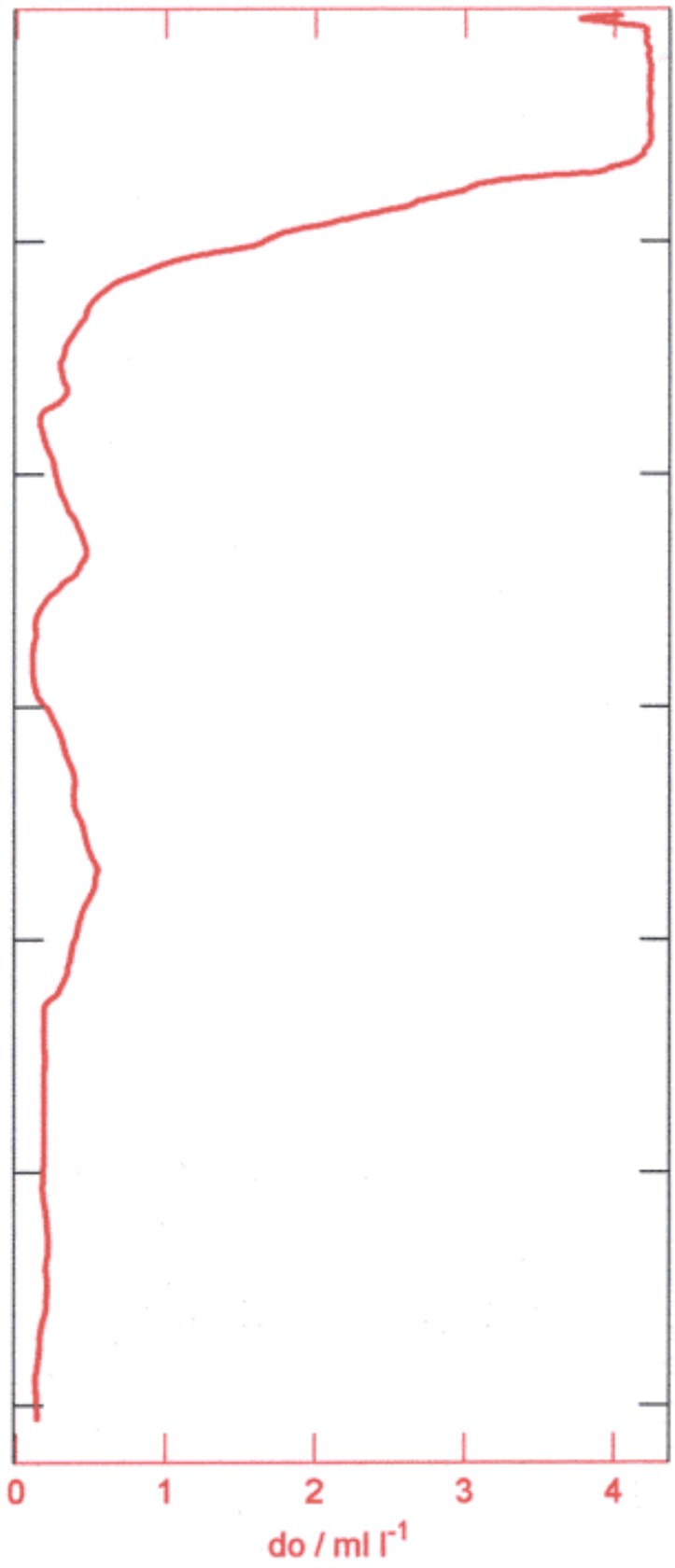
24
25
26
σθ / kg m-3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Mrs. Richards' Lesson Plan

Physical Characteristics of the Troposphere

OBJECTIVES

1. Students will learn about environmental trends in the troposphere- temperature, dew point, pressure and wind speed- by checking their hypotheses against data collected by weather balloons launched from the NOAA ship R/V Ronald H. Brown September 15, 2001 by Dr. Rob Cifelli from Colorado State University.
2. Students will practice their skills in obtaining information from graphs by answering questions.

AGE

Grades 8-10

TIME ALLOWANCE

1-2 hours

MATERIALS

- Overhead transparencies of the troposphere graphs. Note: these graphs are for tropospheric properties at 10 degrees north latitude, 95 degrees west longitude. Precise conditions and height of the tropopause will change with latitude, but general trends will be consistent throughout the world.

- Overhead transparency of the layers of the atmosphere

INSTRUCTION:

1. Introduce the layers of Earth's atmosphere to the students. Show them an overhead transparency of the different layers at their relative altitudes. I have found that many students are unaware that we are actually living in the troposphere- they often seem to think that the atmosphere begins somewhere up in the sky. Make sure this is clear to students before proceeding with the lesson.
2. Ask the students what air pressure is, and whether they think it increases, decreases, or stay the same with altitude. As with the rest of this lesson, the emphasis should be on students making educated guesses, not necessarily on the accuracy of the guesses. The students should write their hypothesis in their notes.

Physical Characteristics of the Troposphere

NOTES: If they are unsure about the answer, prompt them by asking what causes air pressure. Well, it's the pressure exerted by the column of air above us. At sea level, there is the maximum amount of air above us, so the air pressure is greatest. If we were 10 miles high in the sky, there would be much less air above us, and therefore, much lower air pressure. Imagine a pile of bricks stacked from the ground all the way into space. If you were at the very bottom of the pile, you'd have a lot more pressure on you than if you only had half the pile on you. Have the students ever been on a tall mountain and ran out of breath after walking up a flight of stairs? This is an example of the human body noting the difference in air pressure with altitude.

Why isn't the pressure decrease linear? Well, the density of the air molecules does not decrease linearly with increases in altitude. For students who have completed Chemistry or Physics, you can relate the Gas Law and Hydrostatics to further explain the logarithmic decrease in pressure with altitude.

3. Show the students the "Pressure in the Troposphere" graph. Have them copy the chart into their notes and answer the following questions:
   - What is the air pressure at sea level?
   - What is the air pressure at the top of the troposphere (16000 meters)?
   - If you were swimming 5 feet under water, the pressure on your body be greater than _____ millibars.
   - If you were in the stratosphere, the air pressure on your body would be less than _____ millibars.
   - The curve on this graph is what type? (Exponential, logarithmic, linear, etc.)
4. Ask the students what temperature is, and whether they think it increases, decreases, or stays the same with altitude in the troposphere. If they are unsure about the answer, prompt them by asking what "temperature" actually measures. The students should write their hypothesis in their notes.

   NOTES: Heat is created by the collision of air molecules. At sea level, where air pressure is greatest, the density of air molecules is greatest, so there are more collisions, and more heat. As you go higher into the troposphere, the number of air molecules decreases, so there are fewer collisions, and less heat is produced. Heat is also absorbed by greenhouse gasses in the atmosphere, such as ozone. Where there are more greenhouse gases (at Earth's surface and in

Physical Characteristics of the Troposphere

the stratosphere) the heat is retained. Again, ask the students how the temperature changes when they go to the top of a mountain.

The top of the troposphere is where the tropopause begins. At this point, the temperature stays fairly constant, until it reaches the stratosphere, where the temperature actually increases due to heat absorption by ozone.

5. Show the students the "Temperature in the Troposphere" graph. Have them copy the chart into their notes and answer the following questions:
   - What is the temperature at sea level?
   - What is the temperature at 16000 meters?
   - The curve on this graph is generally what type? (Exponential, logarithmic, linear, etc.)
   - At what altitude does the air temperature go below the freezing point?
   - What happens to the temperature at 1600 meters?
   - How do we know that the entire troposphere is shown on this graph?
6. With the same graph being displayed, explain to the students what "dew point" is. When the temperature of the air is reduced to the dew point temperature, the water vapor in the air condenses into water droplets. The closer together the air temperature and the dew point are, the more humid the air. As soon as the air cools to the dew point, the moisture condenses into clouds. For more information see: http://www.ems.psu.edu/~fraser/Bad/BadClouds.html
7. Students answer the following questions in their notes:
   - Which air is more humid- the air at sea level or the air at the top of the troposphere? Explain why.
   - List 2 ranges of altitudes where the air was relatively humid at the time the weather balloon traveled through it.
   - List 2 ranges of altitudes where the air was relatively dry at the time the weather balloon traveled through it.
   - What happens to humidity in the tropopause (the area above the troposhere)?
8. Finally, ask the students to think about what factors impact wind speed.

   NOTES: Wind speed is a reflection of the air pressure gradients. Air moves from high pressure areas to low pressure areas, and the greater the difference, the greater the winds.

Physical Characteristics of the Troposphere

Aside from pressure gradients, there are two additional factors that influence wind speed in the atmosphere. First, you must consider the density of the air. Density and velocity are inversely related. As density decreases, velocity increases. Imagine trying to push a box car full of coal- it would be difficult. The coal is very dense, and a lot of effort would be required. Now imagine pushing a box car full of cotton candy. Even though the volumes are the same, the cotton candy, being less dense than the coal, will be easier to push. Now relate this to the air. Since the air is less dense at higher altitudes, it is easier to push, which means that wind speeds increase.

Second, you must consider friction. If you are standing in an open area with few trees or buildings around (low friction), will the wind have the opportunity to generate a strong force? How about if you are standing in the middle of a forest? Friction is one factor that contributes to wind speed.

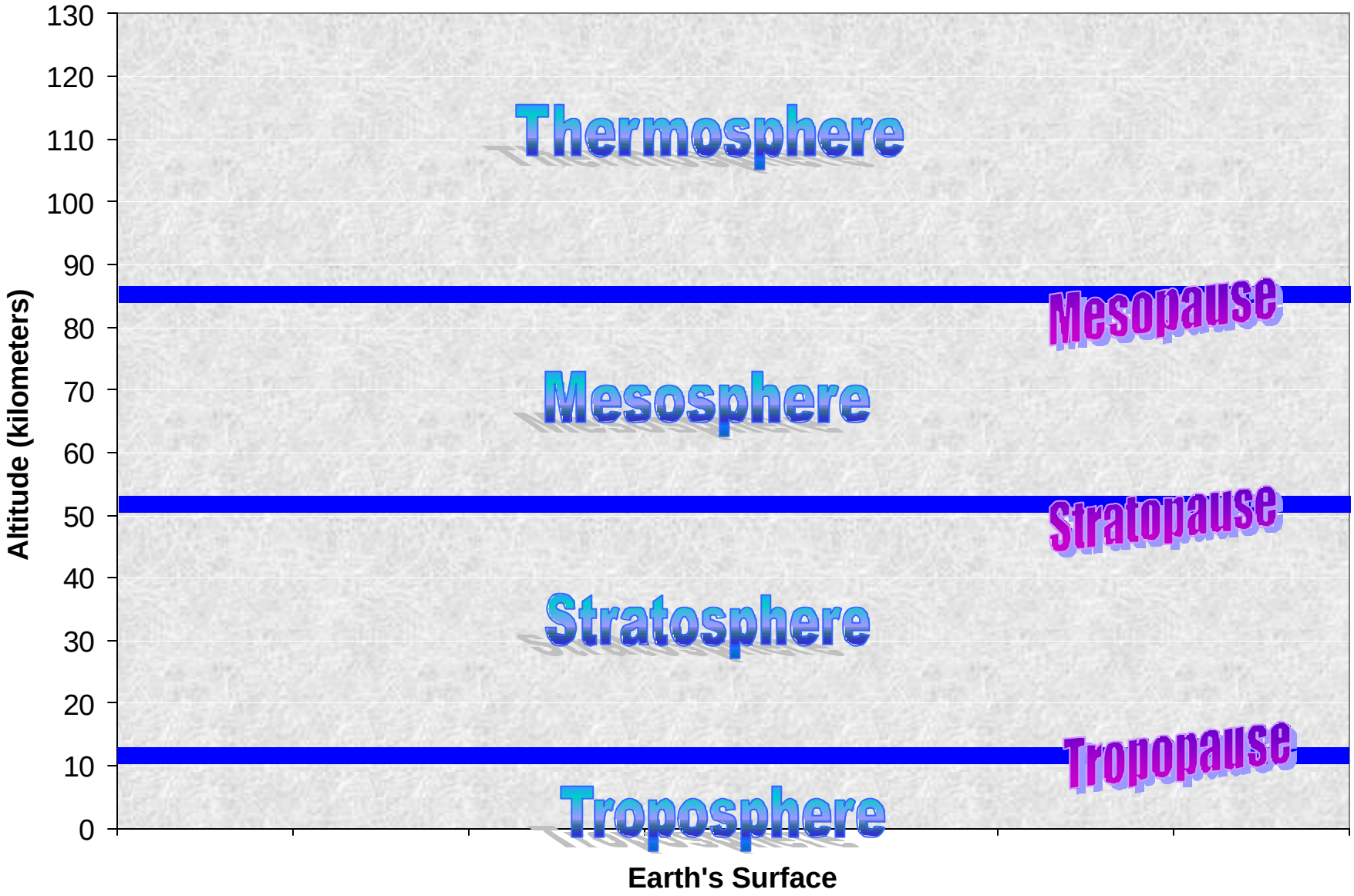
9. Ask students to write their hypothesis about how wind speed changes with altitude. Show them the "Wind Speed in the Troposphere" graph. Have them copy the chart into their notes and answer the following questions:
    - What is the wind speed at sea level?
    - What is the wind speed at 16000 meters?
    - If you drew a line depicting the trend of the data, what happens to wind speed as you increase altitude?
    - Why do you think the line is so curvy? (the scientists who obtained this data are not sure, but students should make educated guesses to try to explain the data)
    - At what altitude is wind speed greatest?
    - At what altitude is wind speed lowest?

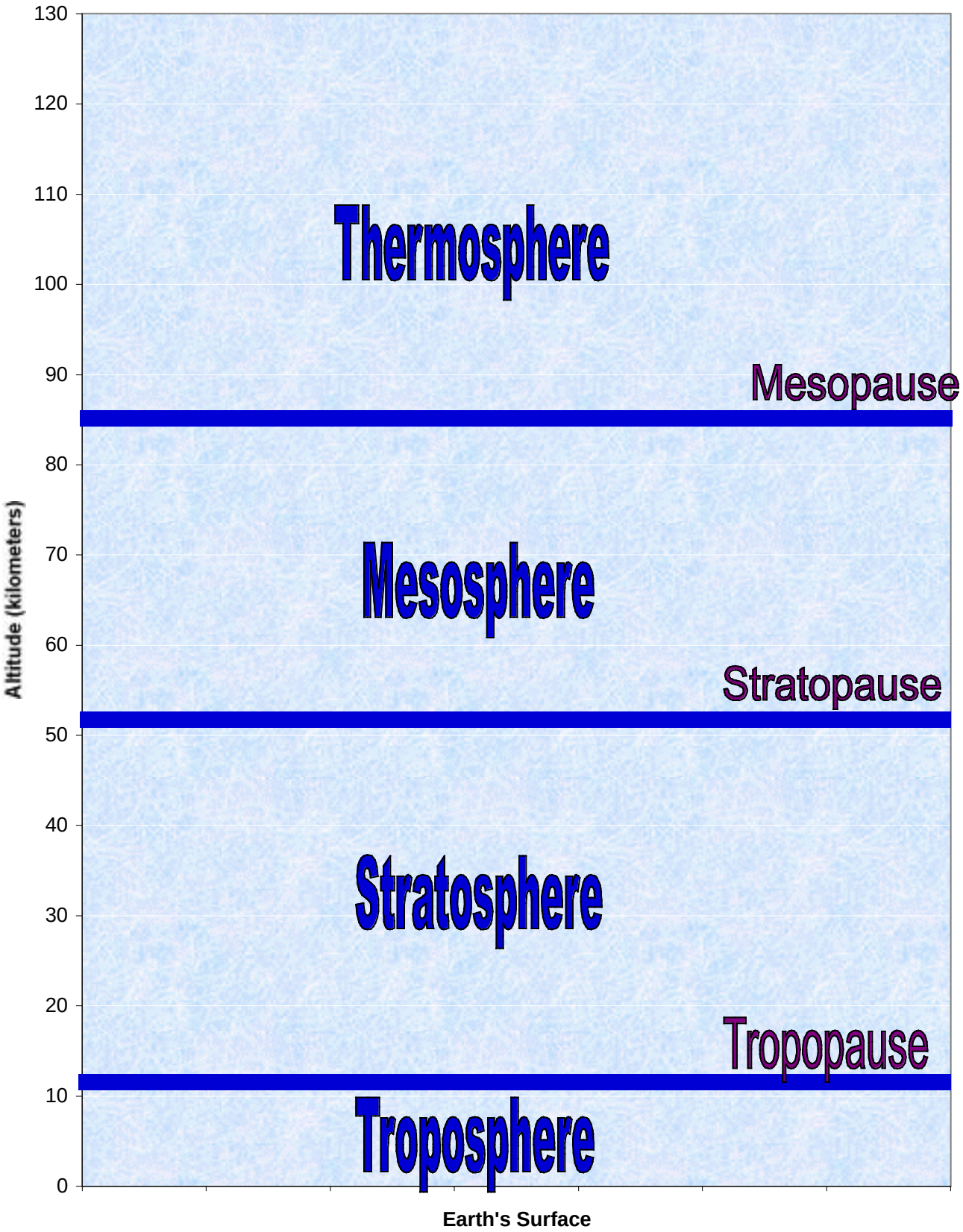
EVALUATION / ASSESSMENT

As a wrap-up to this lesson, students should write a one-paragraph summary of the physical properties of the troposphere with regard to trends in air pressure, temperature and wind speed.

Students will be assessed on the effort they made in creating hypotheses, and successful completion of the questions that accompany each graph.

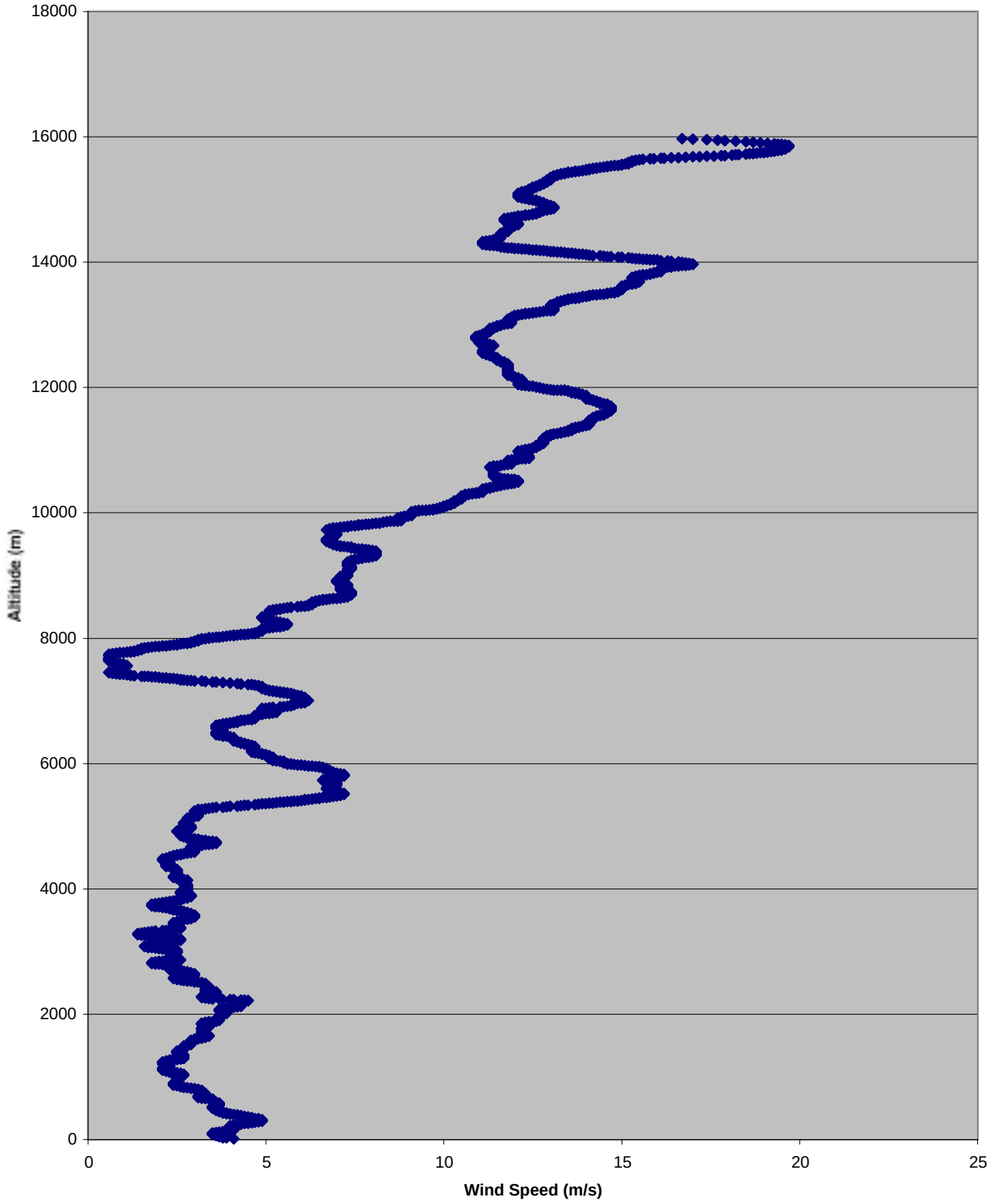
LAYERS OF EARTH'S ATMOSPHERE

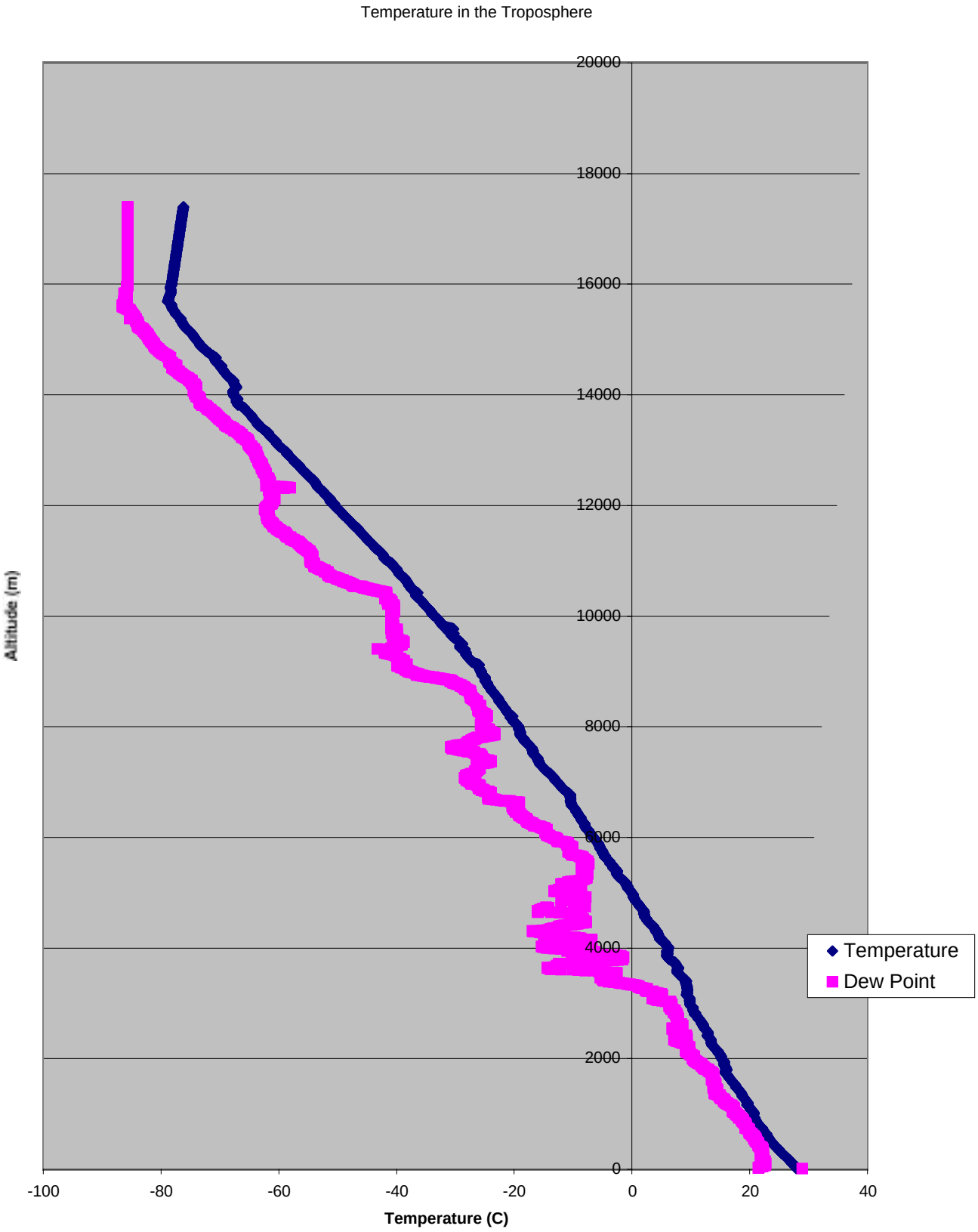



Altitude (kilometers)
130
120
110
100
90
80
70
60
50
40
30
20
10
0
Thermosphere
Mesopause
Mesosphere
Stratopause
Stratosphere
Tropopause
Troposphere
Earth's Surface

Altitude (km)
12
14
51
53
90
92
120

Wind Speed in the Troposphere




Temperature in the Troposphere
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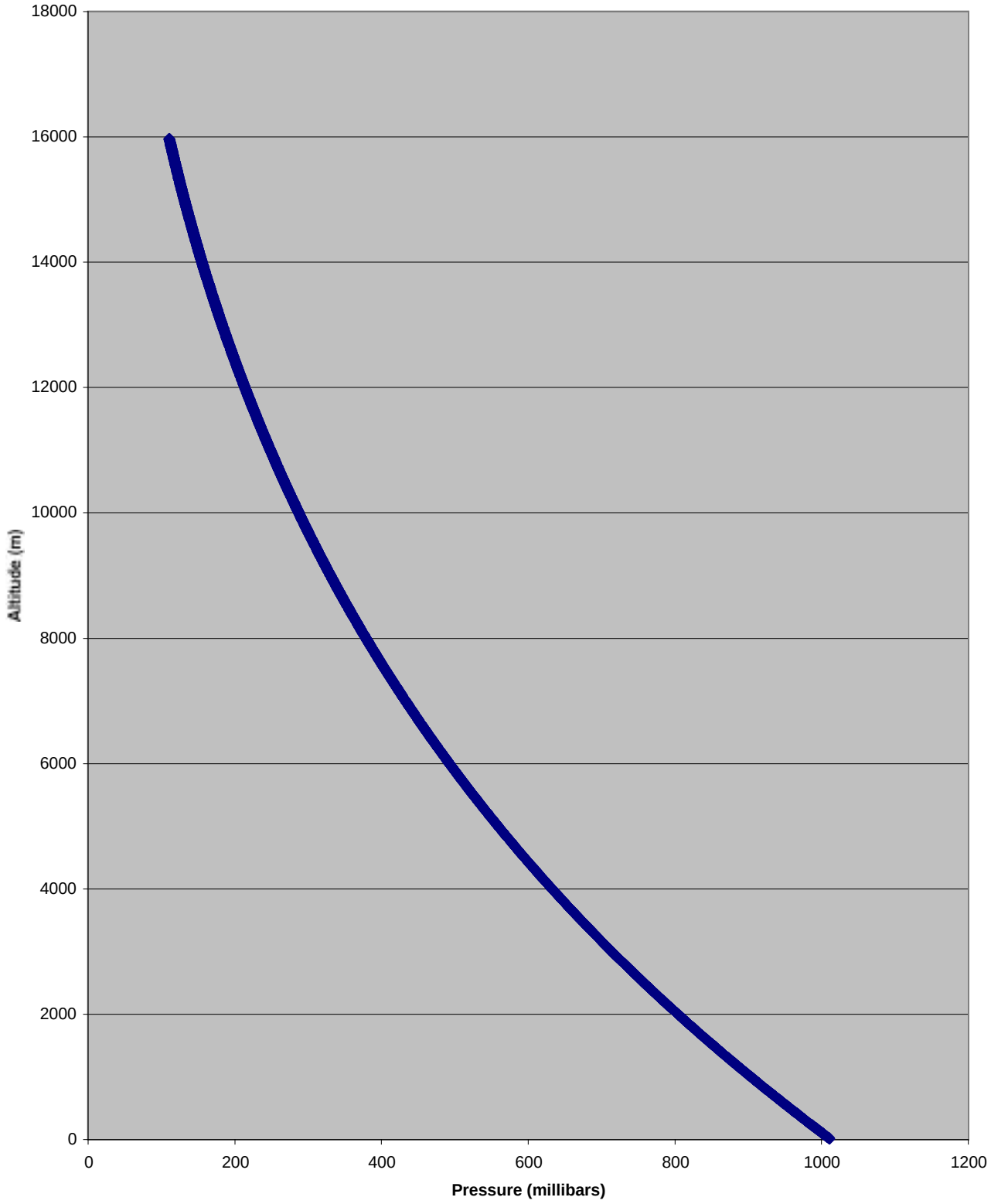
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
Altitude (m)
-100
-80
-60
-40
-20
0
20
40
Temperature (C)
Temperature
Dew Point

Air Pressure in the Troposphere



NOAA ship R/V Ronald H. Brown
Date: 09/15/01
Time: 1848 GMT
Location: Latitude 9.93N, Longitude 94.98W
Data obtained by weather balloon launched by Rob Cifelli from Colorado State University

Pressure (millibars)	Temperature (C)	Dew Point (C)	Wind (m/s)	Direction (degrees)	Altitude (m)
1011.3	27.9	29	4.1	225	10
1010	27.9	21.5	3.9	232	21
1009.5	27.9	21.5	3.8	234	25
1008.5	27.9	21.7	3.8	236	34
1007.6	27.9	21.9	3.7	238	43
1006.8	27.9	22.2	3.7	240	49
1005.8	27.7	22.2	3.6	241	58
1004.9	27.6	22.6	3.6	243	67
1003.9	27.5	22.5	3.5	245	75
1003.1	27.4	22.6	3.5	246	82
1002.6	27.4	22.6	3.5	248	86
1002.4	27.4	22.6	3.5	249	88
1002.2	27.4	22.6	3.5	250	90
1001.9	27.3	22.5	3.5	251	93
1001.7	27.3	22.7	3.5	251	95
1001.4	27.3	22.7	3.5	252	97
1001.2	27.3	22.7	3.5	252	99
1000.9	27.2	22.6	3.6	252	101
1000.7	27.2	22.6	3.6	251	103
1000.2	27.2	22.6	3.7	250	108
999.5	27.2	22.6	3.7	250	114
999	27	22.4	3.8	249	119
998.5	27.1	22.5	3.8	248	123
997.8	27	22.4	3.9	247	129
997	27	22.4	4	246	136
996.5	27	22.4	4	244	140
996.1	27	22.6	4.1	243	145
995.6	26.9	22.5	4.1	242	149
994.6	26.8	22.2	4.1	241	158
994.1	26.8	22.2	4.1	240	162
993.9	26.8	22.2	4.1	239	164
993.4	26.8	22.2	4.1	239	168
992.9	26.7	22.3	4.1	239	173
992.4	26.7	22.1	4.1	239	177
992.2	26.6	22	4.1	240	179
991.7	26.5	22.2	4.1	241	184
991.2	26.5	22.2	4	241	188
990.7	26.5	22.2	4	241	192
990.2	26.4	22.1	4	242	197
989.5	26.3	22.2	4	242	203
988.8	26.3	22.4	4	242	210
988.3	26.2	22.3	4	241	214
987.8	26.2	22.3	4	241	218
987.3	26.2	22.1	4.1	241	223
986.9	26.1	22	4.1	241	227

986.1	26.1	22.2	4.2	241	233
985.2	26	22.1	4.3	242	242
984.5	25.9	22	4.3	242	248
983.7	25.9	22	4.4	243	255
983.3	25.8	21.9	4.5	244	259
982.5	25.8	21.9	4.6	245	266
981.8	25.7	22	4.7	246	272
981.1	25.5	22.2	4.8	246	279
980.4	25.5	22.4	4.8	247	285
979.7	25.4	22.3	4.9	246	292
978.9	25.4	22.3	4.9	246	298
978	25.3	22.2	4.9	245	307
977	25.2	22.3	4.9	244	315
976.3	25.1	22	4.8	243	322
975.6	25	21.9	4.8	242	328
975.1	25	21.9	4.7	240	333
974.4	25	21.9	4.6	238	339
973.7	25	21.9	4.6	237	346
973	25	22.1	4.5	235	352
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971.1	24.7	22	4.3	231	369
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969.4	24.6	22.1	4.2	230	384
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965.9	24.3	21.6	3.9	232	416
965.4	24.3	21.6	3.8	232	421
964.7	24.2	21.5	3.8	233	427
964	24.1	21.4	3.8	233	434
963.5	24.1	21.4	3.8	233	438
963.1	24.1	21.4	3.7	233	442
962.6	24.1	21.4	3.7	233	447
961.7	24.1	21.4	3.7	234	455
961.2	24	21.5	3.7	234	459
960.7	24	21.5	3.6	234	464
960.2	24	21.5	3.6	234	468
959.8	23.9	21.4	3.6	234	472
959.3	23.9	21.4	3.6	234	477
958.8	23.8	21.3	3.6	234	481
958.1	23.8	21.3	3.6	234	487
957.7	23.8	21.3	3.5	234	492
957	23.7	21.2	3.5	234	498
956.5	23.6	21.1	3.5	234	502
956	23.6	21.1	3.5	233	507
955.3	23.5	21	3.5	233	513
954.6	23.5	21	3.5	232	519

953.9	23.5	21	3.5	230	526
953.5	23.4	21.1	3.6	228	530
953	23.4	21.1	3.6	226	534
952.5	23.4	21.1	3.6	224	539
951.8	23.3	20.8	3.7	221	545
951.1	23.3	20.8	3.7	219	552
950.4	23.3	21	3.7	216	558
949.5	23.2	20.9	3.7	214	567
948.8	23.2	20.9	3.7	212	573
948.1	23.1	20.8	3.7	211	579
947	23.1	20.8	3.6	210	590
946.5	23	20.7	3.5	210	594
946	23	20.7	3.5	210	599
945.4	23	20.5	3.5	210	605
944.7	23	20.5	3.5	211	611
944.2	23	20.5	3.5	212	616
943.5	22.9	20.4	3.5	212	622
943.1	22.9	20.4	3.5	212	626
942.6	22.9	20.3	3.5	211	631
942.4	22.9	20.3	3.5	210	633
941.7	22.9	20.3	3.5	209	639
941	22.8	20.2	3.4	207	646
940.5	22.7	20.1	3.4	206	650
940.1	22.7	20.1	3.3	203	654
939.6	22.7	20.1	3.2	201	658
939.4	22.6	20	3.2	199	661
938.7	22.6	20	3.1	197	667
937.8	22.5	20	3.1	196	676
937.1	22.4	20	3.1	195	682
936.9	22.4	20	3.1	194	684
936.4	22.4	20	3.1	194	688
935.9	22.4	20	3.2	194	693
935.5	22.4	20	3.2	194	697
935	22.4	20	3.3	194	701
934.1	22.3	19.9	3.3	195	710
933.7	22.3	19.9	3.3	196	714
933.2	22.2	19.8	3.3	196	718
933	22.2	19.8	3.3	196	720
932.3	22.2	19.8	3.3	196	727
931.6	22.2	19.6	3.3	196	733
930.9	22.2	19.6	3.2	196	739
930.2	22.1	19.3	3.2	196	746
929.8	22.1	19.3	3.2	195	750
929.3	22	19.4	3.2	195	754
928.9	22	19.4	3.2	194	759
928.2	21.9	19.3	3.2	194	765
927.8	21.9	19.5	3.2	193	769
927.1	21.8	19.4	3.2	193	776
926.4	21.7	19.3	3.2	192	782
925.7	21.7	19.3	3.1	191	788
925.3	21.6	19.4	3.1	190	793
924.8	21.6	19.4	3.1	189	797
923.9	21.5	19.3	3	188	805

923.5	21.5	19.3	3	187	810
922.8	21.5	19.3	2.9	185	816
922.1	21.4	19.2	2.8	184	822
921.4	21.4	19.2	2.7	183	829
920.8	21.3	19.1	2.7	181	835
920.1	21.3	19.1	2.6	180	842
919.2	21.2	19	2.6	179	850
918.5	21.2	19	2.5	178	856
918.1	21.1	18.9	2.5	176	861
917.4	21.1	18.9	2.4	174	867
916.9	21.1	18.7	2.4	173	871
916.5	21.1	18.7	2.4	171	876
916	21.1	19	2.4	169	880
915.4	21	18.8	2.4	166	886
914.9	21	18.8	2.4	164	890
914.5	21	18.8	2.4	161	895
913.8	20.9	18.7	2.5	159	901
913.4	20.9	18.7	2.5	157	905
912.7	20.9	18.7	2.5	155	912
912.3	20.9	18.5	2.5	154	916
911.8	20.9	18.5	2.5	152	920
911.4	20.9	18.3	2.5	151	924
910.7	20.8	18.2	2.5	150	931
910.3	20.8	18.4	2.5	149	935
909.8	20.7	18.3	2.5	148	939
909.1	20.7	18.3	2.5	147	946
908.7	20.7	18.3	2.5	146	950
908.3	20.7	18.3	2.5	145	954
907.8	20.7	18.1	2.5	144	958
907.4	20.7	18.1	2.5	144	962
906.7	20.7	18.1	2.5	143	969
906.3	20.7	17.9	2.5	142	973
906	20.7	17.9	2.5	141	975
905.4	20.7	17.9	2.5	140	982
904.9	20.7	17.9	2.5	139	986
904.3	20.7	17.7	2.5	138	992
904.1	20.8	17.8	2.5	137	994
903.6	20.8	17.8	2.5	136	999
902.9	20.8	17.6	2.6	135	1005
902.5	20.8	17.6	2.6	135	1009
902.1	20.8	17.6	2.6	134	1013
901.6	20.8	17.6	2.6	133	1018
901	20.8	17.6	2.7	132	1024
900.5	20.7	17.3	2.7	131	1028
900.1	20.7	17.3	2.7	130	1032
899.6	20.7	17.3	2.7	129	1037
899.2	20.6	17.2	2.6	128	1041
898.5	20.5	17.3	2.6	128	1047
897.7	20.4	17.2	2.6	128	1056
897	20.4	17.2	2.5	127	1062
896.6	20.3	17.1	2.4	127	1066
896.4	20.3	17.1	2.4	127	1068
895.9	20.2	17.2	2.3	127	1073

895.5	20.2	17.2	2.3	127	1077
894.6	20.3	17.3	2.2	126	1085
893.5	20.2	17.2	2.2	125	1096
892.6	20.2	17.4	2.1	123	1104
891.6	20.1	17.3	2.1	120	1115
890.7	20	17.2	2.1	118	1123
890	19.9	17.1	2.1	114	1130
889.6	19.8	17	2.1	111	1134
889.4	19.8	17	2.2	107	1136
888.9	19.8	17	2.2	105	1140
888.7	19.7	16.9	2.3	102	1142
888.3	19.7	16.9	2.3	100	1147
887.6	19.7	16.9	2.3	99	1153
887	19.6	16.6	2.3	97	1159
886.3	19.6	16.5	2.3	97	1166
885.5	19.7	16.4	2.3	96	1174
884.8	19.7	16.2	2.3	96	1180
884.4	19.7	16.2	2.2	96	1185
883.8	19.7	16.2	2.2	96	1191
883.1	19.7	16	2.2	95	1197
882.7	19.7	16	2.1	95	1201
882	19.6	15.9	2.1	94	1208
881.4	19.6	15.9	2.1	93	1214
880.7	19.6	15.7	2.1	92	1220
880.3	19.5	15.6	2.1	91	1225
879.9	19.5	15.8	2.1	90	1229
879.7	19.5	15.8	2.1	89	1231
879.2	19.4	15.7	2.2	88	1235
878.8	19.4	15.7	2.2	88	1239
878.2	19.4	15.7	2.2	87	1246
877.7	19.3	15.6	2.2	87	1250
877.1	19.3	15.6	2.3	87	1256
876.4	19.2	15.5	2.3	87	1263
876	19.2	15.5	2.4	87	1267
875.4	19.1	15.2	2.4	86	1273
875	19.1	15.2	2.5	86	1277
874.7	19.1	15.2	2.5	85	1279
874.3	19.1	15.2	2.6	84	1284
874.1	19.1	15.2	2.6	83	1286
873.7	19	15.1	2.7	81	1290
873.5	19	15.1	2.7	80	1292
873	19	15.1	2.7	78	1296
872.4	18.9	15	2.7	77	1303
872	18.8	14.9	2.7	76	1307
871.3	18.8	14.9	2.7	76	1313
870.7	18.8	14.9	2.7	75	1319
870.1	18.8	14.9	2.7	75	1326
869.4	18.8	14.9	2.7	74	1332
869	18.8	14.9	2.7	74	1336
868.6	18.7	14.8	2.7	74	1340
868.1	18.7	14.6	2.7	75	1345
867.7	18.7	14.6	2.7	75	1349
867.1	18.7	14.4	2.6	75	1355

866.4	18.6	14.3	2.6	75	1361
866	18.6	14.1	2.6	75	1366
865.6	18.6	14.1	2.6	75	1370
865	18.6	14.1	2.5	75	1376
864.3	18.5	14	2.5	74	1382
863.9	18.5	14	2.5	74	1387
863.5	18.5	14.2	2.5	73	1391
862.9	18.4	14.3	2.5	72	1397
862.4	18.4	14.3	2.5	72	1401
862	18.4	14.5	2.5	71	1406
861.6	18.3	14.6	2.5	71	1410
861	18.2	14.5	2.6	71	1416
860.5	18.2	14.5	2.6	71	1420
859.9	18.2	14.5	2.6	71	1427
859.5	18.2	14.3	2.6	71	1431
859.1	18.1	14.2	2.7	72	1435
858.7	18.2	14.5	2.7	72	1439
858.2	18.1	14.4	2.7	73	1443
857.6	18	14.3	2.7	74	1450
857.2	18	14.1	2.7	74	1454
856.6	17.9	14	2.7	75	1460
856.1	17.9	13.8	2.7	76	1464
855.5	17.8	13.9	2.7	77	1471
855.3	17.8	14.1	2.7	78	1473
854.9	17.7	14.2	2.7	79	1477
854.7	17.7	14.2	2.7	80	1479
854.1	17.7	14.2	2.7	81	1485
853	17.7	14.2	2.8	82	1496
852.2	17.7	14	2.8	83	1504
851.8	17.7	14	2.8	84	1508
851.4	17.6	13.9	2.9	85	1512
850.9	17.6	13.9	2.9	85	1517
850.7	17.5	13.8	2.9	85	1519
850.3	17.5	14	2.9	85	1523
849.9	17.5	14.2	2.9	85	1527
849.3	17.4	14.3	2.9	85	1533
848.9	17.4	14.3	2.9	85	1538
848.4	17.5	14.2	2.9	84	1542
848	17.4	14.1	2.9	84	1546
847.6	17.3	14	2.9	84	1550
847.2	17.3	14.2	2.9	85	1554
846.8	17.2	14.1	2.9	85	1558
846.4	17.2	14.1	2.9	86	1563
845.8	17.2	14.1	2.9	88	1569
845.1	17.2	14.1	2.9	89	1575
844.5	17.1	14	2.9	91	1581
843.9	17	13.9	3	93	1588
843.3	17	13.9	3	95	1594
842.9	17	13.9	3	97	1598
842.1	16.9	13.8	3.1	98	1606
841.6	16.8	13.7	3.1	99	1611
841.2	16.8	13.7	3.2	100	1615
840.6	16.7	13.6	3.2	101	1621

840	16.7	13.6	3.3	101	1627
839.6	16.7	13.8	3.3	101	1632
839.2	16.6	13.7	3.3	101	1636
837.9	16.6	13.7	3.4	100	1648
837.7	16.6	13.7	3.4	100	1650
837.5	16.6	13.9	3.4	99	1652
837.3	16.5	13.8	3.4	98	1654
837.1	16.5	13.8	3.4	98	1657
836.7	16.5	13.8	3.3	97	1661
836.5	16.5	13.8	3.3	97	1663
835.5	16.4	13.7	3.3	97	1673
834.7	16.4	13.9	3.2	97	1682
833.9	16.3	13.8	3.2	98	1690
833.3	16.2	13.9	3.2	98	1696
832.6	16.1	13.8	3.2	99	1702
832.2	16.1	13.8	3.2	100	1707
831.8	16.1	13.8	3.2	101	1711
831.2	16.1	13.8	3.2	102	1717
830.8	16	13.7	3.3	102	1721
830.2	16	13.7	3.3	103	1727
829.8	16	13.7	3.3	103	1732
829.2	16	13.7	3.3	103	1738
828.8	15.9	13.6	3.3	102	1742
828.2	15.9	13.6	3.3	102	1748
827.8	15.9	13.4	3.2	101	1752
827.2	15.9	13.4	3.2	100	1759
826.6	15.9	13.2	3.2	99	1765
826	16	13.1	3.2	99	1771
825.4	16	13.1	3.2	98	1777
825	16	13.1	3.3	97	1782
824.4	16.1	13	3.3	97	1788
823.8	16.1	13	3.4	96	1794
823.1	16.1	13	3.4	95	1800
822.7	16.1	12.8	3.4	94	1804
822.3	16	12.6	3.4	94	1809
821.9	16	12.4	3.4	93	1813
821.3	16	12.4	3.3	93	1819
820.7	16	12.4	3.3	93	1825
819.9	16	12.2	3.2	94	1834
819.5	16	12.2	3.2	94	1838
819.1	16	12.2	3.2	95	1842
818.7	16	12.2	3.2	97	1846
818.3	15.9	12.1	3.2	98	1850
818.1	15.9	12.1	3.2	98	1852
817.5	15.8	12	3.3	99	1859
816.7	15.7	11.9	3.3	99	1867
816.1	15.7	11.9	3.4	99	1873
815.7	15.7	11.9	3.5	98	1877
815.1	15.7	11.9	3.6	98	1883
814.7	15.7	11.9	3.6	97	1888
814.4	15.7	11.9	3.6	97	1892
813.8	15.7	11.9	3.7	96	1898
813.2	15.6	11.6	3.7	96	1904

812.8	15.6	11.4	3.7	96	1908
812.6	15.6	11.4	3.7	96	1910
812.4	15.7	11.5	3.7	96	1913
812	15.7	11.3	3.7	96	1917
811.4	15.7	11.3	3.7	96	1923
810.6	15.7	11.1	3.7	97	1931
810	15.7	11.1	3.7	97	1937
809.6	15.7	10.9	3.7	97	1942
809.2	15.7	10.9	3.7	97	1946
809	15.6	10.8	3.7	97	1948
808.6	15.6	10.8	3.7	97	1952
808	15.6	10.8	3.7	98	1958
807.4	15.5	10.7	3.7	98	1964
806.8	15.4	10.6	3.7	98	1971
806.4	15.4	10.6	3.7	98	1975
806	15.4	10.6	3.7	98	1979
805.5	15.4	10.6	3.8	97	1985
804.9	15.3	10.3	3.8	96	1991
804.1	15.3	10.3	3.8	95	2000
803.3	15.2	10.4	3.9	94	2008
802.7	15.2	10.4	3.9	93	2014
802.1	15.2	10.6	3.9	91	2020
801.5	15.2	10.6	3.9	89	2027
800.9	15.2	10.6	3.9	88	2033
800.4	15.2	10.6	3.8	87	2039
800	15.2	10.6	3.8	86	2043
799.6	15.1	10.3	3.8	86	2047
799.2	15.1	10.3	3.7	85	2052
799	15	10.2	3.7	86	2054
798.6	15	10.2	3.7	86	2058
798.2	15	10	3.7	87	2062
797.8	15	10	3.7	88	2066
797.2	15	10	3.7	90	2072
796.5	14.9	9.9	3.8	91	2081
795.9	14.8	9.8	3.8	92	2087
795.5	14.8	9.8	3.9	93	2091
794.9	14.7	9.7	4	93	2097
794.3	14.7	9.7	4	94	2103
793.7	14.7	9.5	4.1	94	2110
793.4	14.7	9.5	4.2	94	2114
792.8	14.7	9.3	4.2	94	2120
792.4	14.7	9.3	4.3	93	2124
792	14.7	9.3	4.3	93	2128
791.4	14.7	9.3	4.3	92	2134
791	14.6	9.2	4.3	92	2139
790.8	14.6	9.2	4.2	92	2141
790.5	14.5	9.1	4.2	91	2145
789.9	14.4	9.2	4.1	91	2151
789.3	14.3	9.3	4.1	92	2157
788.7	14.3	9.3	4.1	92	2163
788.1	14.2	9.4	4.1	92	2170
787.8	14.2	9.4	4.1	92	2174
787.2	14.2	9.6	4.2	93	2180

786.6	14.1	9.7	4.2	93	2186
786	14.1	9.7	4.3	93	2192
785.5	14	9.8	4.4	93	2198
785.1	14	9.8	4.4	92	2203
784.5	13.9	9.6	4.5	92	2209
784.1	13.9	9.6	4.5	92	2213
783.9	13.9	9.6	4.4	92	2215
783.5	13.8	9.5	4.4	93	2219
783	13.8	9.5	4.3	93	2225
782.6	13.8	9.3	4.1	94	2229
782.4	13.7	9.2	4	94	2231
782.2	13.7	9.4	3.8	95	2233
782	13.7	9.4	3.7	96	2236
781.6	13.7	9.2	3.5	96	2240
780.9	13.6	9.1	3.4	96	2248
780.1	13.6	9.1	3.3	96	2256
779.5	13.6	9.1	3.3	96	2262
779.1	13.6	9.1	3.2	95	2266
778.8	13.6	9.1	3.2	94	2271
778.4	13.5	8.8	3.2	92	2275
778	13.5	8.8	3.2	91	2279
777.8	13.5	8.8	3.3	89	2281
777.4	13.5	8.6	3.3	87	2285
777.1	13.5	8.4	3.3	85	2289
776.5	13.5	8.2	3.4	84	2295
775.9	13.5	8.2	3.5	82	2302
775.2	13.5	7.9	3.5	81	2310
774.6	13.5	7.7	3.5	80	2316
773.8	13.5	7.5	3.6	79	2324
773.7	13.5	7.5	3.6	78	2326
773.5	13.4	7.4	3.6	77	2328
772.9	13.4	7.4	3.6	76	2334
772.5	13.4	7.2	3.6	76	2339
772	13.4	7.8	3.6	76	2345
771.6	13.4	8.5	3.6	76	2349
771.4	13.4	9.1	3.5	76	2351
771.2	13.3	9.4	3.5	77	2353
770.8	13.3	9.4	3.4	78	2357
770.3	13.2	9.3	3.4	79	2363
769.9	13.2	9.3	3.4	80	2367
769.5	13.2	9.3	3.3	81	2372
768.9	13.1	9.2	3.3	81	2378
768.6	13.1	9.2	3.3	82	2382
768.2	13	9.3	3.3	82	2386
767.8	13	9.3	3.3	83	2390
767.3	13	9.3	3.3	83	2396
766.9	12.9	9.2	3.4	83	2400
766.5	12.9	9.2	3.4	83	2404
765.9	12.8	9.1	3.4	83	2411
765.6	12.8	9.1	3.4	83	2415
765.4	12.9	9.2	3.4	84	2417
764.8	13	7.7	3.4	84	2423
763.9	13	7.7	3.4	85	2433

763.1	13	7.7	3.3	86	2441
762.6	13	7.7	3.3	87	2448
762	13	7.7	3.3	88	2454
761.5	13	7.7	3.3	90	2460
761.1	13	7.5	3.3	91	2464
760.5	13	7.5	3.3	93	2470
760	12.9	7.4	3.3	94	2476
759.6	12.9	7.4	3.3	95	2481
759.1	12.8	7.5	3.3	95	2487
758.7	12.7	7.4	3.2	96	2491
758.3	12.7	7.4	3.2	96	2495
757.6	12.7	7.4	3.2	96	2503
757	12.6	7.3	3.1	95	2509
756.7	12.6	7.3	3	95	2513
756.1	12.6	7.3	3	96	2520
755.7	12.5	7.2	2.9	96	2524
755.4	12.5	7	2.8	97	2528
755	12.4	6.9	2.7	98	2532
754.4	12.4	6.9	2.6	100	2538
753.3	12.4	6.9	2.5	102	2550
752	12.2	8.3	2.5	104	2565
751.7	12.2	8.3	2.4	107	2569
751.5	12.2	8.3	2.4	109	2571
751.1	12.2	8.3	2.5	112	2575
750.6	12.2	8.5	2.5	114	2581
750	12.1	8.6	2.6	115	2587
749.7	12.1	8.6	2.6	117	2591
749.5	12.1	8.6	2.7	118	2593
749.1	12.1	8.6	2.8	119	2597
748.8	12.1	8.4	2.9	120	2602
748.4	12.1	8.4	2.9	121	2606
747.8	12.1	8.4	2.9	123	2612
747.3	12.1	8.4	3	124	2618
746.6	11.9	8	3	125	2626
745.8	11.9	7.8	3	126	2634
745.1	11.9	7.8	3	126	2643
744.7	11.9	7.8	2.9	127	2647
744.4	11.9	7.8	2.9	128	2651
744.2	11.9	7.8	2.9	128	2653
743.8	11.9	7.8	2.9	128	2657
743.5	11.8	7.7	2.8	128	2661
742.9	11.8	7.7	2.8	129	2667
742.6	11.8	7.7	2.8	129	2671
742.2	11.7	7.6	2.7	128	2675
741.7	11.7	7.8	2.7	128	2681
741.3	11.6	7.7	2.6	128	2686
740.9	11.6	7.7	2.6	128	2690
740.4	11.6	7.7	2.5	128	2696
740	11.5	7.8	2.4	127	2700
739.5	11.4	7.7	2.4	127	2706
739.1	11.3	7.8	2.3	126	2710
738.6	11.4	7.9	2.3	125	2716
738.2	11.4	7.9	2.3	123	2720

737.9	11.4	7.9	2.3	121	2724
737.3	11.3	7.8	2.3	120	2731
736.8	11.2	7.7	2.3	118	2737
736.4	11.2	7.7	2.4	117	2741
736.2	11.2	7.7	2.4	116	2743
736.1	11.2	7.7	2.5	116	2745
735.7	11.2	7.7	2.5	116	2749
735.5	11.2	7.7	2.5	116	2751
735	11.1	7.8	2.5	116	2757
734.1	11.1	7.8	2.4	117	2767
733.2	10.9	7.6	2.4	117	2778
732.7	10.9	7.6	2.3	117	2784
732.1	10.8	7.5	2.2	117	2790
731.9	10.8	7.5	2.1	116	2792
731.8	10.7	7.6	2	114	2794
731.6	10.7	7.6	1.9	113	2796
731.1	10.7	7.6	1.9	111	2802
730.5	10.7	7.6	1.8	108	2808
730	10.7	7.4	1.8	106	2814
729.6	10.8	7.5	1.8	104	2818
729.3	10.8	7.3	1.9	102	2822
728.7	10.7	7.2	1.9	100	2829
728	10.6	7.1	2	99	2837
727.7	10.6	7.1	2.1	98	2841
727.3	10.5	7.2	2.2	97	2845
727	10.5	7.2	2.3	97	2849
726.8	10.5	7.2	2.4	96	2851
726.4	10.5	7.2	2.5	96	2855
726.1	10.5	7.2	2.5	96	2859
725.7	10.4	7.3	2.5	95	2863
725.4	10.4	7.3	2.6	95	2867
724.8	10.4	7.1	2.5	95	2873
724.3	10.4	7.1	2.5	95	2880
723.8	10.4	6.9	2.5	95	2886
723.6	10.4	6.9	2.4	95	2888
723.2	10.4	6.7	2.4	96	2892
723.1	10.4	6.7	2.3	97	2894
722.7	10.4	6.7	2.3	98	2898
722.4	10.4	6.7	2.3	100	2902
721.8	10.4	6.7	2.3	102	2908
721.5	10.4	6.6	2.3	104	2912
720.9	10.4	6.6	2.3	107	2918
720.4	10.4	6.6	2.3	109	2924
719.9	10.3	6.6	2.4	112	2930
719.4	10.2	6.5	2.4	115	2937
719	10.1	6.4	2.4	118	2941
718.5	10.1	6.4	2.4	121	2947
718	10.1	6.4	2.4	124	2953
717.6	10	6.5	2.4	127	2957
717.3	10	6.5	2.4	129	2961
716.9	10	6.5	2.4	132	2965
716.4	9.9	6.6	2.4	135	2971
716.2	9.9	6.6	2.4	138	2973

715.9	9.9	6.8	2.4	141	2977
715.7	9.9	6.6	2.5	143	2979
715.3	9.9	6.4	2.5	146	2983
714.8	9.9	6.4	2.5	148	2989
714.1	9.9	6.4	2.5	150	2998
713.6	9.9	6.4	2.5	152	3004
712.9	9.9	6.6	2.5	154	3012
712.4	9.9	6.6	2.5	155	3018
712	9.9	6.4	2.4	157	3022
711.7	9.9	6.6	2.3	158	3026
711.3	9.9	6.4	2.2	159	3030
711	9.8	5.8	2.1	161	3034
710.5	9.8	5.2	2	162	3040
709.9	9.8	4.6	2	163	3046
709.4	9.9	4.5	1.9	164	3052
708.9	9.9	4.3	1.8	165	3059
708.6	9.9	4.3	1.7	166	3063
708	9.9	4.1	1.7	167	3069
707.7	9.9	4.1	1.7	168	3073
707.2	9.9	3.9	1.6	169	3079
706.7	9.8	3.8	1.6	169	3085
706.3	9.8	3.5	1.7	169	3089
705.8	9.8	3.5	1.7	170	3095
705.5	9.7	3.5	1.7	169	3099
704.9	9.7	3.7	1.8	169	3105
704.4	9.6	3.6	1.8	169	3111
704.1	9.6	3.6	1.9	169	3115
703.6	9.6	4.2	1.9	169	3122
703.2	9.5	4.5	2	169	3126
702.7	9.5	5.1	2.1	169	3132
702.4	9.4	5.2	2.1	169	3136
702	9.4	5.2	2.2	169	3140
701.5	9.3	5.1	2.3	168	3146
701	9.3	4.9	2.3	167	3152
700.5	9.3	4.9	2.4	166	3158
699.8	9.4	5	2.5	165	3166
699.3	9.4	4.6	2.5	164	3172
698.9	9.5	4.5	2.6	162	3176
698.6	9.5	4.3	2.6	161	3180
698.3	9.5	4.1	2.6	160	3184
697.9	9.4	3.8	2.6	159	3188
697.6	9.4	3.6	2.6	159	3193
697.1	9.4	3.6	2.5	158	3199
696.2	9.4	3.6	2.4	158	3209
695.5	9.5	2.6	2.3	157	3217
695	9.5	2.6	2.2	156	3223
694.5	9.5	2.4	2.1	155	3229
694.2	9.5	2.4	2	154	3233
693.8	9.5	2.4	1.9	152	3237
693.5	9.5	2.4	1.8	150	3241
692.8	9.5	2.4	1.7	149	3249
692.3	9.5	2.6	1.6	149	3255
692	9.4	2.3	1.5	149	3259

691.5	9.4	2	1.4	150	3266
691.1	9.4	1.8	1.4	152	3270
690.8	9.4	1.6	1.4	154	3274
690.3	9.4	1.6	1.4	157	3280
689.8	9.4	1.3	1.4	161	3286
689.3	9.4	1.3	1.5	164	3292
688.8	9.5	1.2	1.6	166	3298
687.9	9.4	1.1	1.7	168	3308
687.3	9.3	1	1.8	170	3316
686.8	9.3	0.7	1.9	171	3322
686.3	9.3	0.2	2.1	172	3328
685.9	9.3	0	2.2	172	3332
685.4	9.3	-0.3	2.3	172	3339
684.9	9.2	-0.7	2.4	173	3345
684.4	9.2	-0.9	2.5	174	3351
683.9	9.2	-1.5	2.5	175	3357
683.6	9.2	-1.8	2.6	177	3361
683.1	9.2	-2.1	2.6	179	3367
682.7	9.1	-2.2	2.6	181	3371
682.4	9.1	-2.5	2.6	183	3375
682.1	9.1	-3.1	2.6	184	3379
681.6	9.2	-4	2.5	185	3385
681.1	9.3	-3.9	2.5	186	3391
680.7	9.3	-3.9	2.5	187	3395
680.3	9.2	-4.4	2.4	187	3401
679.8	9.2	-4.7	2.4	186	3407
679.3	9.2	-4.7	2.4	186	3413
678.8	9.1	-4.8	2.4	185	3419
678.4	9	-4.9	2.4	183	3424
677.9	9	-4.9	2.4	182	3430
677.4	8.9	-5	2.4	181	3436
676.8	8.8	-4.7	2.4	181	3444
676.3	8.8	-4.4	2.4	180	3450
676.1	8.7	-4.5	2.4	179	3452
675.9	8.7	-4.8	2.4	179	3454
675.8	8.6	-4.9	2.4	178	3456
675.6	8.6	-4.9	2.5	177	3458
675.3	8.5	-5.3	2.5	177	3462
675.1	8.5	-5.3	2.5	176	3464
674.6	8.5	-5	2.5	175	3470
674.3	8.5	-4.6	2.6	175	3474
673.6	8.5	-4.3	2.6	174	3482
672.7	8.4	-4.1	2.6	174	3494
671.5	8.2	-3.9	2.7	174	3508
671.3	8.2	-3.9	2.7	173	3510
671.2	8.2	-3.9	2.8	173	3512
670.8	8.1	-3.7	2.8	173	3516
670.2	8.1	-3.1	2.9	172	3524
669.2	8	-2.6	2.9	171	3537
668.9	7.9	-2.7	2.9	171	3541
668.7	7.8	-2.5	2.9	170	3543
668.4	7.8	-2.8	3	169	3547
668.1	7.8	-3.4	3	168	3551

667.6	7.8	-4.3	3	168	3557
667.3	7.8	-4.9	3	168	3561
666.9	7.8	-5.3	3	168	3565
666.6	7.8	-5.6	3	168	3569
666.1	7.7	-5.4	3	169	3575
665.8	7.7	-5.4	2.9	170	3579
665.3	7.7	-6.4	2.9	170	3585
664.8	7.7	-7.9	2.9	172	3591
664.3	7.8	-9.1	2.9	172	3597
664	7.8	-10	2.9	173	3601
663.5	7.8	-12	2.8	174	3607
663	7.8	-13.8	2.8	174	3613
662.7	7.8	-13.8	2.8	174	3617
662.2	7.9	-13.7	2.7	173	3623
661.9	7.9	-13.7	2.7	172	3627
661.4	7.9	-14.3	2.7	172	3633
661.1	7.9	-14.3	2.6	170	3637
660.8	7.9	-14.3	2.6	169	3641
660.4	7.9	-13.7	2.6	168	3645
660.1	7.8	-13.2	2.5	167	3649
659.8	7.8	-12.6	2.5	166	3653
659.3	7.8	-12.6	2.4	165	3659
658.7	7.7	-12.7	2.4	165	3667
658.2	7.7	-12.7	2.4	165	3673
657.6	7.6	-12.8	2.3	166	3681
657.1	7.6	-12.2	2.3	166	3687
656.4	7.5	-12.3	2.2	167	3695
655.9	7.5	-12.3	2.2	167	3701
655.8	7.5	-12.3	2.1	166	3703
655.6	7.5	-12.3	2.1	166	3705
655.5	7.4	-12.4	2	164	3707
655.1	7.4	-12.4	1.9	163	3711
654.7	7.3	-11.9	1.9	161	3718
654.2	7.3	-10	1.8	158	3724
653.7	7.3	-9.1	1.8	155	3730
653.1	7.3	-8.7	1.8	153	3738
652.8	7.2	-8	1.8	151	3742
652.6	7.2	-7.6	1.8	149	3744
652.3	7.1	-7	1.8	148	3748
652	7	-6.3	1.9	146	3752
651.6	6.9	-5.8	1.9	145	3756
651.3	6.8	-5.2	2	145	3760
650.8	6.8	-4.3	2	144	3766
650.4	6.7	-3.2	2.1	144	3772
649.9	6.6	-2.3	2.1	143	3778
649.4	6.5	-1.6	2.2	142	3784
648.9	6.4	-1.7	2.3	142	3790
648.6	6.3	-1.8	2.3	142	3794
648.3	6.3	-2.1	2.4	142	3798
648	6.3	-2.1	2.4	142	3802
647.7	6.2	-1.9	2.5	143	3806
647.4	6.2	-1.9	2.5	144	3810
647.2	6.2	-1.9	2.5	146	3812

647	6.2	-1.7	2.5	147	3814
646.6	6.2	-1.4	2.6	149	3820
645.9	6.1	-1.5	2.6	151	3828
645.5	6.1	-1.8	2.6	152	3834
645	6	-1.9	2.7	154	3840
644.5	6	-1.9	2.7	156	3846
643.9	6	-1.9	2.8	157	3854
643.3	6	-1.9	2.8	158	3862
642.9	6	-2.6	2.8	159	3866
642.5	6	-3.9	2.9	160	3872
642.2	6	-5	2.9	161	3876
641.9	6	-5.9	2.9	162	3880
641.5	6	-7.2	2.9	162	3884
641.1	6.1	-8.6	2.9	162	3890
640.8	6.1	-10.2	2.9	162	3894
640.4	6.1	-10.2	2.9	162	3898
640	6.1	-10.2	2.8	162	3904
639.7	6.1	-10.2	2.8	161	3908
639.2	6	-6.2	2.7	161	3914
638.9	6	-6.2	2.7	161	3918
638.4	6	-6.2	2.6	161	3924
637.9	6	-6.6	2.6	161	3930
637.6	6	-6.9	2.6	161	3934
637.3	6	-7.9	2.6	161	3938
637.2	6	-8.7	2.6	161	3940
636.9	6.1	-9.8	2.6	162	3944
636.7	6.1	-11	2.6	161	3946
636.4	6.1	-10.6	2.7	161	3950
635.8	6.1	-10.6	2.7	161	3958
635	6.1	-10.6	2.7	161	3968
634.1	6.1	-11	2.8	160	3980
633.9	6.1	-12	2.8	160	3982
633.6	6.2	-12.9	2.8	159	3986
633.4	6.2	-13.4	2.8	158	3988
633.1	6.2	-13.9	2.8	158	3992
632.7	6.2	-14.5	2.8	158	3998
632.4	6.2	-14.5	2.8	157	4002
632.1	6.1	-14.6	2.8	157	4006
631.7	6.1	-14.6	2.8	157	4010
631.4	6.2	-15.1	2.8	157	4014
631.3	6.2	-15.1	2.8	157	4016
631	6	-15.3	2.8	157	4020
630.5	6	-14.7	2.8	157	4026
629.9	6	-14.1	2.8	157	4034
629.3	5.9	-14.8	2.8	157	4042
629	5.9	-14.8	2.8	157	4046
628.8	5.8	-14.3	2.8	158	4048
628.5	5.8	-14.3	2.8	158	4052
628.2	5.8	-14.3	2.8	158	4056
627.7	5.7	-14.4	2.8	158	4062
627.4	5.7	-14.4	2.7	158	4066
627	5.7	-14.9	2.7	158	4072
626.5	5.7	-14.9	2.7	158	4078

625.9	5.7	-14.4	2.7	158	4086
625.5	5.6	-13.9	2.7	158	4092
625	5.5	-13	2.7	157	4098
624.5	5.5	-12.5	2.7	157	4104
624.1	5.4	-11.7	2.7	156	4110
623.6	5.3	-11.7	2.7	155	4116
623.2	5.3	-10.9	2.7	154	4122
622.7	5.2	-10.1	2.8	154	4128
622.4	5.1	-9.1	2.8	153	4132
622.1	5	-7.8	2.8	152	4136
621.8	5	-6.8	2.7	152	4139
621.3	4.9	-6.9	2.7	151	4145
621.2	4.9	-6.9	2.7	151	4147
620.9	4.8	-7.3	2.6	151	4151
620.6	4.8	-7.3	2.6	150	4155
620	4.8	-9	2.5	150	4163
619.5	4.8	-8.7	2.5	150	4169
619.1	4.9	-8.9	2.5	150	4175
618.5	4.8	-9.7	2.4	150	4183
618.3	4.8	-9.7	2.4	150	4185
618	4.7	-10.2	2.4	149	4189
617.9	4.7	-10.6	2.4	149	4191
617.7	4.7	-11	2.4	149	4193
617.3	4.7	-11.4	2.5	148	4199
616.8	4.6	-11.9	2.5	148	4205
616.4	4.6	-12.3	2.5	147	4211
615.8	4.6	-12.8	2.5	147	4219
615.3	4.6	-13.3	2.5	147	4225
614.9	4.5	-13.8	2.5	146	4231
614.4	4.5	-14.3	2.5	146	4237
614	4.5	-14.3	2.5	147	4243
613.7	4.5	-14.9	2.5	147	4247
613.4	4.5	-14.9	2.5	147	4251
612.9	4.4	-14.9	2.5	148	4257
612.6	4.4	-14.9	2.5	148	4261
612.3	4.3	-15	2.5	149	4265
612	4.3	-15	2.5	149	4269
611.6	4.2	-15.6	2.5	149	4275
611	4.2	-15.6	2.5	150	4283
610.1	4.3	-16.1	2.5	150	4295
609.9	4.3	-16.7	2.5	150	4297
609.6	4.2	-16.8	2.5	150	4301
609.5	4.1	-16.9	2.5	150	4303
609.2	4.1	-16.3	2.4	150	4306
608.7	4.1	-15.2	2.4	150	4312
608.3	4	-14.8	2.4	150	4318
608	4	-14.3	2.4	150	4322
607.5	4	-13.8	2.4	151	4328
607.1	4	-13.8	2.4	151	4334
606.7	4	-13.8	2.4	151	4340
606.1	3.9	-13.4	2.3	151	4348
605.9	3.9	-13.4	2.3	151	4350
605.6	3.8	-13	2.2	151	4354

605.3	3.8	-12.6	2.2	151	4358
604.9	3.7	-12.7	2.2	152	4364
604.4	3.7	-12.3	2.2	152	4370
604	3.6	-12.4	2.2	153	4376
603.6	3.7	-11.9	2.2	153	4382
603.1	3.7	-11.9	2.2	154	4388
602.8	3.7	-12.3	2.2	154	4392
602.4	3.6	-12	2.2	155	4398
602.1	3.6	-11.6	2.2	155	4402
601.6	3.5	-11.3	2.3	155	4408
601.3	3.4	-11	2.3	155	4412
600.9	3.3	-10.3	2.3	155	4417
600.6	3.2	-10.1	2.3	154	4421
600.3	3.2	-9.8	2.3	154	4425
599.9	3.1	-9.5	2.2	153	4431
599.6	3.1	-9.2	2.2	153	4435
599.1	3	-9	2.2	153	4441
598.7	3	-8.4	2.2	152	4447
598.3	2.9	-8.2	2.1	152	4453
598	2.9	-7.9	2.1	152	4457
597.5	2.8	-7.7	2.1	152	4463
597.1	2.8	-7.7	2.1	153	4469
596.7	2.8	-8	2.1	154	4475
596.4	2.7	-8	2.2	155	4479
596.2	2.7	-8	2.2	156	4481
595.8	2.6	-8.1	2.2	157	4487
595.4	2.6	-8.4	2.3	158	4493
594.9	2.5	-8.5	2.3	159	4499
594.5	2.5	-8.2	2.3	160	4504
594	2.5	-8.2	2.3	160	4510
593.6	2.5	-8.2	2.4	161	4516
593.5	2.5	-8.2	2.4	161	4518
593.2	2.5	-8.5	2.4	160	4522
593	2.5	-8.5	2.4	160	4524
592.7	2.5	-8.5	2.4	159	4528
592.3	2.4	-8.6	2.5	159	4534
591.9	2.4	-8.6	2.5	159	4540
591.6	2.3	-9	2.6	160	4544
591.2	2.3	-9	2.6	161	4550
590.7	2.2	-9.1	2.7	163	4556
590.1	2.2	-9.4	2.8	165	4564
589.6	2.2	-9.4	2.8	167	4572
589.1	2.2	-9.4	2.9	170	4577
588.9	2.2	-9.4	2.9	173	4581
588.6	2.2	-9.4	3	176	4585
588	2.2	-9.7	3	179	4593
587.1	2.1	-10.1	3	181	4605
587	2.1	-10.1	3	184	4607
586.8	2	-10.5	3	186	4609
586.7	2	-10.5	3	188	4611
586.4	2	-10.5	3	189	4615
586	2	-10.5	3	190	4621
585.7	2	-10.5	2.9	191	4625

585.1	2	-12.2	2.9	191	4633
584.7	2.1	-13.7	2.9	192	4639
584.1	2.1	-15.9	2.9	192	4646
583.8	2.1	-15.9	2.9	192	4650
583.7	2.1	-15.9	2.9	193	4652
583.4	2	-16	2.9	193	4656
583.3	2	-16	2.9	194	4658
583	2	-16	2.9	194	4662
582.6	2	-16	2.9	195	4668
582.3	1.9	-15.6	3	196	4672
581.8	1.9	-15.6	3	196	4678
581.6	2	-15.5	3.1	197	4682
581	1.9	-15.6	3.2	198	4690
580.1	1.8	-15.2	3.2	198	4702
579.9	1.7	-14.9	3.3	199	4706
579.7	1.7	-14.9	3.4	199	4707
579.4	1.6	-14.5	3.5	199	4711
579	1.6	-14.1	3.5	200	4717
578.6	1.5	-14.2	3.6	200	4723
578.2	1.5	-14.2	3.6	200	4729
577.7	1.5	-14.6	3.6	201	4735
577.5	1.5	-12	3.6	202	4739
577.2	1.4	-9.8	3.6	203	4743
576.9	1.4	-7.9	3.5	203	4747
576.6	1.3	-8.8	3.5	204	4751
576.2	1.3	-9.9	3.4	206	4757
575.8	1.3	-9.9	3.3	207	4763
575.4	1.3	-9.6	3.3	207	4768
575.1	1.3	-9.6	3.2	208	4772
574.6	1.3	-9.6	3.1	209	4778
574.2	1.2	-9.4	3.1	209	4784
573.8	1.2	-9.4	3	209	4790
573.4	1.1	-9.2	3	209	4796
573.1	1.1	-9	2.9	208	4800
573	1.1	-8.7	2.9	208	4802
572.5	1	-8.8	2.8	207	4808
572.1	0.9	-8.6	2.8	206	4814
571.7	0.9	-8.6	2.8	205	4819
571.4	0.9	-8.6	2.8	204	4823
571.2	0.8	-8.7	2.7	204	4827
570.7	0.8	-8.7	2.7	203	4833
570.5	0.7	-9.1	2.7	203	4837
570.2	0.7	-9.3	2.7	202	4841
569.8	0.7	-9.9	2.6	201	4847
569.3	0.7	-10.5	2.6	200	4853
569.1	0.6	-11.1	2.6	200	4857
568.6	0.6	-11.5	2.6	199	4863
568.2	0.5	-11.5	2.6	198	4869
568	0.5	-11.9	2.6	197	4872
567.5	0.5	-11.9	2.6	196	4878
567.1	0.4	-12	2.6	195	4884
566.8	0.5	-11.5	2.6	194	4888
566.6	0.4	-11	2.6	193	4892

566.3	0.4	-10.2	2.6	192	4896
566	0.4	-9.6	2.6	191	4900
565.7	0.4	-8.8	2.6	190	4904
565.5	0.3	-8.4	2.5	190	4908
565.2	0.3	-8.2	2.5	190	4912
564.9	0.2	-7.8	2.5	190	4916
564.6	0.2	-8	2.6	191	4919
564.2	0.2	-8.3	2.6	192	4925
563.5	0.2	-9	2.6	193	4935
562.4	0.2	-10.6	2.7	194	4951
562.3	0.2	-10.6	2.7	195	4953
562.2	0.2	-10.3	2.8	196	4955
562	0.2	-10.3	2.8	196	4957
561.7	0.2	-10.6	2.9	196	4961
561.3	0.2	-10.6	2.9	197	4966
560.9	0.1	-10.4	2.9	196	4972
560.5	0.1	-10.7	2.9	196	4978
560	0.1	-10.7	2.9	195	4986
559.4	0	-10.8	2.9	195	4994
558.9	0	-10.8	2.9	194	5002
558.3	-0.1	-10.9	2.8	194	5009
558.2	-0.1	-11.5	2.8	194	5011
558.1	-0.1	-11.8	2.8	194	5013
557.9	-0.1	-12.4	2.7	194	5015
557.8	-0.2	-12.8	2.7	195	5017
557.5	-0.2	-13.1	2.7	195	5021
557.1	-0.3	-13.2	2.7	196	5027
556.7	-0.3	-12.9	2.7	197	5033
556.3	-0.3	-12.3	2.7	197	5039
555.9	-0.4	-12.4	2.7	198	5045
555.6	-0.4	-12.4	2.7	199	5049
555.2	-0.4	-12.1	2.7	200	5054
554.9	-0.5	-11.8	2.8	201	5058
554.5	-0.6	-11.4	2.8	202	5064
554.1	-0.6	-10	2.8	203	5070
553.7	-0.6	-9	2.8	204	5076
553.3	-0.7	-8.6	2.8	206	5082
552.9	-0.7	-8.6	2.8	207	5088
552.6	-0.7	-9.1	2.8	209	5091
552.4	-0.7	-9.3	2.8	211	5095
552	-0.6	-9.7	2.8	213	5101
551.6	-0.6	-10.3	2.8	215	5107
551.2	-0.7	-10.6	2.8	218	5113
550.9	-0.8	-11	2.8	220	5117
550.6	-0.9	-11.3	2.8	222	5121
550.2	-0.9	-11.6	2.8	224	5127
549.8	-0.9	-11.6	2.9	227	5132
549.4	-1	-11.7	2.9	229	5138
549	-1	-12	2.9	231	5144
548.6	-1	-12	3	233	5150
548.3	-1	-11.7	3	235	5154
548.1	-0.9	-11.6	3	237	5158
547.8	-0.9	-11.3	3.1	239	5162

547.5	-0.9	-11.1	3.1	240	5166
546.9	-1	-10.9	3.1	242	5175
545.9	-1.2	-10.8	3.1	243	5189
545.7	-1.2	-10.6	3.1	244	5193
545.4	-1.3	-10.4	3.1	244	5197
545.1	-1.3	-10.1	3.1	245	5201
544.9	-1.2	-9.6	3.1	245	5205
544.6	-1.3	-9	3.1	245	5208
544.3	-1.4	-8.8	3.1	245	5212
544.2	-1.4	-8.8	3.1	245	5214
543.9	-1.4	-8.6	3.1	244	5218
543.8	-1.5	-8.7	3	244	5220
543.5	-1.5	-8.5	3	244	5224
543	-1.6	-8.3	3	244	5232
542.3	-1.8	-8.1	3	245	5242
541.8	-1.9	-8	3.1	245	5249
541.2	-2	-7.7	3.1	246	5259
540.6	-2.1	-7.6	3.1	246	5267
540.5	-2.1	-7.6	3.2	247	5269
540.2	-2.2	-7.7	3.3	247	5273
540	-2.2	-7.7	3.3	248	5276
539.6	-2.2	-7.7	3.4	248	5282
538.9	-2.2	-7.7	3.5	248	5292
538.6	-2.3	-7.8	3.6	248	5296
538.4	-2.3	-7.8	3.8	248	5300
538.1	-2.4	-7.9	3.9	247	5304
537.6	-2.4	-7.7	4	247	5311
537.2	-2.4	-7.9	4.2	246	5317
536.9	-2.4	-7.7	4.3	246	5321
536.5	-2.5	-7.6	4.4	245	5327
536	-2.6	-7.5	4.5	244	5335
535.5	-2.6	-7.5	4.7	244	5342
535.1	-2.6	-7.5	4.8	244	5348
534.6	-2.5	-7.6	4.9	243	5356
534.5	-2.5	-7.6	5	243	5358
534.2	-2.6	-7.7	5.1	243	5362
534.1	-2.6	-7.7	5.2	244	5364
533.7	-2.5	-7.8	5.3	244	5370
533.2	-2.5	-7.8	5.4	244	5377
532.8	-2.4	-7.7	5.5	244	5383
532.5	-2.4	-7.9	5.6	244	5387
532.2	-2.5	-8	5.7	244	5391
532	-2.6	-8.3	5.8	244	5395
531.7	-2.7	-8.4	5.9	243	5399
531.3	-2.7	-8.4	6	243	5404
530.8	-2.7	-8.4	6.1	242	5412
530.2	-2.7	-8.4	6.1	242	5422
530	-2.8	-8.5	6.2	242	5424
529.8	-2.9	-8.4	6.3	241	5428
529.7	-2.9	-8.4	6.3	241	5430
529.4	-3.1	-8.4	6.4	241	5434
529.1	-3.2	-8.5	6.5	241	5437
528.6	-3.2	-8.5	6.5	241	5445

528.2	-3.2	-8.5	6.6	242	5451
528	-3.2	-8.5	6.7	242	5455
527.6	-3.2	-8.3	6.7	242	5461
527.2	-3.2	-8.3	6.8	242	5466
526.8	-3.3	-8.4	6.9	242	5472
526.6	-3.3	-8.4	6.9	243	5476
526.2	-3.3	-8.4	7	243	5482
525.8	-3.3	-8.2	7	243	5488
525.7	-3.3	-8.2	7.1	243	5490
525.4	-3.3	-8.2	7.1	244	5493
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525	-3.3	-7.8	7.1	244	5499
524.5	-3.5	-7.6	7.2	245	5507
524.1	-3.5	-7.3	7.2	245	5513
523.6	-3.7	-7.5	7.2	245	5521
523.4	-3.7	-7.5	7.1	246	5524
523.1	-3.7	-7.5	7.1	246	5528
522.8	-3.7	-7.7	7.1	247	5532
522.6	-3.7	-7.7	7.1	247	5536
522.3	-3.7	-7.7	7	247	5540
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521.9	-3.7	-7.7	7	248	5546
521.6	-3.7	-7.5	6.9	248	5551
520.9	-3.7	-7.5	6.9	248	5561
520.8	-3.8	-7.6	6.9	248	5563
520.5	-3.9	-7.8	6.9	248	5567
520.3	-3.9	-7.8	6.9	248	5571
520	-3.9	-7.8	6.8	248	5575
519.8	-4	-7.9	6.8	248	5578
519.5	-4	-7.9	6.8	247	5582
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518.6	-4.2	-8.1	6.7	247	5596
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518	-4.3	-8.2	6.8	245	5605
517.6	-4.3	-8.2	6.8	244	5611
517.1	-4.3	-8.2	6.8	243	5619
516.6	-4.4	-8.3	6.8	242	5627
516.2	-4.5	-8.4	6.8	241	5632
516	-4.5	-8.3	6.9	240	5636
515.7	-4.6	-8.5	6.9	239	5640
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511	-4.9	-10.3	6.7	241	5713
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510	-5	-10.6	6.6	243	5729
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508	-5.1	-10.5	6.8	245	5759
507.7	-5.1	-10.3	6.8	245	5763
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507	-5.2	-10	6.9	245	5775
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506	-5.3	-10.1	7.1	247	5790
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504	-5.4	-10.2	7.2	248	5821
503.7	-5.4	-10.2	7.1	248	5826
503.4	-5.4	-10.4	7.1	248	5830
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502.1	-5.5	-10.7	6.9	247	5851
501.8	-5.6	-10.8	6.9	247	5855
501.5	-5.6	-10.9	6.8	246	5861
501.2	-5.7	-11	6.8	246	5865
500.9	-5.7	-11	6.8	246	5871
500.7	-5.7	-11	6.8	246	5872
500.6	-5.7	-11	6.8	245	5874
500.5	-5.7	-11	6.8	245	5876
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499.8	-5.7	-10.8	6.8	245	5888
499.4	-5.7	-10.8	6.7	244	5894
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498.7	-5.8	-11.1	6.7	244	5905

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497.9	-5.9	-12	6.7	243	5916
497.7	-5.9	-12.2	6.6	242	5920
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496.1	-6.1	-12.6	6.5	243	5945
495.9	-6.2	-12.7	6.4	243	5949
495.5	-6.2	-12.7	6.3	244	5955
495.1	-6.2	-12.7	6.2	245	5960
494.8	-6.3	-12.8	6.1	245	5966
494.4	-6.3	-12.8	6	246	5972
494.2	-6.4	-12.9	5.9	246	5976
493.8	-6.4	-12.9	5.8	247	5981
493.6	-6.5	-13	5.7	247	5985
493.4	-6.5	-13	5.7	247	5987
493.2	-6.5	-13.2	5.6	247	5991
493.1	-6.5	-13.4	5.6	247	5993
492.7	-6.5	-13.4	5.6	247	5999
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490.3	-6.9	-14.2	5.4	248	6037
490.1	-6.9	-14.4	5.3	248	6041
489.8	-6.9	-14.4	5.3	249	6044
489.7	-6.9	-14.4	5.2	250	6046
489.5	-6.9	-14.4	5.2	251	6050
489.2	-6.9	-14.4	5.2	252	6054
488.9	-7	-14.5	5.2	254	6060
488.7	-7	-14.5	5.2	255	6064
488.3	-7	-14.5	5.1	256	6069
488.1	-7	-14.5	5.2	257	6073
487.7	-7	-14.5	5.2	259	6079
487.3	-7.1	-14.6	5.2	260	6084
486.9	-7.2	-14.7	5.2	261	6092
486.5	-7.2	-14.5	5.2	262	6098
486	-7.3	-14.6	5.1	262	6105
485.7	-7.3	-14.6	5.1	263	6111
485.3	-7.3	-14.6	5.1	263	6117
485	-7.3	-14.6	5.1	264	6123
484.7	-7.4	-14.5	5	264	6126
484.5	-7.5	-14.6	5	264	6130
484.1	-7.6	-14.4	5	264	6136
483.9	-7.6	-14.7	5	265	6140
483.7	-7.6	-14.7	4.9	265	6143
483.4	-7.6	-14.7	4.9	265	6147
483.1	-7.7	-14.8	4.9	265	6153
482.7	-7.7	-14.8	4.8	265	6159

482.5	-7.7	-14.8	4.8	265	6162
482.3	-7.8	-15.1	4.7	265	6166
481.9	-7.8	-15.1	4.7	265	6172
481.7	-7.8	-15.3	4.7	266	6176
481.4	-7.9	-15.4	4.6	266	6180
481.1	-7.9	-15.4	4.6	267	6185
480.7	-7.9	-15.6	4.6	267	6191
480.4	-7.9	-15.8	4.6	268	6197
480.1	-8	-16.1	4.6	268	6200
479.8	-8	-16.4	4.6	269	6206
479.6	-8	-16.6	4.6	269	6210
479.1	-8	-16.6	4.6	270	6218
478.6	-8	-16.6	4.6	270	6225
478.4	-8	-16.6	4.6	271	6229
478	-8	-16.9	4.6	271	6235
477.8	-8	-16.9	4.6	272	6238
477.4	-8	-16.9	4.6	272	6244
477.2	-8	-16.9	4.6	273	6248
476.9	-8.1	-16.9	4.7	273	6254
476.6	-8.1	-17.2	4.7	273	6257
476.3	-8.2	-17.3	4.7	274	6263
476.1	-8.2	-17.3	4.7	274	6267
475.7	-8.3	-17.4	4.6	274	6273
475.5	-8.3	-17.6	4.6	274	6276
475.1	-8.4	-17.7	4.6	274	6282
474.9	-8.4	-17.7	4.6	273	6286
474.5	-8.4	-17.7	4.5	273	6291
474.2	-8.4	-17.7	4.5	273	6297
474	-8.5	-17.8	4.5	273	6301
473.6	-8.5	-17.8	4.4	272	6307
473.3	-8.6	-17.9	4.4	272	6312
473	-8.6	-17.9	4.4	272	6316
472.7	-8.6	-17.9	4.3	272	6322
472.3	-8.6	-17.9	4.3	272	6327
472	-8.7	-18	4.3	272	6333
471.7	-8.7	-18	4.2	273	6339
471.3	-8.7	-18.3	4.2	273	6344
471	-8.7	-18.3	4.2	273	6350
470.6	-8.7	-18.3	4.1	274	6356
470.4	-8.7	-18.5	4.1	274	6360
470.2	-8.8	-18.6	4.1	274	6363
469.9	-8.8	-18.6	4.1	274	6367
469.7	-8.9	-18.7	4.1	274	6371
469.5	-8.9	-18.7	4.1	274	6375
469.2	-8.9	-18.7	4.1	274	6379
468.9	-8.9	-18.7	4.1	274	6384
468.7	-9	-18.8	4.1	274	6388
468.4	-9	-19.1	4.1	274	6392
468.2	-9	-19.1	4.1	274	6396
467.9	-9.1	-19.1	4.1	274	6401
467.6	-9.1	-19.1	4.1	274	6405
467.3	-9.1	-19.1	4.1	274	6411
467.1	-9.1	-18.9	4	274	6414

466.7	-9.2	-19.2	4	274	6420
466.5	-9.2	-19.2	4	273	6424
466	-9.2	-19.2	3.9	273	6431
465.7	-9.2	-19.2	3.8	273	6437
465.4	-9.3	-19.3	3.8	273	6443
465	-9.3	-19.3	3.7	272	6448
464.8	-9.4	-19.4	3.7	272	6452
464.6	-9.4	-19.7	3.6	272	6456
464.3	-9.4	-19.7	3.6	271	6460
463.9	-9.4	-19.7	3.6	271	6467
463.6	-9.4	-19.7	3.6	271	6473
463.1	-9.5	-19.8	3.6	270	6481
462.6	-9.5	-19.8	3.6	270	6488
462.4	-9.5	-19.8	3.6	270	6492
462.2	-9.6	-19.9	3.6	271	6496
461.9	-9.6	-19.9	3.7	272	6501
461.6	-9.6	-19.9	3.7	273	6505
461.4	-9.7	-20	3.7	274	6509
461.2	-9.7	-20	3.8	276	6513
461	-9.7	-20	3.8	277	6516
460.6	-9.8	-20.1	3.8	280	6522
460.4	-9.8	-20.1	3.8	282	6526
460.2	-9.8	-20.1	3.8	283	6530
459.9	-9.9	-20.1	3.8	285	6533
459.6	-9.9	-20.1	3.8	286	6539
459.4	-9.9	-20.1	3.8	288	6543
459.2	-10	-20.2	3.7	289	6546
458.9	-10	-20.2	3.7	289	6550
458.7	-10	-20.2	3.7	290	6554
458.4	-10.1	-20.3	3.6	290	6560
458.2	-10.1	-20.3	3.6	291	6563
457.9	-10.2	-20.2	3.6	291	6567
457.5	-10.2	-20.2	3.6	291	6575
457.1	-10.2	-19.9	3.6	291	6580
456.8	-10.3	-20	3.6	292	6586
456.6	-10.3	-19.7	3.6	292	6590
456.3	-10.2	-19.6	3.6	293	6595
456	-10.2	-19.4	3.6	293	6599
455.8	-10.3	-19.5	3.6	294	6603
455.5	-10.3	-19.5	3.7	295	6609
455.1	-10.3	-19.5	3.7	296	6614
454.9	-10.3	-19.5	3.7	297	6618
454.6	-10.4	-19.3	3.8	299	6624
454.4	-10.4	-19.3	3.8	300	6627
454.1	-10.4	-19.1	3.9	301	6631
453.9	-10.4	-19.6	3.9	302	6635
453.7	-10.4	-20.3	4	303	6639
453.4	-10.4	-20.6	4	304	6644
453	-10.4	-20.6	4.1	305	6650
452.8	-10.5	-21	4.1	306	6654
452.7	-10.4	-21.2	4.2	307	6656
452.6	-10.4	-21.7	4.2	308	6657
452.1	-10.4	-22.3	4.2	309	6665

451.8	-10.4	-23	4.2	310	6671
451.4	-10.4	-23.3	4.3	310	6678
450.9	-10.4	-23.6	4.3	310	6686
450.8	-10.4	-23.6	4.4	310	6688
450.6	-10.4	-24	4.4	310	6691
450.5	-10.4	-24.3	4.5	310	6693
450.2	-10.4	-24.3	4.6	310	6699
449.7	-10.4	-24.3	4.6	309	6706
449.4	-10.4	-24.3	4.7	308	6712
449	-10.5	-24.4	4.7	307	6719
448.6	-10.5	-24.4	4.7	306	6725
448.3	-10.5	-24.4	4.7	305	6731
448	-10.5	-24.4	4.7	304	6736
447.6	-10.5	-24.4	4.7	302	6742
447.2	-10.5	-24.4	4.7	301	6750
446.8	-10.4	-24.3	4.7	300	6757
446.4	-10.4	-24.3	4.7	298	6763
446	-10.5	-24.4	4.8	297	6770
445.7	-10.5	-24.4	4.8	296	6776
445.4	-10.6	-24.5	4.9	295	6781
444.9	-10.6	-24.2	4.9	293	6789
444.6	-10.7	-23.9	5	293	6795
444.4	-10.7	-23.9	5.1	292	6798
444.3	-10.8	-24	5.1	291	6800
444.1	-10.8	-24	5.2	290	6804
443.8	-10.9	-24.1	5.2	290	6808
443.6	-11	-24.2	5.3	290	6812
443.3	-11.1	-24.3	5.3	289	6817
443.1	-11.1	-24.3	5.2	289	6821
442.9	-11.2	-24.3	5.2	289	6825
442.5	-11.2	-24.7	5.1	289	6830
442.3	-11.2	-25	5.1	289	6834
442.1	-11.2	-25	5	289	6838
441.8	-11.3	-25.5	4.9	289	6843
441.4	-11.4	-25.2	4.9	289	6851
440.9	-11.5	-25.3	4.9	289	6858
440.6	-11.5	-25.3	4.9	289	6864
440.3	-11.6	-25.8	4.9	288	6870
440	-11.7	-25.8	4.9	288	6875
439.7	-11.7	-25.8	5	288	6879
439.3	-11.8	-25.9	5.1	287	6886
439	-11.9	-26	5.2	286	6892
438.7	-11.9	-26	5.4	286	6898
438.5	-11.9	-26	5.4	285	6901
438.2	-11.9	-26	5.5	284	6905
437.9	-11.9	-26	5.6	283	6911
437.5	-12	-26.1	5.7	282	6918
437.3	-12.1	-25.8	5.7	281	6922
437.1	-12.1	-25.8	5.7	280	6926
436.7	-12.2	-25.9	5.8	280	6931
436.5	-12.2	-25.9	5.8	280	6935
436.1	-12.2	-25.9	5.8	279	6942
435.7	-12.3	-26.4	5.8	279	6950

435.4	-12.3	-26.4	5.9	279	6956
435	-12.3	-26.7	5.9	280	6961
434.9	-12.3	-27.1	6	280	6963
434.8	-12.4	-27.2	6	280	6965
434.7	-12.4	-27.2	6	281	6967
434.5	-12.4	-27.2	6.1	282	6970
434.2	-12.5	-27.3	6.1	283	6976
434	-12.5	-27.3	6.1	283	6980
433.7	-12.5	-27.3	6.1	284	6985
433.2	-12.6	-27.4	6.1	285	6993
432.8	-12.7	-27.5	6.2	286	7000
432.5	-12.7	-27.5	6.1	287	7006
432.2	-12.8	-27.6	6.1	288	7011
432.1	-12.8	-27.6	6.1	289	7013
431.8	-12.9	-27.7	6.1	290	7019
431.5	-13	-27.7	6.1	290	7023
431.2	-13	-28.1	6.1	291	7028
430.9	-13	-28.1	6.1	292	7034
430.7	-13	-28.1	6.1	292	7037
430.3	-13	-28.1	6.1	293	7045
429.8	-13.1	-28.2	6.1	294	7054
429.3	-13.1	-28.2	6	294	7062
428.9	-13.2	-28.3	6	295	7069
428.6	-13.3	-28.4	6	296	7075
428.3	-13.3	-28	5.9	296	7080
428.1	-13.3	-28	5.9	297	7084
427.7	-13.4	-28.1	5.8	298	7091
427.3	-13.4	-28.1	5.8	299	7099
426.9	-13.5	-28.2	5.7	299	7104
426.7	-13.5	-28.2	5.7	300	7108
426.5	-13.5	-28.2	5.7	301	7112
426.2	-13.6	-27.9	5.6	301	7117
426	-13.7	-28	5.6	301	7121
425.7	-13.7	-27.6	5.5	302	7127
425.5	-13.8	-27.7	5.5	302	7130
425.4	-13.8	-27.7	5.4	302	7132
425.2	-13.9	-27.4	5.4	302	7136
425.1	-13.9	-27.4	5.4	301	7138
424.9	-13.8	-27.3	5.3	302	7142
424.7	-13.9	-27.1	5.3	302	7145
424.3	-13.9	-26.8	5.2	302	7151
424.1	-14	-26.5	5.2	302	7154
423.8	-14.1	-26.6	5.1	302	7160
423.5	-14.1	-26.6	5.1	303	7166
423.1	-14.3	-26.5	5	303	7173
422.8	-14.4	-26.6	5	303	7179
422.4	-14.4	-26.6	5	304	7186
422.1	-14.4	-26.6	4.9	304	7192
421.9	-14.4	-26.6	4.9	305	7195
421.6	-14.5	-26.3	4.9	305	7201
421.3	-14.6	-26.4	4.9	306	7204
421	-14.6	-26.4	4.9	307	7210
420.8	-14.7	-26.2	4.9	308	7214

420.5	-14.7	-26.2	4.9	309	7219
420.2	-14.8	-26.3	4.9	310	7225
419.9	-14.8	-26	4.8	311	7230
419.5	-14.9	-26.1	4.8	313	7238
419.2	-14.9	-25.8	4.8	314	7243
418.9	-15	-25.9	4.7	316	7249
418.6	-15	-25.9	4.6	317	7254
418.3	-15.1	-26	4.5	317	7260
418	-15.1	-26	4.3	318	7265
417.6	-15.2	-26.1	4.2	318	7273
417.3	-15.2	-26.1	4	319	7278
416.8	-15.3	-26.2	3.8	318	7286
416.4	-15.4	-26.3	3.6	318	7293
416	-15.4	-26.3	3.5	318	7300
415.7	-15.5	-26.4	3.3	317	7306
415.5	-15.6	-26.2	3.2	316	7310
415.3	-15.5	-26.4	3	316	7313
414.9	-15.6	-26.2	2.9	315	7321
414.7	-15.7	-26	2.8	314	7324
414.4	-15.7	-25.7	2.7	313	7330
414.2	-15.7	-25.5	2.6	312	7334
413.8	-15.7	-25	2.6	312	7341
413.5	-15.7	-24.5	2.5	312	7347
413.2	-15.8	-24.6	2.4	312	7352
413	-15.8	-24.3	2.3	312	7356
412.7	-15.8	-23.9	2.2	313	7361
412.4	-15.8	-23.9	2.1	313	7367
412.2	-15.8	-23.9	2	314	7370
411.9	-15.8	-23.9	1.9	315	7376
411.5	-15.9	-24.2	1.8	316	7383
411.4	-15.9	-24.2	1.7	316	7385
411.2	-15.9	-24.4	1.6	316	7389
411.1	-15.9	-24.7	1.5	316	7391
410.9	-15.9	-24.9	1.3	316	7394
410.6	-15.9	-25.1	1.2	316	7400
410.2	-16	-25.2	1.2	316	7407
409.9	-16	-25.2	1.1	316	7413
409.6	-15.9	-25.4	1	318	7418
409.3	-15.9	-25.4	0.9	320	7424
409	-16	-25.5	0.8	325	7429
408.8	-16	-25.5	0.7	330	7433
408.5	-16.1	-25.6	0.7	336	7439
408.3	-16.1	-25.6	0.7	344	7442
408	-16.2	-25.7	0.6	354	7448
407.8	-16.2	-25.4	0.6	1	7451
407.5	-16.3	-25.5	0.6	7	7457
407.2	-16.3	-25.5	0.7	13	7462
407	-16.4	-25.6	0.7	17	7466
406.7	-16.5	-25.7	0.8	20	7472
406.5	-16.5	-25.7	0.8	21	7475
406.2	-16.5	-25.7	0.8	20	7481
406	-16.5	-25.7	0.8	19	7484
405.8	-16.6	-25.8	0.9	16	7488

405.6	-16.6	-25.8	0.9	13	7492
405.4	-16.6	-25.8	0.9	10	7495
405.3	-16.6	-25.8	0.9	7	7497
405	-16.6	-26	0.9	5	7503
404.8	-16.7	-26.1	0.9	2	7506
404.6	-16.7	-26.4	0.9	360	7510
404.4	-16.8	-26.5	0.9	357	7514
404.1	-16.8	-26.7	1	354	7519
403.8	-16.8	-26.7	1	351	7525
403.5	-16.8	-26.7	1	348	7530
403.2	-16.8	-26.7	1	345	7536
402.9	-16.8	-27	1	341	7541
402.7	-16.8	-27.8	1	337	7545
402.4	-16.8	-27.8	1.1	334	7550
402.2	-16.8	-28.1	1.1	330	7554
402.1	-16.7	-28	1.1	327	7558
401.8	-16.8	-28.4	1	324	7563
401.5	-16.9	-28.8	1	321	7569
401.3	-16.9	-28.8	1	318	7572
401	-17	-29.2	1	315	7578
400.7	-17	-29.5	1	312	7583
400.4	-17	-29.5	0.9	309	7589
400.2	-16.9	-29.4	0.9	306	7593
400	-16.9	-29.8	0.8	304	7596
399.8	-17	-30.5	0.8	301	7600
399.7	-17	-30.5	0.8	298	7602
399.4	-17	-30.5	0.7	295	7607
398.9	-17	-30.5	0.7	291	7616
398.2	-17.2	-30.7	0.7	288	7629
398.1	-17.2	-30.7	0.7	285	7631
398	-17.2	-30.4	0.6	281	7635
397.9	-17.2	-30.4	0.6	278	7637
397.6	-17.3	-30.1	0.6	274	7642
397.2	-17.4	-29.9	0.6	272	7649
396.9	-17.5	-29.7	0.6	269	7655
396.7	-17.5	-29.7	0.6	266	7659
396.6	-17.5	-29.3	0.6	264	7660
396.5	-17.5	-29.3	0.6	262	7662
396.4	-17.5	-29	0.6	260	7664
396.1	-17.5	-28.5	0.6	259	7670
395.7	-17.5	-27.9	0.6	257	7677
395	-17.6	-28	0.6	256	7690
394.9	-17.7	-28.1	0.7	255	7693
394.7	-17.7	-27.8	0.7	254	7697
394.5	-17.8	-27.9	0.7	253	7701
394.3	-17.8	-27.9	0.7	251	7704
394.1	-17.8	-27.7	0.7	249	7708
393.9	-17.9	-27.7	0.7	247	7712
393.7	-17.9	-27.7	0.6	244	7715
393.5	-18	-27.6	0.6	240	7719
393.3	-18	-27.6	0.6	236	7722
393	-18.1	-27.7	0.6	231	7728
392.7	-18.2	-27.5	0.6	226	7733

392.5	-18.2	-27.3	0.6	219	7739
392.3	-18.2	-27.3	0.7	212	7743
392.1	-18.3	-27.1	0.7	206	7746
391.8	-18.3	-27.1	0.8	200	7752
391.5	-18.3	-27.1	0.8	196	7757
391.2	-18.3	-26.9	0.9	191	7763
391	-18.3	-26.9	1	188	7766
390.7	-18.3	-26.7	1.1	185	7772
390.4	-18.2	-26.6	1.2	183	7777
390.3	-18.3	-26.7	1.2	182	7781
390	-18.4	-26.5	1.3	181	7786
389.7	-18.5	-26.4	1.3	180	7792
389.4	-18.6	-26.3	1.4	179	7797
389.2	-18.6	-26.1	1.4	179	7801
389	-18.7	-25.9	1.4	179	7805
388.7	-18.7	-25.5	1.4	178	7810
388.5	-18.7	-25.3	1.5	177	7814
388.3	-18.8	-25	1.5	175	7819
388	-18.8	-24.8	1.5	173	7825
387.8	-18.8	-24.5	1.5	171	7828
387.5	-18.8	-24.3	1.5	168	7834
387.2	-18.9	-24	1.6	164	7839
387	-18.9	-23.9	1.6	160	7843
386.7	-18.9	-23.5	1.7	155	7848
386.6	-18.9	-23.3	1.7	152	7852
386.3	-18.9	-23.3	1.8	149	7857
386	-19	-23.3	1.9	146	7863
385.8	-19	-23.3	2	143	7866
385.5	-19	-23.4	2.1	141	7872
385.2	-18.9	-23.5	2.2	140	7877
385	-18.9	-23.7	2.3	138	7883
384.8	-18.9	-23.7	2.4	137	7886
384.6	-18.9	-23.9	2.5	136	7890
384.3	-18.9	-23.9	2.5	135	7895
383.9	-18.9	-23.9	2.6	135	7903
383.7	-18.9	-23.9	2.6	134	7906
383.5	-19	-24.1	2.7	133	7910
383.4	-19	-24.1	2.8	133	7914
383.2	-19	-24.1	2.8	133	7917
382.9	-19	-24.1	2.9	133	7923
382.6	-19	-24.1	2.9	133	7928
382.3	-19.1	-24.4	2.9	133	7934
382.1	-19.1	-24.4	3	133	7939
381.9	-19.2	-24.3	3	133	7943
381.7	-19.2	-24.3	3	133	7946
381.4	-19.2	-24.5	3.1	133	7952
381.1	-19.2	-24.5	3.1	132	7957
380.9	-19.2	-24.7	3.1	131	7961
380.7	-19.2	-24.7	3.1	130	7966
380.5	-19.2	-24.9	3.1	128	7970
380.2	-19.2	-24.9	3.1	126	7975
379.9	-19.2	-24.9	3.2	124	7981
379.6	-19.3	-25.1	3.2	123	7986

379.4	-19.3	-25.1	3.3	121	7992
379.2	-19.3	-25.1	3.4	119	7995
378.9	-19.3	-25.3	3.4	118	8001
378.6	-19.3	-25.3	3.5	117	8006
378.3	-19.3	-25.5	3.6	116	8012
378.2	-19.3	-25.5	3.7	115	8015
377.9	-19.4	-25.6	3.8	114	8021
377.5	-19.5	-25.7	3.9	113	8028
377.2	-19.5	-25.5	4	112	8034
377	-19.5	-25.5	4.1	111	8037
376.7	-19.6	-25.6	4.1	110	8044
376.6	-19.6	-25.6	4.2	109	8046
376.4	-19.6	-25.4	4.3	108	8050
376.3	-19.7	-25.5	4.3	106	8052
376.1	-19.7	-25.5	4.4	105	8055
376	-19.7	-25.5	4.4	105	8057
375.9	-19.7	-25.5	4.5	104	8061
375.7	-19.8	-25.4	4.5	103	8064
375.4	-19.9	-25.2	4.6	102	8070
375.2	-19.9	-25	4.7	102	8073
374.9	-20	-24.9	4.7	102	8079
374.8	-20.1	-25	4.7	101	8082
374.4	-20.1	-25.2	4.8	101	8090
374.1	-20.1	-25.2	4.8	100	8095
373.7	-20.1	-25.2	4.8	100	8102
373.4	-20.2	-25.3	4.9	99	8110
373.1	-20.2	-25.3	4.9	99	8115
372.7	-20.2	-25.1	4.9	98	8122
372.4	-20.3	-25.2	4.9	97	8130
372.1	-20.3	-25.2	4.9	97	8135
371.7	-20.4	-25.3	4.9	96	8142
371.5	-20.4	-25.1	4.9	94	8148
371.2	-20.5	-25.2	5	93	8153
370.9	-20.6	-25.1	5	92	8158
370.7	-20.6	-25.1	5.1	91	8162
370.5	-20.5	-25.1	5.1	90	8167
370.3	-20.4	-24.8	5.2	89	8171
370	-20.4	-24.8	5.3	88	8177
369.8	-20.3	-24.7	5.4	88	8180
369.6	-20.2	-24.6	5.4	87	8186
369.3	-20.3	-24.7	5.5	87	8191
369.1	-20.4	-24.6	5.5	87	8195
368.8	-20.6	-24.8	5.5	87	8202
368.4	-20.7	-24.8	5.6	87	8209
368.1	-20.8	-24.9	5.6	87	8214
367.9	-20.9	-24.9	5.6	87	8220
367.7	-20.9	-24.9	5.6	86	8224
367.5	-21	-25	5.5	85	8227
367.4	-21	-25	5.5	85	8229
367.2	-20.9	-25.1	5.5	84	8233
367.1	-20.9	-25.3	5.5	83	8234
366.9	-21	-25.4	5.4	82	8240
366.4	-21	-25.4	5.4	81	8249

366.1	-21.1	-25.5	5.3	81	8256
365.7	-21.2	-25.6	5.3	81	8263
365.5	-21.2	-25.7	5.2	80	8267
365.4	-21.2	-25.7	5.2	80	8269
365.2	-21.2	-25.9	5.1	80	8274
364.8	-21.2	-25.9	5.1	81	8281
364.4	-21.3	-26	5.1	81	8290
363.8	-21.4	-26.1	5	81	8301
363.4	-21.4	-26.1	5	81	8310
363.3	-21.4	-26.1	5	82	8312
363.2	-21.4	-25.9	5	82	8314
363.1	-21.5	-26	4.9	82	8315
362.9	-21.5	-26	4.9	82	8321
362.6	-21.5	-25.8	4.9	82	8326
362.3	-21.6	-25.9	4.9	81	8332
362.1	-21.6	-25.8	4.9	81	8337
361.8	-21.7	-25.9	5	81	8342
361.6	-21.7	-25.9	5	80	8346
361.4	-21.7	-25.7	5	80	8351
361.1	-21.8	-25.8	5	79	8357
360.8	-21.8	-25.8	5.1	79	8362
360.6	-21.9	-25.8	5.1	78	8368
360.3	-21.9	-25.8	5.1	78	8373
360	-21.9	-25.8	5.1	78	8378
359.8	-22	-26	5.1	77	8384
359.7	-22	-26	5.1	77	8386
359.5	-22	-26.2	5.1	76	8389
359.3	-22	-26.3	5.1	75	8395
358.9	-22	-26.3	5.1	75	8402
358.6	-22.1	-26.4	5.1	74	8409
358.2	-22.1	-26.3	5.1	73	8416
357.9	-22.2	-26.4	5.1	73	8423
357.6	-22.3	-26.3	5.1	72	8429
357.4	-22.3	-26.3	5.1	72	8432
357.2	-22.3	-26.3	5.2	71	8436
357	-22.4	-26.4	5.2	71	8441
356.8	-22.4	-26.2	5.2	71	8445
356.5	-22.5	-26.3	5.3	71	8450
356.3	-22.5	-26.3	5.3	71	8456
356	-22.5	-26.5	5.4	70	8461
355.9	-22.5	-26.5	5.4	70	8465
355.6	-22.5	-26.5	5.5	70	8470
355.2	-22.5	-26.7	5.6	69	8479
354.6	-22.6	-26.9	5.7	69	8490
354.5	-22.6	-26.9	5.7	68	8493
354.3	-22.6	-26.9	5.9	68	8497
354.1	-22.7	-27	5.9	68	8500
353.9	-22.7	-27	6	68	8504
353.7	-22.8	-27.1	6.1	67	8509
353.4	-22.8	-27.1	6.2	67	8515
353.2	-22.8	-27.1	6.2	67	8520
353	-22.8	-27.3	6.2	67	8524
352.7	-22.8	-27.3	6.2	68	8529

352.5	-22.9	-27.4	6.3	68	8534
352.2	-22.9	-27.2	6.3	68	8540
352	-23	-27.3	6.3	68	8545
351.7	-23	-27.3	6.3	68	8551
351.5	-23	-27.3	6.3	69	8554
351.3	-23.1	-27.4	6.3	69	8559
351	-23.1	-27.4	6.3	69	8565
350.8	-23.2	-27.3	6.3	69	8570
350.5	-23.2	-27.3	6.4	69	8576
350.2	-23.3	-27.4	6.4	70	8581
350	-23.3	-27.4	6.4	70	8586
349.8	-23.3	-27.4	6.4	70	8590
349.6	-23.4	-27.4	6.5	70	8595
349.3	-23.4	-27.4	6.5	70	8601
349.1	-23.5	-27.5	6.6	70	8606
348.8	-23.5	-27.5	6.6	71	8611
348.5	-23.5	-27.5	6.7	71	8617
348.4	-23.6	-27.6	6.8	71	8620
348.1	-23.6	-27.4	6.9	71	8626
347.9	-23.7	-27.5	7	71	8631
347.6	-23.7	-27.5	7.1	71	8636
347.4	-23.8	-27.6	7.1	70	8642
347	-23.8	-27.6	7.2	70	8649
346.8	-23.9	-27.8	7.3	70	8654
346.4	-23.9	-27.8	7.3	70	8661
346.2	-23.9	-28	7.3	70	8667
346	-23.9	-28	7.3	70	8670
345.8	-24	-28.3	7.3	70	8674
345.5	-24	-28.3	7.3	70	8681
345.2	-24	-28.3	7.4	70	8688
344.9	-24	-28.3	7.4	70	8693
344.6	-24.1	-28.4	7.4	70	8699
344.5	-24.1	-28.5	7.4	70	8702
344.2	-24.1	-28.5	7.4	70	8708
344.1	-24.2	-28.6	7.4	70	8711
343.9	-24.2	-28.6	7.4	70	8715
343.7	-24.3	-28.7	7.4	70	8718
343.4	-24.3	-28.7	7.4	70	8725
343.1	-24.4	-29	7.4	70	8733
342.8	-24.4	-29	7.4	69	8738
342.7	-24.4	-29	7.4	69	8740
342.6	-24.4	-29	7.3	69	8743
342.4	-24.4	-29	7.3	68	8747
342.1	-24.5	-29.4	7.2	68	8754
341.6	-24.6	-29.7	7.2	68	8763
341.2	-24.6	-29.7	7.2	67	8772
341.1	-24.6	-29.7	7.1	67	8773
341	-24.5	-29.7	7.1	67	8777
340.9	-24.5	-29.9	7.1	67	8779
340.7	-24.5	-30.1	7.1	67	8782
340.5	-24.6	-30.2	7.1	67	8788
340.3	-24.6	-30.2	7.1	67	8791
340.1	-24.6	-30.4	7.1	67	8797

339.9	-24.7	-30.4	7.1	67	8800
339.6	-24.7	-30.4	7.2	67	8805
339.4	-24.8	-30.5	7.2	68	8811
339.2	-24.8	-30.7	7.2	68	8814
339	-24.9	-30.8	7.3	68	8820
338.8	-24.9	-30.8	7.3	68	8823
338.6	-24.8	-30.7	7.3	69	8829
338.3	-24.9	-30.6	7.3	69	8834
338.1	-24.9	-30.8	7.3	69	8839
337.7	-24.9	-31.2	7.3	69	8846
337.5	-24.9	-31.6	7.3	69	8852
337.2	-24.9	-31.8	7.2	69	8857
337	-24.9	-32.2	7.2	69	8862
336.7	-24.9	-32.4	7.2	69	8868
336.4	-24.9	-32.8	7.1	69	8875
336.2	-24.9	-33.2	7.1	69	8880
335.9	-24.9	-33.5	7.1	69	8885
335.7	-24.9	-33.7	7.1	69	8891
335.4	-25	-34.3	7	68	8896
335.3	-25	-34.5	7	68	8900
335.1	-25	-34.8	7	68	8903
334.9	-25.1	-35.1	7	68	8908
334.5	-25.2	-35.5	7	67	8915
334.5	-25.2	-35.5	7	67	8917
334.3	-25.3	-35.8	7	66	8921
334.2	-25.4	-35.9	7.1	66	8923
334	-25.4	-36.5	7.1	66	8926
333.8	-25.3	-36.1	7.1	65	8931
333.5	-25.4	-36.2	7.1	65	8939
333.3	-25.4	-36.2	7.1	65	8942
333.2	-25.4	-36.2	7.1	64	8946
333	-25.4	-36.5	7.1	64	8949
332.7	-25.5	-36.6	7.1	64	8954
332.5	-25.5	-36.6	7.1	64	8960
332.1	-25.5	-36.9	7.1	64	8969
331.5	-25.6	-37.3	7.1	63	8981
331.4	-25.6	-37.3	7.2	63	8983
331.3	-25.6	-37.6	7.2	63	8986
331.2	-25.6	-37.6	7.2	63	8988
331	-25.6	-37.6	7.3	63	8992
331	-25.6	-37.9	7.3	63	8993
330.8	-25.6	-37.9	7.3	63	8997
330.7	-25.6	-37.9	7.3	63	8999
330.6	-25.6	-37.9	7.3	64	9002
330.5	-25.6	-37.9	7.3	64	9004
330.3	-25.7	-38	7.3	64	9008
330.1	-25.8	-38.1	7.3	64	9013
329.8	-25.8	-38.4	7.3	65	9020
329.3	-25.8	-38.4	7.3	65	9031
328.8	-25.8	-38.4	7.3	65	9041
328.3	-25.9	-38.5	7.3	66	9052
328.2	-25.9	-38.5	7.3	66	9054
328.1	-25.9	-38.8	7.3	67	9057

328	-25.9	-38.8	7.3	67	9059
327.7	-26	-38.9	7.3	67	9064
327.5	-26	-39.2	7.3	68	9069
327.3	-26	-39.2	7.3	68	9075
327	-26.1	-39.3	7.3	68	9080
326.8	-26.1	-39.3	7.3	68	9085
326.5	-26.1	-39.7	7.3	68	9091
326.3	-26.1	-39.7	7.3	69	9096
326.1	-26	-39.6	7.4	69	9101
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325.6	-25.9	-39.5	7.4	68	9112
325.4	-25.9	-38.8	7.4	68	9117
325.1	-26	-38.2	7.4	68	9122
324.9	-26.2	-38.4	7.4	68	9128
324.6	-26.3	-38.8	7.4	68	9133
324.4	-26.4	-38.9	7.4	68	9138
324.2	-26.6	-39.1	7.4	68	9144
323.9	-26.7	-39.2	7.3	69	9149
323.7	-26.8	-38.9	7.3	69	9154
323.5	-26.9	-38.7	7.3	69	9159
323.4	-27	-38.8	7.3	69	9161
323.3	-27.1	-38.9	7.3	69	9163
323.2	-27.1	-38.9	7.3	69	9165
323	-27.1	-38.9	7.3	69	9170
322.7	-27.2	-38.7	7.3	69	9175
322.5	-27.2	-38.7	7.3	69	9181
322.3	-27.3	-38.8	7.3	70	9186
322.1	-27.3	-38.8	7.3	69	9189
321.9	-27.3	-38.8	7.3	69	9195
321.6	-27.4	-39.2	7.3	69	9200
321.5	-27.4	-39.2	7.3	69	9203
321.2	-27.5	-39.3	7.3	69	9209
321	-27.5	-39.3	7.3	69	9214
320.9	-27.5	-39.3	7.4	69	9217
320.6	-27.6	-39.4	7.4	69	9223
320.4	-27.6	-39.4	7.4	68	9228
320.2	-27.6	-39.4	7.4	68	9232
320	-27.7	-39.8	7.4	68	9237
319.8	-27.7	-39.8	7.4	68	9242
319.6	-27.8	-39.8	7.5	68	9246
319.4	-27.8	-39.8	7.5	68	9251
319	-27.9	-39.9	7.6	68	9260
318.7	-27.9	-39.9	7.6	68	9267
318.3	-28	-40	7.7	68	9275
318.1	-28	-40	7.7	68	9279
317.9	-28.1	-40.1	7.8	68	9284
317.7	-28.1	-40.1	7.8	68	9288
317.6	-28.2	-40.2	7.9	69	9291
317.4	-28.2	-40.5	8	69	9296
317	-28.2	-40.8	8	69	9303
316.8	-28.2	-40.8	8	69	9309
316.5	-28.2	-41.2	8.1	69	9316
316.3	-28.2	-41.5	8.1	70	9321

316	-28.2	-41.5	8.1	70	9326
315.7	-28.2	-41.9	8.1	70	9333
315.5	-28.2	-41.9	8.1	70	9338
315.3	-28.2	-41.9	8.1	70	9344
315	-28.3	-42	8.1	70	9351
314.7	-28.3	-41.6	8.1	70	9356
314.4	-28.3	-41.3	8.1	70	9363
314.2	-28.3	-40.6	8.1	70	9368
313.9	-28.3	-40.3	8.1	71	9375
313.7	-28.3	-40.6	8.1	71	9380
313.5	-28.3	-40.6	8.1	71	9384
313.3	-28.3	-40.9	8	72	9389
313	-28.3	-41.3	8	72	9394
312.9	-28.3	-42	8	72	9398
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311.7	-29.2	-40.2	7.5	75	9426
311.2	-29.2	-40.2	7.4	76	9436
310.7	-29.2	-39.9	7.4	76	9449
310.5	-29.2	-39.9	7.3	77	9454
310.2	-29.2	-39.7	7.2	77	9459
310	-29.1	-39.6	7.1	77	9464
309.8	-29	-39.5	7.1	78	9470
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309.3	-28.9	-39.1	7	78	9480
309.1	-28.8	-39	7	78	9485
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308.5	-28.8	-39.3	6.9	80	9499
308.3	-28.9	-39.4	6.9	80	9504
308	-28.9	-39.7	6.9	81	9510
307.8	-28.9	-39.4	6.9	82	9515
307.6	-29	-39.2	6.8	83	9520
307.4	-29	-38.7	6.8	84	9525
307.1	-29.1	-38.8	6.8	84	9531
306.9	-29.2	-38.9	6.8	85	9536
306.7	-29.3	-39	6.7	85	9541
306.5	-29.3	-39	6.7	86	9546
306.2	-29.4	-39.1	6.7	86	9552
306	-29.5	-39.4	6.7	86	9557
305.8	-29.6	-39.5	6.7	86	9562
305.6	-29.7	-39.6	6.7	86	9567
305.3	-29.8	-39.7	6.7	86	9574
305	-29.9	-39.8	6.7	85	9579
304.8	-29.9	-39.8	6.8	85	9585
304.6	-30	-40.1	6.8	85	9590
304.4	-30.1	-40.2	6.8	85	9595
304.2	-30.2	-40.3	6.9	84	9600
303.8	-30.3	-40.4	6.9	84	9609
303.4	-30.3	-40.4	6.9	84	9618

303	-30.5	-40.6	6.9	84	9626
302.8	-30.5	-40.6	6.9	83	9632
302.7	-30.5	-40.6	6.9	83	9635
302.4	-30.6	-40.4	6.9	83	9640
302.2	-30.6	-40.4	6.9	83	9645
302.1	-30.6	-40.4	7	83	9649
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301.6	-30.5	-40.6	7	83	9659
301.5	-30.4	-40.2	7	83	9663
301.3	-30.3	-39.9	6.9	83	9668
301	-30.2	-39.8	6.9	84	9673
300.8	-30.2	-40.6	6.9	84	9678
300.7	-30.2	-40.8	6.9	85	9682
300.5	-30.4	-40.7	6.9	85	9687
300.2	-30.4	-40.5	6.9	86	9692
300.1	-30.4	-40.2	6.9	86	9696
299.9	-30.6	-40.2	6.9	87	9701
299.7	-30.7	-40.2	6.8	88	9704
299.6	-30.8	-40.3	6.8	89	9708
299.4	-31	-40.5	6.8	89	9711
299.3	-31.1	-40.6	6.8	90	9715
299.1	-31.1	-40.6	6.8	90	9718
299	-31.2	-40.7	6.7	91	9722
298.9	-31.2	-40.5	6.8	91	9725
298.7	-31.3	-40.5	6.8	91	9729
298.5	-31.2	-40.5	6.8	92	9734
298.3	-31.2	-40.5	6.8	92	9739
298.1	-31.1	-40.4	6.8	92	9744
297.9	-30.9	-40.2	6.9	92	9748
297.7	-30.6	-39.9	6.9	92	9753
297.5	-30.3	-39.9	7	92	9758
297.3	-30.3	-40.4	7.1	92	9763
297	-30.3	-40.9	7.1	92	9769
296.8	-30.5	-40.8	7.2	92	9774
296.7	-30.6	-40.9	7.3	92	9777
296.5	-30.8	-40.8	7.3	92	9782
296.2	-31	-40.8	7.4	92	9788
296	-31.2	-40.7	7.5	92	9793
295.8	-31.3	-40.5	7.6	92	9798
295.6	-31.5	-40.7	7.6	93	9803
295.4	-31.6	-40.6	7.7	93	9807
295.2	-31.8	-40.5	7.8	93	9812
295	-32	-40.7	7.9	93	9817
294.8	-32.1	-40.6	8	92	9822
294.6	-32.2	-40.5	8.1	92	9827
294.3	-32.2	-40.5	8.2	92	9834
293.9	-32.3	-40.6	8.3	91	9845
293.5	-32.3	-40.6	8.4	91	9853
293.2	-32.3	-40.6	8.5	90	9860
293.1	-32.3	-40.6	8.6	90	9863
292.9	-32.3	-40.6	8.7	89	9867
292.8	-32.4	-40.6	8.7	89	9870
292.7	-32.4	-40.6	8.7	89	9872

292.6	-32.5	-40.7	8.8	88	9876
292.4	-32.5	-40.7	8.8	88	9879
292.3	-32.4	-40.6	8.8	88	9882
292.1	-32.4	-40.6	8.8	88	9888
291.9	-32.5	-40.7	8.7	88	9891
291.7	-32.5	-40.7	8.7	88	9896
291.6	-32.6	-40.8	8.7	88	9900
291.4	-32.6	-40.6	8.7	88	9905
291.2	-32.6	-40.6	8.7	88	9908
291	-32.7	-40.7	8.7	88	9913
290.8	-32.7	-40.7	8.8	87	9919
290.6	-32.8	-40.8	8.8	87	9922
290.4	-32.8	-40.8	8.8	87	9927
290.3	-32.8	-40.6	8.9	87	9931
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289.9	-32.9	-40.7	8.9	86	9941
289.7	-33	-40.8	9	85	9944
289.5	-33	-40.8	9	85	9949
289.4	-33	-40.8	9.1	84	9953
289.2	-33.1	-40.7	9.1	84	9958
289	-33.1	-40.7	9.1	84	9963
288.7	-33.2	-40.8	9.1	83	9970
288.3	-33.3	-40.8	9.1	83	9979
288	-33.3	-40.8	9.1	83	9987
287.8	-33.4	-40.9	9.1	83	9992
287.5	-33.5	-40.8	9.1	83	9997
287.3	-33.6	-40.9	9.1	83	10003
287.1	-33.6	-40.7	9.1	83	10008
286.9	-33.7	-40.8	9.1	83	10013
286.7	-33.8	-40.7	9.2	82	10018
286.5	-33.8	-40.7	9.2	82	10023
286.3	-33.9	-40.8	9.2	82	10028
286.1	-33.9	-40.8	9.3	82	10032
286	-33.9	-40.8	9.3	81	10035
285.9	-33.9	-40.8	9.4	81	10037
285.9	-33.9	-40.8	9.5	80	10039
285.8	-34	-40.9	9.5	80	10040
285.7	-34	-40.9	9.6	79	10042
285.5	-34	-40.7	9.7	79	10047
285.2	-34	-40.7	9.7	78	10054
285	-34	-40.5	9.8	78	10059
284.8	-34.1	-40.6	9.8	77	10064
284.6	-34.1	-40.6	9.9	77	10069
284.3	-34.1	-40.4	9.9	76	10076
284.1	-34.1	-40.4	9.9	76	10081
284	-34.2	-40.5	10	76	10085
283.8	-34.2	-40.5	10	75	10088
283.7	-34.2	-40.5	10	75	10092
283.6	-34.2	-40.3	10	75	10095
283.4	-34.3	-40.4	10	75	10098
283.2	-34.3	-40.6	10	75	10103
283.1	-34.3	-40.6	10.1	75	10107
282.9	-34.3	-40.6	10.1	75	10112

282.7	-34.4	-40.9	10.1	75	10115
282.5	-34.4	-40.9	10.1	75	10121
282.3	-34.4	-40.7	10.2	75	10126
282.2	-34.5	-40.5	10.2	75	10129
281.9	-34.5	-40.3	10.2	75	10136
281.7	-34.6	-40.4	10.2	75	10141
281.5	-34.7	-40.5	10.2	75	10146
281.4	-34.7	-40.5	10.3	76	10148
281.4	-34.7	-40.3	10.3	76	10150
281.3	-34.7	-40.3	10.3	76	10151
281.1	-34.8	-40.4	10.3	77	10156
281	-34.8	-40.4	10.3	77	10160
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280.5	-34.9	-40.5	10.3	77	10170
280.3	-34.9	-40.5	10.3	77	10177
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279.9	-35.1	-40.5	10.3	77	10187
279.7	-35.1	-40.5	10.4	77	10192
279.5	-35.2	-40.6	10.4	77	10196
279.4	-35.2	-40.6	10.4	77	10199
279.2	-35.3	-40.7	10.4	77	10204
279	-35.3	-40.9	10.4	77	10207
278.8	-35.3	-41.4	10.5	77	10214
278.4	-35.4	-40.8	10.5	76	10223
278.2	-35.4	-40.8	10.5	76	10230
278	-35.4	-40.8	10.5	76	10235
277.7	-35.4	-40.8	10.5	76	10240
277.5	-35.4	-40.8	10.5	76	10245
277.3	-35.5	-40.7	10.5	76	10252
277.2	-35.6	-40.8	10.5	76	10253
277.1	-35.6	-40.8	10.5	76	10255
277.1	-35.7	-40.9	10.5	76	10257
276.9	-35.7	-41.2	10.5	76	10262
276.7	-35.8	-41.5	10.5	76	10265
276.5	-35.8	-41.5	10.6	76	10270
276.3	-35.8	-41	10.6	76	10277
276	-35.9	-41.1	10.6	76	10284
275.7	-35.9	-41.1	10.6	76	10291
275.6	-35.9	-41.1	10.7	76	10294
275.5	-36	-41.4	10.7	76	10297
275.3	-36	-41.4	10.8	76	10301
275.2	-36	-41.4	10.8	75	10304
275	-36.1	-41.6	10.9	75	10308
274.8	-36.1	-41.6	10.9	75	10313
274.7	-36.2	-41.9	11	75	10316
274.6	-36.2	-41.9	11	75	10319
274.4	-36.3	-41.8	11	75	10323
274.3	-36.3	-41.8	11.1	75	10326
274.2	-36.3	-41.7	11.1	75	10330
273.9	-36.4	-41.7	11.1	75	10336
273.6	-36.5	-41.8	11.1	75	10343
273.5	-36.5	-41.8	11.1	75	10347
273.3	-36.5	-41.8	11.1	75	10352

273.2	-36.6	-41.8	11.1	75	10355
273	-36.6	-41.8	11.1	75	10358
272.8	-36.6	-41.8	11.1	75	10363
272.7	-36.6	-41.8	11.1	76	10367
272.6	-36.7	-41.7	11.1	76	10370
272.4	-36.7	-41.7	11.1	76	10375
272.2	-36.7	-41.7	11.2	76	10379
272	-36.7	-41.7	11.2	77	10384
271.8	-36.7	-41.9	11.2	77	10389
271.7	-36.7	-41.9	11.3	77	10392
271.5	-36.6	-41.8	11.3	77	10397
271.3	-36.5	-41.8	11.3	78	10402
271.1	-36.5	-41.8	11.4	78	10407
270.9	-36.4	-41.9	11.4	78	10413
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270.1	-36.6	-42.3	11.6	79	10435
269.9	-36.7	-42.5	11.6	80	10438
269.7	-36.8	-42.6	11.6	80	10443
269.5	-36.9	-42.9	11.7	80	10448
269.4	-37	-43.2	11.7	81	10451
269.2	-37.1	-43.4	11.8	81	10456
269	-37.1	-43.4	11.8	82	10462
268.9	-37.2	-43.7	11.9	82	10465
268.7	-37.3	-44	11.9	83	10470
268.5	-37.3	-44	12	83	10475
268.3	-37.4	-44.3	12	83	10480
268	-37.5	-44.6	12.1	84	10487
267.8	-37.5	-44.8	12.1	84	10492
267.6	-37.5	-45	12.1	84	10497
267.4	-37.5	-45.2	12.1	84	10502
267.2	-37.6	-45.5	12.1	84	10509
267	-37.6	-45.5	12.1	85	10514
266.8	-37.6	-45.7	12	85	10519
266.6	-37.6	-45.9	12	85	10524
266.3	-37.6	-45.9	12	85	10531
266.3	-37.6	-46.1	11.9	85	10532
266.2	-37.7	-46.4	11.8	85	10534
266.1	-37.7	-46.9	11.8	85	10536
266.1	-37.7	-47.1	11.7	85	10537
265.9	-37.8	-47.2	11.7	85	10541
265.7	-37.8	-47.2	11.6	85	10546
265.6	-37.8	-47.2	11.6	85	10549
265.4	-37.8	-47.2	11.5	85	10554
265.2	-37.9	-47.3	11.5	85	10559
265	-37.9	-47.3	11.5	85	10564
264.9	-37.9	-47.6	11.5	85	10568
264.7	-37.9	-47.6	11.5	86	10573
264.5	-37.9	-47.6	11.4	86	10578
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263.8	-38.1	-48	11.4	87	10596
263.6	-38.1	-48.3	11.4	87	10601
263.5	-38.2	-48.4	11.4	88	10605
263.3	-38.2	-48.4	11.4	88	10610
263.1	-38.2	-48.4	11.4	88	10615
262.9	-38.2	-48.6	11.4	88	10620
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260.8	-38.5	-50	11.4	88	10675
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260.5	-38.6	-50.1	11.4	88	10684
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260.2	-38.7	-50.5	11.4	88	10692
260	-38.8	-50.6	11.4	88	10695
259.9	-38.8	-50.6	11.4	88	10699
259.8	-38.9	-51	11.4	88	10702
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259.4	-39	-51.1	11.4	88	10712
259.3	-39.1	-51.2	11.4	88	10715
259.1	-39.1	-51.2	11.3	88	10720
259	-39.1	-51.2	11.3	88	10724
258.8	-39.2	-51.3	11.4	88	10729
258.6	-39.3	-51.4	11.4	88	10732
258.4	-39.3	-51.4	11.4	88	10737
258.3	-39.4	-51.5	11.4	88	10740
258.1	-39.4	-51.5	11.5	88	10745
258	-39.4	-51.5	11.6	89	10749
257.8	-39.5	-51.6	11.6	89	10755
257.4	-39.5	-51.6	11.7	89	10764
257.2	-39.5	-51.6	11.8	89	10770
257	-39.5	-51.6	11.8	89	10776
256.9	-39.6	-51.7	11.9	89	10779
256.7	-39.6	-51.7	11.9	89	10784
256.5	-39.6	-51.7	11.9	89	10789
256.4	-39.7	-51.7	11.9	89	10792
256.2	-39.7	-52.1	11.9	88	10797
256	-39.7	-52.1	11.9	88	10802
255.9	-39.8	-52.2	11.8	88	10806
255.7	-39.8	-52.2	11.8	88	10809
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253.6	-40.2	-53.2	12.4	87	10867
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252	-40.6	-53.9	12.3	88	10909
251.9	-40.6	-53.9	12.3	88	10912
251.8	-40.6	-53.9	12.3	88	10914
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249.3	-41.3	-54.5	12.2	91	10984
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248.9	-41.4	-54.6	12.2	91	10993
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248.3	-41.7	-54.5	12.4	91	11010
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247.9	-41.9	-54.7	12.5	91	11022
247.7	-41.9	-54.4	12.5	91	11027
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245.9	-42.1	-54.2	12.7	89	11074
245.8	-42.2	-54.3	12.7	89	11079
245.5	-42.2	-54.3	12.7	88	11086
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245.1	-42.3	-54.4	12.7	88	11099
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244.9	-42.3	-54.4	12.8	88	11103
244.8	-42.3	-54.4	12.8	87	11106
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244	-42.5	-54.6	12.8	87	11129
243.7	-42.6	-54.7	12.8	87	11136
243.5	-42.6	-54.7	12.8	87	11142
243.3	-42.6	-54.7	12.8	86	11147
243.1	-42.7	-54.7	12.8	86	11152
243	-42.7	-54.7	12.8	86	11155
242.9	-42.7	-54.7	12.8	85	11159
242.8	-42.8	-54.8	12.8	85	11162
242.7	-42.8	-54.8	12.8	85	11165
242.6	-42.8	-54.8	12.8	85	11168
242.3	-42.9	-54.9	12.8	85	11175
242	-43	-55	12.8	85	11183
241.8	-43.1	-55.1	12.8	84	11190
241.5	-43.2	-55.2	12.9	84	11196
241.4	-43.3	-55.3	12.9	84	11201
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241	-43.4	-55.4	12.9	85	11213
240.8	-43.5	-55.5	12.9	85	11218
240.7	-43.5	-55.5	12.9	85	11221
240.5	-43.6	-55.5	12.9	85	11226
240.3	-43.6	-55.5	13	85	11231
240.1	-43.5	-55.8	13	84	11237
239.8	-43.6	-55.9	13	84	11244
239.6	-43.6	-55.9	13.1	84	11251
239.4	-43.7	-56	13.1	84	11257
239.1	-43.8	-56	13.2	84	11264
238.9	-43.8	-56	13.3	84	11270
238.7	-43.9	-56.1	13.3	84	11277
238.4	-44	-56.2	13.4	83	11283
238.2	-44.1	-56.3	13.4	83	11290
238	-44.1	-56.3	13.5	83	11297
237.7	-44.2	-56.4	13.5	82	11303
237.5	-44.3	-56.5	13.5	82	11310
237.3	-44.3	-56.5	13.6	82	11315
237.2	-44.3	-56.5	13.6	81	11318
237	-44.4	-56.6	13.6	81	11323
236.9	-44.4	-56.6	13.6	81	11326
236.7	-44.4	-56.6	13.6	81	11332
236.4	-44.5	-56.7	13.6	80	11341
236.2	-44.6	-56.8	13.7	80	11346
236	-44.6	-57.1	13.7	80	11352
235.8	-44.7	-57.2	13.7	80	11357
235.7	-44.8	-57.3	13.8	80	11362
235.4	-44.9	-57.4	13.8	80	11368
235.2	-44.9	-57.4	13.9	79	11375
234.9	-45	-57.8	13.9	79	11383

234.6	-45	-57.8	14	79	11391
234.5	-45	-57.8	14	79	11395
234.4	-45.1	-57.9	14	79	11398
234.3	-45.1	-57.9	14	79	11401
234.1	-45.1	-57.9	14.1	79	11406
233.9	-45.2	-58	14.1	79	11412
233.7	-45.2	-58	14.1	80	11417
233.5	-45.2	-58	14.1	80	11422
233.4	-45.3	-58.4	14.1	80	11427
233.2	-45.4	-58.5	14.1	80	11432
233	-45.4	-58.5	14.1	80	11437
232.8	-45.4	-58.5	14.1	80	11443
232.5	-45.5	-58.6	14.1	80	11452
232.3	-45.6	-58.7	14.1	81	11456
232.2	-45.6	-58.7	14.1	81	11461
232	-45.6	-58.7	14.1	81	11468
231.8	-45.6	-58.7	14.1	81	11473
231.6	-45.7	-58.8	14.2	81	11478
231.4	-45.8	-58.9	14.2	81	11482
231.2	-45.8	-58.9	14.2	81	11489
231	-45.9	-58.9	14.2	81	11494
230.8	-46	-59	14.2	81	11502
230.4	-46	-59	14.2	81	11512
230.1	-46.1	-59.5	14.2	81	11520
229.8	-46.2	-59.6	14.3	81	11530
229.7	-46.2	-59.6	14.3	81	11533
229.6	-46.3	-59.7	14.3	81	11536
229.4	-46.3	-59.7	14.3	81	11541
229.2	-46.4	-59.8	14.4	81	11547
229	-46.4	-59.8	14.4	81	11552
228.9	-46.4	-60.1	14.4	81	11557
228.7	-46.4	-60.1	14.5	81	11562
228.5	-46.5	-60.2	14.5	81	11568
228.2	-46.5	-60.2	14.5	81	11575
228	-46.6	-60.3	14.5	81	11583
227.7	-46.6	-60.3	14.6	81	11590
227.6	-46.6	-60.3	14.6	81	11594
227.4	-46.7	-60.4	14.6	80	11599
227.2	-46.9	-60.6	14.6	80	11606
227	-47	-60.7	14.6	80	11612
226.7	-47.1	-60.8	14.6	80	11619
226.6	-47.2	-60.8	14.7	80	11623
226.4	-47.2	-60.8	14.7	80	11630
226.1	-47.2	-60.8	14.7	79	11636
225.9	-47.3	-60.9	14.7	79	11643
225.8	-47.3	-60.9	14.7	79	11648
225.6	-47.3	-60.9	14.7	79	11651
225.4	-47.4	-61	14.7	79	11657
225.2	-47.4	-61	14.7	78	11664
225	-47.5	-61.1	14.7	78	11669
224.9	-47.5	-61.1	14.7	78	11674
224.7	-47.6	-61.2	14.7	78	11680
224.4	-47.6	-61.2	14.7	78	11686

224.3	-47.7	-61.3	14.7	78	11691
224	-47.8	-61.4	14.7	78	11698
223.8	-47.9	-61.5	14.6	78	11704
223.7	-47.9	-61.5	14.6	78	11709
223.5	-47.9	-61.5	14.6	78	11714
223.3	-48	-61.5	14.6	78	11720
223	-48	-61.5	14.6	78	11728
222.9	-48	-61.5	14.5	78	11731
222.8	-48.1	-61.6	14.5	78	11735
222.7	-48.1	-61.6	14.5	78	11738
222.5	-48.1	-61.6	14.4	78	11743
222.4	-48.2	-61.7	14.4	78	11748
222.1	-48.3	-61.8	14.4	78	11754
221.9	-48.3	-61.8	14.4	78	11760
221.7	-48.4	-61.9	14.3	78	11767
221.5	-48.4	-61.9	14.3	78	11773
221.2	-48.5	-61.6	14.3	77	11781
221	-48.6	-61.7	14.2	77	11788
220.8	-48.6	-61.7	14.2	77	11794
220.6	-48.7	-61.8	14.2	77	11801
220.4	-48.7	-61.8	14.1	77	11805
220.3	-48.8	-61.9	14.1	76	11810
220.1	-48.9	-62	14	76	11815
219.9	-49	-62	14	76	11820
219.8	-49	-62	14	76	11825
219.6	-49	-61.7	14	76	11829
219.4	-49	-61.7	14	75	11834
219.2	-49.1	-61.8	14	75	11841
219.1	-49.1	-61.8	14	75	11845
218.8	-49.1	-61.8	14	75	11853
218.5	-49.2	-61.9	14	75	11861
218.3	-49.3	-61.9	14	75	11868
218.1	-49.3	-61.9	13.9	75	11874
217.9	-49.4	-62	13.9	74	11881
217.7	-49.4	-62	13.9	74	11887
217.5	-49.5	-62.1	13.8	74	11892
217.3	-49.5	-62.1	13.8	74	11898
217.2	-49.6	-62.2	13.8	74	11903
217	-49.7	-61.9	13.7	74	11908
216.9	-49.8	-62	13.7	74	11911
216.7	-49.8	-62	13.6	74	11916
216.4	-49.8	-62.4	13.6	74	11925
216.1	-49.9	-62.1	13.5	74	11935
215.8	-50	-62.2	13.5	74	11943
215.6	-50	-61.9	13.4	74	11951
215.5	-50.1	-62	13.4	74	11953
215.5	-50.1	-62	13.3	74	11954
215.4	-50.2	-62.1	13.2	74	11956
215.4	-50.2	-62.1	13.1	73	11957
215.2	-50.3	-61.8	13	73	11962
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214.6	-50.4	-61.9	12.8	73	11981
214.2	-50.5	-61.7	12.7	72	11994

213.8	-50.5	-61.7	12.6	72	12005
213.4	-50.5	-61.4	12.5	72	12016
213.3	-50.5	-61.4	12.4	72	12021
213.1	-50.6	-61.2	12.3	71	12027
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212.3	-51.1	-61.1	12.1	71	12050
212.1	-51.2	-61.2	12.1	70	12056
211.9	-51.2	-61.2	12.1	70	12064
211.7	-51.2	-60.9	12.1	70	12070
211.5	-51.2	-60.9	12.1	70	12077
211.2	-51.2	-60.9	12.1	69	12085
210.9	-51.3	-61	12.1	69	12092
210.7	-51.2	-60.9	12.2	69	12100
210.5	-51.2	-60.9	12.2	69	12107
210.3	-51.2	-60.9	12.2	69	12111
210.2	-51.2	-60.7	12.2	69	12116
210	-51.2	-60.7	12.2	69	12121
209.8	-51.3	-60.8	12.2	69	12127
209.7	-51.3	-60.8	12.1	69	12132
209.4	-51.4	-60.9	12.1	68	12140
209.1	-51.5	-61	12.1	68	12150
208.8	-51.6	-61.1	12	68	12157
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208.4	-51.9	-61.3	12	68	12170
208.2	-51.9	-61.3	11.9	68	12176
208.1	-51.9	-61.3	11.9	67	12180
208	-52	-61.2	11.9	67	12184
207.8	-52.1	-61.3	11.8	67	12191
207.5	-52.1	-61.3	11.8	67	12199
207.4	-52.2	-61.4	11.8	66	12203
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207	-52.3	-61.5	11.8	66	12216
206.7	-52.3	-61.5	11.8	66	12224
206.4	-52.3	-61.5	11.8	66	12233
206.2	-52.4	-61.5	11.8	66	12241
205.9	-52.4	-61.5	11.8	66	12249
205.6	-52.5	-61.4	11.8	66	12257
205.4	-52.6	-61.5	11.8	66	12263
205.2	-52.7	-61.6	11.8	66	12270
205.2	-52.7	-61.6	11.8	66	12271
205.1	-52.7	-61.6	11.8	66	12273
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204.9	-52.8	-61.7	11.8	65	12281
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203.8	-53.3	-58	11.8	64	12315
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203.1	-53.4	-60	11.8	64	12339
202.9	-53.5	-60.7	11.8	63	12344
202.7	-53.5	-61.4	11.8	63	12350
202.5	-53.5	-62.1	11.8	63	12356
202.4	-53.5	-62.1	11.8	63	12361
202.2	-53.6	-61.7	11.8	63	12367
201.9	-53.6	-61.5	11.8	63	12376
201.5	-53.7	-61.4	11.7	62	12389
201.3	-53.7	-61.4	11.7	62	12395
201.1	-53.8	-61.5	11.7	62	12402
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200.2	-53.9	-61.6	11.5	61	12430
200	-53.9	-61.6	11.5	61	12436
199.9	-54	-61.7	11.5	61	12439
199.8	-54	-61.7	11.5	61	12444
199.5	-54	-61.7	11.5	61	12453
199.1	-54.1	-61.6	11.5	61	12464
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198.4	-54.5	-61.8	11.4	61	12489
198.2	-54.6	-61.9	11.4	61	12494
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197	-55	-62.2	11.2	62	12531
196.9	-55	-62.1	11.2	62	12536
196.7	-55.1	-62.1	11.1	62	12542
196.5	-55.1	-62.1	11.1	62	12549
196.4	-55.1	-62.1	11.1	63	12552
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195.8	-55.2	-62.2	11.1	63	12572
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194.8	-55.7	-62.5	11.2	62	12603
194.7	-55.7	-62.5	11.2	62	12608
194.5	-55.8	-62.4	11.2	62	12614
194.3	-55.8	-62.4	11.3	62	12622
193.9	-55.8	-62.4	11.3	62	12633
193.7	-56	-62.6	11.3	62	12642
193.4	-56	-62.6	11.3	62	12651

193.2	-56.1	-62.7	11.4	62	12657
193	-56.1	-62.7	11.4	62	12665
192.8	-56.2	-62.8	11.4	62	12671
192.6	-56.3	-62.9	11.3	62	12676
192.5	-56.3	-62.7	11.3	62	12681
192.3	-56.4	-62.8	11.3	62	12687
192.1	-56.4	-62.8	11.2	62	12693
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191.5	-56.4	-62.8	11	62	12712
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191.1	-56.5	-62.9	11	62	12726
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189.8	-57.1	-63.1	11	61	12769
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184.3	-58.5	-63.7	11.4	59	12957
184	-58.6	-63.8	11.5	58	12966

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176.3	-61.3	-66.1	13.1	55	13231
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176.2	-61.4	-66.2	13.1	55	13237
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173.9	-61.8	-66.8	13.1	55	13317
173.7	-61.9	-66.9	13.1	55	13323
173.5	-62	-67	13.1	54	13331
173.3	-62	-67	13.2	54	13337
173.2	-62.2	-67.3	13.2	54	13341
173	-62.3	-67.4	13.2	54	13347
172.8	-62.4	-67.5	13.2	54	13355
172.8	-62.4	-67.5	13.2	54	13358
172.6	-62.5	-67.6	13.2	53	13362
172.5	-62.5	-67.6	13.3	53	13367
172.3	-62.6	-67.7	13.3	53	13373
172.1	-62.6	-67.7	13.3	53	13380
171.9	-62.7	-67.8	13.4	53	13388
171.7	-62.8	-68.1	13.4	53	13395
171.5	-62.8	-68.1	13.5	53	13403
171.3	-62.9	-68.1	13.5	53	13410
171.2	-63	-68.2	13.6	53	13415
171	-63.1	-68.5	13.7	53	13420
170.9	-63.2	-68.6	13.7	53	13424
170.7	-63.3	-68.7	13.8	53	13430
170.6	-63.3	-68.7	13.8	54	13435
170.4	-63.4	-68.8	13.9	54	13441
170.2	-63.5	-68.9	13.9	54	13448
170.1	-63.5	-68.9	14	54	13454
169.9	-63.6	-69	14.1	54	13458
169.8	-63.6	-69.1	14.1	55	13464
169.6	-63.6	-69.1	14.2	55	13472
169.4	-63.5	-69	14.3	55	13478
169.3	-63.6	-69.1	14.4	55	13482
169.2	-63.6	-69.1	14.5	55	13487
168.9	-63.7	-69.2	14.6	56	13496
168.7	-63.7	-69.2	14.6	56	13502
168.6	-63.8	-69.3	14.7	56	13508
168.5	-63.8	-69.3	14.8	56	13512
168.3	-63.9	-69.4	14.8	57	13517
168.1	-64	-69.6	14.9	57	13524
167.9	-64	-69.6	14.9	58	13532
167.7	-64	-69.6	14.9	58	13541
167.5	-64.2	-69.8	14.9	58	13548
167.3	-64.2	-69.8	15	59	13556
167.1	-64.3	-70.1	15	59	13562
167	-64.3	-70.1	15	59	13566
166.9	-64.3	-70.1	15	60	13571
166.7	-64.3	-70.1	15	60	13577
166.5	-64.3	-70.1	15	60	13584
166.2	-64.5	-70.3	15	60	13595
166	-64.5	-70.3	15	60	13604
165.8	-64.5	-70.4	15	60	13611
165.6	-64.6	-70.5	15	60	13617

165.5	-64.6	-70.5	15.1	60	13621
165.3	-64.7	-70.6	15.1	60	13627
165.2	-64.7	-70.6	15.1	60	13632
165	-64.8	-70.7	15.2	60	13638
164.9	-64.8	-70.7	15.2	61	13644
164.8	-64.9	-70.8	15.3	61	13648
164.6	-64.9	-70.8	15.3	61	13654
164.4	-65	-70.9	15.4	61	13660
164.3	-65	-70.9	15.4	61	13665
164.2	-65.1	-71	15.4	61	13671
163.8	-65.2	-71.2	15.5	62	13682
163.5	-65.3	-71.3	15.5	62	13694
163.2	-65.4	-71.4	15.4	62	13706
162.9	-65.5	-71.5	15.4	63	13718
162.8	-65.6	-71.6	15.4	63	13723
162.6	-65.6	-71.6	15.4	63	13728
162.5	-65.7	-71.9	15.4	64	13733
162.4	-65.7	-71.9	15.3	64	13737
162.2	-65.8	-72	15.3	65	13743
162	-65.8	-72	15.3	65	13749
161.8	-65.8	-72	15.3	66	13757
161.7	-65.8	-72	15.4	66	13763
161.5	-65.9	-72.1	15.4	67	13768
161.4	-66.1	-72.2	15.4	68	13774
161.1	-66.2	-72.3	15.5	68	13783
161	-66.2	-72.3	15.5	69	13788
160.9	-66.2	-72.3	15.6	69	13791
160.8	-66.3	-72.4	15.6	70	13795
160.7	-66.4	-72.5	15.7	70	13800
160.5	-66.6	-72.7	15.8	70	13807
160.3	-66.9	-73	15.8	71	13814
160.1	-66.9	-73	15.9	71	13822
159.9	-66.9	-73	15.9	71	13829
159.8	-66.9	-73.2	16	71	13835
159.7	-66.9	-73.2	16	71	13839
159.5	-66.9	-73.2	16.1	71	13844
159.3	-67	-73.3	16.1	72	13851
159.2	-67.1	-73.3	16.1	72	13857
159.1	-67.2	-73.4	16.1	72	13861
159	-67.2	-73.4	16.1	72	13866
158.8	-67.1	-73.3	16.1	72	13872
158.6	-67.1	-73.3	16.1	72	13878
158.5	-67.1	-73.3	16.1	72	13882
158.4	-67.1	-73.3	16.1	72	13887
158.3	-67.2	-73.4	16.1	72	13892
158.1	-67.2	-73.4	16.1	72	13898
157.9	-67.2	-73.4	16.1	72	13904
157.8	-67.1	-73.5	16.2	72	13909
157.7	-67	-73.4	16.2	72	13913
157.6	-67	-73.4	16.3	72	13917
157.5	-66.9	-73.3	16.4	72	13922
157.4	-67	-73.4	16.4	72	13926
157.2	-67	-73.4	16.5	72	13932

157.1	-67.1	-73.5	16.6	71	13937
156.9	-67.2	-73.6	16.7	71	13943
156.8	-67.2	-73.6	16.8	71	13947
156.7	-67.3	-73.7	16.9	71	13953
156.6	-67.3	-73.7	16.9	71	13957
156.4	-67.4	-73.8	17	71	13963
156.3	-67.5	-73.9	17	71	13968
156.1	-67.5	-73.9	16.9	71	13973
156	-67.6	-74	16.9	71	13978
155.9	-67.6	-74	16.8	71	13982
155.7	-67.6	-74	16.7	71	13990
155.5	-67.6	-74	16.6	71	13998
155.3	-67.7	-74.2	16.4	71	14006
155.1	-67.7	-74.2	16.3	71	14015
154.9	-67.7	-74.2	16.1	71	14022
154.7	-67.7	-74.2	16	71	14031
154.6	-67.7	-74.2	15.9	71	14034
154.6	-67.7	-74.2	15.8	71	14035
154.4	-67.8	-74.3	15.7	71	14039
154.3	-67.8	-74.3	15.6	71	14045
154.2	-67.8	-74.3	15.5	71	14050
154.1	-67.8	-74.3	15.4	71	14054
153.9	-67.8	-74.3	15.3	71	14060
153.8	-67.7	-74.4	15.2	71	14066
153.6	-67.7	-74.4	15	71	14072
153.5	-67.7	-74.4	14.9	71	14076
153.3	-67.6	-74.3	14.7	71	14082
153.2	-67.5	-74.2	14.6	71	14088
153	-67.4	-74.1	14.5	71	14094
152.9	-67.4	-74.1	14.4	71	14100
152.8	-67.4	-74.1	14.2	71	14103
152.7	-67.3	-74	14.1	71	14109
152.5	-67.3	-74	14	71	14116
152.3	-67.2	-74	13.9	71	14122
152.2	-67.2	-74	13.8	71	14128
152	-67.2	-74	13.7	71	14135
151.9	-67.2	-74	13.6	71	14139
151.8	-67.2	-74.1	13.5	71	14144
151.6	-67.3	-74.2	13.4	71	14150
151.5	-67.3	-74.2	13.3	72	14156
151.3	-67.3	-74.2	13.2	72	14162
151.2	-67.4	-74.3	13.1	72	14166
151.1	-67.4	-74.3	13	72	14170
151	-67.4	-74.3	12.9	72	14176
150.9	-67.4	-74.3	12.8	72	14181
150.8	-67.5	-74.4	12.7	72	14185
150.6	-67.5	-74.4	12.6	72	14189
150.5	-67.5	-74.4	12.5	72	14194
150.4	-67.6	-74.7	12.4	72	14200
150.3	-67.6	-74.7	12.3	72	14204
150.2	-67.6	-74.7	12.2	72	14209
150.1	-67.6	-74.7	12.1	72	14213
149.9	-67.6	-74.7	12	72	14217

149.8	-67.6	-74.7	11.9	72	14223
149.7	-67.6	-74.7	11.8	72	14228
149.5	-67.6	-74.7	11.7	72	14234
149.3	-67.6	-74.9	11.6	72	14242
149.1	-67.6	-74.7	11.6	72	14251
148.9	-67.7	-74.8	11.5	72	14260
148.8	-67.8	-74.9	11.4	73	14263
148.8	-67.8	-75.1	11.4	73	14264
148.7	-67.9	-75.2	11.3	72	14267
148.6	-68.1	-75.3	11.2	72	14272
148.5	-68	-75.2	11.2	72	14276
148.4	-68.1	-75.3	11.1	72	14281
148.2	-68.1	-75.3	11.1	72	14289
147.9	-68.2	-75.4	11.1	71	14298
147.8	-68.3	-75.5	11.1	71	14305
147.6	-68.4	-75.6	11.1	70	14313
147.4	-68.4	-75.8	11.1	70	14319
147.3	-68.5	-75.9	11.1	69	14324
147.2	-68.6	-76	11.2	69	14329
147.1	-68.6	-76	11.2	68	14332
147	-68.7	-76.1	11.3	68	14336
146.9	-68.7	-76.1	11.3	67	14342
146.7	-68.8	-76.2	11.4	67	14348
146.5	-68.8	-76.4	11.4	66	14355
146.4	-68.9	-76.5	11.5	66	14361
146.3	-68.9	-76.5	11.5	65	14367
146.1	-68.9	-76.5	11.5	65	14373
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145.8	-69	-76.8	11.6	63	14386
145.6	-69.1	-76.9	11.6	63	14392
145.5	-69.1	-76.9	11.6	62	14397
145.3	-69.2	-76.9	11.6	62	14405
145.2	-69.2	-76.9	11.6	61	14411
145	-69.2	-76.9	11.6	61	14416
144.9	-69.3	-77.2	11.6	60	14422
144.8	-69.3	-77.2	11.6	60	14428
144.6	-69.4	-77.3	11.6	59	14435
144.4	-69.4	-77.3	11.6	59	14441
144.3	-69.5	-77.4	11.6	58	14447
144.2	-69.5	-77.6	11.6	58	14453
144	-69.5	-77.6	11.7	58	14460
143.8	-69.6	-77.7	11.7	57	14466
143.7	-69.6	-77.7	11.7	57	14472
143.6	-69.7	-77.8	11.7	56	14478
143.4	-69.7	-78	11.7	56	14485
143.3	-69.8	-78.1	11.8	55	14491
143.1	-69.8	-78.1	11.8	55	14496
143	-69.7	-77.8	11.8	55	14502
142.8	-69.6	-77.5	11.8	54	14510
142.7	-69.6	-77.3	11.8	54	14515
142.5	-69.6	-77.3	11.8	54	14521
142.4	-69.7	-77.4	11.8	54	14527
142.2	-69.8	-77.5	11.8	54	14533

142.1	-70	-77.7	11.8	54	14540
141.9	-70.1	-77.8	11.9	54	14549
141.7	-70.3	-78	11.9	54	14558
141.5	-70.4	-78	11.9	54	14565
141.3	-70.4	-78	11.9	53	14571
141.2	-70.5	-78.3	12	53	14575
141.1	-70.6	-78.4	12	53	14581
140.9	-70.6	-78.4	12	53	14588
140.7	-70.7	-78.5	12.1	52	14597
140.5	-70.7	-78.5	12.1	52	14604
140.3	-70.7	-78.5	12.1	51	14613
140.2	-70.7	-78.5	12.1	51	14620
140	-70.8	-78.6	12	50	14628
139.8	-70.8	-78.6	12	50	14636
139.7	-70.8	-78.6	11.9	49	14640
139.6	-70.8	-78.6	11.9	49	14646
139.5	-70.8	-78.6	11.8	48	14650
139.3	-70.8	-78.6	11.8	48	14656
139.2	-70.7	-78.5	11.7	47	14660
139.1	-70.6	-78.4	11.7	47	14666
138.9	-70.7	-78.5	11.7	47	14672
138.8	-70.8	-78.6	11.7	46	14676
138.7	-70.9	-78.7	11.7	46	14682
138.6	-71	-78.8	11.7	46	14688
138.4	-71.1	-78.9	11.7	46	14694
138.3	-71.1	-78.9	11.8	46	14699
138.1	-71.2	-79	11.9	46	14707
138	-71.3	-79.1	11.9	47	14712
137.9	-71.4	-79.2	12	47	14718
137.7	-71.5	-79.3	12.1	47	14724
137.6	-71.5	-79.3	12.1	47	14730
137.5	-71.6	-79.6	12.2	48	14735
137.3	-71.7	-79.7	12.3	48	14743
137.2	-71.8	-79.7	12.3	48	14748
137	-71.8	-79.7	12.4	48	14754
136.9	-71.9	-79.8	12.5	49	14760
136.8	-72	-79.9	12.5	49	14766
136.6	-72.1	-80	12.6	49	14771
136.5	-72.2	-80.1	12.6	49	14779
136.3	-72.2	-80.1	12.6	49	14784
136.2	-72.3	-80.2	12.7	49	14790
136	-72.4	-80.3	12.7	49	14797
135.9	-72.4	-80.3	12.7	49	14804
135.7	-72.4	-80.3	12.7	49	14813
135.6	-72.5	-80.4	12.8	50	14817
135.5	-72.5	-80.4	12.8	50	14822
135.3	-72.6	-80.5	12.8	50	14827
135.2	-72.7	-80.6	12.9	50	14832
135.1	-72.8	-80.7	12.9	51	14836
135	-72.9	-80.8	13	51	14842
134.9	-72.9	-80.8	13	51	14847
134.7	-73	-80.8	13.1	52	14855
134.6	-73.1	-80.9	13.1	52	14860

134.4	-73.1	-80.9	13.1	52	14866
134.3	-73.2	-81	13.1	52	14872
134.2	-73.2	-81	13.1	53	14877
134	-73.3	-81.1	13.1	53	14883
133.9	-73.3	-81.1	13	53	14889
133.8	-73.3	-81.1	13	53	14895
133.7	-73.3	-81.1	13	53	14900
133.5	-73.3	-81.1	12.9	54	14906
133.4	-73.4	-81.2	12.9	54	14912
133.3	-73.4	-81.2	12.9	54	14917
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132.9	-73.6	-81.4	12.8	54	14935
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131.9	-73.9	-81.7	12.6	53	14979
131.7	-73.9	-81.7	12.6	53	14986
131.6	-74	-81.8	12.5	54	14992
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131.3	-74.1	-81.9	12.4	54	15004
131.1	-74.1	-81.9	12.3	54	15011
131	-74.2	-81.9	12.3	54	15017
130.8	-74.3	-82	12.2	54	15024
130.7	-74.3	-82	12.2	54	15030
130.6	-74.3	-82	12.1	54	15036
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130.3	-74.4	-82.1	12.1	55	15047
130.2	-74.4	-82.1	12.1	55	15053
130.1	-74.4	-82.1	12.1	55	15058
130	-74.4	-82.1	12.1	56	15064
129.8	-74.5	-82.2	12.1	56	15070
129.7	-74.5	-82.2	12.1	56	15075
129.6	-74.6	-82.3	12.1	56	15081
129.4	-74.6	-82.3	12.1	57	15087
129.4	-74.6	-82.3	12.1	57	15091
129.2	-74.7	-82.4	12.1	57	15097
129.1	-74.7	-82.4	12.2	57	15102
129	-74.8	-82.5	12.2	58	15108
128.8	-74.9	-82.6	12.2	58	15114
128.7	-74.9	-82.6	12.2	58	15119
128.6	-74.9	-82.6	12.3	58	15125
128.5	-74.9	-82.6	12.3	58	15131
128.3	-74.9	-82.6	12.4	59	15136
128.2	-75	-82.7	12.4	59	15142
128.1	-75.2	-82.9	12.4	59	15148
128	-75.3	-83	12.4	59	15153
127.8	-75.3	-83	12.4	59	15159
127.7	-75.3	-83	12.5	59	15165
127.6	-75.3	-83	12.5	59	15169
127.5	-75.4	-83	12.5	59	15175

127.4	-75.5	-83.1	12.5	59	15179
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127.2	-75.6	-83.2	12.5	59	15189
127.1	-75.6	-83.2	12.5	59	15193
127	-75.7	-83.3	12.6	59	15197
126.9	-75.7	-83.3	12.6	58	15203
126.8	-75.8	-83.4	12.6	58	15207
126.7	-75.9	-83.7	12.6	58	15213
126.5	-75.9	-83.7	12.7	58	15220
126.4	-75.9	-83.7	12.7	58	15225
126.3	-76	-83.8	12.7	58	15231
126.1	-76	-83.8	12.7	58	15238
126	-76	-83.8	12.8	58	15244
125.9	-76.1	-83.9	12.8	58	15249
125.7	-76.1	-83.9	12.8	58	15256
125.6	-76.1	-83.9	12.8	58	15262
125.4	-76.2	-83.8	12.8	57	15269
125.3	-76.2	-83.8	12.9	57	15275
125.2	-76.2	-83.8	12.9	57	15280
125	-76.3	-83.9	12.9	57	15287
124.9	-76.3	-83.9	12.9	57	15293
124.8	-76.3	-83.9	12.9	57	15299
124.6	-76.4	-84	12.9	57	15306
124.5	-76.4	-84	13	57	15311
124.4	-76.4	-84	13	57	15316
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124.2	-76.5	-84.1	13	56	15325
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124	-76.6	-84.2	13	56	15334
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123.8	-76.6	-84.2	13	56	15346
123.6	-76.6	-84.2	13	56	15352
123.5	-76.6	-84.2	13.1	56	15358
123.4	-76.6	-84.2	13.1	56	15365
123.2	-76.6	-84.6	13.1	56	15375
123	-76.7	-85.3	13.2	56	15380
122.9	-76.8	-85	13.2	57	15387
122.8	-76.9	-84.6	13.2	57	15393
122.6	-76.9	-84.4	13.3	58	15400
122.5	-77	-84.5	13.3	58	15405
122.3	-77.1	-84.6	13.4	58	15412
122.2	-77.1	-84.6	13.4	58	15418
122.1	-77.2	-84.7	13.5	59	15425
122	-77.2	-84.7	13.5	59	15431
121.8	-77.3	-84.8	13.6	59	15436
121.7	-77.3	-84.8	13.7	59	15442
121.6	-77.4	-84.9	13.7	59	15447
121.5	-77.4	-84.9	13.8	58	15452
121.4	-77.4	-84.9	13.9	58	15457
121.3	-77.5	-85	13.9	58	15461
121.2	-77.5	-85	14	57	15467
121.1	-77.5	-85	14	57	15473

121	-77.5	-85	14.1	57	15477
120.9	-77.6	-85.1	14.1	56	15482
120.7	-77.6	-85.1	14.2	56	15488
120.7	-77.6	-85.1	14.2	55	15492
120.5	-77.6	-85.1	14.3	55	15498
120.5	-77.7	-85.2	14.3	54	15502
120.3	-77.7	-85.2	14.4	54	15508
120.2	-77.8	-85.3	14.5	54	15513
120.1	-77.8	-85.3	14.6	54	15520
120	-77.9	-85.3	14.6	53	15526
119.8	-77.9	-85.3	14.7	53	15531
119.7	-77.9	-85.5	14.8	53	15538
119.6	-78	-85.6	14.9	53	15544
119.4	-78	-85.6	15	53	15551
119.3	-78	-85.8	15	53	15556
119.2	-78	-85.8	15.1	53	15563
119	-78.1	-86.1	15.2	53	15569
118.9	-78.1	-86.1	15.2	53	15576
118.8	-78.1	-86.1	15.2	53	15582
118.6	-78.1	-86.4	15.2	52	15588
118.5	-78.2	-86.5	15.3	52	15594
118.4	-78.2	-86.5	15.3	52	15601
118.3	-78.2	-86.5	15.3	52	15607
118.1	-78.2	-86.5	15.3	51	15614
118	-78.2	-86.5	15.4	51	15619
117.9	-78.2	-86.2	15.4	51	15626
117.7	-78.2	-85.8	15.5	51	15632
117.6	-78.3	-85.7	15.6	50	15639
117.5	-78.4	-85.8	15.8	50	15644
117.4	-78.4	-85.8	15.9	50	15648
117.3	-78.5	-85.9	16.1	50	15654
117.2	-78.5	-85.9	16.2	50	15658
117.1	-78.5	-85.9	16.4	50	15662
117	-78.5	-85.9	16.6	51	15666
116.9	-78.5	-85.9	16.8	51	15671
116.8	-78.7	-86.1	17	51	15676
116.7	-78.8	-86.2	17.2	51	15680
116.7	-78.9	-86.3	17.4	51	15685
116.6	-78.8	-86.2	17.6	52	15689
116.5	-78.8	-86.2	17.8	52	15693
116.4	-78.7	-86.1	17.9	52	15696
116.3	-78.7	-86.1	18.1	52	15701
116.2	-78.7	-86.1	18.2	52	15710
116	-78.7	-86.1	18.3	52	15717
115.9	-78.7	-86.1	18.5	52	15722
115.8	-78.6	-86	18.6	51	15728
115.7	-78.6	-86	18.7	51	15733
115.6	-78.6	-86	18.8	51	15739
115.4	-78.6	-86	18.9	51	15744
115.3	-78.6	-86	19	51	15750
115.2	-78.6	-86	19.1	50	15755
115.1	-78.6	-86	19.2	50	15761
115	-78.5	-85.9	19.3	50	15767

114.9	-78.5	-85.9	19.3	50	15772
114.8	-78.5	-85.9	19.4	50	15778
114.7	-78.5	-85.9	19.5	49	15783
114.5	-78.5	-85.9	19.5	49	15789
114.4	-78.5	-85.9	19.5	49	15794
114.3	-78.4	-85.8	19.6	49	15800
114.2	-78.4	-85.8	19.6	49	15806
114.1	-78.4	-85.8	19.6	49	15811
114	-78.4	-85.8	19.6	49	15817
113.9	-78.4	-86	19.6	49	15822
113.8	-78.4	-86.2	19.6	49	15828
113.7	-78.3	-86.1	19.6	50	15833
113.5	-78.3	-85.9	19.7	50	15840
113.4	-78.3	-85.7	19.7	50	15846
113.3	-78.3	-85.7	19.7	50	15851
113.2	-78.3	-85.7	19.7	51	15857
113	-78.3	-85.7	19.6	51	15864
112.9	-78.3	-85.7	19.6	52	15870
112.8	-78.3	-85.7	19.5	52	15875
112.7	-78.3	-85.7	19.4	53	15881
112.6	-78.3	-85.7	19.3	54	15888
112.5	-78.3	-85.7	19.1	54	15893
112.3	-78.3	-85.7	18.9	55	15902
112.1	-78.4	-85.8	18.7	56	15911
111.9	-78.4	-85.8	18.5	57	15920
111.8	-78.4	-85.8	18.2	58	15928
111.6	-78.4	-85.8	17.9	59	15936
111.5	-78.4	-85.8	17.7	60	15945
111.3	-78.4	-85.8	17.4	61	15952
111.2	-78.3	-85.7	17	62	15960
111	-78.2	-85.6	16.7	63	15967
	-78.19	-85.6			15974
	-78.18	-85.6			15981
	-78.17	-85.6			15988
	-78.16	-85.6			15995
	-78.15	-85.6			16002
	-78.14	-85.6			16009
	-78.13	-85.6			16016
	-78.12	-85.6			16023
	-78.11	-85.6			16030
	-78.1	-85.6			16037
	-78.09	-85.6			16044
	-78.08	-85.6			16051
	-78.07	-85.6			16058
	-78.06	-85.6			16065
	-78.05	-85.6			16072
	-78.04	-85.6			16079
	-78.03	-85.6			16086
	-78.02	-85.6			16093
	-78.01	-85.6			16100
	-78	-85.6			16107
	-77.99	-85.6			16114
	-77.98	-85.6			16121

-77.97	-85.6	16128
-77.96	-85.6	16135
-77.95	-85.6	16142
-77.94	-85.6	16149
-77.93	-85.6	16156
-77.92	-85.6	16163
-77.91	-85.6	16170
-77.9	-85.6	16177
-77.89	-85.6	16184
-77.88	-85.6	16191
-77.87	-85.6	16198
-77.86	-85.6	16205
-77.85	-85.6	16212
-77.84	-85.6	16219
-77.83	-85.6	16226
-77.82	-85.6	16233
-77.81	-85.6	16240
-77.8	-85.6	16247
-77.79	-85.6	16254
-77.78	-85.6	16261
-77.77	-85.6	16268
-77.76	-85.6	16275
-77.75	-85.6	16282
-77.74	-85.6	16289
-77.73	-85.6	16296
-77.72	-85.6	16303
-77.71	-85.6	16310
-77.7	-85.6	16317
-77.69	-85.6	16324
-77.68	-85.6	16331
-77.67	-85.6	16338
-77.66	-85.6	16345
-77.65	-85.6	16352
-77.64	-85.6	16359
-77.63	-85.6	16366
-77.62	-85.6	16373
-77.61	-85.6	16380
-77.6	-85.6	16387
-77.59	-85.6	16394
-77.58	-85.6	16401
-77.57	-85.6	16408
-77.56	-85.6	16415
-77.55	-85.6	16422
-77.54	-85.6	16429
-77.53	-85.6	16436
-77.52	-85.6	16443
-77.51	-85.6	16450
-77.5	-85.6	16457
-77.49	-85.6	16464
-77.48	-85.6	16471
-77.47	-85.6	16478
-77.46	-85.6	16485
-77.45	-85.6	16492

-77.44	-85.6	16499
-77.43	-85.6	16506
-77.42	-85.6	16513
-77.41	-85.6	16520
-77.4	-85.6	16527
-77.39	-85.6	16534
-77.38	-85.6	16541
-77.37	-85.6	16548
-77.36	-85.6	16555
-77.35	-85.6	16562
-77.34	-85.6	16569
-77.33	-85.6	16576
-77.32	-85.6	16583
-77.31	-85.6	16590
-77.3	-85.6	16597
-77.29	-85.6	16604
-77.28	-85.6	16611
-77.27	-85.6	16618
-77.26	-85.6	16625
-77.25	-85.6	16632
-77.24	-85.6	16639
-77.23	-85.6	16646
-77.22	-85.6	16653
-77.21	-85.6	16660
-77.2	-85.6	16667
-77.19	-85.6	16674
-77.18	-85.6	16681
-77.17	-85.6	16688
-77.16	-85.6	16695
-77.15	-85.6	16702
-77.14	-85.6	16709
-77.13	-85.6	16716
-77.12	-85.6	16723
-77.11	-85.6	16730
-77.1	-85.6	16737
-77.09	-85.6	16744
-77.08	-85.6	16751
-77.07	-85.6	16758
-77.06	-85.6	16765
-77.05	-85.6	16772
-77.04	-85.6	16779
-77.03	-85.6	16786
-77.02	-85.6	16793
-77.01	-85.6	16800
-77	-85.6	16807
-76.99	-85.6	16814
-76.98	-85.6	16821
-76.97	-85.6	16828
-76.96	-85.6	16835
-76.95	-85.6	16842
-76.94	-85.6	16849
-76.93	-85.6	16856
-76.92	-85.6	16863

-76.91	-85.6	16870
-76.9	-85.6	16877
-76.89	-85.6	16884
-76.88	-85.6	16891
-76.87	-85.6	16898
-76.86	-85.6	16905
-76.85	-85.6	16912
-76.84	-85.6	16919
-76.83	-85.6	16926
-76.82	-85.6	16933
-76.81	-85.6	16940
-76.8	-85.6	16947
-76.79	-85.6	16954
-76.78	-85.6	16961
-76.77	-85.6	16968
-76.76	-85.6	16975
-76.75	-85.6	16982
-76.74	-85.6	16989
-76.73	-85.6	16996
-76.72	-85.6	17003
-76.71	-85.6	17010
-76.7	-85.6	17017
-76.69	-85.6	17024
-76.68	-85.6	17031
-76.67	-85.6	17038
-76.66	-85.6	17045
-76.65	-85.6	17052
-76.64	-85.6	17059
-76.63	-85.6	17066
-76.62	-85.6	17073
-76.61	-85.6	17080
-76.6	-85.6	17087
-76.59	-85.6	17094
-76.58	-85.6	17101
-76.57	-85.6	17108
-76.56	-85.6	17115
-76.55	-85.6	17122
-76.54	-85.6	17129
-76.53	-85.6	17136
-76.52	-85.6	17143
-76.51	-85.6	17150
-76.5	-85.6	17157
-76.49	-85.6	17164
-76.48	-85.6	17171
-76.47	-85.6	17178
-76.46	-85.6	17185
-76.45	-85.6	17192
-76.44	-85.6	17199
-76.43	-85.6	17206
-76.42	-85.6	17213
-76.41	-85.6	17220
-76.4	-85.6	17227
-76.39	-85.6	17234

-76.38	-85.6	17241
-76.37	-85.6	17248
-76.36	-85.6	17255
-76.35	-85.6	17262
-76.34	-85.6	17269
-76.33	-85.6	17276
-76.32	-85.6	17283
-76.31	-85.6	17290
-76.3	-85.6	17297
-76.29	-85.6	17304
-76.28	-85.6	17311
-76.27	-85.6	17318
-76.26	-85.6	17325
-76.25	-85.6	17332
-76.24	-85.6	17339
-76.23	-85.6	17346
-76.22	-85.6	17353
-76.21	-85.6	17360
-76.2	-85.6	17367
-76.19	-85.6	17374
-76.18	-85.6	17381
-76.17	-85.6	17388
-76.16	-85.6	17395

Mrs. Richards' Lesson Plan

Research Cruise Scavenger Hunt

OBJECTIVES

1. Students will familiarize themselves with the research being conducted on the Ronald H. Brown from San Diego, CA to the Galapagos Islands by completing a scavenger hunt using Mrs. Richards' daily logs.
2. The scavenger hunt will give the students an opportunity to interact with the daily logs posted on the web site, embedding the key points of the logs into their memories more effectively that if they had just read the logs.

AGE

Grades 8-12.

TIME ALLOWANCE

2 hours

MATERIALS

Printed hard copies of Mrs. Richards' daily logs- available at www.ogp.noaa.gov/epic

Scavenger Hunt worksheet for each student

Internet access for students to answer a couple of the scavenger hunt questions (one computer could be shared by the whole class)

INSTRUCTION:

1. This is lesson is intended for classrooms that have been following the NOAA ship Ronald H. Brown on it's research cruise from San Diego, CA to the Galapagos Islands, September 5- October 6, 2001. If you have not been following the cruise, take a day or more to familiarize yourself and the students will the Teacher at Sea Program, Mrs. Richards' daily logs and photos, and videos posted on the web site at www.ogp.noaa.gov/epic
2. Hand out the worksheet to each student, or groups of students. Give them hard copy printouts of the daily logs (sitting them at the computer is not recommended because they could use the "Find" feature in the browser to give them an unfair advantage).

Research Cruise Scavenger Hunt

3. This activity would be best if designed as a game- the person to finish first gets a prize, the group that gets the most correct answers in a given period of time wins a prize, etc.

EVALUATION / ASSESSMENT

Successful completion of the Scavenger Hunt Worksheet

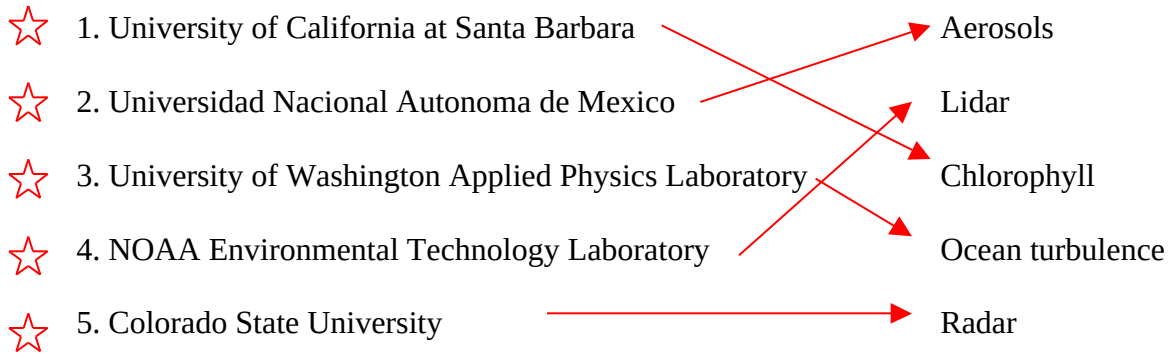
Name: _____

Research Cruise Scavenger Hunt

KEY

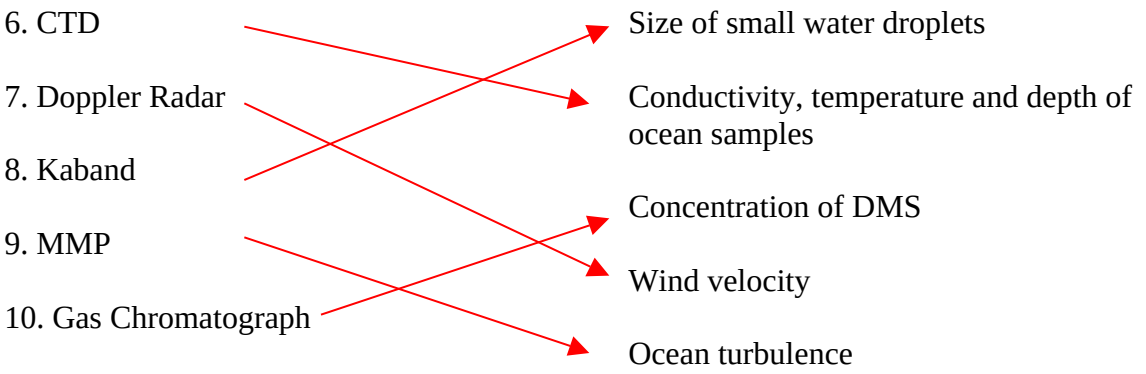
Mrs. Richards has been sailing the Pacific Ocean and telling you all about the research and living conditions aboard the R/V Ronald H. Brown. Use her daily logs to complete the following.

Match the research group on the left with the key words on the right.



Place a star next to each group above whose research will help climate forecasting models.

Match the equipment on the left with one of the key things it measures on the right



11. Get on the internet and find a map of the world. Print it out, and circle San Diego, CA and the Galapagos Islands. Draw a line connecting the two.

12. What latitude and longitude will the ship be spending most of the cruise? $10^{o}N, 95^{o}W$

Name: _____

Research Cruise Scavenger Hunt

KEY

13. What does the SeaWiFS satellite measure? _ different wavelengths of light being reflected from the surface of the ocean _____

14. Find one person in your class who has spent at least one night on a boat. _____

15. The Ronald H. Brown was in the middle of a storm that evolved into Hurricane _Ivo_

16. How does the speed at which air heating over the ocean differs from air heating over land, and how does that impact the size of storms in the ocean versus over land? Heating is much slower over the ocean, resulting in much larger storms

17. What mysterious phenomena have some sailors seen at sunset? green flash

18. Find two people in your class that have crosses the equator. 1) _____ 2) _____

19. How is energy transferred from the air to the ocean? wind causes waves, which add energy. tides add energy. sun adds heat energy.

20. Get on the internet and find a weather satellite photo that includes the latitude and longitude you answered for question #12. Print it out and attach it to this handout. (hint: try a Yahoo search of "NCAR RAP")

21. During what research operation are we most likely to see sharks? when we're working with or near buoys

22. What's the name of the equipment that uses liquid nitrogen, lots of lenses and mirrors, and a laser? lidar

23. What is a gumby suit used for? survival

24. What does a sonic anemometer measure? heat flux

25. Pick a number between 2 and 9. Multiply it by 9. Add the two digits together. Subtract 5. Find the letter of the alphabet that corresponds with that number (ex. 1=A, 2=B, etc.). Find a country whose name starts with that letter of the alphabet. Take the second letter of that country name, and find an animal that starts with that letter. What animal did you pick? (ok, this has nothing to do with the research cruise, but one of the scientists taught it to me)

26. What is the name of the devices dropped by the airplanes that are flying near the ship? radiosondes

Name: _____

Research Cruise Scavenger Hunt

KEY

27. What is an aerosol? any airborne particle

28. List 4 animals that have been seen on or near the ship. egrets, pilot whales, spiders, porpoises

29. What brand of ice cream is the freezer on the ship full of? Haagen Daas

30. When people get used to being on a ship, and they no longer feel seasick, they have "sea legs." If you were a cartoon artist, what do you think sea legs would look like? Draw it in the space below.

Name: _____

Research Cruise Scavenger Hunt

Mrs. Richards has been sailing the Pacific Ocean and telling you all about the research and living conditions aboard the R/V Ronald H. Brown. Use her daily logs to complete the following.

Match the research group on the left with the key words on the right.

1. University of California at Santa Barbara	Aerosols
2. Universidad Nacional Autonoma de Mexico	Lidar
3. University of Washington Applied Physics Laboratory	Chlorophyll
4. NOAA Environmental Technology Laboratory	Ocean turbulence
5. Colorado State University	Radar

Place a star next to each group above whose research will help climate forecasting models.

Match the equipment on the left with one of the key things it measures on the right

6. CTD	Size of small water droplets
7. Doppler Radar	Conductivity, temperature and depth of ocean samples
8. Kaband	Concentration of DMS
9. MMP	Wind velocity
10. Gas Chromatograph	Ocean turbulence

11. Get on the internet and find a map of the world. Print it out, and circle San Diego, CA and the Galapagos Islands. Draw a line connecting the two.

12. What latitude and longitude will the ship be spending most of the cruise? _____

13. What does the SeaWiFS satellite measure?

_____

Name: _____

Research Cruise Scavenger Hunt

14. Find one person in your class who has spent at least one night on a boat. _____

15. The Ronald H. Brown was in the middle of a storm that evolved into Hurricane _____

16. How does the speed at which air heating over the ocean differs from air heating over land, and how does that impact the size of storms in the ocean versus over land?
_____

17. What mysterious phenomena have some sailors seen at sunset? _____

18. Find two people in your class that have crosses the equator. 1) _____ 2) _____

19. How is energy transferred from the air to the ocean?
_____

20. Get on the internet and find a weather satellite photo that includes the latitude and longitude you answered for question #12. Print it out and attach it to this handout. (hint: try a Yahoo search of "NCAR RAP")

21. During what research operation are we most likely to see sharks?
_____

22. What's the name of the equipment that uses liquid nitrogen, lots of lenses and mirrors, and a laser? _____

23. What is a gumby suit used for? _____

24. What does a sonic anemometer measure? _____

25. Pick a number between 2 and 9. Multiply it by 9. Add the two digits together. Subtract 5. Find the letter of the alphabet that corresponds with that number (ex. 1=A, 2=B, etc.). Find a country whose name starts with that letter of the alphabet. Take the second letter of that country name, and find an animal that starts with that letter. What animal did you pick? (ok, this has nothing to do with the research cruise, but one of the scientists taught it to me) _____

26. What is the name of the devices dropped by the airplanes that are flying near the ship? _____

27. What is an aerosol? _____

Name: _____

Research Cruise Scavenger Hunt

28. List 4 animals that have been seen on or near the ship?

_____

29. What brand of ice cream is the freezer on the ship full of? _____

30. When people get used to being on a ship, and they no longer feel seasick, they have "sea legs." If you were a cartoon artist, what do you think sea legs would look like? Draw it in the space below.

Mrs. Temoshok's Lesson Plan

WHAT TIME IS IT?

Objectives:

- Students will demonstrate an understanding of latitude and longitude by identifying locations by degrees.
- Students will learn and use the meanings of a.m. and p.m. appropriately.
- Students will become familiar with a 24-hour (universal) clock.
- Students will demonstrate an understanding of time zone changes by calculating the time at different degrees longitude.

Age: grades 4 – 6

Time: 1 – 2 lessons

Materials:

- Globe
- Clock
- Map of the world for each student or pair of students
- Copy of student worksheet for each student.

Instruction:

- Check for students' understanding of time zone differences by leading a discussion about why the whole world is not on the same time. Illicit ideas about why it is important that there be an agreed upon time universally. (Some ideas might be plane schedules, sporting events, TV shows, etc.) Explain that this came about a long time ago in a place called Greenwich, England. (The French wanted it to be in Paris, but the English prevailed.) So Greenwich became the place on the map we now call the Prime Meridian or 0 degrees longitude, otherwise called Greenwich Mean Time (GMT), ZULU time, or more properly, Universal Time. When traveling in a ship or plane there is a special clock that is always set to Universal Time. If you know your longitude and GMT time, you can figure out what time zone you are in.
- Demonstrate a 24-hour (universal) clock by counting from 1 a.m. (ante-meridian) and continuing counting past 12 p.m. (post-meridian) all the

way to 24:00. Students might make a chart relating the two types of clocks. (Ex. 2:00 p.m. = 1400 hours)

- Review longitude and latitude: Explain that there are 360^{o} of longitude (the circumference of the Earth) and that there are 24 hours in a day. So $360^{o} / 24 = 15^{o}$. Meaning that for each 15 degrees west of GMT the time on the clock is (-1) and (+1) for each 15 degrees East from 0.
- This is a 2-step problem. First take the longitude and divide it by 15. Add or subtract that answer to the known GMT.
- Example: If the ship is at 30^{o} W, the time is (+2) hours from GMT. ($30^{o} / 15 = 2$). So if the GMT were 3:00, the local time would be 1:00.
- Distribute student worksheet and maps or globes. Have students work in pairs to complete the assignment.

Evaluation/Assessment

Students will be assessed on successful completion of the worksheet and successful writing of 2 original problems.

Name: _____

WHAT TIME IS IT?

Example:
What time would it be if the GMT is 4:00 a.m. and your longitude is 45oW?

45/15=3 4:00 - 3 = 1:00 a.m.

1. What time would it be if the GMT is 1:00 a.m. and your longitude is 45oW?

2. What time would it be if the GMT is 13:00 and your longitude is 30oW?

3. What time would it be if the GMT is 17:00 and your longitude is 75oW?

4. What time is it in Hawaii if the GMT is 3:00?

5. What time is it in the Galapagos Islands if the GMT is noon?

Make up two of your own problems to give to a classmate. Write the solutions on the back.

1.

2.

Mrs. Temoshok's Lesson Plan

Weather Maps

OBJECTIVES:

1. Students will understand the collection of weather data as presented in different formats (newspaper, TV, Internet).
2. Students will use appropriate terminology related to weather maps.
3. Students will use the internet to capture weather data from a city of choice and present a TV style weather report to the class.

AGE: Grade 3 - 5

TIME:

- Three 45-minute periods of instruction; a week or so to collect data (can be done for homework or homeroom time); plus time for presentations.

MATERIALS

- Videotaped TV weather report.
- Copies of a recent weather map from a local newspaper.
- Copies (or an overhead) of a weather map from a national newspaper (USA Today has an excellent one which can be found on the internet.)
- Access to Internet (or previously downloaded weather maps from various cities and locations around the world.)
- Poster board and markers

INSTRUCTION:

- Begin a discussion of weather reporting by asking children what today's weather will be like. How did they know not to bring an umbrella or wear boots today? Have them tell about weather reports they may have seen on TV. Do any of their parents watch the weather on TV or read it in the paper everyday? These are common events in citizens' daily lives. Discuss the advantages of knowing with some certainty what the weather will be like for today and the rest of the week. What other people in your community would benefit from this knowledge? (Grocery stores, school buses) What about people in other parts of the country (farmers, fishers, pilots)?

- Ask students which direction they think the weather moves. (Generally west to east in the US.) Does knowing what the weather was yesterday in a city west of you help to predict the local weather? What are some things that affect the weather in your locality? (Mountains, lake, coastline)
- Have students watch a taped broadcast of a local weather report. You might want to show it once through completely and then rewind it and watch it again in segments. Pay particular attention to the meteorologist's presentation of the weather pattern and the colors used to show temperature. Make a list on the board of any words that are unfamiliar.
- Distribute a recent copy of your local newspaper's weather map. Have students orient themselves by identifying major cities or landmarks with a highlighter. Make observations about the map with regard to temperature, precipitation, and cloudiness. What symbols are used to illustrate wind, snow, rain, and ice? Etc. Discuss the elements of the map: the colors used, the keys denoting temperatures, additional symbols.
- Display an overhead transparency (or distribute copies) of a national weather map. Have students make observations about similarities and differences in the maps. (Children should recognize consistencies in symbols and terminology.)
- Have each student choose a city or location from around the world. Assign them to keep a log of the average daily high and low temperatures, precipitation, etc. for a one or two week period.
- At the end of the time period, students should create a poster map of their chosen location and prepare a written summary of the weather for that time.
- Students are to present a TV style weather report to the class.

EVALUATION/ASSESSMENT:

1. Daily log of weather conditions in the location of choice.
2. Poster map and written report on weather in location of choice.
3. Presentation to class of TV style weather report.

Mrs. Temoshok's Lesson Plan

Clouds

Objectives

1. Students will use books and other resources to research different clouds types.
2. Students will identify different cloud formations by their characteristics.
3. Students will use classification skills to create a reference chart.
4. Students will use symbols to identify cloud types.
5. Students will demonstrate an understanding of the relationship of clouds to weather by maintaining a classroom weather chart.

Age: Grade 3 – 5

Time Allowance:

- 45 minute direct instruction, several class periods to construct final product

Materials:

- Books on clouds (school library), magazines to cut up
- Markers and Paper
- Cotton or other craft materials
- Daily weather maps from local newspaper or Internet access.

Vocabulary:

- Saturation – unable to hold more water
- Nimbus – rain cloud
- Stratus – sheetlike, layered
- Cumulus – piled up, accumulated
- Cirrus – high, thin, wispy, temperature below freezing, often called "mares' tails"

Background information:

- Clouds are formed by cooling of the air below its saturation point. This can happen in several ways: Warm air may move over a cold surface and be cooled; Warm air is lifted by a heavier mass of cold air which pushes under it like a wedge; Air may be heated by contact with the Earth's warm surface. It expands, becomes lighter, and rises. As it rises, it cools.
- Clouds are first classified according to how they are formed. There are two basic types: (1) Clouds formed by rising air currents. These are piled up and puffy. They are called "cumulus," which means piled up or accumulated. (2) Clouds formed when a layer of air is cooled below the saturation point without vertical movement. These are in sheets or fog like layers. They are called "stratus", meaning sheetlike or layered.
- Clouds are further classified by altitude into four families: high, middle, low, and towering clouds. High clouds are almost entirely ice. Middle clouds are basically stratus or cumulus. Low clouds are responsible for most of the weather that occurs locally.

Instruction:

- Begin by having students fold a regular sheet of paper into a 4 square.
- Ask students to do a quick sketch in one square of what the sky might look like just before a thunderstorm and label it "thunderstorm". Then use a different square to do the same for each of the following: a snowy day, a beautiful spring day, a cold winter day etc.
- Review the water cycle with students and discuss how clouds are formed. What makes for the different shapes and characteristics of clouds? Do all clouds produce rain? Why? Why not?
- Present a selection of books and materials for students to use to learn about clouds. (I would have children work with a partner to read, take notes, and sketch the different types of clouds. For younger children I would model this activity.) Explain that they will be making their own reference book to identify clouds on a daily basis.
- Allow students time and resources to conduct the investigation. Depending on the age and size of the class they may need more or less instruction on formatting. You might model the research by

organizing a poster format for reference. Explain, however, that a poster would be hard to carry around outside when making observations.

- Present a timeline for completion and grading scale.
- Create a classroom weather center (if you don't already have one) where assigned students record today's weather details. Use published newspaper weather reports to verify the accuracy of the recordings.

Evaluation/Assessment

Students will be graded on the final product.
Cloud identifications should have:

1. A representative picture (can be drawn or magazine cut out)
2. A clear written description
3. The symbol that meteorologists use to identify that cloud type
4. The weather that is most commonly associated with this type of cloud.

Mrs. Richards' Lesson Plan

Basic Math – Plan a Cruise

OBJECTIVES

1. Measure distances and report them in fractions
2. Convert fractions to decimals
3. Multiply decimals

AGE

Grades 6-10. This lesson can also be used with older students in Remedial Math level classes.

Extension Idea at the end of this lesson plan can be used for Pre-Algebra or Algebra students.

TIME ALLOWANCE

This may take 2-3 hours, depending on the level of the students

MATERIALS

Rulers
Maps of the cruise route

INSTRUCTION:

1. Students are provided with maps that show the cruise route (straight lines connecting the waypoints listed in the EPIC 2001 Operations Plan - attached).
2. Students use their rulers to determine the scale of the map (ex. 5/8" = 1000 miles)
3. Use ruler to measure distances between each waypoint, and report as a fraction
4. Convert the distances, reported as fractions, into decimal format (no calculators!)
5. Divide the measured distance (decimal) by the scale distance (decimal), and multiply by the scale to determine actual distance between waypoints

   Example:

   The scale of the map is 3/8 inch = 1000 miles.

Basic Math – Plan a Cruise

A student measures 0.2 inches between two waypoints.

Calculate 0.2 / .375 * 1000 to find distance in miles

6. Next, calculate how many hours it will take to reach each destination (assume 14 mph by boat)
7. Calculate how many days the trip will take (number of hours divided by 24)
8. Calculate fuel consumption (5 mpg)
9. Students should create a table (similar to the one below) to turn in for grading.

EXTENSION IDEA FOR ALGEBRA STUDENTS

- Have the students determine the formulas required for each calculation.
- Have the students create word problems from their project on note cards. An in-class assignment can involve students exchanging note cards to gain additional practice with determining the formulas to use.

Mrs. Richards' Lesson Plan

Basic Math – Plan a Cruise

Waypoint	Map Distance (fraction)	Map Distance (decimal)	True Distance (miles)	Travel Time (hours)	Travel Time (days)	Fuel Consumption (gallons)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						

EVALUATION / ASSESSMENT

Teacher will circulate among students to provide assistance and make sure they are on track

Completed table will be graded

(excerpt from the EPIC 2001 Operation Plan, dated 7/15/01)

2.3 Cruise Way Points:

LEG 1

Way Point	Lat.	Long.	Naut. Miles	Ave. Sp	Hrs	ArrDep Date	Date	Comments
1	32.7 N	117.2 W	–	0 .0	–	9/3	9/6	San Diego
2	20.0 N	110.0 W	862	13.0	66.0	9/89/8		
3	12.0 N	95.0 W	1005	13.0	77.0	9/11	-	
4	12.0 N	95.0 W	--	0. 0	7.0	-	9/11	Repair buoy
5	10.0 N	95.0 W	120	13.0	9.0	9/12	9/12	
6	8.0 N	95.0 W	120	13.0	9.0	9/12	-	
7	8.0 N	95.0 W	--	0.0	7.0	-	9/13	Repair Buoy
8	10.0 N	95.0 W	120	13.0	9.0	9/13	-	Repair Buoy
9	10.0 N	95.0 W	--	0.0	480.0	-	10/3	ITCZ ops
10	0.0 N	95.0 W	600	9.8	61.0	10/5	10/5	CTD section
11	0.5 S	91.5 W	212	13.0	16.0	10/6	10/9	Galapagos Is.

LEG 2

Way Point	Lat.	Long.	Naut. Miles	Ave. Sp	Hrs	ArrDep Date	Date	Comments
1	0.5 S	91.5 W	–	--	70.0	10/6	10/9	Galapagos Is.
2	2.0 S	95.0 W	228	13.0	18.0	10/10	10/10	
3	8.0 S	95.0 W	360	9.8	37.0	10/11	10/11	CTD section
4	20.0 S	85.0 W	932	9.8	95.0	10/15	--	CTD section
5	20.0 S	85.0 W	–	0.0	144.0	--	10/21 mooring	IMET
6	20.0 S	72.0 W	756	9.8	77.0	10/24	10/24	CTD section
7	20.5 S	70.3 W	102	13.0	8.0	10/25	-	Arica, Chile

Mrs. Richards' Lesson Plan

Math- Research Cruise Word Problems

OBJECTIVES

1. Students will learn about life onboard the NOAA Research Vessel Ronald H. Brown and practice basic arithmetic by completing word problems.
2. Students will practice basic arithmetic by creating word problems relating to their school or home.

AGE

Grades 5-8

TIME ALLOWANCE

1 hour

MATERIALS

Copies of word problem handout for each student

INSTRUCTION:

1. Students should already have had some exposure to word problems. Teacher can reintroduce this concept, or jump right into the lesson. Hand out the word problems to each student to complete individually.
2. Remind the students to check their answers as they are working on them, and again when they are done. Do they make sense given the question that is being asked? It is important for students to *think* about math and the answers they expect, rather that just plug in numbers and circle an answer.
3. After students have completed the attached handout, they should hand write a list of supplies that the ship needs for future cruises of similar length. This will force the student to check their answers again from a common sense standpoint.
4. For homework, have each student write 3 word problems based on their school or home. There is a large opportunity for variation among student responses. This is an opportunity for students to think about the environments they are in, while converting some of those familiar environments into numerical terms.

Math- Research Cruise Word Problems

EVALUATION / ASSESSMENT

Students will be assessed on successful completion of the word problems and successful writing of 3 word problems of their own creation. It is important to check that the student-written problems include enough information that a third party could answer the question.

Name: _____

Research Cruise Word Problems

Student Handout

1. If the Ronald H. Brown traveled at 15 miles per hour, 24 hours a day, for 32 days, how far would it go?

2. The Ronald H. Brown research vessel has 57 people onboard. Each person is either part of the Scientific Party or part of the Crew. If there are 25 people in the Scientific Party, how many crewmembers are there on the ship?

3. What percent of people on the ship are Crew?

4. There are 57 people on the ship. Nine are women. How many men are on the ship?

5. What percent of people on the ship are women?

Name: _____

Research Cruise Word Problems

Student Handout

6. The women on the ship like to drink a lot of water- 5 glasses a day. The men only drink 3 glasses a day. If the ship is at sea for 32 days, what is the minimum amount of drinking water it needs to keep everyone's thirst quenched?

7. Everyone on the ship loves to receive email from their family and friends. If the average person sends 423kb of data each day, how many kb of email is sent off the ship after 32 days?

8. Fire drills are done once a week on the ship. Abandon ship drills are done once a week on the ship. Man overboard drills are done once a month on the ship. If the ship is at sea for exactly one month, how many drills will there be?

9. There are 57 people on the ship. Two-thirds of the people like to eat salad with their dinner. Each salad contains one-eighth of a head of lettuce. How many head of lettuce should the cook prepare each day?

Name: _____

Research Cruise Word Problems

Student Handout

10. If one knot equals 0.87 miles per hour, and the ship is traveling at 13 knots, how many miles per hour is the ship traveling?

In the space below, write 3 word problems using numerical data from your home or school. Be sure to solve the problem, showing your work.

1.

2.

3.

Mrs. Temoshok's Lesson Plan

MATH - CRUISE WORD PROBLEMS

Objectives:

- Students will learn about life onboard the NOAA Research Vessel Ronald H. Brown and practice basic arithmetic by completing word problems.

- Students will practice basic arithmetic by creating word problems relating to their school or home.

Age: grades 3 – 5

Time: 1 hour

Materials:

Copies of word problem handout for each student

Instruction:

1. Students should already have had some exposure to word problems. Teacher can reintroduce this concept, or jump right into the lesson. Hand out the word problems to each student to complete individually.
2. Remind the students to check their answers as they are working on them, and again when they are done. Do they make sense given the question that is being asked? It is important for students to *think* about math and the answers they expect, rather that just plug in numbers and circle an answer.
3. For homework, have each student write 2 word problems based on their school or home. There is a large opportunity for variation among student responses. This is an opportunity for students to think about the environments they are in, while converting some of those familiar environments into numerical terms.

EVALUATION / ASSESSMENT

Students will be assessed on successful completion of the word problems and successful writing of 2 word problems of their own creation. It is important to check that the student-written problems include enough information that a third party could answer the question.

Name: _____

Research Cruise Word Problems

(You may use a calculator but remember to show your work!)

1. If the RV Brown traveled at 10 mile per hour, 24 hours a day, for 17 days, how many miles would it travel all together?

2. The RV Brown has 52 people onboard. Each person is either part of the Scientific Party or part of the crew. If there are 28 people in the Scientific Party, how many crewmembers are there on the ship?

3. There are 52 people on the ship. Nine are women. How many men are on the ship?

4. The women on the ship like to drink a lot of water – 5 glasses a day. The men only drink 3 glasses a day. If the ship is at sea for 17 days, what is the minimum amount of drinking water it needs to keep everyone's thirst quenched?

5. Everyone on the ship loves to receive email from their family and friends. If the average person sends 400kb of data each day, how many kb of email is sent of the ship after 17 days?

6. Fire drills are done once a week on the ship. Abandon ship drills are done once a week. Man overboard drills are done once a month on the ship. If the ship is at sea for exactly one month, how many drills will there be?

7. There are 52 people on the ship. One-half of the people like to have 2 slices of bread with their dinner. One quarter of the people like to have 1 slice with their dinner. The rest have no bread with dinner. How many people have no bread with dinner?

8. If a package of bread has 30 slices in it, what is the fewest number of packages of bread that must be put out for dinner so everyone gets what they want?

In the space below, write 2 word problems using numbers from your home or school. Be sure to solve the problem, showing your work.

1.

2.

Math – Design a Ship

MATH CONCEPTS INCLUDED

Converting fractions to decimals
Working with scale
Basic multiplication
Basic division

AGE

Grades 6-10. This lesson can also be used with older students in Remedial Math level classes.

TIME ALLOWANCE

Depending on the level of the students this may take 2-3 hours for the math portion, and an additional hour for the ship construction

OBJECTIVES

1. Students will learn what schematic diagrams are, while becoming familiar with the NOAA research vessel Ronald H. Brown
2. Students will use some creativity and design a ship (research, cruise, fishing, etc.)
3. Students will use basic math to calculate square footages (multiplication)
4. Students will draw their ship to scale, and calculate the real life size. All measurements on the drawings must be annotated with the distances reported in inches (fractions and decimals), and their real-world equivalents
5. Students will build models of their ship, based on their drawings

MATERIALS

- Rulers
- Graph paper
- Materials for constructing ships – construction paper, cardboard, glue, scissors
- Schematic diagrams of the Ronald H. Brown NOAA Research Vessel, as an example of how to draw their designs (attached)

INSTRUCTION:

Day 1

Math – Design a Ship

1. Teacher will introduce the concept of models and scale. Teacher will distribute diagrams of the Ronald H. Brown research vessel as examples of what a diagram of a ship might look like.
2. Students will measure distances on the diagrams, and convert them into real life measurements using the scale.

Day 2

3. Students will sketch their own ship, and determine a scale.
4. Annotate all lines in the sketch, indicating the scale measurements and the real world measurements

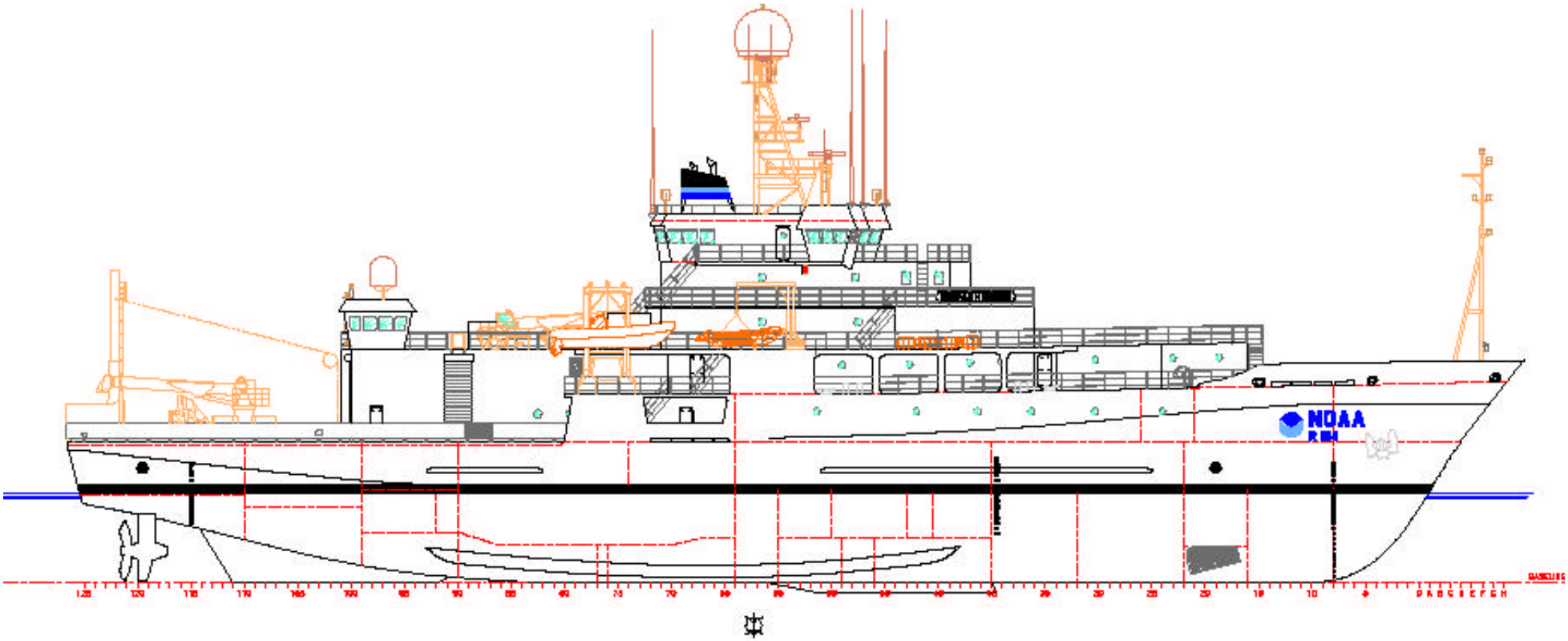
Day 3

5. Build the ship. Students should bring any special materials they need.

EVALUATION / ASSESSMENT

Students turn in drawings, all calculations, and model for grading. Students will be graded on how accurate their model is, compared to their drawings.

NOAA Research Vessel - Ronald H. Brown
http://www.moc.noaa.gov/rb/



OUTBOARD PROFILE