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Unit 7.5, Lesson 1: Notes

Name Ishaan

My Notes

This submarine's position is controlled by floats and anchors.

1. Enter the missing information in the table.

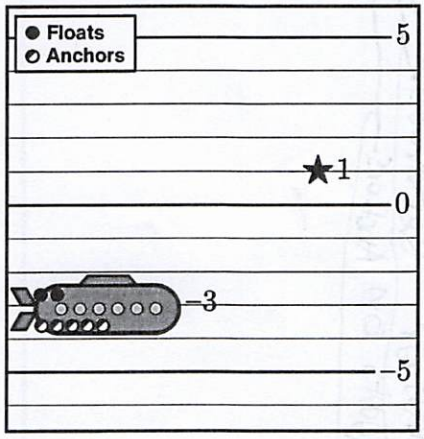
Start	Action	Final
–3	Add 2 floats	–1
–3	Remove 2 anchors	–1
–3	Add 11 floats	8
–3	Add 4 Anchors Remove 4 Floats	–7

2. The submarine starts at –3 units. List three different actions that would move it to 1 unit.

Action 1:
Add 4 Floats

Action 2:
Remove 4 Anchors

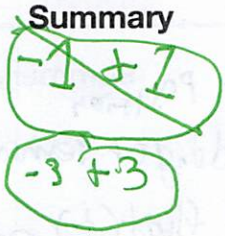
Action 3:
Add 2 floats
Remove 2 Anchors



- zero pair = 0

Summary

Ex.



- [x] I can use floats and anchors to solve problems.
- [x] I can identify different ways to represent the same change.

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Unit 7.5, Lesson 2: Notes Name _____

My Notes

+ = Add

- = Remove

7 = float (positive)

(-3) = Anchor (Negative)

1. Complete the table for these four submarine scenarios.

Start	Action	Final Expression	Final Value
–2	Add 6 floats	–2 + 6	4
1	Remove 5 anchors	1 – (– 5)	6
3	Remove 7 floats	3 – 7	-4
-1	Add 4 Anchors	–1 + (–4)	-5

Describe your strategy for calculating the value of each expression. Use the number line if it helps you with your thinking.

2.1 – 4 − (– 2)

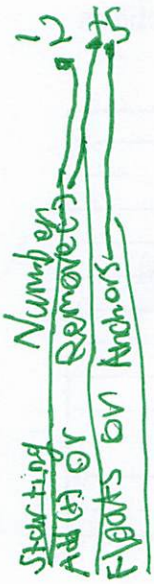
-4 remove 2 Anchors

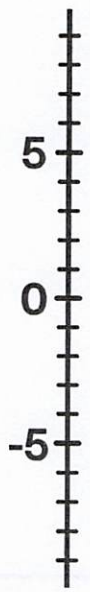
= -2

2.2 – 4 + (–2)

-4 Add 2 Anchors

= -6





Summary

1. Find your starting position
2. Decide if you're adding or removing
3. Is the second number a float (+) or an anchor (-).

- [ ] I can connect adding and removing floats and anchors to adding and subtracting integers.
- [ ] I can identify different expressions that have the same value.

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Unit 7.5, Lesson 3: Notes Name _____

My Notes

start + change = End

Starting Number — Which direction you go — Similar to anchor/floor — where you end

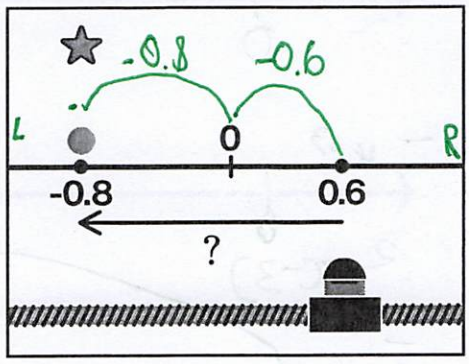
+ = Move right

− = Move left

solve: get x alone on one side of the = sign

1.1 Select all the equations that represent this challenge.

- ☑ $0.6 + x = -0.8$
- ☒ $-0.8 + x = 0.6$
- ☑ $x = -0.8 - 0.6$
- ☒ $x - 0.6 = -0.8$



1.2 What is the value of x that makes this equation true? Explain your strategy.

$-0.6 + -0.8$

$= -1.4$

Determine the value of the variable that makes each equation true.

2.1 $-1.3 + x = 7.2$

+1.3

$x = 8.5$

2.2 $\frac{3}{4} + \left(+\frac{5}{4}\right) = x$

$\frac{8}{4} = x$

$= 2 = x$

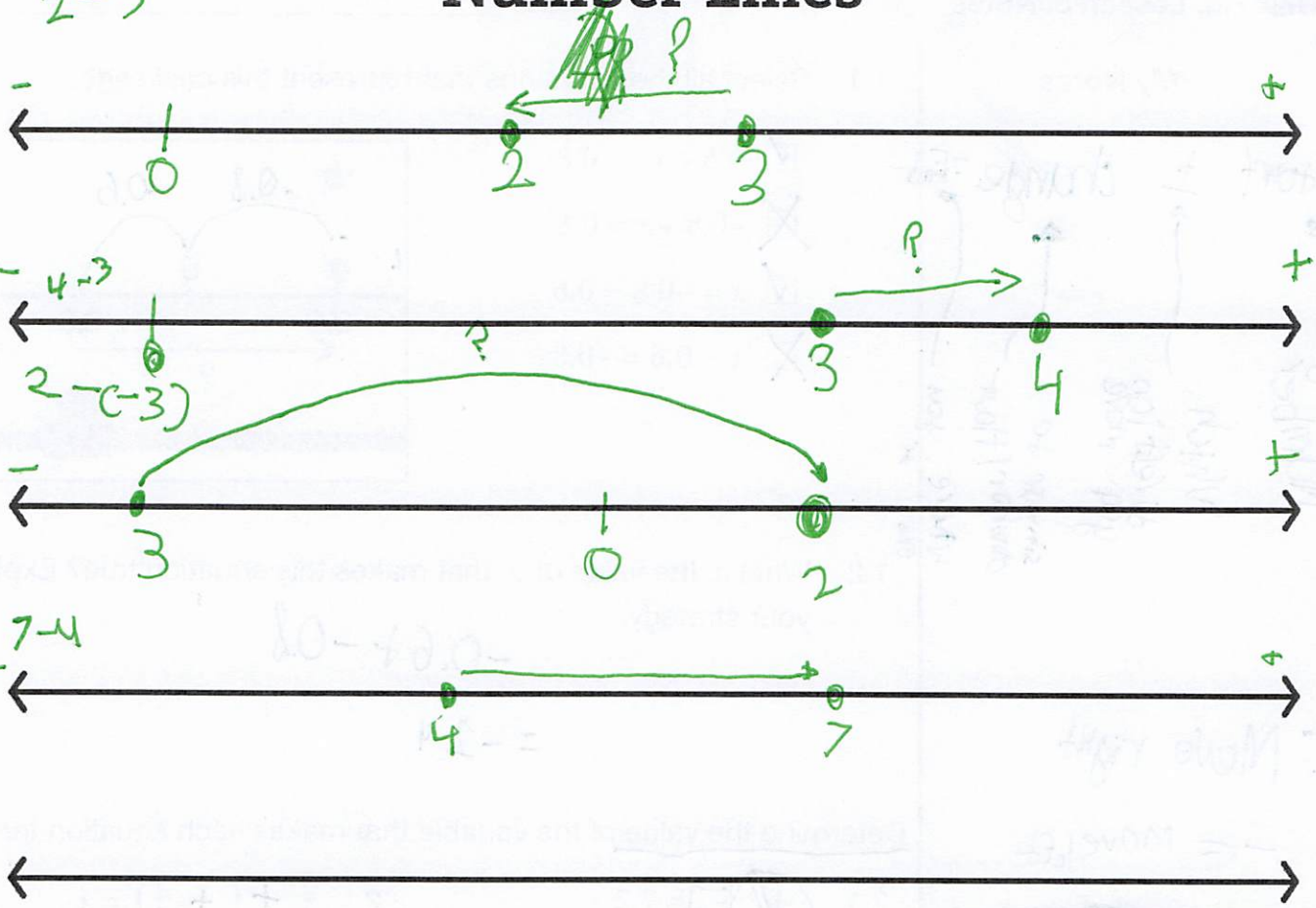
Summary

1. Two negatives make a positive.
2. solve = means get x alone.
3. For adding/subtracting fraction get a common denominator

- ☑ I can add and subtract integers, decimals, and fractions on a number line.
- ☑ I can determine the value of a variable that makes an equation true.

Number Lines

2-3



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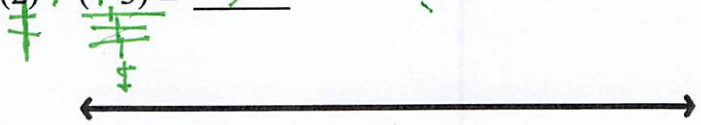
Unit 7.5, Lesson 4: Notes Name _____

My Notes

For each expression, draw a number line diagram and determine its value.

1.1 $(-5) - (2) =$ -7

1.2 $(2) + (+5) =$ 7



1.3 What is similar and different about your ~~diagrams~~ problems?

Similar - using the same number
Different - signs & order

2. The statement below is (always / sometimes / never) true.

$x - 1$ is greater than $x - 4$.

My reasoning:

if $x = -5$
$x = 0$
$x = 5$

$-5-1 > -5-4$
$-6 > -9$
$0-1 > 0-4$
$-1 > -4$
$5-1 > 5-4$
$4 > 1$

Summary

- Test a positive, zero, and negative to determine if a statement is true.

- [x] I can draw a number line to add and subtract positive and negative numbers.
- [x] I can compare and contrast similar expressions (e.g., $2.5 - 3.5$ and $3.5 - 2.5$).
- [x] I can make arguments about addition and subtraction with variables.

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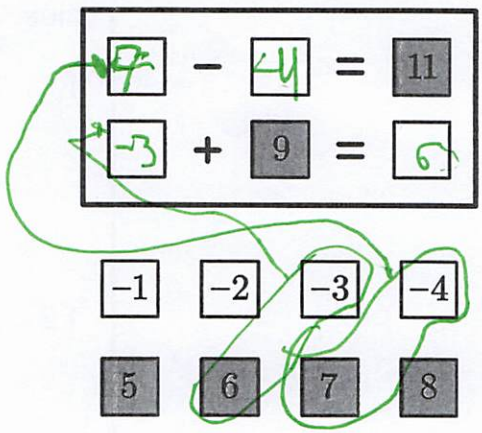
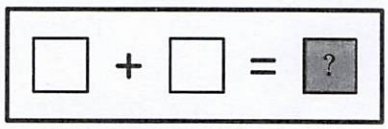
Unit 7.5, Lesson 5: Notes Name _____

My Notes

1. Fill in the blanks using these numbers to make the equations true.



2. Imagine adding a pair of numbers. Describe how you can tell whether its value will be positive, negative, or zero.



- If the signs are different whichever number is bigger.
- If signs are the same, its whatever the signs is.

Ex. −5 + 4 = Negative

5 + (−4) = Positive
−5 + (−4) = Negative
5 + 4 = positive.

Summary

- Just keep trying.

☑ I can add and subtract positive and negative numbers in complicated expressions.

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Unit 7.6, Lesson 3: Notes Name Ishaan

My Notes

A drive-in movie theater charges $6.00 per car, plus a fee for each person in the car. A family of 3 came in one car and paid $22.50 total.

1. Select the tape diagram that best matches this situation.

Diagram A

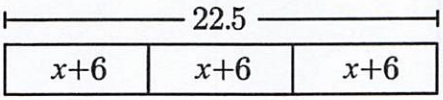
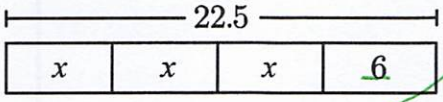


Diagram B



2. Write an equation to represent this situation.

$3x + 6 = 22.5$

3. How much was the fee for each family member?

$\frac{3x}{3} = \frac{16.5}{3}$ $x = \$5.50$

4. Describe how you can tell from the tape diagram that your solution makes sense.

Match how many unknowns you have and how many number there are.

5. Describe how you can tell from the equation that your solution makes sense.

The total tells us how much it equals. Count how many x's there are and count how many times the numbers show up.

Summary

- Count how many x's and how many numbers show up and make sure they match

- [x] I can connect tape diagrams, equations, and stories.
- [x] I can write an equation to represent a tape diagram or a story.

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Unit 7.6, Lesson 4: Notes

Name _____

My Notes

1. Deiondre bought a juice for $\$3$ and 2 sandwiches that cost x dollars each. Altogether, the items cost $\$11.50$. Complete each section below.

Tape Diagram	Equation
Solution	**Meaning of Solution**

2. Describe the similarities and differences between the tape diagrams of the equations below.

$2x + 3 = 11.5$ $\qquad$ $2(x + 3) = 11.5$

Similarities:

Differences:

Summary

- ☐ I can connect a situation to a tape diagram, equation, and solution.
- ☐ I can write an equation to represent a situation and use a tape diagram to answer a question about it.

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Unit 7.5, Lesson 6: Notes

Name I Shaan

My Notes

Adding = +

Removing = −

Floats = +

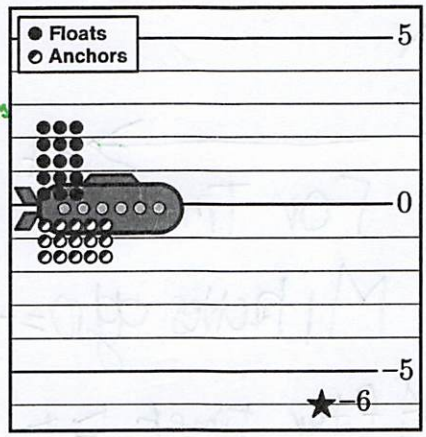
Anchors = −

	Float +	Anchor −
Add +	↑ +	↓ −
Remove −	↓ −	↑ +

This submarine is controlled by groups of 5 floats and groups of 3 anchors. The submarine starts at 0 units.

1.1 Explain why adding 2 groups of 3 anchors moves the submarine to –6 units.

Adding anchors move the sub downward. So adding 2 groups of 3 anchors move the sub $2 \times -3 = -6$ or 6 units down.



1.2 Where will the submarine end up after . . .

. . . removing 3 groups of 5 floats? -15 ↓ $(-3)(5)$

. . . removing 3 groups of 3 anchors? 9 ↑ $(-3)(-3)$

3. Calculate the value of $(-2)(-7)$. Explain your strategy.

$(-2)(-7) = 14$

This is like removing 2 groups of 7 anchors which makes you go up 14 spaces

Summary

	Float +	Anchor −
Add +	↑ +	↓ −
Remove −	↓ −	↑ +

Same signs = +

different signs = −

- ☑ I can use floats and anchors to represent multiplying positive and negative numbers.
- ☑ I can explain why the product of two numbers will be positive or negative.

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Unit 7.5, Lesson 7: Notes Name _____

My Notes

For Rate

← = −

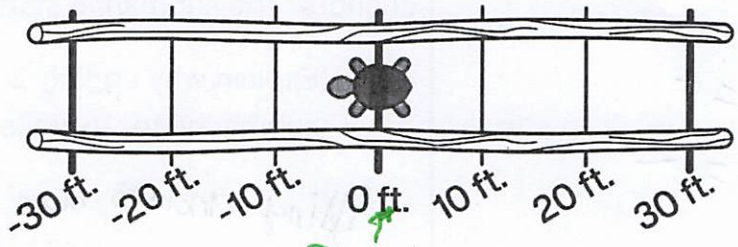
→ = +

For Time

Minutes ago = −

After timer = + starts

This is Mat, Tam's twin turtle. Assume Mat walks at a constant rate.



Start Time

1.1 Complete the table.

Time (min.)	Position (ft.)
0	0
1 • −4	−4
5 • −4	−20
7	−28

1.2 What is Mat's rate of change?

Rate of change = −4

1.3 Where was Mat 5 minutes ago?

before the timer started, he was on the right side of 0.

2. Use the turtle scenario to explain why it makes sense that $(-5)(-4)$ is positive.

−5 represents 5 mins ago

−4 represents that he was walking

20 represents where he was 5 mins before the timer started.

Summary

When multiplying or dividing

same signs = +

different signs = −

- [x] I can use position, rate, and time to represent multiplying positive and negative numbers.
- [x] I can explain why multiplying two negative numbers has a positive value.

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Unit 7.5, Lesson 8: Notes Name 1

My Notes

position = Rate • Time

The table shows three different turtle scenarios.

Each turtle is traveling at a constant rate.

1.1 Complete the table.

Turtle	Rate (ft./min.)	Time (min.)	Position (ft.)
A	–3 ×	2.5 =	−7.5
B	–2 ×	11.5 =	–23
C	−5.5 ←	–2	11

1.2 Describe your strategy for calculating Turtle B's time.

Since rate • time = position, if we are missing rate or time we can just divide.

$\text{time} = \frac{\text{position}}{\text{rate}}$

2. Do $-\frac{8}{2}$ and $\frac{-8}{-2}$ have the same value? Why or why not?

They do not because

$-\frac{8}{2} = -4$ and $\frac{-8}{-2} = 4$

Summary

- Division is just undoing a multiplication problem (working backwards)
- Rate • Time = position → Find the missing value
- Same signs = +
- Different signs = −

- [x] I can multiply and divide positive and negative numbers.
- [x] I can identify different expressions that have the same value.

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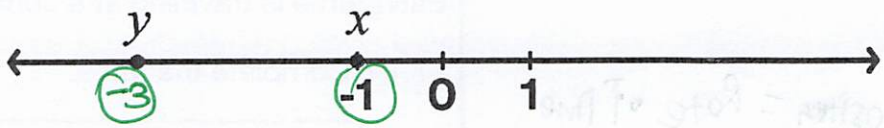
Unit 7.5, Lesson 9: Notes Name _____

My Notes

Assume some reasonable value,

1. x and y are plotted on the number line below.



Order these expressions from least to greatest.

$x - y$ $\quad -1+(+3)=2$ $\qquad$ $x \cdot y$ $\quad -1 \cdot -3 = 3$ $\qquad$ $2x = 2(-1) = -2$

Least 2x _____ x-y _____ x·y _____ **Greatest**

2. The statement below is (always / sometimes / never) true.

$-x \cdot y$ is less than $x \cdot y$.

	①	②	③	④
x	+	−	+	−
y	+	−	−	+

My reasoning:

① $-(+)(+) < (+)(+) \rightarrow -<+$ ✓

② $-(-)(-) < (-)(-) \rightarrow -<+$ ✓

③ $-(+)(-) < (+)(-) \Rightarrow +<-$ sometimes

★ Question will be on test

Summary

① Check reasonable value

② Test different values

☑ I can reason about expressions that involve variables.

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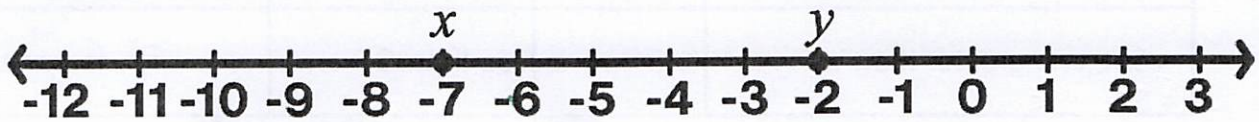
Unit 7.5, Lesson 9: Expressions Name(s) _____

Activity 1: Least to Greatest

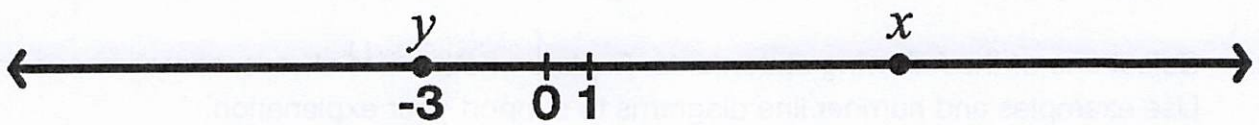
For each set of x- and y-values, order the expression cards by value from least to greatest. Record your answers below. Use the number line if it helps you with your thinking.

1.



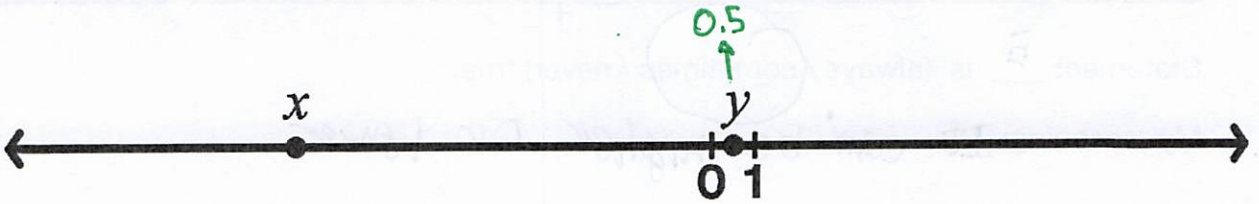
Least A B F E C D **Greatest**

2.



Least D C E F A B **Greatest**

3.



Least E B A D F C **Greatest**

4. Describe 2–3 patterns you noticed as you were ordering the expressions.

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Unit 7.5, Lesson 9: Expressions Name(s) 1

Activity 2: Always, Sometimes, Never

1. Select one of the following statements. Explain whether it is always, sometimes, or never true. Use examples and number line diagrams to support your claim.

Statement A	Statement B	Statement C
$x+y$ is greater than $x-y$.	$3-x$ is less than $2-x$.	$\frac{-x}{x}$ is positive.

Statement C is (always / sometimes / never) true.

My reasoning: theres one negative not two so makes it positive

	①	②	③	④
x	+1	-1	+1	-1
y	+1	-1	-1	+1

2. Select one of the following statements. Explain whether it is always, sometimes, or never true. Use examples and number line diagrams to support your explanation.

Statement D	Statement E	Statement F
$-x \cdot y$ is the opposite of $x \cdot y$.	$\frac{y}{2}$ is less than y.	$x \cdot y$ is greater than $\frac{x}{y}$.

Statement E is (always / sometimes / never) true.

My reasoning: It can be higher or lower

Are You Ready for More?

What must be true of the x- and y-values in the number line below?

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Unit 7.5, Lesson 9: Expressions Name(s) _____

Lesson Synthesis

Describe strategies you can use to decide if a statement is always, sometimes, or never true.

Use the examples in the box if they help you with your explanation.

Choose different values both larger or smaller, positive, & negative to test if the statement are true

$\frac{-x}{x}$ is positive
$\frac{y}{2}$ is less than y

Cool-Down

x and y are plotted on the number line below. Order the expressions from least to greatest. Use the number line if it helps you with your thinking.

$x+y$ $x-y$ $x \cdot y$ $\frac{x}{y}$

Least $x \cdot y$ $x+y$ $\frac{x}{y}$ $x-y$ **Greatest**

Name : Ronan

One-Step Equations: Integers

Mixed Operations Level 1: S1

Solve each equation.

1) $10 = z + 6$

$z = 4$

2) $8y = 48$

$y = 6$

3) $q - 12 = 1$

$q = 13$

4) $18 = \frac{a}{2}$

$a = 36$

5) $\frac{r}{3} = 7$

$r = 21$

6) $11 = m - 4$

$m = 15$

7) $t - 19 = 2$

$t = 21$

8) $1 + s = 3$

$s = 2$

9) $24 = 4c$

$c = 6$

10) $\frac{v}{5} = 9$

$v = 45$

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Unit 7.5, Lesson 11: Notes

Name IShaan

My Notes

start + change = end

S + C = e

① −3.16 + C ≠ −1.71

+3.16 +3.16

+3.16 C ≠ 1.45

② S + 1.57 ≠ 1.35

−1.57 −1.57

S ≠ −0.22

③ 6.03 + 0.96 ≠ e

6.99 ≠ e

④ −21.64 + C ≠ −19.26

+21.64 +21.64

C ≠ 2.38

1.1 This table shows how the average temperature in different places around the world have changed from 1900 to 2014.

Enter the missing values.

	Location	Average Temperature in 1900 (°C) (start, S)	Average Temperature in 2014 (°C) (end, e)	Change From 1900 to 2014 (°C) (change, C)
①	Ulaanbaatar, Mongolia	−3.16	−1.71	1.45
②	Khabarovsk, Russia	−0.22	1.35	1.57
③	Punta Arenas, Chile	6.03	6.99	0.96
④	Greenland	−21.64	−19.26	2.38

1.2 Describe a strategy you used for deciding whether a missing value was positive or negative.

Look at which number was bigger when adding/subtracting.

1.3 Which location had the largest change in temperature from 1900 to 2014? What might the impact of this change be?

Greenland. Ice is melting. Oceans rise. Polar bear die.

Summary

start + change = end

S + C = e

☑ I can apply what I've learned to solve problems about changing temperatures.

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Unit 7.5, Lesson 12: Notes

Name _____

My Notes

S+C=E

Average = total / #

This table shows the minimum sea ice in the Arctic for various years.

Year	Minimum Sea Ice (cubic kilometers)
1980	16 316
1990	13 815
2000	11 084
2010	4 742
2020	4 158

1. What was the change in sea ice from 1980 to 1990?

   Show whether the change is positive or negative.

   16,316 + C = 13,815
   −16,316 −16,316
   C = −2,501

2. How much did the sea ice change **per year** on average between 1980 to 1990?

   $\frac{-2,501}{10 \text{ years}} = -250.1$ per year

3. During which decade was ice melting fastest? Explain.

   2000 to 2010 because the change is minimum and ice is the largest

Summary

(No Summary)

☑ I can solve problems and make predictions using positive and negative rates.

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Unit 7.5, Lesson 12: Arctic Sea Ice Name(s) _____

Activity 1: Arctic Sea Ice

The table shows the minimum amount of ice in the Arctic during the summer for various years.[1]

1. Estimate the amount of sea ice for 1980, 2010, and 2020. Enter your estimates in the table. Then discuss your strategy with a neighbor.

2. Compare your estimates with the data your teacher shares. What story do the differences between your estimates and the actual data tell about how the amount of Arctic sea ice is changing?
   - 1980 was similar to my estimate.
   - 2010/2020 were both lower than our estimates.

Year	Summer Sea Ice (cubic kilometers)
1980	16546
1990	13 815
2000	11 084
2010	8353
2020	5622

3. Choose two years of **actual data**. Determine the average change in summer sea ice per year between those years. (Note: The average change per year is equal to the change in summer sea ice divided by the number of years.)

$\frac{11,084 - 13815}{10} = \frac{-2,731}{10} = -273.1$ per year

4. Some scientists predict that there will be no summer sea ice in the Arctic by 2050.[2] Do you think this prediction is reasonable? Use the data to explain your thinking.

$-273.1 \times 30 = -8193$

Actual Ice in 2020 → 4158

$4158 - 8193 = -4038$ ← can't have negative ice so all of the ice would melt.

[1] Polar Science Center, http://psc.apl.uw.edu/research/projects/arctic-sea-ice-volume-anomaly/data/

[2] Doyle Rice, "Arctic will see ice-free summers by 2050 as globe warms, study says," *USA Today*, April 22, 2020.

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Unit 7.5, Lesson 12: Arctic Sea Ice Name(s) _____

Activity 2: Impact

The sea level is rising globally, in part due to melting ice. The table below shows the total sea level rise since 1950 in Virginia Key, Florida, a historically Black beach community outside of Miami.[3]

Year	Sea Level Rise Since 1950 (in.)
1950	0
2010	4.44
2012	6.41
2014	7.5
2016	8.59

1. What does the number 0 mean in this scenario?
The water hasn't risen.

2. Is the relationship between year and sea level rise close to proportional? Explain how you know.
$\frac{4.44}{60} = 0.074$ | $\frac{1.97}{2} = 0.985$ No, because the change is not the same per year

3. Use the data to predict approximately how much the sea level could rise by the year 2100 compared to 1950.
$\frac{8.59-0}{2016-1950} \approx \frac{8.59}{66} \approx 0.13$ in/year $\cdot 84 = 10.92 + 8.59$
≈ 19.51 in

What do you think the impact of the rising sea level might be on . . .

4.1 . . . the community in Virginia Key, Florida?
Less beaches, less stores, less space, it would be underwater

4.2 . . . your community?
It wouldn't affect as too much here.

Are You Ready for More?

Switzerland is taking action to reduce the rate of sea ice melt. Each year, a group of residents cover up part of the Rhône Glacier with huge white blankets.[4] These blankets can help reduce seasonal melting by up to 70%. If we started doing something similar for the Arctic ice, how many more years would it take until there is no more summer sea ice in the Arctic? Use the data from Activity 1 to support your reasoning.

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[3] Sealevelrise.org, https://sealevelrise.org/states/florida/
[4] Helena Bachmann, "The Swiss found a way to save this glacier from melting: Wrap it in a giant blanket," *USA Today*, March 13, 2018.

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Unit 7.5, Lesson 12: Arctic Sea Ice Name(s) _____

Lesson Synthesis

Describe how you can use the rate of ice melt to make predictions about future amounts of summer Arctic sea ice.

Use the examples in the table if it helps you with your explanation.

we can estimate how much ice has melted per year and use that amount to multiply by how many years in the future we are trying to measure for.

Year	Summer Sea Ice (cubic kilometers)
1980	16 316
1990	13 815
2000	11 084
2010	4 742
2020	4 158

Cool-Down

In 2020, the average temperature in some parts of the Arctic was about −19. 3°F. [5]

The temperature in the Arctic increased about 0. 135 degrees **per year** in the last decade.[6]

If the Arctic continues to warm at the same rate, what will be the average temperature in 2050?

0.135 × 30 = 4.050 it increased by 2050

−19.30 − 4.050 = −15.30

−15,30 by 2050

[5] Berkeley Earth, http://berkeleyearth.lbl.gov/locations/73.13N-38.77W.
[6] Eric Niiler, "The Arctic Is Warming Much Faster Than the Rest of Earth," *Wired*, December 14, 2019.

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Unit 7.5, Lesson 13: Notes Name _____

My Notes

1. What is a carbon footprint?

How much carbon you use compared to how much you save elsewhere — your effect on the environment.

A family of 5 tries to reduce their carbon footprint. This expression represents their carbon footprint (measured in tons of carbon):

$$31 + (-4.4) + 5(-0.8) + 2(-2.4)$$

$31 - 4.4 + 5 - 0.8 + 2 - 2.4 = 27.8$ tons of carbon.

2.1 Calculate this family's carbon footprint.

2.2 Taking one less airplane flight changes your carbon footprint by -0.9 tons of carbon per flight per person. Do you think it's reasonable for this family to become carbon neutral by not taking flights? Explain your thinking.

$5 \cdot -0.9 = -4.5$ tons per flight

$\frac{17.8}{-4.5} = 3.95$ 2 flights per year.

No because the family can't take that many flights per year

Summary

- Carbon neutral means the numbers add up to 0

☑ I can apply what I've learned to analyze ways of reducing carbon emissions.

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Unit 7.5, Lesson 13: Solar Panels and More Name(s) _____

Activity 1: Solar Panels

Sunny Side Up Café in California is researching solar panels as a way to reduce carbon emissions *and* save money on electricity. Each month, Sunny Side Up Café will get a credit on their electricity bill for the electric that is generated by the solar panels.

Here is a copy of their January electric bill.

1. Enter the missing information on the bill.

2. How much electricity would Sunny Side Up Café need to generate to have their bill total be $0?

270.79 ÷ 0.11
= 2,462 kWh

January Bill			
	Kilowatt Hours (kWh)	Charge/ Credit per kWh	Total Charge/ Credit
Electricity Used	2,083	• $0.13 =	$270.79
Electricity Generated	1,938	• −$0.11 =	−$213.18
Total Due			$57.61

3. The solar panels cost $24,500. The owner of Sunny Side Up says it's not worth it to buy solar panels if they plan to stay in their building for only one more year. Do you agree?

24,500 vs. −213.18(12)
24,500 vs. −2,558.16

- Financially it doesn't make sense,
- If they had unlimited money and only cared about the environment it would only make sense.

4. Do you think buying solar panels is worth it for Sunny Side Up Café? Use the data to support your argument.

- If they stayed for 9-10 years it would make sense because the cost vs savings would balance out.

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Unit 7.5, Lesson 13: Solar Panels and More Name(s) _____

Activity 2: Carbon Footprint

1. The "Families" table on the Supplement sheet shows the carbon emissions of three families, measured in tons of carbon dioxide per year. What do you notice? What do you wonder?

Family A is taking steps to reduce their carbon footprint. The expression below represents their current carbon footprint.

$$54.8 + 4(-0.6) + (-4.4) + 2(-0.8) + 8(-0.9)$$

2.1 Discuss the following with your group:

- What do you think a *carbon footprint* is?
- Use the "Carbon Reductions" table in the Supplement to figure out what this family did to reduce their carbon footprint.

- 4 people recycle garbage
- using solar panels
- 2 people eat vegetarian
- Taking 3 less flights

2.2 Calculate Family A's total carbon footprint.

39.2 tons of carbon

3.1 Develop a plan for Family B or Family C to become carbon neutral (carbon footprint is 0) or carbon negative (carbon footprint is less than 0).

- 2 people won't eat beef
- 3 people would use public transportation
- 2 people wash clothes w/ cold water
- 2 people become vegetarians
- Add solar panels

- One person bikes
- replace 3 windows

3.2 Write an expression that represents the carbon footprint based on your plan.

$22.7 + 2(-0.6) + 3(-2.4) + 2(-0.84) + 2(-0.8) + (-4.4) + 1(-5.1) + 3(-2.5)$

Are You Ready for More?

The fashion industry produces 10% of all of humanity's carbon emissions.[1] In 2019, the fashion industry produced more than 3. 6 billion tons of carbon. On paper, show which of the following would have a greater impact: the fashion industry reducing their carbon footprint by 1% or each of the 6 337 929 households in Florida installing solar panels?

[1] Morgan McFall-Johnsen, "The fashion industry emits more carbon than international flights and maritime shipping combined. Here are the biggest ways it impacts the planet," *Business Insider*, Oct 21, 2019.

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Unit 7.5, Lesson 13: Solar Panels and More Name(s) _____

Lesson Synthesis

What new questions do you have about carbon emissions after exploring this lesson?

No new Qs.

Cool-Down

A utility company charges $0.23 for every kilowatt-hour of energy that a customer uses. They give a credit of $0.215 for every kilowatt-hour of electricity that a customer with a solar panel generates.

Enter the missing information on the bill.

Bill			
	Kilowatt Hours (kWh)	Charge/ Credit per kWh	Total Charge/ Credit
Electricity Used	900	$0.23	$207
Electricity Generated	712	−$0.215	−$153.08
Total Due			$53.92

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Unit 7.5, Lesson 13: Supplement

Families

This table shows the carbon emissions of three families, measured in tons of carbon dioxide per ye
Assume each family has four family members.[1]

Item	Family A (tons of carbon)	Family B (tons of carbon)	Family C (tons of carbon)
Food	10.4	4.6	16
Housing	17.9	9.3	27.5
Clothing	1.4	0.7	3.0
Transportation	15.0	4.7	23.2
Services	10.1	3.4	21.9
Total	54.8	22.7	91.6

Carbon Reductions

This table shows some of the ways that people can reduce their carbon footprint per year.

Action	Carbon Reduction (tons)	Action	Carbon Reduction (tons)
Using solar panels	–4.4 per home	Replacing your furnace or boiler with an ENERGY STAR model	–0.36
Recycling garbage	–0.6 per person	Replacing your windows with ENERGY STAR windows	–1.5
Composting food waste	–0.5 per person	Washing your clothes with cold water	–0.34
Eating a vegetarian diet	–0.8 per person	Using public transportation	–2.4 per person
Not eating beef	–0.6 per person	Biking instead of driving	–5.1 per person
Eating meat one less day per week	–0.2 per person	Taking one less airplane flight	–0.9 per flight

[1] Morteza Taiebat and Ming Xu, "5 charts show how your household drives up global greenhouse gas emissions," *The Conversation*, September 10, 2019.

Carbon Reductions Sources

Using Solar Panels

- **Source:** "Greenhouse Gases Equivalencies Calculator - Calculations and References," EPA
- **Data:** An average U.S. household uses of 12 146 kWh of electricity per year, which equates to carbon emissions of 5.906 metric tons of carbon emissions.
- **Assumptions:** Solar panels can generate enough electricity to meet more than 75% of the energy needs of a home, therefore offsetting 4.4 tons or more of carbon in a year.

Recycling Garbage

- **Sources:**
  - "Greenhouse Gases Equivalencies Calculator - Calculations and References," EPA
  - "Facts and Figures on Materials, Waste and Recycling," EPA
- **Data:** Recycling instead of landfilling 1 ton of waste saves 2.94 metric tons of carbon dioxide equivalent. In 2017, the average person produced 4.51 pounds of waste per day and recycled an average of 25% of this waste.
- **Calculations:** $4.51 \cdot 365 \cdot 0.25 \cdot 0.0005 \cdot 2.94 \approx 0.6$ tons carbon reduction

Composting

- **Source:** Kelly Oakes, "How cutting your food waste can help the climate," *BBC*, February 25, 2020.
- **Data:** The average person wastes 68 kilograms of food per year. Each kilogram of wasted food leads to 7.77 kilograms of carbon emissions. Greenhouse gas emissions from composting are just 14% of the same food dumped into landfill.
- **Calculations:** $68 \cdot 7.77 \cdot 0.86 \approx 454.4$ kg of carbon emissions (or 0.5 tons carbon reduction)

Eating Vegetarian/Not Eating Beef/Eating Meat One Less Day Per Week

- **Source:** "Shrink your food footprint," Shrink That Footprint

Replacing your furnace or boiler with an ENERGY STAR model/Replacing your windows with Energy Star windows

- **Source:** EPA Carbon Footprint Calculator

Washing your clothes with cold water

- **Source:** EPA Carbon Footprint Calculator
- **Assumption:** 10 loads of laundry per week for an average family.

Using public transportation

- **Source:** "Reducing Your Transportation Footprint," Center for Climate and Energy Solutions

Biking instead of driving

- **Source:** "Greenhouse Gas Emissions from a Typical Passenger Vehicle," EPA

Taking one less airplane flight

- **Source:** Tatiana Schlossberg, Flying Is Bad for the Planet. You Can Help Make It Better, *New York Times*, July 27, 2017.