Review 1: Operations with Integers and Fractions

This book belongs to: KEY **Block:** _______

Section	Due Date	Questions I Find Difficult	Marked	Corrections Made and Understood

Self-Assessment Rubric

Category	Sub-Category	Description	
Expert	6	Work meets the objectives; is clear, error free, and demonstrates a mastery of the Learning Targets	"You could teach this!"
	5	Work meets the objectives; is clear, with some minor errors, and demonstrates a clear understanding of the Learning Targets	"Almost Perfect, one little error."
Apprentice	4	Work almost meets the objectives; contains errors, and demonstrates sound reasoning and thought concerning the Learning Targets	"Good understanding with a few errors."
	3	Work is in progress; contains errors, and demonstrates a partial understanding of the Learning Targets	"You are on the right track, but key concepts are missing."
Novice	2	Work does not meet the objectives; frequent errors, and minimal understanding of the Learning Targets is demonstrated	"You have achieved the bare minimum to meet the learning outcome."
	1	Work does not meet the objectives; there is no or minimal effort, and no understanding of the Learning Targets	"Learning Outcomes not met at this time."

Learning Targets and Self-Evaluation

Learning Target	Description	Mark
$R-1$	• Understanding the place holder system and rounding numbers	
$R-2$	• Executing operations with integers (Add/Subtract/Multiply/Divide)	
$R-3$	• Equivalence, fraction to decimal, simplifying, and conversion of fractions	
$R-4$	• Addition and Subtraction of all types of fractions	
$R-5$	• Multiplication and Division of all types of fractions	
$R-6$	• Order of operations	
$R-7$	• Percentage operations, fraction to decimal to percent, and ratios	

Competency Self-Evaluation

A valuable aspect to the learning process involves self-reflection and efficacy. Research has shown that authentic self-reflection helps improve performance and effort, and can have a direct impact on the growth mindset of the individual. In order to grow and be a life-long learner we need to develop the capacity to monitor, evaluate, and know what and where we need to focus on improvement. Read the following list of Core Competency Outcomes and reflect on your behaviour, attitude, effort, and actions throughout this unit.

Rank yourself with a check mark: E (Excellent), G (Good), S (Satisfactory), N (Needs Improvement)

		E	G	S	N
Personal Responsibility	• I **listen** during instruction period and come to class ready to ask questions				
	• I am **fully prepared** for Unit Quizzes				
	• I am **fully prepared** to re-Quizzes				
	• I **follow** instructions and **assist** peers • I am **on task** during work blocks • **I complete** assignments **on time**				
Self-Regulation	• I keep track of my **Learning Targets**				
	• I take **ownership** over my goals, learning, and behaviour • I can **solve problems** myself and know when to ask for help • I can **persevere** in challenging tasks • I **take responsibility** to be actively engaged in the lesson and discussions				
	• I only use my phone for school tasks				
Classroom Responsibility and Communication	• I am **focused** on the discussion and lessons • I **ask questions** during the lesson and class • I give **my best effort** and **encourage** others to work well • I am polite and communicate questions and concerns with my peers and teacher				
Collaborative Actions	• I can **work with others** to achieve a common goal • I make **contributions** to my group • I **am kind** to others, can work collaboratively and **build relationships** with my peers • **I can identify** when others need support and provide it				
Communication Skills	• I present informative **clearly**, in an organized way • **I ask and respond** to simple direct questions • I am an **active listener**, I support and encourage the speaker • I **recognize** that there are different points of view and can disagree respectfully				
	Overall				

Goal for next Unit – refer to the above criteria. **Please select** (underline/highlight) **two areas** you want to focus on

Review 1.1 – Place Value and Rounding

Place Holders and What They Mean

- Every number has 'place holders' that have significant value of where each number is placed
- It is all based on a BASE 10 system
- We say BASE 10 because when we get to 10 in each position we move to the next one

Example: $$1234.567$$

1 – Is the THOUSANDS
2 – Is the HUNDREDS
3 – Is the TENS
4 – Is the ONES or UNITS
5 – Is the TENTHS
6 – Is the HUNDREDTHS
7 – Is the THOUSANDTHS

- We use these PLACE HOLDERS when we determine when and where to ROUND numbers
- We use the language when we are naming numbers

Understanding Numbers

- We need to look at numbers as what they are, don't use slang.
- 2017 It's not 20 17; it is two thousand and seventeen.

We often take for granted our number sense. If you **can't read it properly** or know what the position system is, how could you possibly understand it? It would be like trying to spell without knowing what the letters mean.

Example: Convert to numbers or words

i) Forty Two

ii) Seven Hundred, twenty three and five tenths

iii) 123.56

iv) 53.1234

Solution:

i) 42

ii) 723.5

iii) One Hundred, twenty-three, and fifty-six hundredths

iv) Fifty-three and one thousand, two hundred, and thirty four ten-thousandths

Rounding Decimals

- When you do a calculation and the answer has more decimal places than are needed for an appropriate answer, you must round your answer.
- The "rule" for rounding is: 5 or higher rounds up, anything else rounds down.

The steps for rounding are:

Example 1:

Round to 2 decimal places (hundredths):

795.3482

1. Determine how many decimal places you need and draw a line under the digit (number) in that place.
2. Draw a vertical line to the right of the underlined digit.
3. Circle the digit to the RIGHT of your vertical line
   a. If the rounding digit is a 0, 1, 2, 3, or 4 then you are "rounding down" and the target digit stays the same.
   b. If the rounding digit is a 5, 6, 7, 8, or 9 then your are "rounding up" and the target digit will increase by 1. This can cause a ripple effect (examples to follow).
4. Drop all the digits to the right of your vertical line.

What you are really doing is asking if the original number is closer to 795.34 or 795.35

Example 2: Round 765.3482 to 1 decimal place (tenths place).

765.3482

765.3|482

765.3

Example 3: Round 743.6953 to 2 decimal places (hundredths).

743.6953

743.69|53

743.70

Rounding Whole Numbers

- The process for rounding whole numbers is similar until the last step.

Example 1:

Round 427 to the nearest ten.

1. Determine which place you need and draw a line under the digit (number) in that place.
2. Draw a vertical line to the right of the underlined digit.
3. Circle the digit to the RIGHT of your vertical line.
   a. If the rounding digit is a 0, 1, 2, 3, or 4 then you are "rounding down" and the target digit stays the same.
   b. If the rounding digit is a 5, 6, 7, 8, or 9 then your are "rounding up" and the target digit will increase by 1. This can cause a ripple effect (examples to follow).
4. All the digits to the right of your vertical line become zeros.

427

What you are really doing is asking if the original number is closer to 430 or 420

Example 2: Round 23 165 to the nearest thousand.

23 165

23|165

23 000

Example 3: Round 43 853 to the nearest hundred.

43 853

43 8|65

43 900

Review 1.1 – Practice Questions

Number to Words

1) Convert the following numbers to their word equivalents

a) 23 Twenty Three

b) 148.57 One hundred forty eight and fifty seven hundredths

c) −14.5 Negative fourteen and five tenths

d) 0.0087 Eighty Seven Ten Thousandths

e) 12 345.6789 Twelve thousand three hundred forty five and six thousand seven hundred and eighty nine ten thousandths

2) Convert the following words to their number equivalents

a) Ninety seven and one tenth 97.1

b) Negative Five and thirty four hundredths -5.34

c) One thousand Two Hundred and fifteen and four thousandths 1215.004

d) One million, Four hundred Thousand and twelve 1 400 012

e) Eighty six and seven ten-thousandths 86.0007

Rounding Decimal Numbers

3) Round to the nearest tenth (one decimal place):

a) 8.946 8.9

b) 2.673 2.7

e) 5.149 5.1

f) 9.7723 9.8

4) Round to the nearest hundredth (two decimal places):

a) 8.946 8.95

b) 2.673 2.67

e) 5.149 5.15

f) 9.7723 9.77

5) Round to the nearest thousandth (three decimal places):

a) 8.9467	8.947	e) 5.1491	5.149
b) 2.6734	2.673	f) 9.7723	9.772

6) Round as indicated. The target digit is underlined.

a) 94.67	94.7	e) 275.3822	275.382
b) 86.734	86.73	f) 275.3822	275.38

Rounding Whole Numbers

7) Round to the nearest whole number:

a) 89.4	89	e) 514.7	515
b) 2673.8	2674	f) 97.3	97

8) Round to the nearest ten:

a) 89	90	e) 514	510
b) 2673	2670	f) 97	100

9) Round to the nearest hundred:

a) 89	100	e) 514	500
b) 2673	2700	f) 97	100

10) Round to the nearest thousand:

a) 1189	1000	e) 5914	6000
b) 2673	3000	f) 9397	9000

Review Section 1.2 - Integers

Adding and Subtracting Integers

- They represents all the **countable numbers**, both **positive** and **negative**

$$(\ldots - 3, -2, -1, 0, 1, 2, 3, \ldots)$$

- A great place to start is to **understand** that **subtraction** can be shown as **adding negatives**

Example: $7 - 4 = 7 + (-4)$

This may seem weird now, but it will come in handy later

If this helps, think of positive and negatives as:

Positive – good things

Negative – bad things

- This way when we are **adding and subtracting** just **think** of adding good and bad things or taking good or bad things away
- All you need to consider then is **which did you have more of** in the beginning

Example:

$6 - 2 = 4$

$-4 - 8 = -12$

$-7 + 4 = -3$

$5 + (-3) = 2$

$12 - 14 = -2$

$-7 + (-2) = -9$

- When we **subtract negatives** don't think 'subtract', but think – **take away**

So... $5 - (-3)$

You have **5 good things** and you **take away 3 bad things**

- Since you **don't have bad things** to begin with **introduce some in equilibrium (zero)**
- Now you can **take away the bad**, but it **leaves the good** you brought.

DIAGRAM

$+ + + + +$

5 positives

$+ + +$
$- - -$

This is 0

Now you can take away the negatives.

What are you left with?

$+ + + + + \; + + +$

Example: Use diagrams to solve the following:

$-4 - (-3)$

This situation is easier since we have what we need to take away. Just take 3 negatives away.

$- - - -$

4 negatives

$-$

1 negative

$-4 - (-3) = -1$

$5 - (-2)$

Now you can take away the negatives.

What are you left with?

$5 - (-2) = 7$

$+ + + + +$

5 positives

$+ +$
$- -$

This is 0

$+ + + + + + + +$

8 positives

$-6 - (4)$

Now you can take away the positives.

What are you left with?

$-6 - (4) = -10$

$- - - - - -$

6 negatives

$- - - -$
$+ + + +$

This is 0

$- - - - - -$
$- - - -$

10 negatives

$15 - (-15)$

Now you can take away the negatives.

What are you left with?

$15 - (-15) = 30$

$+ + + + +$
$+ + + + +$
$+ + + + +$

15 positive

$+ + + + + - - - - -$
$+ + + + + - - - - -$
$+ + + + + - - - - -$

This is 0

$+ + + + + + + + + +$
$+ + + + + + + + + +$
$+ + + + + + + + + +$

30 positives

Multiplying and Dividing Integers

- When **multiplying and dividing** integers, **two wrongs make a right** and **two rights make a right**

$+ * + = +$

$+ * - = -$

$- * + = -$

$- * - = +$

Same $*$ **Same** is always **positive**

Opposites are always **negative**

Examples:

$5 * (-4) = -20$

$12 \div 3 = 4$

$-2 * (-3) = 6$

$-18 \div 2 = -9$

$5 * (-4) = -20$

$(-7) * (-4) = 28$

$2 * -(-4) = 8$

$-(-4) * (-3) = -12$

$15 \div (-5) = -3$

Review 1.2 – Practice Questions

Integers are both positive and negative numbers. Don't go too fast, think about each situation

1.	$7 + (-4) =$ 3	2.	$(-6) - 8 =$ −14
3.	$19 + (-7) =$ 12	4.	$(-3) + (-4) =$ −7
5.	$(-6) - (-12) =$ 6	6.	$5 + 8 =$ 13
7.	$9 - (-3) =$ 12	8.	$12 - 4 =$ 8
9.	$(-13) + 8 =$ −5	10.	$(-17) - 17 =$ −34
11.	$(-4) - 17 + 8 =$ −13	12.	$8 - 17 + (-7) =$ −16
13.	$2 + 7 - 12 =$ −3	14.	$-12 - 4 - (-17) =$ 1

Multiply the following.

15.	$3 \cdot 4 =$ 12	16.	$(-3) \cdot 4 =$ −12
17.	$3 \cdot (-5) =$ −15	18.	$(-2) \cdot (-6) =$ 12
19.	$-4 \cdot 3 \cdot -2 =$ 24	20.	$7 \cdot -3 \cdot -4 \cdot 2 =$ 168
21.	$15 \cdot -3 \cdot 6 =$ −270	22.	$0 \cdot -3 \cdot 4 =$ 0

Divide the following.

23.	$14 \div (-2) =$ −7	24.	$22 \div 11 =$ 2
25.	$-42 \div 6 =$ −7	26.	$-18 \div (-3) =$ 6
27.	$(-20) \div 5 =$ −4	28.	$(-49) \div (-7) =$ 7
29.	$(-1234) \div 2 =$ −617	30.	$(-690) \div (-3) \div 2 \div 5 =$ 23
31.	$0 \div -5 =$ 0	32.	$(-34) \div 0 =$ Undefined

Section 1.3 - Fractions

Fractions

- What are they?
  - They are **rational numbers**, which means they can be written as a **terminating (stops) or repeating decimal**

❖ Everything we do with fractions is dependent on if we know what a fraction is to begin with.

What is a Fraction?

- Piece of a whole
- Piece of something
- Something broken into pieces

And this is the representation:

Number of Pieces you Have

$$\frac{7}{12}$$

Number of Pieces that Make a Whole

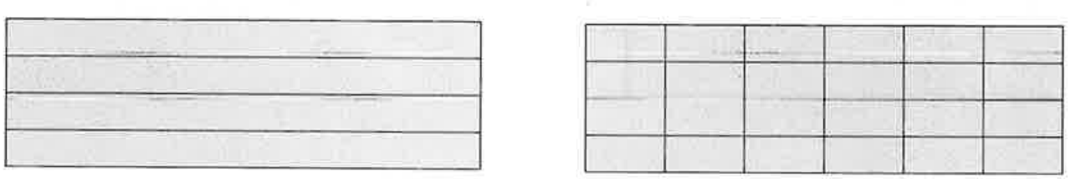
Consider this:

- If you have 5 pieces and they are all **one fifth in size**, you have a whole.
- $\frac{5}{5}$ Think about a Kit Kat bar, 5 pieces all the same size, makes 1 bar!

The **whole** that is **broken in to pieces** is always the same size, namely: 1

If you have 4 pieces of size 4 and 24 pieces of size 24, the whole they create is the same size.

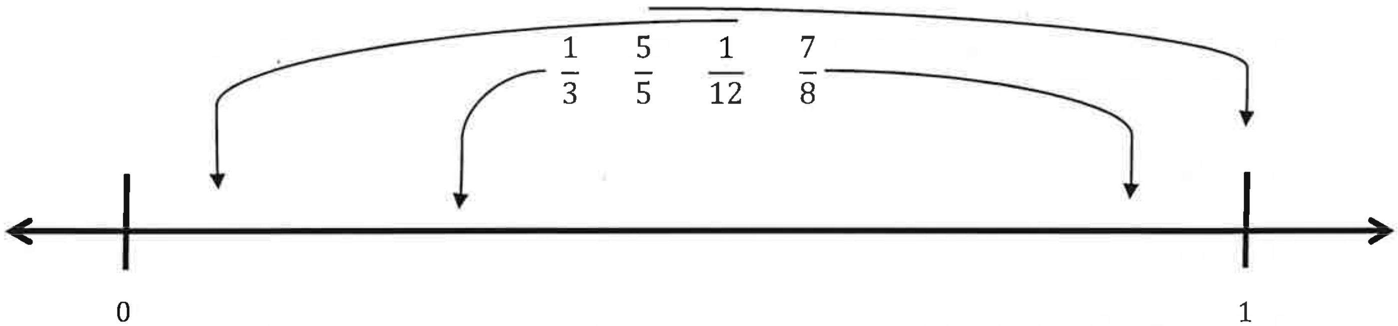
Example:



SAME size WHOLE, DIFFERENT size PIECES

- So now let's **estimate some fractions** on a number line:

Put these numbers on the line, why did you choose where you did?



- The distinguishing thing about fractions is that **every fraction** is either a **terminating (ends) or repeating decimal number**.

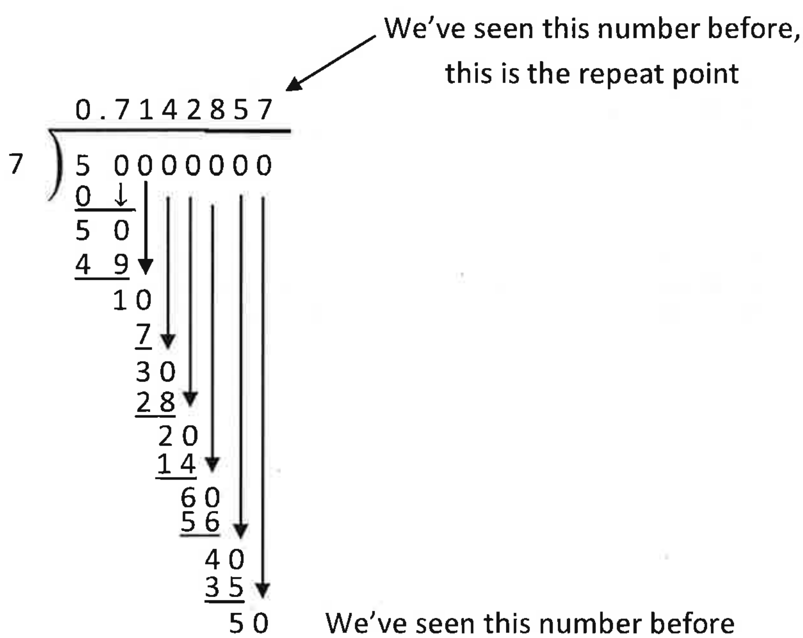
- Numbers that **neither terminate nor repeat cannot** be expressed as fractions, Pi (π) being the most famous example, but there are an **infinite number** of them

Converting from a Fraction to a Decimal

- We can figure out the **decimal expansion of any fraction**, using good old fashion **long division**

Example: Write $\frac{5}{7}$ as a decimal number

This reads 5 divided by 7



So, $\frac{5}{7} = 0.\overline{714285}$

Equivalence

Equivalence is a term that means **'the same value'**

- Two or more fractions can be **equivalent**, which means they have the **same value**, but they **look different**

Example: $\frac{1}{2}$ is the same as $\frac{2}{4}$ $\frac{3}{6}$ $\frac{4}{8}$ $\frac{15}{30}$ etc.

The question is now do we get there?

We **multiply the original fraction by 1**. The catch is that **anything divided by itself** is one. So by multiplying by 1, we use a fraction instead, that will give us the desired denominator.

$$1 = \frac{3}{3} = \frac{5}{5} = \frac{21}{21} = \frac{-4}{-4} = \frac{156}{156}\ etc$$

So to **make equivalent fractions** we **multiply** the **original fraction by 1**, in the **form of a fraction**.

Example:

$\frac{1}{3} = \frac{?}{6}$ → $\frac{1}{3} * \frac{2}{2} = \frac{2}{6}$

$\frac{5}{7} = \frac{15}{?}$ → $\frac{5}{7} * \frac{3}{3} = \frac{15}{21}$

$\frac{9}{4} = \frac{?}{16}$ → $\frac{9}{4} * \frac{4}{4} = \frac{36}{16}$

Comparing Fractions

- ✓ In order to **accurately compare** two or more fractions we need to make sure **all the pieces are the same size**. That means we need **a common denominator**.

<u>**Example:**</u> $\frac{2}{3}$ and $\frac{3}{4}$ $\frac{6}{7}$ and $\frac{7}{8}$

$\frac{2}{3} * \frac{4}{4} = \frac{8}{12}$, $\frac{3}{4} * \frac{3}{3} = \frac{9}{12}$ $\frac{6}{7} * \frac{8}{8} = \frac{48}{56}$, $\frac{7}{8} * \frac{7}{7} = \frac{49}{56}$

Since $\frac{9}{12}$ bigger than $\frac{8}{12}$ Since $\frac{49}{56}$ bigger than $\frac{48}{56}$

$\frac{3}{4}$ is bigger than $\frac{2}{3}$ $\frac{7}{8}$ is bigger than $\frac{6}{7}$

Mixed vs Improper Fractions

<u>**Improper fractions:**</u> are fractions where the numerator (top number) is bigger than the denominator (bottom number)

<u>**Example:**</u> $\frac{13}{5}$, $\frac{11}{3}$

<u>**Mixed fractions:**</u> are fractions with a whole number and a proper fraction

<u>**Example:**</u> $3\frac{1}{4}$, $7\frac{2}{3}$, $2\frac{5}{6}$

Converting from Mixed to Improper and Vice-Versa

- Again, think about your pieces (size and number)

So, $\frac{11}{4}$ means that you have 11 pieces and 4 make a whole

- Let's break that down then,

$4 + 4 + 3 = 11$ So we can have $\frac{4}{4} + \frac{4}{4} + \frac{3}{4}$

- We still have 11 pieces of size 4.

And since $\frac{4}{4}$ is 1 We can write it as $1 + 1 + \frac{3}{4}$ or $2\frac{3}{4}$

$$\frac{11}{4} = 2\frac{3}{4}$$

Vice Versa

$3\frac{2}{5}$ means we have $1 + 1 + 1 + \frac{2}{5}$ but since we can write 1 as $\frac{5}{5}$

We can say we have, $\frac{5}{5} + \frac{5}{5} + \frac{5}{5} + \frac{2}{5} = \frac{17}{5}$

$$3\frac{2}{5} = \frac{17}{5}$$

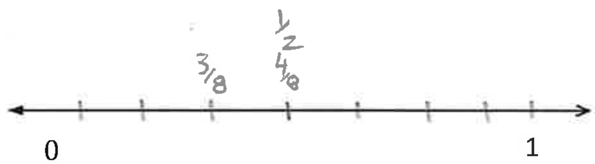
Review Section 1.3 – Practice Problems

Place the following fractions on the number line below, add markings to justify your reasoning

1. $\frac{2}{3}$

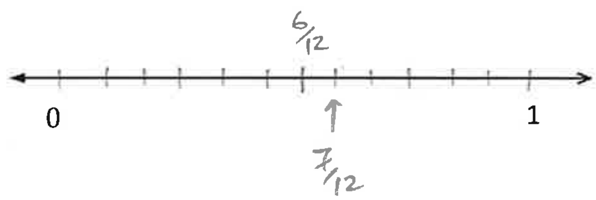
Why: Split in to 3 equal chunks

2. $\frac{3}{8}$



Why: Split into 8 equal chunks

3. $\frac{7}{12}$

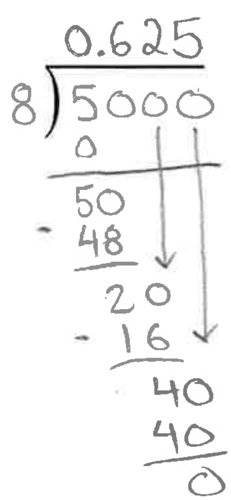


Why: Split into 12 equal chunks

Convert the following two fractions to decimals, show all the division steps

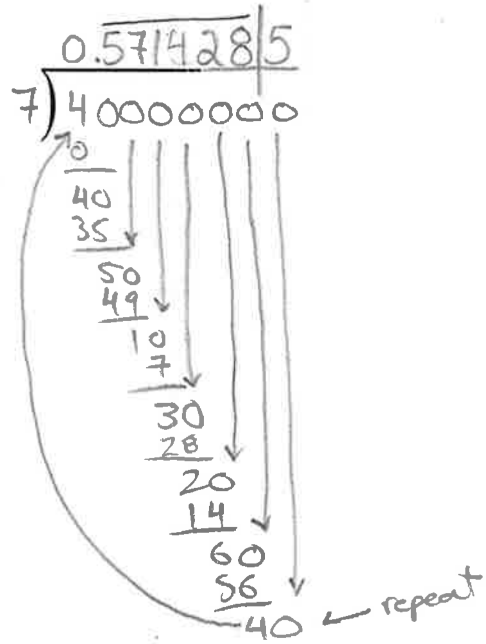
4. $\frac{5}{8}$

0.625



5. $\frac{4}{7}$

$0.\overline{571428}$



6. What makes two fractions equivalent? Why does changing to another form not change the value of the original fraction? Give me an example.

If they have the same value but look different Ex: $\frac{1}{2}$ $\frac{5}{10}$

Because converting is $\frac{1}{2} \cdot \frac{5}{5} = \frac{5}{10}$ and $\frac{5}{5} = 1$ multiplying by 1 does not change the value

Convert the following fractions to equivalent fractions with the given denominator.

7. $\frac{3}{4} = \frac{12}{16}$

8. $-\frac{2}{3} = \frac{-6}{9}$

9. $\frac{12}{15} = \frac{36}{45}$

10. $-\frac{4}{5} = \frac{-80}{100}$

11. $\frac{1}{7} = -\frac{-2}{14}$

12. $\frac{6}{7} = \frac{18}{21}$

13. $\frac{12}{13} = \frac{156}{169}$

14. $\frac{9}{11} = \frac{81}{99}$

15. $-\frac{2}{9} = -\frac{8}{36}$

16. $\frac{14}{3} = \frac{28}{6}$

17. $\frac{18}{7} = \frac{72}{28}$

18. $\frac{5}{8} = \frac{20}{32}$

19. When attempting to compare two fractions, what makes it very easy?

Getting a common denominator. If the pieces are the same size we just have to compare the number we have

Ex $\frac{2}{3}$ and $\frac{5}{9}$

↓

$\frac{6}{9}$ $\frac{5}{9}$ have more on the left. $\frac{2}{3} > \frac{5}{9}$

Same size

Compare the following fractions using $<, >, =$. Justify your reasoning.

20. $\frac{2}{3} < \frac{3}{4}$ $\quad \frac{8}{12} \quad \frac{9}{12}$

21. $\frac{1}{2} = \frac{25}{50}$ $\quad \frac{25}{50}$

22. $\frac{6}{7} < \frac{7}{8}$ $\quad \frac{48}{56} \quad \frac{49}{56}$

23. $\frac{4}{5} = \frac{8}{10}$ $\quad \frac{8}{10}$

24. $-\frac{2}{3} < \frac{2}{3}$ negative

25. $\frac{12}{13} > \frac{11}{12}$ $\quad \frac{144}{156} \quad \frac{143}{156}$

26. $\frac{3}{7} < \frac{5}{8}$ $\quad \frac{24}{56} \quad \frac{35}{56}$

27. $\frac{6}{6} = \frac{13}{13}$ $\quad 1 \quad 1$

28. $\frac{8}{9} > \frac{6}{7}$ $\quad \frac{56}{63} \quad \frac{54}{63}$

Convert the following fractions from MIXED to IMPROPER or VICE VERSE

29. $3\frac{2}{7} \rightarrow \frac{23}{7}$

30. $-4\frac{1}{4} \rightarrow -\frac{17}{4}$

31. $6\frac{3}{5} \rightarrow \frac{33}{5}$

32. $-5\frac{3}{11} \rightarrow -\frac{58}{11}$

33. $2\frac{5}{6} \rightarrow \frac{17}{6}$

34. $-4\frac{3}{10} \rightarrow -\frac{43}{10}$

35. $\frac{17}{3} \rightarrow 5\,^{2}/_{3}$

36. $-\frac{23}{5} \rightarrow -4\,^{3}/_{5}$

37. $\frac{18}{7} \rightarrow 2\,^{4}/_{7}$

38. $-\frac{23}{6} \rightarrow -3\,^{5}/_{6}$

39. $\frac{19}{4} \rightarrow 4\,^{3}/_{4}$

40. $-\frac{33}{10} \rightarrow -3\,^{3}/_{10}$

Section 1.4 – Fractions Cont.

- The **Simplified Form** of a fraction is when it is **reduced down** so the numerator and denominator have **no common factors**

- The process is the **same** as finding **equivalent fractions**, but instead of multiplying, **we divide**

- The best way to understand this is to understand the **prime factors** of each number.

Example: $\frac{28}{54}$ this is not simplified

- Right away I see that both numbers have a factor of 2 in common, but let's go further.

Break both numbers down into **prime factors**.

- The Prime Factors of 28 are: $2, 2, and\ 7$

- The Prime Factors of 54 are: $2, 3, 3, 3,$

- So, when you see factors that they have in common, divide out those common factors

$\frac{28}{54} \div \frac{2}{2} = \frac{14}{27}$ - The only factors left **aren't common**, so it's simplified

- This concept of division is where the idea of **cancelling out factors** comes from

What this means is we can rewrite $\frac{28}{54}$ as $\frac{2*2*7}{2*3*3*3}$

- ✓ Then when you have the same factor on the **top and the bottom**, they divide to give 1. And 1 multiplied by anything is doesn't change it.

- ✓ We can therefore say that when you have the same factor on top and bottom they cancel out.

$$\frac{2*2*7}{2*3*3*3} = \frac{\cancel{2}*2*7}{\cancel{2}*3*3*3} = \frac{2*7}{3*3*3} = \frac{14}{27}$$

- The outcome of canceling out the factors is the Same as the division of the common factors
- Both work!

Adding and Subtracting Fractions

- There is often a lot of stress and frustration when we get to operations with fractions
- Once you can grasp **what a fraction is** and how to make **equivalent fractions** the rest is actually quite straightforward

- In order to accurately **add or subtract fractions** what do we need?

- Remember, the **numerator: pieces we have** and **denominator: number of pieces in a whole.**

Naturally what is required is that **the pieces that make up the whole are the same size**

So what do we need?

We need a **COMMON DENOMINATOR** (Same sized pieces), we get that using equivalent fractions

Let's do some examples:

Example: $\frac{1}{3}+\frac{5}{7}= \quad \frac{1}{3}*\frac{7}{7}+\frac{5}{7}*\frac{3}{3}= \quad \frac{7}{21}+\frac{15}{21}= \quad \frac{22}{21}$

The Lowest Common Denominator in this case is 21, so we just multiply the fractions by each others denominator as a fraction over itself

Example: $\frac{6}{7}-\frac{3}{4}= \quad \frac{6}{7}*\frac{4}{4}-\frac{3}{4}*\frac{7}{7}= \quad \frac{24}{28}-\frac{21}{28}= \quad \frac{3}{28}$

Example: $\frac{1}{2}+\frac{5}{6}= \quad \frac{1}{2}*\frac{3}{3}+\frac{5}{6}= \quad \frac{3}{6}+\frac{5}{6}= \quad \frac{8}{6},$ but we can simplify that, $\frac{8}{6}\div\frac{2}{2}=\frac{4}{3}$

The Lowest Common Denominator in this case is the denominator of one of the two fractions, so we just multiply one of the fractions by whatever multiple gets us the desired result

Example: $\frac{3}{10}-\frac{1}{5}= \quad \frac{3}{10}-\frac{1}{5}*\frac{2}{2}= \quad \frac{3}{10}-\frac{2}{10}= \quad \frac{1}{10}$

Adding and Subtracting Mixed Fractions

It is good form and will limit errors if you **always** **CONVERT** from Mixed to Improper Fractions before doing the operations.

Example: $2\frac{1}{3} - 1\frac{3}{4}$

$$2\frac{1}{3} - 1\frac{3}{4} \rightarrow \quad \frac{7}{3} - \frac{7}{4} \rightarrow \quad \frac{7}{3} * \frac{4}{4} - \frac{7}{4} * \frac{3}{3} \rightarrow \quad \frac{28}{12} - \frac{21}{12} = \quad \frac{7}{12}$$

Example: $-5\frac{5}{6} + 2\frac{7}{8}$

$$-5\frac{5}{6} + 2\frac{7}{8} \rightarrow \quad -\frac{35}{6} + \frac{23}{8} \rightarrow \quad \frac{-35}{6} * \frac{4}{4} + \frac{23}{8} * \frac{3}{3} \rightarrow \quad \frac{-140}{24} + \frac{69}{24} = \quad -\frac{71}{24}$$

The Lowest Common Denominator in this case is 24, so multiply the fractions by whatever multiple gets us the desired result

Example: $1\frac{2}{3} + 3\frac{4}{5} - 4\frac{1}{2}$

$$1\frac{2}{3} + 3\frac{4}{5} - 4\frac{1}{2} \rightarrow \quad \frac{5}{3} + \frac{19}{5} - \frac{9}{2} \rightarrow \quad \frac{5}{3} * \frac{10}{10} + \frac{19}{5} * \frac{6}{6} - \frac{9}{2} * \frac{15}{15}$$

$$\rightarrow \quad \frac{50}{30} + \frac{114}{30} - \frac{135}{30} = \quad \frac{29}{30}$$

Section 1.4 – Practice Problems

Simplify the following fractions

1. $\frac{12}{36} \to \frac{1}{3}$
2. $\frac{24}{120} \to \frac{1}{5}$
3. $\frac{234}{468} \to \frac{1}{2}$
4. $\frac{36}{48} \to \frac{3}{4}$
5. $-\frac{14}{21} \to -\frac{2}{3}$
6. $-\frac{10}{50} \to -\frac{1}{5}$
7. $\frac{18}{27} \to \frac{2}{3}$
8. $\frac{11}{77} \to \frac{1}{7}$

Add the following fractions, leave answers in simplified form

9. $\frac{1}{5} + \frac{2}{5}$ $\frac{3}{5}$

10. $\frac{3}{5} + \frac{2}{15}$ $\frac{11}{15}$

$\frac{9}{15} + \frac{2}{15}$

11. $\frac{2}{7} + \frac{8}{21}$ $\frac{14}{21}$

$\frac{6}{21} + \frac{8}{21}$

12. $-\frac{3}{4} + \frac{1}{4}$ $-\frac{1}{2}$

$-\frac{2}{4} = -\frac{1}{2}$

13. $\frac{1}{3} + \frac{2}{5}$ $\frac{11}{15}$

$\frac{5}{15} + \frac{6}{15}$

14. $\frac{11}{12} + \frac{4}{7}$ $\frac{125}{84}$

$\frac{77}{84} + \frac{48}{84} = \frac{125}{84}$

15. $\frac{3}{4} + \frac{5}{6}$ $\frac{19}{12}$

$\frac{18}{24} + \frac{20}{24}$ $\frac{38}{24} = \frac{19}{12}$

16. $3\frac{2}{5} + 4\frac{1}{3}$ $\frac{116}{15}$

$\frac{17}{5} + \frac{13}{3}$

$\frac{51}{15} + \frac{65}{15} = \frac{116}{15}$

17. $5\frac{4}{7} + 2\frac{2}{5}$ $\frac{279}{35}$

$\frac{39}{7} + \frac{12}{5}$

$\frac{195}{35} + \frac{84}{35} = \frac{279}{35}$

18. $-2\frac{3}{8} + 3\frac{5}{6}$ $\frac{35}{24}$

$-\frac{19}{8} + \frac{23}{6}$

$-\frac{57}{24} + \frac{92}{24} = \frac{35}{24}$

Subtract the following fractions, leave answers in simplified form

19. $\frac{3}{5} - \frac{2}{5}$ $\frac{1}{5}$

20. $\frac{1}{7} - \frac{3}{14}$ $\frac{-1}{14}$

$\frac{2}{14} - \frac{3}{14}$

21. $\frac{7}{8} - \frac{9}{11}$ $\frac{5}{88}$

$\frac{77}{88} - \frac{72}{88} = \frac{5}{88}$

22. $-\frac{3}{17} - \frac{1}{2}$ $-23/34$

$\frac{-6}{34} - \frac{17}{34} = \frac{-23}{34}$

23. $\frac{3}{4} - \frac{5}{6}$ $-\frac{1}{12}$

$\frac{18}{24} - \frac{20}{24} = -\frac{2}{24} = -\frac{1}{12}$

24. $3\frac{2}{7} - 4\frac{1}{3}$ $-22/21$

$\frac{23}{7} - \frac{13}{3}$

$\frac{69}{21} - \frac{91}{21} = -\frac{22}{21}$

25. $5\frac{4}{5} - 2\frac{2}{3}$ $47/15$

$\frac{29}{5} - \frac{8}{3}$

$\frac{87}{15} - \frac{40}{15} = \frac{47}{15}$

26. $-2\frac{3}{4} - 3\frac{5}{8}$ $-51/8$

$-\frac{11}{4} - \frac{29}{8}$

$-\frac{22}{8} - \frac{29}{8} = -\frac{51}{8}$

Perform the combined operations, leave answers as an improper fraction in simplified form

27. $\frac{3}{4} + \frac{5}{6} - \frac{2}{3}$ $11/12$

$\frac{9}{12} + \frac{10}{12} - \frac{8}{12} = \frac{11}{12}$

28. $2\frac{3}{5} + 4\frac{2}{3} - (-1\frac{2}{15})$ $42/5$

$\frac{13}{5} + \frac{14}{3} + \frac{17}{15}$

$\frac{39}{15} + \frac{70}{15} + \frac{17}{15} = \frac{126}{15} = 42/5$

29. $-5\frac{4}{8} + 2\frac{13}{26} - 4\frac{5}{10}$ $-15/2$

$-5\frac{1}{2} + 2\frac{1}{2} - 4\frac{1}{2}$

$-\frac{11}{2} + \frac{5}{2} - \frac{9}{2} = -\frac{15}{2}$

30. $-3\frac{1}{4} + 1\frac{2}{3} - (-3\frac{5}{6})$ $9/4$

$-\frac{13}{4} + \frac{5}{3} + \frac{23}{6}$

$\frac{-39}{12} + \frac{20}{12} + \frac{46}{12} = \frac{27}{12} = \frac{9}{4}$

Section 1.5 – Multiplying and Dividing Fractions

Multiplication of Fractions

- It is simply **TOPS with TOPS** and **BOTTOMS with BOTTOMS**

$$\frac{Numerator \ * Numerator}{Denominator * Denominator}$$

Example: $\frac{2}{3} * \frac{5}{7} = \frac{2*5}{3*7} = \frac{10}{21}$

Example: $\frac{-5}{9} * \frac{1}{4} = \frac{-5*1}{9*4} = \frac{-5}{36} = -\frac{5}{36}$

Example: $\frac{4}{-7} * \frac{-3}{5} = \frac{4*-3}{-7*5} = \frac{-12}{-35} = \frac{12}{35}$

Example: $-\frac{1}{5} * \frac{6}{11} = \frac{-1*6}{5*11} = \frac{-6}{55} = -\frac{6}{55}$

Simple enough?

Now, what we can do though is **SIMPLIFY** the question first by **identifying the Common Factors**, just like when we **simplified individual fractions**.

Example:

$\frac{14}{49}$ can be written as: $\frac{2*7}{7*7}$ and since $\frac{7}{7}$ is equal to 1 what we have left is:

$\frac{2}{7} * 1 = \frac{2}{7}$ see how we cancelled out the common factors

Now Watch this…

We can do the same steps before we multiply

Example: $\frac{2}{7} * \frac{5}{8}$

$$\frac{2}{7} * \frac{5}{8} \to \quad \frac{2}{7} * \frac{5}{2 * 4} \to \quad \frac{2 * 5}{2 * 4 * 7} \to \quad \frac{\cancel{2} * 5}{\cancel{2} * 4 * 7} \to \quad \frac{5}{4 * 7} = \frac{5}{28}$$

Let's try some.

Example: $\frac{5}{12} * \frac{3}{20}$

$$\frac{5}{12} * \frac{3}{20} \to \quad \frac{5}{3 * 4} * \frac{3}{4 * 5} \to \quad \frac{5 * 3}{3 * 4 * 4 * 5} \to \quad \frac{\cancel{5} * \cancel{3}}{\cancel{3} * 4 * 4 * \cancel{5}} \to \quad \frac{1}{4 * 4} = \frac{1}{16}$$

Example: $-\frac{2}{3} * \frac{9}{14}$

Remember $(-2) = (-1) * 2$

$$\frac{-2}{3} * \frac{9}{14} \to \quad \frac{-2}{3} * \frac{3 * 3}{2 * 7} \to \quad \frac{(-1)2 * 3 * 3}{3 * 2 * 7} \to \quad \frac{(-1)\cancel{2} * \cancel{3} * 3}{\cancel{3} * \cancel{2} * 7} \to \quad \frac{(-1) * 3}{7} = \frac{-3}{7} = -\frac{3}{7}$$

Example: $\frac{21}{36} * \frac{42}{153}$

$$\frac{21}{36} * \frac{42}{153} \to \quad \frac{3 * 7}{6 * 6} * \frac{6 * 7}{3 * 3 * 17} \to \quad \frac{3 * 7 * 6 * 7}{6 * 6 * 3 * 3 * 17} \to \quad \frac{\cancel{3} * 7 * \cancel{6} * 7}{\cancel{6} * 6 * \cancel{3} * 3 * 17} \to \quad \frac{7 * 7}{6 * 3 * 17} = \frac{49}{306}$$

Example: $-\frac{6}{12} * -\frac{2}{3}$

$$\frac{-6}{12} * \frac{-2}{3} \to \quad \frac{(-1) * 2 * 3}{2 * 2 * 3} * \frac{(-1) * 2}{3} \to \quad \frac{(-1) * 2 * 3 * (-1) * 2}{2 * 2 * 3 * 3} \to \quad \frac{(\cancel{-1}) * \cancel{2} * \cancel{3} * (\cancel{-1}) * \cancel{2}}{\cancel{2} * \cancel{2} * \cancel{3} * 3}$$

$$= \frac{1}{3}$$

Division of Fractions

- First I'll show you the somewhat complicated but quite gorgeous method.

You may have been told somewhere along the line that dividing fractions is **just flipping the second fraction** and **changing the division sign to multiplication**, how many of you heard this before?

Do you know why?

Here's why.

Example:

$\frac{1}{2} \div \frac{2}{3}$ *well the fraction bar essentially means division so we can rewrite this as …*

$$\frac{\frac{1}{2}}{\frac{2}{3}} \quad \textit{yes it is one big fraction, made up of two fractions}$$

Now let's make this into an **equivalent fraction** with a denominator of one. Remember that in order for it to be equivalent we need to multiply the big fraction by 1.

$$\frac{\frac{1}{2} * \frac{3}{2}}{\frac{2}{3} * \frac{3}{2}} \quad \textit{this second portion is equal to } 1$$

So what do we get…

$$\frac{\frac{1}{2} * \frac{3}{2}}{\frac{6}{6}} = \frac{\frac{1}{2} * \frac{3}{2}}{1} = \frac{1}{2} * \frac{3}{2}$$

We ended up with,

$$\frac{1}{2} * \frac{3}{2}$$

So what has happened? The division symbol changed to multiplication and the fraction flipped.

And the result is:

$$\frac{1}{2} * \frac{3}{2} \qquad = \qquad \frac{3}{4}$$

Now the simpler method, the logic here is awesome...

Consider our starting point...

$$\frac{1}{2} \div \frac{2}{3} \quad \textit{how can I divide up pieces if they are the same size?}$$

If I get a **COMMON DENOMINATOR:**

$$\frac{1}{2} = \frac{3}{6} \quad and \quad \frac{2}{3} = \frac{4}{6}$$

So my equation now looks like:

$$\frac{3}{6} \div \frac{4}{6}$$

If you now divide the same sized pieces,

$$\frac{3 \div 4}{6 \div 6} = \frac{3 \div 4}{1} = 3 \div 4 \qquad = \qquad \frac{3}{4}$$

BOOM!

You're turn...

Example: $\frac{2}{3} \div \frac{5}{7}$

Flip Method

$$\frac{2}{3} \div \frac{5}{7} = \frac{2}{3} * \frac{7}{5} = \frac{14}{15}$$

Denominator Method

$$\frac{2}{3} \div \frac{5}{7} = \frac{14}{21} \div \frac{15}{21} = \frac{14 \div 15}{21 \div 21} = \frac{14 \div 15}{1} = \frac{14}{15}$$

Example: $\frac{12}{13} \div \frac{6}{11}$

Flip Method

$$\frac{12}{13} \div \frac{6}{11} = \frac{12}{13} * \frac{11}{6} = \frac{2}{13} * \frac{11}{1} = \frac{22}{13}$$

Denominator Method

$$\frac{12}{13} \div \frac{6}{11} = \frac{132}{142} \div \frac{78}{142} = \frac{132 \div 78}{142 \div 142} = \frac{132 \div 78}{1}$$

$$= \frac{132}{78} = \frac{66}{39} = \mathbf{\frac{22}{13}}$$

Simplified both of these to get our final answer.

Section 1.5 – Practice Questions

Multiply the following fractions, simplify before you multiply if desired, leave answer in simplified form

1. $\frac{1}{3} * \frac{12}{7}$ $\frac{4}{7}$

2. $-\frac{8}{9} * \frac{21}{16}$ $-\frac{7}{6}$

3. $\frac{12}{14} * \frac{7}{8}$ $\frac{3}{4}$

4. $\frac{8}{25} * \frac{35}{14} * \frac{2}{5}$ $\frac{28}{25}$

5. $\frac{5}{14} * \left(-\frac{21}{10}\right) * \frac{15}{7}$ $-\frac{45}{28}$

6. $-\frac{7}{4} * \frac{2}{21} * \frac{14}{8}$ $-\frac{7}{24}$

Divide the following fractions, simplify when you can, leave answer in simplified form

7. $\frac{2}{3} \div \frac{8}{9}$ $\frac{3}{4}$

8. $-\frac{3}{4} \div \frac{15}{8}$ $-\frac{2}{5}$

9. $\frac{12}{5} \div 4$ $\frac{3}{5}$

10. $4 \div \frac{12}{15}$ 5

11. $\frac{34}{121} \div \frac{17}{55}$ Answer: $\frac{10}{11}$

$\frac{34}{121} \cdot \frac{55}{17}$

12. $-\frac{38}{27} \div \frac{57}{18}$ Answer: $-\frac{4}{9}$

$\frac{38}{27} \cdot \frac{18}{57}$

13. $-\frac{13}{17} \div \frac{39}{34}$ Answer: $-\frac{2}{3}$

$-\frac{13}{17} \cdot \frac{34}{39}$

14. $-\frac{343}{125} \div \frac{49}{25}$ Answer: $-\frac{7}{5}$

$-\frac{343}{125} \cdot \frac{25}{49}$

Answer the following, leave answer as a simplified fraction, improper if applicable

15. $3\frac{1}{2} * 2\frac{1}{3}$ Answer: $\frac{49}{6}$

$\frac{7}{2} \cdot \frac{7}{3}$

16. $3\frac{1}{2} \div 2\frac{1}{3}$ Answer: $\frac{3}{2}$

$\frac{7}{2} \div \frac{7}{3}$

$\frac{7}{2} \cdot \frac{3}{7} = \frac{3}{2}$

17. $-5\frac{2}{5} * 3\frac{1}{3}$ Answer: -18

$-\frac{27}{5} \cdot \frac{10}{3}$

18. $-5\frac{2}{5} \div 3\frac{1}{3}$ Answer: $-\frac{81}{50}$

$-\frac{27}{5} \div \frac{10}{3}$

$-\frac{27}{5} \cdot \frac{3}{10} = -\frac{81}{50}$

19. $3\frac{3}{4} \div 1\frac{1}{8} * 1\frac{2}{25}$ Answer: $\frac{18}{5}$

$\frac{15}{4} \div \frac{9}{8} \cdot \frac{27}{25}$

$\frac{15}{4} \cdot \frac{8}{9} \cdot \frac{27}{25}$

20. $3\frac{1}{4} \div 2\frac{7}{16} * 1\frac{1}{8}$ Answer: $\frac{3}{2}$

$\frac{13}{4} \div \frac{39}{16} \cdot \frac{9}{8}$

$\frac{13}{4} \cdot \frac{16}{39} \cdot \frac{9}{8}$

Section 1.6 – Order of Operation – BEDMAS or PEDMAS

- There is a sequence of solving equations, **an order to follow**, just like a recipe.
- It goes like this:

B – **Brackets:**	Get inside any brackets then start the list again, are there more? Otherwise continue..
E – **Exponents:**	Solve any exponential statement and write as a result
D – **Division:**	Do any **multiplication and division** statements at the **same time from left to right**
M – **Multiplication:**	Do any **multiplication and division** statements at the **same time from left to right**
A – **Addition:**	Do any remaining **addition and subtraction** at the **same time, from left to right**
S – **Subtraction:**	Do any remaining **addition and subtraction** at the **same time, from left to right**

Example:

$$2 * 3 + 5 \div 5$$

$$6 + 5 \div 5$$
$$6 + 1$$
$$7$$

Example:

$$4^2 * 2 + 6 - 3$$

$$16 * 2 + 6 - 3$$
$$32 + 6 - 3$$
$$38 - 3$$
$$35$$

Example:

$$5(2+3-6)*4\div 2$$

$$5(5-6)*4\div 2$$
$$5(-1)*4\div 2$$
$$(-5)*4\div 2$$
$$-20\div 2$$
$$-10$$

Example:

$$5+\{6^2\div 2(5-2+3)\}$$

$$5+\{6^2\div 2(3+3)\}$$
$$5+\{6^2\div 2(6)\}$$
$$5+\{36\div 2(6)\}$$
$$5+\{18(6)\}$$
$$5+\{108\}$$
$$113$$

Example:

$$(15-4+5\div 5-2*3)^2$$

$$(15-4+1-2*3)^2$$
$$(15-4+1-6)^2$$
$$(11+1-6)^2$$
$$(12-6)^2$$
$$(6)^2$$
$$36$$

Section 1.6 – Practice Questions

Calculate the following using your Order of Operations

1. $6 + 2 * 3$ $6+6$ **12**	2. $2 * 3 + 2 * 4$ $6 + 8$ **14**
3. $4 * 6 - 5 * 3$ $24 - 15$ **9**	4. $16 - 8 \div 4 - 2$ $16 - 2 - 2$ **12**
5. $12 \div 3 - 16 \div 8$ $4 - 2$ **2**	6. $25 - 18 \div 6 - 10$ $25 - 3 - 10$ **12**
7. $7 - 3 - 10 \div 2$ $4 - 5$ **−1**	8. $-6 * 2 - 4 - 2$ $-12 - 4 - 2$ **−18**

Calculate the following using your Order of Operations

9. $6 - (2 * 3)$ $6 - 6$ **0**	10. $(6 - 2) + 3$ $4 + 3$ **7**
11. $-8 - (5 - 3)$ $-8 - 2$ **−10**	12. $(-8 - 5) - 3$ $-13 - 3$ **−16**
13. $-(8 - 3) + (3 - 7)$ $-5 + -4$ **−9**	14. $100 \div (10 \div 5)$ $100 \div 2$ **50**
15. $(128 \div 32) \div 2$ $4 \div 2$ **2**	16. $5 * 10 - (7 + 3) \quad -24$ $50 - 10 \quad -24$ **16**

Calculate the following using your Order of Operations

17. $3 * 2^3$ $3 \cdot 8$ $\boxed{24}$	18. $(3 * 2)^3$ 6^3 $\boxed{216}$
19. $-5 - 3^2$ $-5-9$ $\boxed{-14}$	20. $(-5 - 3)^2$ $(-8)^2$ $\boxed{64}$
21. $2^4 \div 2^2 * 2^5 \div 2^3$ $16 \div 4 \cdot 32 \div 8$ $4 \cdot 32 \div 8$ $128 \div 8 \rightarrow \boxed{16}$	22. $(2^4 \div 2^2) * (2^5 \div 2^3)$ $(16 \div 4)(32 \div 8)$ $(4)(4) = \boxed{16}$
23. $\frac{6+3*4}{6+3*4}$ $\frac{6+12}{6+12} = \frac{18}{18} = \boxed{1}$	24. $\frac{(6+3)(4)}{(6+3)(4)} = \frac{(9)(4)}{(9)(4)} = \frac{36}{36} = \boxed{1}$

Simplify the following using your Order of Operations

25. $12 + 2[(20 - 8) - (1 + 3^2)]$ $12+2[(12)-(10)]$ $12+2[2]$ $\boxed{16}$	26. $\frac{(-2)^3+4^2}{3-5^2+3*6}$ $\frac{-8+16}{3-25+18} = \frac{8}{-4} = \boxed{-2}$
27. $20 \div 4 + \{2 * 3^2 - [3 + (6 - 2)]\}$ $5+\{2 \cdot 9 - [3+4]\}$ $5+\{18-7\}$ $5+11$ $\boxed{16}$	28. $\frac{40-1^3-2^4}{3(2+5)+2}$ $\frac{40-1-16}{3(7)+2} = \frac{23}{21+2}$ $= \frac{23}{23} = \boxed{1}$

Review 1.7 – Percentages

What is a percentage?

- It is a ratio.... Which means **FRACTIONS**

The general form of a percentage is:

$$\frac{anything}{100}, \quad for\ example: \quad \frac{78}{100} \quad is\ 78\% \quad \frac{5}{100} \quad is\ 5\%$$

So when we are **working with percentages** we need to **represent them** as **decimals** and not %

So think percentage and money.

$$100\% = \$1.00$$

$$76\% = \$0.76$$

$$50\% = \$0.50$$

$$23\% = \$0.23$$

$$4\% = \$0.04$$

Converting from Decimals to Percent and Percent to Decimals

We **have to convert to decimal form** when we work with percentages

- If we have a fraction with denominator of 100 it is easy to convert to percent.

Example:

$$\frac{78}{100} = 0.78 = 78\%$$

- If we have fractions with a denominator that **can multiply** to 100 is it still pretty easy to get percent

Example:

$$\frac{12}{50} = \frac{24}{100} = 0.24 = 24\%$$

$$\frac{3}{20} = \frac{15}{100} = 0.15 = 15\%$$

$$\frac{19}{25} = \frac{76}{100} = 0.76 = 76\%$$

- If we have fractions with a denominator that can't multiply to 100, we have to divide out the fraction to get the decimal expansion.

Example:

$$\frac{3}{12} = \frac{1}{4} = \quad 4\overline{)1}^{\;0.25}$$

$$\frac{5}{8} = \quad 8\overline{)5}^{\;0.625}$$

$$\frac{12}{15} = \quad 15\overline{)12}^{\;0.8}$$

Percentages to Fractions (Simplified)

- This is simple enough.
- Start as a fraction over 100 and simplify it

Example:

$$78\% = \frac{78}{100} = \frac{39}{50}$$

$$64\% = \frac{64}{100} = \frac{32}{50} = \frac{16}{25}$$

$$25\% = \frac{25}{100} = \frac{5}{20} = \frac{1}{4}$$

Figuring out percentages of numbers

- This is used all the time when we think about discounts and deals.
- All we need to do here is good old fashion multiplication

Example: What is 37% of 200?

$$200 \cdot 37\% \quad \rightarrow \quad 200 \cdot 0.37 = 74$$

Example: What is 10% of 86

$$86 \cdot 10\% \quad \rightarrow \quad 86 \cdot 0.10 = 8.6$$

Example: What is 80% of 1200

$$1200 \cdot 80\% \quad \rightarrow \quad 1200 \cdot 0.80 = 960$$

It works the same with money.

Example: What is 30% off of $45

$$\$45 \cdot 30\% \quad \rightarrow \quad \$45 \cdot 0.30 = \$13.50$$

Example: What is 20% off of $120

$$\$120 \cdot 20\% \quad \rightarrow \quad 120 \cdot 0.20 = \$24$$

There is more then one way to do this…. Can you show me more?

Lastly how can we calculate tax?

- When we calculate tax first we have to change the percentage to a decimal
- Next we multiply by the price
- Then we add that amount to the original price

Example: What is the final purchase price of a $59 item with 5% GST

There are two ways to do this too.... What's the difference between the two?	
$\$59 \cdot 5\% \rightarrow \$59 \cdot 0.05 = \$2.95$ $\$59 + \$2.95 = \$61.95$	$\$59 \cdot 105\% \rightarrow \$59 \cdot 1.05 = \$61.95$ $\$61.95$

Example: What is the final purchase price of a $145 item with 12% tax

There are two ways to do this too.... What's the difference between the two?	
$\$145 \cdot 12\% \rightarrow \$145 \cdot 0.12 = \$17.40$ $\$145 + \$17.40 = \$162.40$	$\$145 \cdot 112\% \rightarrow \$145 \cdot 1.12 = \$162.40$ $\$162.40$

Example: What is the final purchase price of a $399.95 PS4 with 7% tax

There are two ways to do this too.... What's the difference between the two?	
$\$399.95 \cdot 7\% \rightarrow \$399.95 \cdot 0.07 = \$28$ $\$399.95 + \$28.00 = \$427.95$	$\$399.95 \cdot 107\% \rightarrow \$399.95 \cdot 1.07 = \$427.95$ $\$427.95$

Section 1.7 – Practice Questions

Convert from Fractions to Decimals to Percentages

	Fraction	Decimal	Percentage
1.	$\frac{3}{5}$	0.60	60%
2.	$\frac{7}{25}$	0.28	28%
3.	$\frac{2}{3}$	$0.\overline{66}$	$66.\overline{6}$%
4.	$\frac{3}{8}$	0.375	37.5%

Convert from Percentages to Simplified Fractions

	Percentage	Decimal	Fraction
5.	78%	0.78	$\frac{78}{100} = \frac{39}{50}$
6.	35%	0.35	$\frac{35}{100} = \frac{7}{20}$
7.	98%	0.98	$98/100 = 49/50$
8.	25%	0.25	$25/100 = \frac{1}{4}$

Find the Percentage of the Following Numbers

9. $14\%\ of\ 325$ 325 · 0.14 **45.5**	10. $57\%\ of\ 12\ 235$ 12 235 0.57 **6973.95**	11. $99\%\ of\ 100$ **99**
12. $2\%\ of\ 500$ 500 0.02 10.00 **10**	13. $46\%\ of\ 10$ **4.6**	14. $113\%\ of\ 13\ 278$ 13 278 × 1.13 **15004.14**

Percentages and Money

15. If you wanted to buy a new car for $37 500 and had to pay GST (5%) how much is the tax and how much will the car cost you?

37500
× 0.05
1875

37500 + 1875 = **$39375**

or

37 500
× 1.05
39375

16. You've gone shopping and you have bought $327.95 dollars worth of clothes and shoes, there is a 30% discount on the items and then you have to pay GST (5%) and PST (7%), how much is the total purchase going to cost you?

327.95
× 0.30
98.39

327.95 − 98.39 = 229.56

229.56
× 0.12 PST+GST combined
27.55

229.56 + 27.55 = **257.11**

Answer Key

Section R-1.1

1.	See Written Key
2.	
a)	97.1
b)	−5.34
c)	1215.004
d)	1 400 012
e)	86.0007
3.	
a)	8.9
b)	2.7
c)	5.1
d)	9.8
4.	
a)	8.95
b)	2.67
c)	5.15
d)	9.77
5.	
a)	8.947
b)	2.673
c)	5.149
d)	9.772
6.	
a)	94.7
b)	86.73
c)	275.382
d)	275.38
7.	
a)	89
b)	2674
c)	515
d)	97
8.	
a)	90
b)	2670
c)	510
d)	100
9.	
a)	100
b)	2700
c)	500
d)	100
10.	
a)	1000
b)	3000
c)	6000
d)	9000

Section R-1.2

1.	3
2.	-14
3.	12
4.	-7
5.	6
6.	13
7.	12
8.	8
9.	-5
10.	-34
11.	-13
12.	-16
13.	-3
14.	1
15.	12
16.	-12
17.	-15
18.	12
19.	24
20.	168
21.	-270
22.	0
23.	-7
24.	2
25.	-7
26.	6
27.	-4
28.	7
29.	-617
30.	23
31.	0
32.	*Undefined*

Section R-1.3

1.	*See Written*
2.	*See Written*
3.	*See Written*
4.	0.625
5.	0.571428 *Repeat*
6.	*Answers Vary*
7.	12
8.	-6
9.	36
10.	-80
11.	-2
12.	18
13.	156.
14.	81
15.	8
16.	28
17.	72
18.	20
19.	*Answers Vary*
20.	$<$, *need reason*
21.	$=$, *need reason*
22.	$<$, *need reason*
23.	$=$, *need reason*
24.	$<$, *need reason*
25.	$>$, *need reason*
26.	$<$, *need reason*
27.	$=$, *need reason*
28.	$>$, *need reason*

29.	$^{23}/_{7}$
30.	$^{-17}/_{4}$
31.	$^{33}/_{5}$
32.	$^{-58}/_{11}$
33.	$^{17}/_{6}$
34.	$^{-43}/_{10}$
35.	$5\frac{2}{3}$
36.	$-4\frac{3}{5}$
37.	$2\frac{4}{7}$
38.	$-3\frac{5}{6}$
39.	$4\frac{3}{4}$
40.	$-3\frac{3}{10}$

Section R-1.4

1.	$1/3$
2.	$1/5$
3.	$1/2$
4.	$3/4$
5.	$-2/3$
6.	$-1/5$
7.	$2/3$
8.	$1/7$
9.	$3/5$
10.	$11/15$
11.	$14/21$
12.	$-1/2$
13.	$11/15$
14.	$125/84$
15.	$19/12$
16.	$116/15$
17.	$279/35$
18.	$35/24$
19.	$1/5$
20.	$-1/14$
21.	$5/88$
22.	$-23/34$
23.	$-1/12$
24.	$-22/21$
25.	$47/15$
26.	$-51/8$
27.	$11/12$
28.	$42/5$
29.	$-15/2$
30.	$9/4$

Section R-1.5

1.	$4/7$
2.	$-7/6$
3.	$3/4$
4.	$28/25$
5.	$-45/28$
6.	$-7/24$
7.	$3/4$
8.	$-2/5$
9.	$3/5$
10.	5
11.	$10/11$
12.	$-4/9$
13.	$-2/3$
14.	$-7/5$
15.	$49/6$
16.	$3/2$
17.	-18
18.	$-81/50$
19.	$18/5$
20.	$3/2$

Section R-1.6

1.	12
2.	14
3.	9
4.	12
5.	2
6.	12
7.	-1
8.	-18
9.	0
10.	7
11.	-10
12.	-16
13.	-9
14.	50
15.	2
16.	16
17.	24
18.	216
19.	-14
20.	64
21.	16
22.	16
23.	1
24.	1
25.	16
26.	-2
27.	16
28.	1

Section R-1.7

1.	0.60, 60%
2.	0.28, 28%
3.	0.66, 66.6%
4.	0.375, 37.5%
5.	$0.78, \frac{39}{50}$
6.	$0.35, \frac{7}{20}$
7.	$0.98, \frac{49}{50}$
8.	$0.25, \frac{1}{4}$
9.	45.5
10.	6973.95
11.	99
12.	10
13.	4.6
14.	15 004.14
15.	$39 375
16.	$257.11