Grade 9 (Math 10F) Reference Notes (PRISM PURPLE MATHEMATICS) – in two pages

See also previous studies and previous reference notes: UPGRADE NOTES for PRISM GREEN

Chapter 1-Whole Numbers and Decimals. No notes are necessary here. Multiplying, dividing, adding, subtracting prior studies.

Chapter 2 – Fractions

Proper Fractions. Means the numerator is less than the denominator**. Ex: 1/6**
Improper Fraction. Means the numerator is *more* than the denominator**. Ex: 3/2** (three halves of a pizza).
Mixed fraction (carpenter's fractions). Use whole numbers mixed with a proper fraction. *Ex:* one and a half pizzas, or **1½** pizzas. **(means: 1 + ½ pizzas)**
Adding and Subtracting Fractions. Must have the same denominator, same size slice of pizza. Find a **LCM** of the denominators (also called a **Lowest Common Denominator**) and make equivalent fractions of the same denominator.

Ex1: $\frac{1}{2}+\frac{1}{4}=\frac{2}{4}+\frac{1}{4}=\frac{3}{4}$ **Ex2:** $\frac{1}{3}+\frac{2}{7}=\frac{7}{21}+\frac{6}{21}=\frac{13}{21}$ **Ex3:** $\frac{3}{4}-\frac{1}{2}=\frac{3}{4}-\frac{2}{4}=\frac{1}{4}$

Least Common Multiple (LCM). The lowest number that some given numbers can evenly go into. ***Ex1***: LCM of **2,3 and 4** is **12**. Because 2*6 is 12, 3*4 is 12, and 4*3 is 12. *To find LCM*: factorize to *primes* each given number: 2 is already prime; 3 is already prime; 4 is 2*2. Pick the largest 'gaggle' of each prime factor and multiply them. So: 3*2*2=12. So 12 is the **LCM. Or** just use table method →.

Multiplying Fractions. Multiply ***numerators*** together for new numerator, multiply *denominators* together for new denominator. **Ex1:** $\frac{1}{2}*\frac{3}{4}=\frac{1*3}{2*4}=\frac{3}{8}$ Half of three-quarters of a pizza is three–eighths of a pizza! *Easy*; no common denominator required!

Reciprocals. The reciprocal of a number means that number divided into one. If seven people share one thing, they each get **1/7th** of the thing. A number multiplied by its reciprocal is just one. $7*\frac{1}{7}=\frac{7}{1}*\frac{1}{7}=\frac{7}{7}=1$

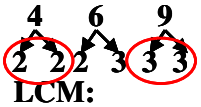
Number	Reciprocal
6	1/6
21	1/21
7	1/7

Dividing By Fractions. Just *multiply* by a reciprocal. $\frac{\left(\frac{1}{3}\right)}{\left(\frac{2}{3}\right)}=\frac{1}{3}\div\frac{2}{3}=\frac{1}{3}*\frac{3}{2}=\frac{3}{6}=\frac{1}{2}$

Dividing something by one half really means multiplying the something by two!

Reduce fraction to lowest terms means to make the numerator and denominator as low as possible without changing their proportion. Just keep dividing top and bottom by prime numbers**.**
Ex: 1: $\frac{12}{16}=\frac{6}{8}=\frac{3}{4}$
Ex 2: $\frac{30}{60}=\frac{15}{30}=\frac{5}{10}=\frac{1}{2}$
Divide top / bottom by 2, then 3, then 5. Or use prime factor tree.

LCM		
4	6	9
8	12	18
12	18	27
18	24	36
24	30	45
28	36	54
32	42	63
36	48	72



LCM:
2*2*3*3=36

Chapter3 – Pre-Algebra Equations

Number phrases (expressions) have these example meanings: **'n + 7' means**: seven more than '**n**', '**n**' increased by seven, '**n**' plus seven, the sum of **n** and seven…. **'n – 4' means**: four less than '**n**', **n** decreased by **four**, **n** subtract **four**, the difference of **n** and **4**…. '**3 * z**' or simply '**3z**'means: the product of **3** and **z**, **z** bunches of **3**, or three bunches of **z**, …**'q/4'** or '**q ÷ 4**' or $4\overline{)q}$; '**q**' divided by **4**, how many of size **4** squeeze into a size **q**, **4** times *what* is **q**, .**Quotient** is the result of divide; **product** of multiply.

Solving Simple Equations. Undo what was done to the unknown variable. Impossible to mess up if you do same to both sides.

Solving Equations using subtraction or adding. Just *undo* what is done to 'unknown variable'!!!

Ex1: **x + 8 = 12**. Subtract 8 from both sides; **x = 12 – 8; x = 4**. ***Ex2***: **x – 5 = 4**. Add 5 to both sides; **x = 4 + 5; x = 9**.

Solving Equations using Multiplying or Dividing. Just undo what is done to variable!

Ex1: **x ÷ 8 = 3**. Multiply both sides by 8; **x = 3 * 8; x = 24**. ***Ex2***: **x * 5 = 40**. Divide both sides by 5; **x = 40÷ 5; x = 8**.

Equations are two expressions compared with an equals symbol. 'Is', 'was', 'will be' means 'equals' in equations.

Chapter 4 – Using Pre-Algebra. **Constants:** Values that don't change: **3, 7, 95.327, π. Variables**. Values that are unknown for now and represented by a symbol: **z, q, P**, "let **x** be my shoe size then …".

Polynomials. *Expressions* with groups of terms, made up of products of variables and constants, all added or subtracted. **Examples**: **4x – 1; 3p + 2**, the cost of 3 pizzas plus a $2 coke; **3x + 4z + 3tz**. **Like terms:** Terms that have the same variables or products of variables; group them together! **Ex1**: 3 cows plus 4 cows is 7 cows: **3c + 4c = 7c**; **Ex2: 4p + 3q + 2p – q = 6p + 2q**

Chapter 5 – Rates, Ratios, Proportions, Percents

Rate: comparison of two different units. **Ex**: 70 km per hour
Ratios: comparison of same units. 4 hours of every 24 hours I mark homework.
Proportions: making things equal by 'portion' type. If one bannock uses **2 cups** of flour, how many bannock do you get for **6 cups** of flour? **Cross Multiplying** is useful for proportions! **Ex 1**: $\frac{1\,Bannock}{2\,Cups\,Flour}=\frac{x}{6\,Cups\,Flower}$ **∴ x = 3 Bannock.**

Examples: Cross Multiplying:

$\frac{2}{3}\times\frac{x}{15}$ $\quad 2*15=3x$ $\quad 30=3x$ $\quad \frac{30}{3}=x$ $\quad x=10$

$\frac{2}{3}\times\frac{14}{p}$ $\quad 2p=3*14$ $\quad 2p=42$ $\quad p=\frac{42}{2}$ $\quad p=21$

Fractions to Decimals. Just convert to **10ths** or **100ths** or **1,000ths** using proportions or just use a calculator or else long division.

Ex1: $\frac{3}{5}=\frac{6}{10}=0.6$ **Ex2:** $\frac{1}{8}=\frac{125}{1000}=0.125$ **Ex3:** $\frac{1}{3}=0.333333....(repeating)$

$\frac{3}{5}=5\overline{)3.0}\,\overset{0.6}{}$

Every fraction is a decimal or repeating decimal and vice versa.

Decimals to Fractions.

Ex: 0.25 *means* 25/100ths and then reduce to lowest terms**:** $\frac{25}{100} = \frac{1}{4}$

Percent (%). **Just French for '***per hundred'***. 65% means** 65/100**, that is all.**

Percent to decimal**:** divide by 100**,** ***or*** **move decimal point 2 places left.**

Ex1**:** $75\% = \frac{75}{100} = 0.75$ ***Ex2*****:** 2.35% **means** 0.0235

Decimal to Percent**.** Multiply by 100%**, or move decimal point two places right.**

Ex1**: 0.025 *100% = 2.5%** ***Ex2*****: 0.625*100%=62.5%**

A decent calculator will actually do the conversion for you if you are desperate.

Percent %	Decimal	Fraction
37.5%	0.375	3/8
50	0.5	1/2
2.5%	0.025	1/40
100%	1.0	1

Chapter 6 – Simple and Compound Interest. Covered again in Grade 11 and with Compound Interest.

Simple Interest Formula: **I = P*r*t**. I = Amount of Interest earned, **P** is Principal, **r** is interest rate per year, **t** is number of years.

Chapter 7 and 8 – Metric Measurement. See previous Upgrade Reference Notes.

Chapter 9 – Geometry

Triangles Types. **Equilateral Δ**: *All 3* sides equal. **Isosceles Δ**: *At least* two sides equal. **Scalene Δ**: *No* sides same length.

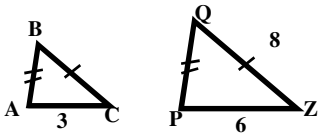
Circle Geometry (not in Prism) . ***1.*** The Measure Of The Central Angle Is Equal To Twice The Measure Of The Inscribed Angle Subtended By The Same Arc. ***2.*** Inscribed Angles Subtended By The Same Arc Are Congruent. ***3.*** The Angle Inscribed In A Semicircle (or on a diameter) Is A Right Angle. ***4.*** A Tangent To A Circle Is Perpendicular To The Radius At The Point Of Tangency. ***5.*** The Tangent Segments To A Circle, From Any External Point, Are Congruent. ***6***. The Perpendicular Bisector Of A Chord Contains The Centre Of The Circle. ***7.*** The Perpendicular From The Centre Of A Circle To A Chord Bisects The Chord.

CHAPTER 10 – SIMILAR TRIANGLES

Similarity. Two triangles are similar if same shape (but not necessarily same size). ***Corresponding*** sides are proportional, ***corresponding*** corner angles are the same (congruent). Given two triangles that are similar, that is:

ΔABC ~ ΔPQZ; then the *corresponding* sides have the same ratios; that is:

$\frac{AB}{PQ} = \frac{BC}{QZ} = \frac{AC}{PZ}$ (use *any pair* of *ratios* to solve the unknown sides)



So $\frac{BC}{8} = \frac{3}{6}$. Solving for side **BC**; **BC** = 4

Keep 'baby' on top, 'mommy' in bottom, or vice versa.

Chapter 11 – Perimeter, Area, Volume. **Surface Area**; just add the area of the faces. See your own notes.

Chapter 12 Graphs. No notes here. **Chapter 13 – Probability**. See Upgrade notes also.

Algebra Readiness. **Properties of Numbers**; Commutative, Distributive, Properties of zero, etc : See upgrade reference notes.

Solve two step equations ….just undo what was done to the unknown quantities! **Your Aim**: to get **x** by itself = ***something*** .

3x + 5 = 17 **3x = 17 – 5** **3x = 12** **x = 12 / 3** **x = 4** **Check** answer, *evaluate*: **3(4) + 5 = 17?** ☺	**3x – 1 = 2x + 4** **subtract 2x from both sides, add 1 to both sides**: **3x – 2x = 4 + 1** **Add *or* subtract *like terms*:** **1x = 5**; *so* **x = 5** , **CHECK** original problem by *evaluating*. **3(5) – 1 = 2(5) + 4? *Yes!*** ☺

Inequalities. 5 > 3: 5 is greater than 3**. 4 ≤ 7:** 4 *is less than or equal to* **7.**

Solve Inequalities. Just like regular algebra but an inequality (ex: **<, > , ≤**) instead of an equals (=). *However*, a couple extra special rules you will learn in Grade 10!

Example: 2b + 7 > 17
2b > 17 – 7
2b>10
b> 10/2
b>5 Check! Plug in any number > 5,does it work? Yes!

Integers. Integers are whole counting numbers but include *negative* numbers! Negative numbers are: 'below zero', a debit, a bill you owe, the *opposite* of a number. Five below zero (ie: 0 – 5) is a negative number.

Basic Operations with Integers (by example). –3 + (–3) + (–4) = –10; (–5) * 4 = –20; (–3) * (–4) = 12; etc.

Adding two #s of same sign→*keep same sign***. Subtraction of two #s different signs→**keep sign of number furthest from zero**.**

Subtracting a negative is adding! Taking away something crappy in your life improves your life, makes it less crappy.

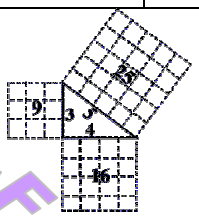
Multiply or divide two #s of same sign→positive sign**. Multiply or divide two #s of different sign→**negative sign**.**

'4 bunches of crappy stuff is really crappy, really negative. Taking away 4 bunches of crappy stuff is good, positive', *etc.*

Exponents: x^7 means: **x*x*x*x*x*x*x. 'x'** is the '*base*', **7** is the '*exponent*'. Entire expression' x^7', is called a '*power*'.

Product Rule of Exponents Add exponents of powers when two powers having same base are multiplied	$x^a * x^b = x^{(a+b)}$ $2^3 * 2^5 = 2^8$ $x^2 * x^3 = x^5$	**Quotient Rule of Exponents**: Subtract exponent in denominator from exponent in numerator for powers of same base.	$\frac{x^4}{x^3} = x^{(4-3)} = x^1 = x$ $7^5 \div 7^3 = 7^2$

Pythagorean Theorem. **"***In any right-angled triangle the length of the longest side (hypotenuse) squared is equal to the sum of the squares of the lengths of the other two sides.*" Or: $c^2 = a^2 + b^2$; *where* **c** is the hypotenuse, **a** and **b** are the other two shorter sides.



x	x^2
3	9
4	16
6	36
9	81
$\sqrt{x}$	x

Square Roots: Means to '*unsquare*', to think backwards. 4^2**=16** so $\sqrt{16} = 4$;

$7^2 = 49$ so $\sqrt{49} = 7$.