**Essentials of Quantitative Reasoning**

based upon a KAPLAN Math Workbook

**Arithmetic**

□ Reals 실수 = rationals 유리수 + irrationals 무리수 (π, $\sqrt{2}$ etc.)

rationals 유리수 = integers정수 + decimal fractions소수 + common fractions분수

$□ Common fractions=\frac{numerator}{denominator} $ $\leftarrow fraction bar (divided by)$

□ **Reducing** or **canceling** to the lowest terms: $\frac{2}{4}= \frac{1}{2}$

□ LCM: least common multiple 최소공배수 (multiple 배수)

□ Mixed numbers: $4\frac{1}{3}$ , etc.

□ 1 2 3 **.** 4 5 6

□ Remainder: 17 = 5 X 3 + **2**

□ Factors = divisors 약수 (36: 1,2,3,4,6,9,12,36) / common factors 공약수

□ The greatest common factor (divisor) 최대공약수

□ Prime numbers 소수: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29 …

 ▷ “1” is not considered a prime number.

□ Prime factors 소인수: 2, 3, 5, … 즉 “prime number”로 구성된 약수들

▷ “1” is not considered a prime factor.

□ Prime factorization: 소수의 곱으로 나타내는 것 (480 = 25 x 3 x 5)

□ Consecutive numbers

▷ consecutive positive numbers: 1,2,3,4,5, …

▷ consecutive even numbers: …, -4, -2, 0, 2, 4, …

▷ consecutive prime numbers: 2, 3, 5, 7, 11, 13, …

□ Multiple 배수: 6 =3X2

□ Product: 곱하기한 값

□ 1 penny = $0.01 / 1 nickel = $0.05

1 dime = $0.1 / 1 quarter = $0.25

□ Signed Numbers

▷ Like signs: + + / - - (-1)+(-1)=(-2)

▷ Unlike signs: + - / - - (-1)+(+2)=(+1)

□ 문제유형

약수찾기

What is the greatest integer that will divide evenly **into** both 48 and 60?

□ Average Rate = Average *A* per *B* = $\frac{Total A}{Total B}$

▷ John travels 30miles in 2hrs and then 60miles in 3 hours. What so his

 average speed in miles per hour?

 $\frac{\left(30+60\right)miles}{\left(2+3\right) hours}$

□ Round **to** the nearest hundredth: 소수 3째 자리에서 반올림 (3.526 => 3.53)

□ Ratio of *X* to *Y* = $\frac{X}{Y}$ = *X* : *Y*

□ *Percent* is just another word for ***hundredth***: 19% means ***19 hundredth***.

□ A2: A **squared** / A3: A ***cubed***

□ Radical = 근호 = root

□ $A^{\frac{1}{n}}$ = $\sqrt[n]{A}$ : Read “the *n*th root of A.”

□ $(A^{b})$c = *A*bc  / *A*b X *A*c = *A*(b+c) / *A*-b = $\frac{1}{A^{b}}$ = ($\frac{1}{A}$)b / $\frac{A^{c}}{A^{b}}$ = $A^{(c-b)}$

□ Write 0.001 ***in scientific notation***: 1.0 X 10-3

□ 1 less than A% of B = B X A% - 1

**Algebra**

□$ X^{a}$: ***the base*** is *X* and **the exponent** is *a*.

□ In a **quadratic equation**(2차방정식), the ***Quadric Formula***: $x=\frac{-b\pm \sqrt{b^{2}-4ac}}{2a}$

□ 문제유형

▷ The quotient of *h* divided by -11: $\frac{h}{-11}$

▷ The difference between a number and 4.5 is -1: *n* – 4.5 = -1, *n*=3.5

 ▷ If $9,500 is invested at 4.5% annual interest, compounded quarterly,

what is the balance after 2 yrs?

◌ Compounded Interest: A = $P(1+\frac{r}{c} )^{t\*c}$

where, c = 4 (quarterly), 2 (semiannually) or 1 (annually)

◌ Simple Interest: A = P(1+r\*t)

▷ If $2,300 is invested at $5 \frac{1}{2} $% annual interest, compounded semiannually,

 what is the balance after 5 yrs?

□ *f* (*x*) = *X* 2 -1, *X* = 1: the input = 1, the output is 0

 the **Domain**: the set of input numbers => 1,-1

 the **Range**: the set of output values => 0

□ If there are multi points on a graph in which ***two different Y-values*** exist for ***the same***

 ***X-value***, it represents ***no function***.

□ Slope = $\frac{Rise}{Run}$ = $\frac{change in Y}{change in X}$

□ The slope of any horizontal line is ‘0’ and the slope of any vertical line is ‘undefined.’

□ ***Parallel*** lines have the same slope.

 ***Perpendicular*** lines have slopes that are negative reciprocals of each other.

 => The perpendicular line of ‘y=-$ \frac{3}{2}$ +2’ is ‘y=+$ \frac{2}{3}$ +2.’

\* perpendicular to~ : ~에 수직인, 수직선(면)

□ SYMMETRY: A point whose coordinates are (a, b) can be reflected across the line

y=x in the coordinate plane. The coordinates of the reflected point will be (b, a).

To say it another way, the points (a, b) and (b, a) ***are symmetric about*** the line y=x.

□ Parabola: 포물선

□ Circles

 X2 + Y2 = Z2 🡺 Center (0, 0) / Z = radius

(X-a)2 + (Y-b)2 = Z2 🡺 Center (a, b) / Z = radius

□ A ***Piecewise Function*** is defined by more than one equation, where each equation

 applies to a different part of the domain of the function. The ***absolute function*** is

an example of a piecewise function: $f\left(x\right)=$ |*X*|.

□ A coordinate plane has a ***quadrant*** (4분면).

|  |  |
| --- | --- |
| yxThe graph of ***C*** x f(x) the graph of f(x) ***stretched from the X-axis*** bya factor of ***C***. |  yxThe graph of $\frac{1}{C}$ x f(x) the graph of f(x) ***compressed toward the X-axis***a factor of ***1/C***. |

□ $-X\geq -4$ 🡺 $X\leq 4$

**Geometry**

□ Two lines are parallel: l1 || l 2

□ Acute angles: x<90°, Right angles: x=90°, Obtuse angles: 90°<x<180°

꼭지점: vertex ( vertices)

□ Two lines are ***perpendicular*** if they intersect at a 90° angle.

□ Two lines are ***supplementary*** if the sum of their measures is **180°**.

□ Two lines are ***complementary*** if together they make up **a right angle**.

□ The ***height***, or ***altitude***, of a triangle is a perpendicular distance from a vertex to

 the side opposite the vertex.

□ The length of any side of a triangle is less than the sum of the lengths of the

other two sides: b + c > a > b – c.

□ In a ***Right triangle*** (직각삼각형), the height and base are the two ***legs***.

 Height

 (Leg1) Hypotenuse

 Base (Leg2)

□ In a ***Isosceles triangle*** (이등변삼각형), two sides of equal length are ***legs***.

 Leg1 Leg2

 Height

Base

□ a ***Equilateral triangle***: 정삼각형

□ When two triangles are similar with each other,

 $\frac{Area ∆DEF}{Area ∆ABC}$ = $( \frac{DE}{AB} )^{2}$

□ When two triangles, ∆ABC and ∆DEF, are ***congruent to*** with each other,

 AB = DE, BC = EF and AC = DF. Moreover, ∠A=∠D, ∠B=∠E and ∠C=∠F.

□ A ***Transversal***: 횡단선, ***quadruple***: 4배의/4배가 되게 하다

□ sin30 =$ \frac{1}{2} $, sin60 =$ \frac{\sqrt{3}}{2} $, sin45 = cos45 =$ \frac{\sqrt{2}}{2}$

 cos30 =$ \frac{\sqrt{3}}{2} $, sin60 =$ \frac{1}{2}$

tan30 =$ \frac{\sqrt{3}}{3} $, tan60 =$ \sqrt{3} $, tan45 = 1

□ A ***Regular polygon*** (정다각형) has sides of equal length & interior angles of

 equal measure. The ***Perimeter*** of a polygon is the sum of the lengths of the sides.

□ The sum of interior angles of polygons

 Triangles: 180° / ***Quadrilateral***s (4각형): 180° X 2 = 360° / Pentagons: 180° X 3 = 540°

 Hexagon: 180° X 4 = 720° / ***Heptagon***: 180° X 5 = 900° / Octagon: 180° X 6 = 1,080°

□ Quadrilaterals: Rectangles (직사각형), Squares (정사각형),

 ***Parallelogram*** (평행사변형), ***Trapezoids*** (부등변사각형(사다리꼴))

□ A ***diagonal*** (대각선) of a polygon is a line segment connecting two nonadjacent vertices.

□ Diameter (직경), Radius (반경), ***Chord*** (현), ***Central angle***

Central Angle

Chord

***Minor arc***

***Major arc***

□ The ***Circumference*** of a circle: $2πr= πD$

□ The ***area*** of a circle: $πr^{2}= \frac{πD^{2}}{4}$

□ The **arc** (원호) of a circle: ***Minor arc*** & ***Major arc***

□ A ***Revolution*** of wheel is the circumference of the wheel.

□ Square *ABCD* is ***inscribed in*** circle O; Circle O is ***circumscribed about*** square *ABCD*.

**원에 내접하는 삼각형의 한 변이**

**원의 직경인 경우, 이 삼각형은**

**항상 직각삼각형 !**

***Tip !***

***O***

***O***

***A***

***B***

***C***

***D***

□ A ***Solid*** is a three-dimensional figure: ***Rectangular solid***s, ***Cube***s, ***Cylinder***s and ***Sphere***s.

***Edges***

***Faces***

□ The ***Edge***s of a solid are line segments that connect the vertices.

□ A cube has ***twelve*** ***edges*** and ***six faces***.

**Data Interpretation**

□ The ***Union*** (합집합) of *A* and *B*: $A∪B$; the ***Intersection*** (교집합) of *A* and *B*: $A∩B$

 The ***Inclusion-exclusion principle***: $\left|A∪B\right|= \left|A\right|+ \left|B\right|- |A∩B|$

□ The ***Multiplication principle***: When the first event does not influence the second one,

 the number of possible outcomes is ***m*** X ***n***; where ***m*** is the number of possible outco-

mes for the first event and ***m*** is the number of possible outcomes for the second one.

 The probability of two independent events occurring is $P\left(A∩B\right)=P \left(A\right) X+P(B)$.

□ ***Permutations*** (순열): ***n***$! $, ***n*** factorial

□ Permutations of ***n*** objects taken ***k*** at a time

 : $P\left(n,k\right)$ = ***n****P****k*** = $\frac{n!}{(n-k)!}$

 <Suppose you have a set of ***n*** objects, but ***you want order some of them***.

Let the number of objects you are choosing for the subset be ***k***.>

문제유형 There are ten finalists for the school spelling bee. A 1st, 2nd and 3rd place

 trophy will be awarded with no ties or duplications. (순서가 문제됨)

□ ***Combinations*** (조합) of ***n*** objects taken ***k*** at a time

 : ***n****C****k*** = $\frac{n!}{k! (n-k)!}$

 <Suppose you have a set of ***n*** objects and you still want to select some number,

 ***k***, of them, but ***their order does not matter***.>

문제유형 From a box of 12 candles, you are to remove 5. How many different sets

 of 5 candles could you remove?

 문제유형 If 8 schools are all in the same conference, how many soccer games are

 played during the season if the teams all play each other exactly once?

□ When there is an even number of terms in a set, the ***median*** is the average of the two

middle terms.

□ ***Mode***: the number that appears most frequently.

□ The ***Interquartile range***

 The ***1st quartile (Q1)*** : the median of all of the numbers below the mean

The **2nd *quartile (Q2)***: the median of the entire data set

The **3rd *quartile (Q3)***: the median of the numbers above **Q2**

🡺 a ***box-and-whisker plot*** or a ***box plot***

□ The ***Standard deviation***

 : Find the **arithmetic mean** of the set

🡺 Find the ***differences*** between the mean and each value in the set

 🡺 ***Square*** each of the differences

 🡺 Find the ***average*** of the squared differences

 🡺 Take the positive ***square root*** of the average