Kuwait University Aptitude Test (Review Sheet) by EduKuwait

Real numbers:

1. Divisibility rules

2	A number is divisible by 2 if the number ends in an even number	238 The number 8 is even
3	A number is divisible by 3 if the sum of the digits is divisible by 3	375 3+7+5= 15 15 is divisible by 3
4	A number is divisible by 4 if the last 2 digits are divisible by 4	412 12 is divisible by 4
5	A number is divisible by 5 if the number ends in a 0 or 5	585 840 The numbers end in a 0
6	A number is divisible by 6 if the number is divisible by 2 and 3	48 48 is divisible by 2 and 3
9	The numbers are divisible by 9 if the sum of the numbers is divisible by 9	756 7+5+6=18 18 is divisible by 9
10	In numbers divisible by 10 if the number ends in a 0	500 970 the numbers end in a 0

2. Fractions

$ab + ac = a(b + c)$	$\frac{a}{b} - \frac{c}{d} = \frac{ad - bc}{bd}$
$a\left(\frac{b}{c}\right) = \frac{ab}{c}$	$\frac{a - b}{c - d} = \frac{b - a}{d - c}$
$\frac{\left(\frac{a}{b}\right)}{c} = \frac{a}{bc}$	$\frac{a + b}{c} = \frac{a}{c} + \frac{b}{c}$
$\frac{a}{\left(\frac{b}{c}\right)} = \frac{ac}{b}$	$\frac{ab + ac}{a} = b + c$
$\frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd}$	$\frac{\left(\frac{a}{b}\right)}{\left(\frac{c}{a}\right)} = \frac{ad}{bc}$

3. Exponents

$2^0 = 1$	$3^2 * 3^5 = 3^{2+5} = 3^7$
$17^1 \equiv 17$	$\frac{3^5}{3^2} = 3^{5-2} = 3^3$
$\sqrt{4} = 4^{\frac{1}{2}}$	$(3^2)^5 = 3^{2\times5} = 3^{10}$
$\sqrt[3]{27} = 27^{\frac{1}{3}}$	$\left(\frac{3}{4}\right)^2 = \frac{3^2}{4^2}$
$9^{-2} = \frac{1}{9^2}$	$\left(\frac{3}{4}\right)^{-2} = \left(\frac{4}{3}\right)^2$
$2^5 \times 3^5 = (2 \times 3)^5$	$\frac{3^{-2}}{4^{-5}} = \frac{4^5}{3^2}$
$81^{\frac{3}{2}} = \sqrt[2]{81^3}$	

4. Square roots

$\sqrt{225} = 15$ (always the positive number)

$a, b \geq 0$ for even n	
$\sqrt[n]{a} = a^{\frac{1}{n}}$	$\sqrt[n]{ab} = \sqrt[n]{a}\sqrt[n]{b}$
$\sqrt[m]{\sqrt[n]{a}} = \sqrt[mn]{a}$	$\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$

Polynomials:

$x^2 - a^2 = (x + a)(x - a)$
$x^2 + 2ax + a^2 = (x + a)^2$
$x^2 - 2ax + a^2 = (x - a)^2$
$x^2 + (a + b)x + ab = (x + a)(x + 6)$
$x^3 + 3ax^2 + 3a^2x + a^3 = (x + a)^3$
$x^3 + a^3 = (x + a)(x^2 - ax + a^2)$
$x^3 - a^3 = (x - a)(x^2 + ax + a^2)$

Note: If you do not want to memorize these formulas, please look at the videos on our website for easier solutions

To find the number of solutions for a polynomial of degree 2, find:
$\mathbf{b^2 - 4ac}$

$b^2 - 4ac = 0 \rightarrow$ 1 solution
$b^2 - 4ac > 0 \rightarrow$ 2 solutions
$b^2 - 4ac < 0 \rightarrow$ No solutions

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Functions:

A function gives us one output only.

$g^{\circ}f(x) = g(f(x))$
$f^{\circ}g(x) = f(g(x))$

Domain of the function

R = All real numbers
∅ = No solution

In numerators:

$\sqrt[n]{x}$ { If n is even, x has to be ≥ 0
If n is odd, the domain is R

In denominators

$\frac{x}{y} \rightarrow y \neq 0$ $\quad \frac{x}{\sqrt[n]{y}}$ { If n is even, $y > 0$
If n is odd, $y \neq 0$

Absolute values:

$\lvert a\rvert = \lvert -a\rvert$	$\lvert ab\rvert = \lvert a\rvert\lvert b\rvert$	$\lvert a + b\rvert \leq \lvert a\rvert + \lvert b\rvert$
$\lvert a\rvert \geq 0$	$\left\lvert\frac{a}{b}\right\rvert = \frac{\lvert a\rvert}{\lvert b\rvert}$	$\lvert a\rvert = \begin{cases} a, \text{if } a \geq 0 \\ -a, \text{if } a < 0 \end{cases}$

Rule A $|x| = \begin{cases} x \text{ if } x \geq 0 \\ -x \text{ if } x < 0 \end{cases}$

Rule B $|a| = b \text{ only if } a = b \text{ or } a = -b$

Rule C $|a| = |b| \text{ only if } a = b \text{ or } a = -b$

Rule D If you have $3\sqrt{x^3}$ or $\sqrt{x^2}$ or $\sqrt[n]{x^n}$ etc.

Replace the root with |x| if the root is even $\sqrt{x^2}, \sqrt[4]{x^4}, \sqrt[6]{x^6}$
Replace the root with X if the root is odd $\sqrt[3]{x^3}, \sqrt[5]{x^5}, \sqrt[7]{x^7}$

i.e. $\sqrt{x^2} = |x|$ (for both positive and negative numbers)
$\sqrt[3]{x^3} = x$ (for both positive and negative numbers)

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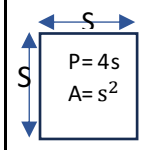
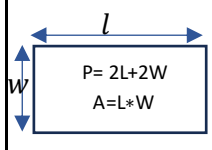
2D & 3D Shapes:

2D (Perimeters & Areas)

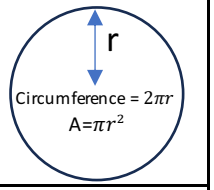
Square



Rectangle

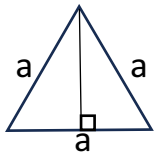


Circle



Equilateral Triangle

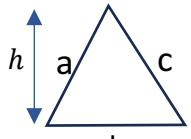
$p = 3a$



$A = \frac{\sqrt{3}}{4} * a^2$

Triangle

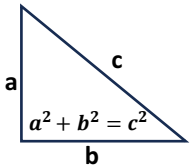
(Sum of all angles = 180^0)



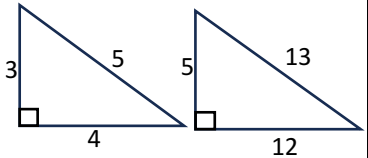
$p = a + b + c$

$A = \frac{1}{2} b * h$

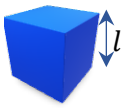
Right Triangles



Popular right triangles

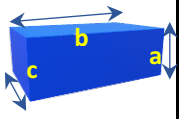


3D (surface areas & volumes)



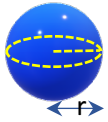
Cube
Surface area
$A = 4l^2$
Volume
$V = l^3$

Cuboid



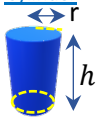
Surface area
$A = 2(ab + +bc + ac)$
Volume
$V = abc$

Sphere



Surface area
$A = 4\pi r^2$
Volume
$V = \frac{4}{3}\pi r^3$

Cylinder



Surface area
Curved
$A = 2\pi rh$
Volume
$V = \pi r^2 h$

Inequalities:

To find the range, you can either solve directly using the methods in our notes and "skip the interval method" or plug in numbers from the solutions into the main equation and see if it satisfies the condition (back solving).

Percentages: (also review the percentages quick sheet)

$$\%\ \text{increase/decrease} = X \pm \frac{\text{increase/decrease}}{100} * X = \text{new amount}$$

$$\%\ \text{Change} = \left|\frac{\text{New amount} - \text{Old amount}}{\text{Old amount}}\right| * 100$$

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Word problems (Applications)

Conversion Rates	1000 m = 1 km 100 Cm = 1 m 1000 mm = 1 m
	1000 g = 1 kg
	1000 ml = 1 liter
	1 min = 60 seconds 1 hour = 60 minutes 1 hour = 3600 seconds
Venn diagram problems	Total = A+B – Both + Neither
Growth or Loss	$y = a(b)^{\frac{t}{m}}$ y = new amount a = original amount b = Growth/Loss in terms of what is remaining t = total time m = time for each Growth/Loss
Work	Working together $\frac{1}{\text{Rate A}} + \frac{1}{\text{Rate B}} = \frac{1}{\text{Rate together}}$ Working against each other $\frac{1}{\text{Rate A}} - \frac{1}{\text{Rate B}} = \frac{1}{\text{Rate against each other}}$
$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$	
Interest = Capital * Interest rate * Years	

General tips

1. Do not multiply numbers until the very end after you have crossed off and simplified everything.
2. Factor polynomials whenever possible to make solving easy.
3. If you have n-unknown you need n-equations to solve.
4. When stuck, look at the answer choice for hints on how to solve.
5. If the question asks you to compare the answer choices, always start with the easiest choice.

Alternatives ways of solving

A. Substitution: plug a random number into X or Y or any variable into the question and the answer choices and see which choices give you the correct answer. You must check all the answers chosen.

B. Back solving: plug in numbers from the answer choice into the main equation and see if it satisfies. Mostly used for domain, solution sets, value, and word problems.

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