I- Answer by ***true*** or ***false***:

a. $\sqrt{-2\times(-3)}=\sqrt{-2}\times\sqrt{-3}$

b. The square roots of 4 are ∓ 2

c. The opposite of $\sqrt{2}$ is $\sqrt{-2}$

d. If x is a positive number, then $\sqrt{x}$ is always positive.

e. If x is a negative number, then $\sqrt{-x}$ doesn't exist.

f. $\sqrt{(-5)^2}=-5$

g. $\dfrac{\sqrt{8}}{2}=4$

h. $\sqrt{(2-7)^2}=-5$

i. $\sqrt{(\pi-2)^2}=\pi-2$

j. $\sqrt{(\pi-5)^2}=\pi-5$

k. $\sqrt{z^2}=z$

l. If $x>0$, then $\sqrt{4x^2}=\pm 2x$

m. If $x<0$, then $\sqrt{4x^2}=-2x$

II- Indicate true statements and correct false ones:

a. $\sqrt{-10^2}=-10.$

b. $\sqrt{(-5)^2}-\dfrac{\sqrt{5^2}}{5}=4.$

c. $\dfrac{\sqrt{7}}{3}$ is the positive square root of $\dfrac{7}{9}$.

d. $\sqrt{\dfrac{25}{100}}=0.05.$

e. $\sqrt{\dfrac{9}{100}}=0.3.$

f. $\dfrac{\sqrt{9}}{9}=1.$

g. -3 is the negative square root of -9.

h. The square roots of: $\sqrt{\dfrac{5}{45}}$ *are* $\sqrt{\dfrac{1}{3}}$ & $-\sqrt{\dfrac{1}{3}}$.

i. $\sqrt{25}-\sqrt{16}=3.$

j. *If* $x^2=5$ *then*, $x=25$ *or* $x=-25$.

k. *If* $x^2=-(-3)^2$ *then* $x=-9$.

l. *If* $x^2=10^{-2}$ then it is impossible to find value of x.

III- ***i-*** Complete the following table:

Compute the numerical values of	For $x=1$	For $x=0$	For $x=3$	For $x=5$
$A=\sqrt{(x-2)^2}$				

ii- Is it true that $\sqrt{(x-2)^2}=x-2$ for all real values of x? Explain.

iii- For what values of x is $A=0$?

IV- Write the following in the form of $a\sqrt{b}$ (where a & b are two strictly positive real numbers).

$a)$ $\sqrt{32}$ $\quad b)$ $\sqrt{2500}$ $\quad c)$ $\sqrt{0.009}$

$d)$ $5\sqrt{11\times 33}$ $\quad e)$ $-5\sqrt{6\times 15}$ $\quad f)$ $-2\sqrt{10}\times 3\sqrt{35}$

V- Consider the points *A*, *B* and *C* such that $AB=\sqrt{12}, BC=\sqrt{75}$ *and* $AC=\sqrt{147}$.
Show that points *A*, *B* and *C* are collinear.

VI- Choose for each question the ***only correct answer*** that corresponds to it, with ***justification***.

No.	Questions	Expected answers		
		a	B	c
1.	Among these numbers $2\pi, -\sqrt{39}, \frac{\sqrt{9}}{3}$, there is	One irrational number	Two irrational numbers	Three irrational numbers
2.	$0.\overline{4} + 2.\overline{14}$	$2.\overline{54}$	$2.\overline{58}$	$2.\overline{418}$
3.	$2^2 + 2^{-2} =$	2^0	4^0	$\frac{17}{4}$
4.	$\sqrt{0.\overline{4}} =$	$0.\overline{2}$	0.2	$\frac{2}{3}$
5.	$\sqrt{7.\overline{1}} - \frac{13}{6} =$	$-\frac{5}{3}$	$\frac{1}{2}$	-1
6.	If $\begin{cases} A = 6 + 2\sqrt{5} \\ B = 6 - 2\sqrt{5} \end{cases}$ then $\sqrt{A \times B} =$	16	4	± 4
7.	$\left(4\sqrt{2} - 2\right)\left(\sqrt{2} + 1\right) - \left(\sqrt{2} + 1\right)^2$ is	An integer	A rational number	An irrational number
8.	Given a triangle ABC of sides $AB = \sqrt{2 + \sqrt{3}}\,cm$, $AC = \frac{\sqrt{6} + \sqrt{2}}{2}$ and $BC = 1 + \sqrt{3}$ cm, then	triangle ABC is isosceles at B	triangle ABC is scalene	triangle ABC is right and isosceles at A
9.	If $x < 0$, then $\sqrt{16x^2 + 9x^2} =$	$7x$	$-5x$	$5x$

VII- Consider an equilateral triangle ABC of sides $AB = \sqrt{a} + \sqrt{8}; BC = b\sqrt{2} + \sqrt{18}$ and $AC = \sqrt{200} - 3\sqrt{2}$.

i- For what values of $a \& b$ are the sides of the given triangle defined? Explain.

ii- Evaluate $a \& b$, so that $a \geq 0 \& b > -3$.

VIII- Fill with the appropriate number:

$i.\ \sqrt{2 + ...} = 3.$ $\quad ii.\ \sqrt{3 \times 6 + ...} = 11.$ $\quad iii.\ \sqrt{64 + 36} = ...$

$iv.\ \sqrt{25 - ....} = 3.$ $\quad v.\ \sqrt{480 - 3 \times ....} = 21.$

IX- Write the following expressions without radicals, i***f possible***:

$A = \sqrt{\sqrt{4^2} - \left(\sqrt{13}\right)^2 + 5^2}$ $\quad C = \sqrt{3^2 - \left(3\sqrt{2}\right)^2 + \sqrt{7^2}}$ $\quad E = \sqrt{6 - \sqrt{21 + \sqrt{13 + \sqrt{7 + \sqrt{4}}}}}$

$B = \sqrt{(-2)^3 + 5^2 - \left(2\sqrt{2}\right)^2}$ $\quad D = 3\sqrt{\frac{8}{27}} + \frac{3}{4}\sqrt{\frac{128}{3}}$ $\quad F = \sqrt{11 - \sqrt{2 + \sqrt{8 - \sqrt{13 + \sqrt{9}}}}}$

X- Reduce the following:

$A = 2\sqrt{7} - 3\sqrt{7} + \sqrt{7} - 5\sqrt{7}.$

$B = 6\sqrt{2} - 7\sqrt{72} + 5\sqrt{50}.$

$C = 2\sqrt{3} - 4\sqrt{2} - 5\sqrt{3} + 7\sqrt{2}.$

$D = 3\sqrt{7} + 7\sqrt{28} - 6\sqrt{63} + 2\sqrt{700} - 12\sqrt{7}.$

XI- Simplify:

$A = (\sqrt{5} - 2)(\sqrt{3} + 2\sqrt{6}).$

$B = (3\sqrt{2} - 2\sqrt{3})(3\sqrt{2} + 2\sqrt{3}).$

$C = (3 - 2\sqrt{2})^2 + 12\sqrt{2}$

$D = (\sqrt{3} - \sqrt{2})^2.$

$E = \sqrt{2}(\sqrt{2} - \sqrt{3}) + \sqrt{3}(5 - \sqrt{2}) + 5 - 2\sqrt{27}.$

XII- Solve each of the following equations, if possible:

a. $x^2 = 9$

b. $x^2 = 1600$

c. $x^2 = \dfrac{45}{16}$

d. $9x^2 - 25 = 0$

e. $(x+1)^2 = 49$

f. $x^2 + 4 = 0$

g. $\sqrt{x} = 1.2$

h. $\sqrt{x} = 3\sqrt{2}$

i. $\sqrt{x} + \sqrt{25} = 4$

j. $\sqrt{x+1} = 3$

k. $\sqrt{x} + \sqrt{16} = 5$

XIII- Simplify the following expressions, such that *x*, *y*, *z*, *a*, *b*, *c*, & *n* are positive integers.

a. $\sqrt{x^4 y^5 z^6}$

b. $2xy\sqrt{25x^3 y^2}$

c. $\sqrt{\dfrac{9x^7 y^{15}}{16a^{13} b^5}}.$

d. $\sqrt{\dfrac{xy}{9bc}} \times \sqrt{\dfrac{8xy}{b^3 c^5}}$

e. $\sqrt{\dfrac{10^n}{3^{2n+1}}} \times \sqrt{\dfrac{10^n}{3}}.$

f. $\dfrac{2}{3}\sqrt{9^n \times 2^{2n}}.$

XIV- Answer by ***True*** or ***False*** with ***justification*** and ***correct*** the false statements:

1. Given that $a = \sqrt{(3 - \sqrt{3})^2}$ and $b = \sqrt{(1 - \sqrt{3})^2}$, then $\dfrac{a}{b} = \sqrt{3}.$
2. If $A = 15.\overline{45} + \dfrac{1}{3}$, then can be written in the form: $A = \dfrac{4735}{103}.$

XV- Compare the following:

a. $A = 5\sqrt{2}$ & $B = 7\sqrt{2}$

b. $C = 3\sqrt{2}$ & $D = 2\sqrt{3}$

c. $R = -4\sqrt{5}$ & $N = -5\sqrt{3}$

d. $A = -5 - 7\sqrt{7}$ & $B = -4 - 6\sqrt{7}$

e. $C = 7 - 2\sqrt{5}$ & $D = 5 - 3\sqrt{5}$

XVI- The dimensions of a rectangle are: $r = 7 + 2\sqrt{5}$ *and* $n = 3 + \sqrt{5}.$

a. Compute the expression: $r - n.$

b. Deduce which of the dimensions r *or* n represents the width of the rectangle.

c. Find the length of the rectangle's diagonal.

d. Calculate the area and the perimeter of the given rectangle.

XVII- Let x b e a real number defined by: $x=\sqrt{8-2\sqrt{7}}-\sqrt{8+2\sqrt{7}}$

a- Compare $8-2\sqrt{7}$ and $8+2\sqrt{7}$. Deduce the sign of *x*. (1pt)

b- Show that $x^2=4$. Deduce the value of x.

XVIII- Rationalize denominator of the following:

$a.\ \frac{2}{\sqrt{3}}$ $b.\ \frac{3}{2\sqrt{5}}$ $c.\ \frac{2\sqrt{3}}{5\sqrt{7}}$ $d.\ \frac{1-\sqrt{3}}{\sqrt{2}}$

$e.\ \frac{\sqrt{5}-2}{3\sqrt{3}}$ $f.\ \frac{1}{1-\sqrt{5}}$ $g.\ \frac{3}{\sqrt{13}-2}$ $h.\ \frac{5}{\sqrt{11}+2}$

$i.\ \frac{1}{\sqrt{2}-\sqrt{3}}$ $j.\ \frac{3}{2\sqrt{3}-3\sqrt{2}}$ $k.\ \frac{5}{\sqrt{3}+\sqrt{7}}$ $l.\ \frac{\sqrt{3}}{\sqrt{5}-2\sqrt{3}}$.

XIX- Consider the following expressions: $X=\frac{7-3\sqrt{5}}{3+\sqrt{5}}$ *and* $Y=\left(2-\sqrt{5}\right)^2$

a. Show that: $X=Y$

b. Prove that: $\sqrt{\frac{7-3\sqrt{5}}{3+\sqrt{5}}}+\frac{4\sqrt{5}-5}{\sqrt{5}}$ is an integer.

XX- Consider the two numbers: $x=\sqrt{5}-2$ & $y=\sqrt{5}+2$.

a. Show that $x+y=\frac{1}{x}+\frac{1}{y}$.

b. Let $A=\sqrt{2}(\sqrt{3}+1)$ *and* $B=2-\sqrt{3}$.

c. Show that A^2+B^2 is an integer.

For the gifted: you try it, and definitely you can do it on your own. You'll be rewarded.

A circular target has a diameter of 1m. A smaller circle is placed within the target. What should the diameter of the smaller circle be if a complete beginner has the chance to hit the inner circle as often he or she hits the outer circle. (***Draw a sketch of your own***)

Mastering problems		
Chapter	*Exercises*	*Pages*
CH-: Powers	1,2,4,5,6,7,8,9,10,12,13,15 &17	$122\to125$