| Al-Mahdi High | Mathematics | $10^{th}$-Grade |
|---|---|---|
| Name: . . . . . . . . | "Absolute value & Intervals" | W.S-3 |

*I-* Find the absolute value of each of the following:

$a=\sqrt{5}-3$ $\quad b=2-\sqrt{7}$ $\quad c=3\times10^{-4}$

$d=(-3)^{101}$ $\quad e=\pi+x^2$ $\quad f=-\frac{1}{2}+\frac{3}{4}$

*II-* Choose the only correct answer:

| No. | Question | Expected Answers | | |
|---|---|---|---|---|
| | | a | b | c |
| 1. | $2^3-\left\|2^2-2\right\|=$ | 2 | 4 | 6 |
| 2. | If $x\le 2$ then $\|2-x\|=$ | $2-x$ | $-x-2$ | $x-2$ |
| 3. | For all $x\in\Re^{*+}$ then | $\|x\|<0$ | $\|-x\|=x$ | $\|x\|=-x$ |
| 4. | $]-\infty,3]\cap]-2,5[=$ | $]-\infty,5[$ | $]-2,3]$ | $[3,5[$ |
| 5. | $]-\infty,3]\cup]-2,5[=$ | $]-\infty,5[$ | $]-2,3]$ | $[3,5[$ |
| 6. | If $-10\le 2x<-8$ then | $4\le x<5$ | $4<x\le 5$ | $-5\le x<-4$ |

*III-* Compute the numerical value of: $N=2a-|a-3b|+b^2$ where, $a=-1\,\&\,b=2$ .

*IV-* Give the geometric (graphical) meaning of:

a) $|x+\sqrt{2}|$ $\qquad$ b) $|x+2|=|x-1|$

*V-* Compare the following:

*a*) $|3n-5|$ *and* $|3n|+5$

*b*) $|2+3x|$ *and* $2+3|x|$

*VI-* Write in form of double inequality (Without absolute value).

a. $-|-3x-4|\le 8$ $\qquad$ b. $-|-7x-9|>-5$.

*VII-* Write in form of a single inequality (Using absolute value).

a. $-3<x<5$ ; $-\frac{28}{3}<x<14$ ; $x\in]-1,5[$.

b. $-4<y<16$ ; $-2.1<y<5.3$ ; $y\in]-\infty,1]\cup[4,+\infty[$.

*VIII-* Express without absolute value sign:

$A=|x+1|\times|-3x-6|+\left|\frac{x}{x^2+1}\right|\times|x^3+x|$ $\qquad B=\left|\frac{2x}{1-x}-2x\right|$ , where $x>1$

*IX*- Solve in $\mathbb{R}$.

a. $|-a| = a$ ; $-|a| = a$ ; $\frac{1}{a} = -\left|-\frac{4}{5}\right|$.

b. $|5-n| = 7$ ; $\left|n-\frac{3}{2}\right| = |-3||n+7|$ ; $|3-|n-5|| = 13$.

*X*- Let $I_1 = [1;5], J_1 = ]-\infty;3], I_2 = ]-10;0[ \,\&\, J_2 = [0;3[$ be intervals in $\mathbb{R}$.

a. Determine the center and length of the intervals $I_1 \& I_2$.

b. Find $I_1 \cup J_1, I_1 \cap J_1, I_2 \cup \overline{J_2}, \& \overline{I_2 \cap J_2}$.

*XI*- Consider the sets:

$A = \{x \in \Re / |x-1| > 2\}$ & $B = \{x \in \Re / |2x+1| < 4\}$

Write $A, B, A \cap B, A \cup B$ using intervals. `

*XII*- Show that if: $|x-1| \le \frac{1}{3}$ *then* $|3x-3| \le \frac{3}{2}$.

$|x-2| < \frac{1}{4}$ *then* $|x^2-4| < \frac{5}{4}$.

*XIII*- Solve in $\mathbb{R}$, the following equations:

$a)\ \left(8^x\right)^{-x-2} = 2^3$.

$b)\ \frac{3}{2x-4} + \frac{x-3}{x^2-2x} + \frac{2x^2+7}{2x^2-4x}$.

$c)\ 3|x+3| + 2|2x+8| = 5$.

$d)\ 3|x-4| - 2|3x+1| = 2$.

$e)\ 3|2-x| + 2|5-x| = 6$.

*XIV*- Do not fall into the trap $|-a| = a$.

a. For what real values of $a$ is the given equation correct?

b. For what real values of $a$ is it not valid?

*XV*- Solve the following inequalities. Express the solution sets as intervals or union of intervals and graph them. Use the result $\sqrt{z^2} = |z|$ as appropriate.

$a)\ x^2 < 3$ $b)\ 9 \le x^2$ $c)\ \frac{1}{9} < x < \frac{1}{4}$

$d)\ (x-1)^2 < 4$ $e)\ x^2 - x < 0$ $f)\ x^2 - x - 2$ $(Solve\ "e \,\&\, f"\ in\ two\ ways)$

*XVI*- Solve: $\left|\sqrt{x^2+9} + (x-2)\right| \times \left|\sqrt{x^2+9} - (x-2)\right| = 4$

*XVII*- Consider on $x'Ox$ the points $A(-2), B(4) \& M(x)$

a. Express in terms of $x$, the distance $AM$ & $BM$.

b. Determine the set of values of $x$, so that:

i. $AM = 3$

ii. $BM < 7$