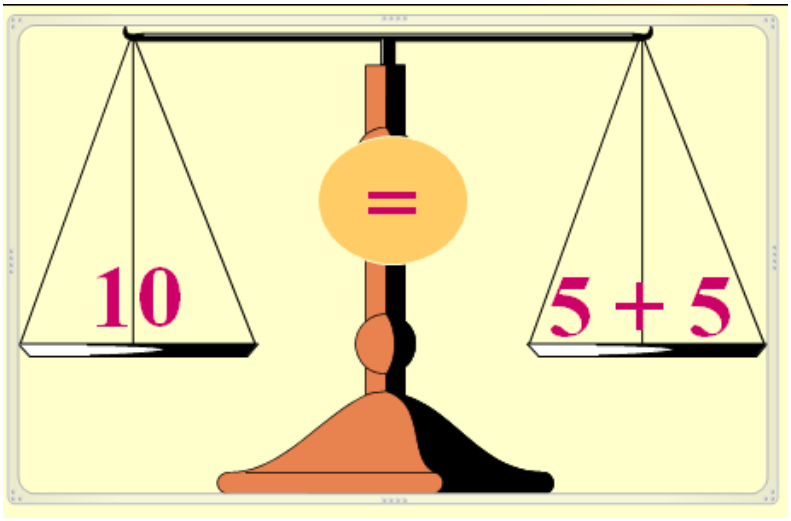
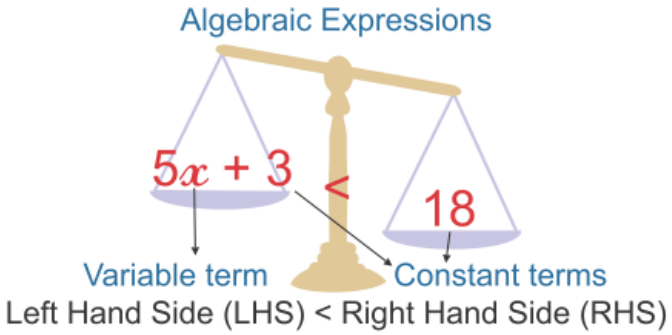
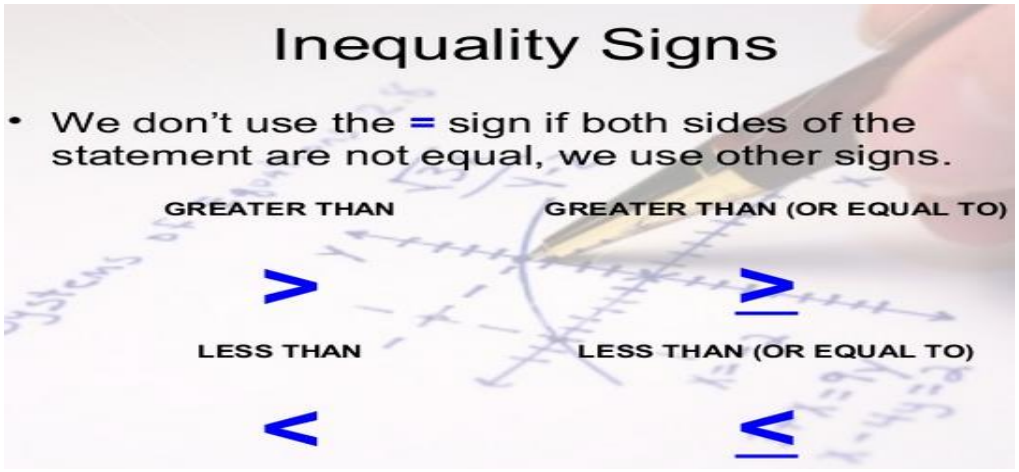
Algebra-2 (Inequality and Modulus)

Equal or Unequal?

- We call a math statement an ***EQUATION*** when both sides of the statement are **equal** to each other.
  - Example: $10 = 5 + 3 + 2$
- We call a math statement an ***INEQUALITY*** when both sides of the statement are **not equal** to each other.
  - Example: $10 \neq 5 + 5 + 5$







You must be 18 or older to vote.

Your age must be "greater than **or** equal to 18", which is written:

$$\text{Age} \geq 18$$

A **solution** of an inequality is a number which when substituted for the variable makes the inequality a true statement.

For example: 50 is a solution of $2x+5 < 3x-6$

because $2 \cdot 50+5<3 \cdot 50-6$

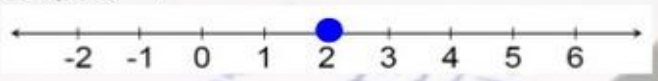
ALWAYS EXPRESS THE ANSWER AS AN INTERVAL!

If $x>11$, the solution is $(11,\infty)$

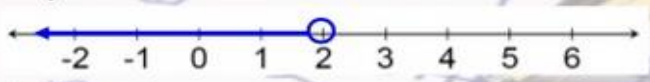
If $x \leq 3$, the solution is $(-\infty,3]$

Graphing Inequalities

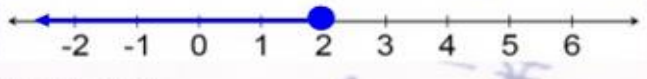
- **Graph x = 2**



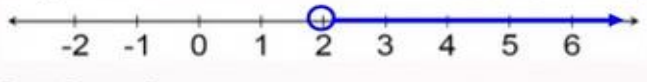
- **Graph x < 2**



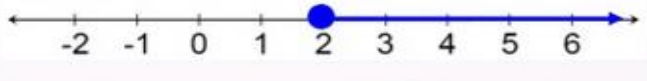
- **Graph x ≤ 2**



- **Graph x > 2**



- **Graph x ≥ 2**



A "closed" circle (●) indicates we include the number.

An "open" circle (○) indicates we ***DO NOT*** include the number.

By shading in the number line we are indicating that all the numbers in the shade are also possible answers.

Addition property of inequalities: If $A < B$ then, $A + c < B + c$

Subtraction property of inequalities: If $A < B$, then $A - c < B - c$

Multiplication property of inequalities: If $A < B$, then $cA < cB$

If $A < B$, then $-cA > -cB$

Division property of inequalities: If $A < B$, then $\frac{A}{c} < \frac{B}{c}$

If $A < B$, then $\frac{A}{-c} > \frac{B}{-c}$

Solve the inequality for x:

(i) $x^2-17x+60 \geq 0$

(ii) $(x+3)(2x-5)x \leq 0$

(iii) $(x^2+5)(x-7)(x+3) > 0$

(iv) $(x-5)^2(x+1)^3(x-10)^3 \geq 0$

Q.

$$\frac{(x-7)}{(x+8)} \leq 0$$

Quantity A	Quantity B
Number of integral values x can take	15

Ans C

Modulus (Absolute value)

“In life be like modulus so that the result is always positive or at least neutral.” -HJ

In Mathematics if a number or quantity is –ve then it knocks the door of Modulus. Now I don’t want be –ve anymore. Please make me +ve. Then modulus replies that you need to confine yourself into 2 walls(||) then only I can make you +ve.

$|x| = x$ if $x \geq 0$

$= -x$ if $x < 0$

$|x| = |-x|$

$|x|^2 = x^2$

Find the value of x?

$|x-7| = 5$

$|2x-7| = -7$

“God helps those who, helps themselves and modulus helps only negative.”

$x^2+5|x|+6=0$, Find the number of real solutions?

Ans: 0

Q. Find the minimum value of y?

$y = 20+|2x-7|$

Ans: 20

a + minimum = minimum

a + maximum = maximum

a - Minimum = Maximum

a – maximum = minimum

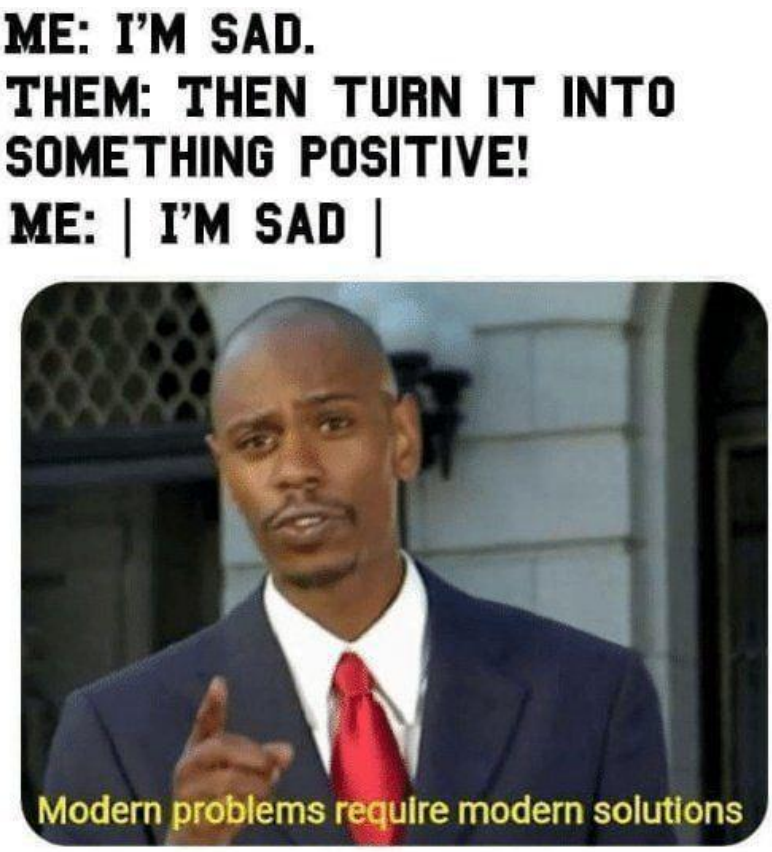
Q.

$|x+5|+|x-7| = 28$

Ans: 15,-13

$|4-2x|+|x+7| = 30$

Ans:



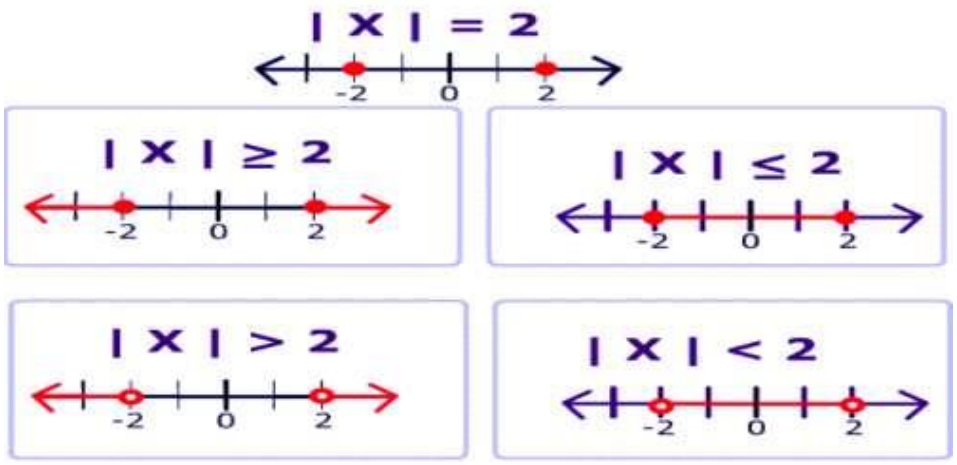
Find the minimum value of y as well as value of x for which y is minimum?

(i) $y = |x+4| + |x-7|$

Ans Min value = 11 for $-4 \leq x \leq 7$

(ii) $y = |2x-8| + |x+4|$

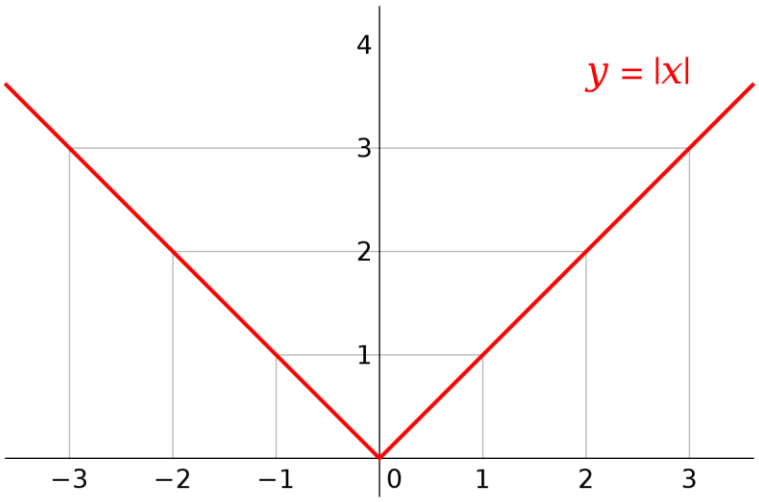
Ans : Minimum value = 8 for x = 4

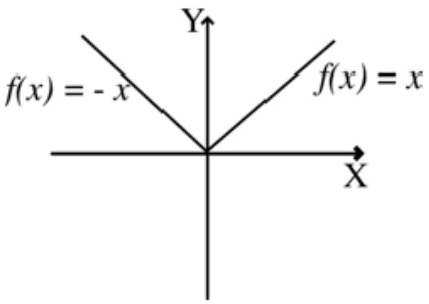


Q. |x-5|> 7, Solve for x?

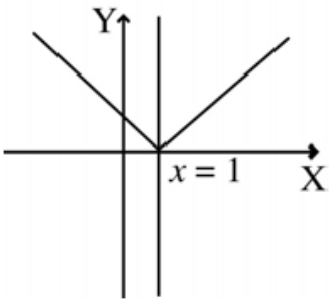
Q. |x+2|≤ 10

Quantity A	Quantity B
Number of integral values x can take	19

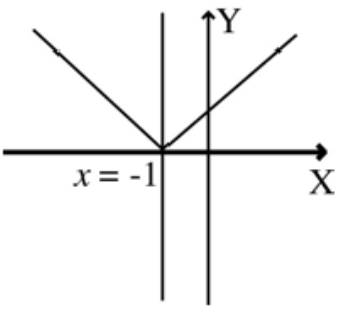




f(x) = | x |



f(x) = | x– 1|



f(x) = | x + 1|

Q. $xy > 0$

Quantity A	Quantity B
$\frac{x}{y}$	0

Soln: A

Q. $a > 0$

Quantity A	Quantity B
a^b	0

Soln: A

Q.

Quantity A	Quantity B
$\frac{2^{50}}{3^{50}}$	$\frac{2^{50}+7^{20}}{3^{50}+7^{20}}$

Soln: If $\frac{a}{b}<1$ and a,b,x are positive

Then $\frac{a}{b} < \frac{a+x}{b+x} < \frac{a+2x}{b+2x}$.....

Answer is B.

Q. x & y are positive

Quantity A	Quantity B
xy	$(xy)^2$

Soln: D

Q

Quantity A	Quantity B
$2\times3\times4\ldots..\times23$	$5\times6\times7\ldots..\times24$

Soln: 5 to 23 are common both the sides. Remove common part and now compare the remaining values.

$2\times3\times4 \quad = \quad 24$

Ans-C

Q.

Quantity A	Quantity B
$\frac{\sqrt{65}-\sqrt[3]{63}}{\sqrt{15}}$	1

Soln: $\sqrt{65}>8$, $\sqrt[3]{63}<4$ & $\sqrt{15}<4$

$$\frac{(>8)-(<4)}{(<4)} = \frac{>4}{<4} > 1$$

Ans: A

Q. $\sqrt[3]{m^4} = \frac{7}{11}$

Quantity A	Quantity B
m	$\frac{7}{11}$

Soln: If $0<a<1$ and $0<b<1$, then $a < a^b < 1$

If $0<a<1$ and $b>1$ then $a^b < a < 1$

If $a>1$ and $0<b<1$ then $1 < a^b < a$

If $a>1$ and $b>1$ then $1 < a < a^b$

Ans: A

Q.Quantity A	Quantity B
$9\frac{3}{4}$	$9+\frac{3}{4}$

Ans C

Q. N = 113×133×239×169×209.

Quantity A	Quantity B
Increase in N when 113 is increased by 20	Increase in N when 169 is increased by 20

Soln: Answer is A

Q.x>y>0

Quantity A	Quantity B
$\left(\frac{x}{y}+\frac{y}{x}\right)$	2

Soln: For +ve numbers AM ≥ GM ≥ HM

Answer A

Q.

Quantity A	Quantity B
The tens digit of $(4^{100}\times5^{99})$	The tens digit of $(4^{100}\times5^{101})$

Soln: C

Q.n is an integer

Quantity A	Quantity B
$7.23\times10^{(n+1)}$	$723\times10^{(n-1)}$

Soln: C