High Impact GED

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Basic Math

Fractions and Decimals in Order

When asked to put numbers in order from least to greatest it is important to make sure your numbers are all in the same form. It is easiest to change a fraction, or a percent, to a decimal.

- A percent to a decimal, move the decimal two places to the left. **.75% now .75**
- A fraction to a decimal, divide the bottom of the fraction into the top. **Bottom √ Top**

Examples:

a) Which of the following lists the values from least to greatest?

a) $\frac{2}{7}, 0.658, 1.3, \frac{8}{3}, \frac{13}{2}$

b) $\frac{2}{7}, 0.658, \frac{8}{3}, 1.3, \frac{13}{2}$

c) $1.3, \frac{2}{7}, 0.658, \frac{8}{3}, \frac{13}{2}$

d) $\frac{8}{3}, \frac{13}{2}, 1.3, 0.658, \frac{2}{7}$

$$1.3, \frac{8}{3}, \frac{2}{7}, 0.658, \frac{13}{2}$$

b) Between which pair of decimals should $\frac{4}{7}$ be placed on a number line?

e) 0.3 and 0.4

f) 0.4 and 0.5

g) 0.5 and 0.6

h) 0.6 and 0.7

Greatest Common Factor

Greatest Common Factor problems are solved by breaking a number into all its **prime number** parts. Prime numbers are numbers divisible by only themself and 1. (2, 3, 5, 7, 11, 13, 17, 19 …)

- Your answer will ALWAYS be the same number or lower than the numbers given.
- Once you find all the prime factors **each** number individually THEN make a list of all the numbers they have in common and **multiply** them.

Examples:

a) What is the greatest common factor of 7 and 11?
b) What is the greatest common factor of 5 and 20?
c) What is the greatest common factor of 20 and 10?
d) What is the greatest common factor of 12 and 18?

Least Common Multiple

Least Common Multiple are solved by multiplying each number until the first **common** number is found.

- Your answer will ALWAYS be the same number or higher than the numbers given.
- There are always more common numbers as you multiply. You are looking for the **least**.

Examples:

a) Boxes that are 12 inches tall are being piled next to boxes that are 10 inches tall. What is the least height in feet at which the two piles will be the same height?
b) Susan and Daphne are participating in a walk-a-thon at the local community college track to raise money. Susan can walk around the track in 4 minutes. Daphne can walk around the track in 6 minutes. Susan and Daphne started walking at the same time. How many minutes will it be until they complete a lap at the same time?
c) What is the least common multiple of 3 and 15?

Undefined: Questions That are Mathematically Unsolvable

Type 1 Fraction Form:

✓ When zero is on the bottom of a fraction it will be undefined.
✓ 2 x's on the bottom will always result in 2 answers.

Example: What number for x would make the following equation undefined?

$$\frac{x+5}{x(x-4)} \quad x = 4 \text{ and } x = 0$$

$$4(4-4) = 4(0) = 0$$
$$0(0-4) = 0(-4) = 0$$

Both 4 and 0 would make the bottom zero if plugged in for x.
*hint two x's required 2 answers

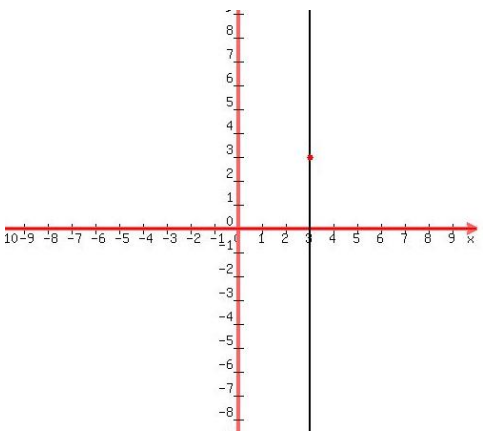
Type 2 Square Root Form:

✓ A negative square root ($\sqrt{\ }$) is undefined.
✓ No two numbers, that are the same, can be multiplied to give you a negative.
✓ Same Signs always result in a positive number when multiplied.

Example: $\sqrt{-16}$ would be undefined because two numbers when multiplied are the ***same*** sign, their product can never result in a negative number.

Type 3 Graph of a Vertical Line:

✓ The slope of a vertical line is considered undefined.
✓ Vertical lines have rise but no run, therefore the denominator of the fractional slope would be zero.
✓ **Example:** (3,0) when y = 0 then x = -3



a) What value for x makes $\frac{5}{3x+1}$ undefined?

b) What value of *x* makes the expression $\frac{x-3}{4+x}$ undefined?

c) What value for x would make the expression $\sqrt{x}$ undefined?

d) Which expression is undefined in the set of real numbers?

a) $\sqrt{-4}$ b. $\frac{0}{4}$ c. 0^4 d. $-4\ x\ 0$

e) Which of the following values of x makes the expression $\frac{4}{(x+4)(5-x)}$ undefined?

a) −9
b) −4
c) 4
d) 9

f) Which of the following values of x makes the expression $\frac{4(x-2)}{(4x+8)(x-3)}$ undefined?

a) $x = -3$
b) $x = -2$
c) $x = 2$
d) $x = 3$

g) Which of the following expressions are undefined when $x = -1$?

a) $\frac{x+1}{x-1}$

b) $\frac{x-1}{x+1}$

c) $\frac{x}{2x+2}$

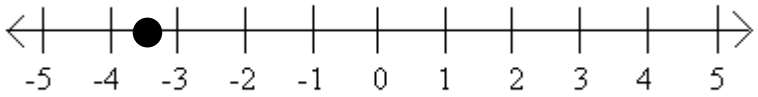
d) $\frac{1}{(x+3)(x+1)}$

Distance / Absolute Value

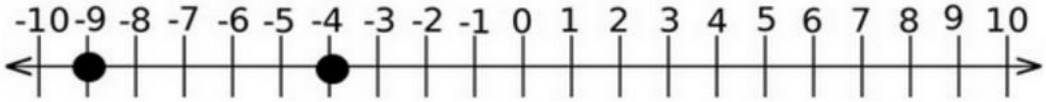
✓ Distance or "how far" questions **never** result in a negative answer
✓ You are being asked for distance from point to point not to IDENTIFY the point.
✓ Absolute Value Bars |#| ask how far the number contained in the |#| is from zero
✓ A negative sign in front of an absolute value changes that positive number back to a negative.

Examples:

a) What is the distance from the point to zero?



b) What is the distance between the two points on the number line?



a) $-9-4$ b) $-9+4$ c) $|-9-4|$ d) $|-9+4|$

c) Simplify $|8-(-3)|$

d) The points -4 and 5 are plotted on a number line. What is the distance, in units, between the two points?

Exponents and Radicals

2nd Power		Square Root		3rd Power	Cube Root
$1^2 = 1$	$7^2 = 49$	$\sqrt{1} = 1$	$\sqrt{49} = 7$	$1^3 = 1$	$\sqrt[3]{1} = 1$
$2^2 = 4$	$8^2 = 64$	$\sqrt{4} = 2$	$\sqrt{64} = 8$	$2^3 = 8$	$\sqrt[3]{8} = 2$
$3^2 = 9$	$9^2 = 81$	$\sqrt{9} = 3$	$\sqrt{81} = 9$	$3^3 = 27$	$\sqrt[3]{27} = 3$
$4^2 = 16$	$10^2 = 100$	$\sqrt{16} = 4$	$\sqrt{100} = 10$	$4^3 = 64$	$\sqrt[3]{64} = 4$
$5^2 = 25$	$11^2 = 121$	$\sqrt{25} = 5$	$\sqrt{121} = 11$	$5^3 = 125$	$\sqrt[3]{125} = 5$
$6^2 = 36$	$12^2 = 144$	$\sqrt{36} = 6$	$\sqrt{144} = 12$		

Square ($\sqrt[2]{\ }$) Roots: **CAN <u>NEVER</u>** BE NEGATIVE (Undefined)

Negative Cube ($\sqrt[3]{\ }$) Roots: **<u>CAN</u>** be negative and the answer will <u>always be negative.</u>

Operations with Radicals

To Add or Subtract Radicals: Add or subtract the numbers in front of the radical sign.

- Only add/subtract **<u>like</u> (the same number)** radicals together $\sqrt{7} + 4\sqrt{7} = 5\sqrt{7}$
- Do the math for any perfect square or cube $3\sqrt[3]{125} + 7\sqrt[3]{125} = 10\sqrt[3]{125} = 10(5) = 50$

To multiply Radicals: multiply the numbers outside (in front of) the radical sign then multiply the numbers under the radical. If your result is a perfect square or cube solve the equation by multiplying the outside by result of the perfect square or cube). Ex: $3\sqrt{2} \times 4\sqrt{8} = 12\sqrt{16} = 12(4) = 48$

Fractional square and cube roots: solve the top and the bottom separately it is okay to solve any perfect square and leave the non-perfect as is. Example: $\sqrt{\frac{4}{7}} = \frac{\sqrt{4}}{\sqrt{17}} = \frac{2}{\sqrt{17}}$

a) $3\sqrt{7} + \sqrt{7}$

b) $\sqrt[3]{-\frac{27}{64}}$

c) What is $\sqrt[3]{15.625}$

d) The cube root of 40 is between which of the following integers?

a. 2 and 3
b. 3 and 4
c. 4 and 5
d. 5 and 6

e) Which of the following is the closest approximation of $\sqrt{80}$?

a. 3
b. 8
c. 9
d. 6,400

Operations with exponents

Zero Power rule: ANY number to the zero power is **equal to 1** Example: $15^0 = 1$

Power Rule: raise any exponent on the inside of an equation to the power on the outside of the equation by **multiplying** the powers. Example: $(x^2y^3)^3$ would be x^{2x3} $y^{3x3} = x^6y^9$

Negative Exponent Rule: Invert Negative exponents to make them positive Example: $5^{-2} = \frac{1}{5^2} = \frac{1}{25}$

Product Rule: When multiplying numbers with exponents you **add the exponents** for any numbers with the same base. Example: $(x^4)(x^5) = x^{4+5} = x^9$

Quotient Rule: When dividing numbers with exponents you **subtract the exponents** for any numbers with the same base. Example: $\frac{x^7}{x^5} = x^{7-5} = x^2$

Fractional Exponents: The bottom number of a fractional exponent becomes the root to the power of the numerator Example: $16^{\frac{1}{2}} = \sqrt[2]{16}\ ^1$=4 or $8^{\frac{2}{3}} = \sqrt[3]{8}^2 = 2^2 = 4$

Examples:

f) $\frac{y^{12}}{y^8}$

g) $(m^{12})\ (m^3)$.

h) $3(22 + (-7)^2$

i) $(2^9 \times 3^5) \times (2^4 \times 3)^2$

j) Use the rules of exponents to simplify the expression $(6-1)^0$.

k) What is the value of $(-9)^3$?

l) Use the rules of exponents to simplify the expression 2^{-2}

m) Use the rules of exponents to simplify the expression $(g^5)^9$.

n) Which expressions in the boxes are equivalent to $\frac{m^3n^6}{m^5n^6}$?

0	1	m^2	$\frac{m^5}{m^3}$	$\frac{n^6}{n^6}$	$\frac{m^2n^6}{n^6}$