

1) Given the following set of numbers, which statement(s) in the box is(are) **true**?

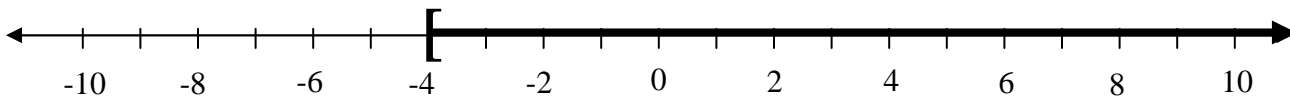
W = Whole Numbers  
 Z = Integers  
 Q = Rational Numbers  
 H = Irrational Numbers  
 R = Real Numbers

- |   |
|---|
| I $W \subseteq Z$<br>II Every number of H is found in set R.<br>III Q would not contain the number $-3.5$ . |
|---|

- A I and II only  
 B II only  
 C II and III only  
 D I only  
 E I, II, and III

Statement 1 is correct. Every whole number is an integer. Statement II is correct. Every irrational number is in the set of Real numbers. Statement III is incorrect. All positive or negative terminating decimals <b>are</b> rational.
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2) Represent the following graph as an inequality and using interval notation.



- A  $x \geq -4, (-4, \infty)$   
 B  $x > -4, [-4, \infty)$   
 C  $x \geq -4, [-4, \infty]$   
 D  $x \geq -4, (\infty, -4]$   
 E  $x \geq -4, [-4, \infty)$

The bracket means -4 is included in the set of numbers, so an equal sign is a part of the inequality. The bold arrow indicates 'greater than': $x \geq -4$ In interval notation, the smallest value is always written first: $[-4, \infty)$
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3) A small raisin weighs 23 g. How much would 8500 such raisins weigh? Use scientific notation.

- A  $(19.55 \times 10^5) g$   
 B  $(1.955 \times 10^4) g$   
 C  $(1.955 \times 10^5) g$   
 D  $(10.8 \times 10^4) g$   
 E  $(1.08 \times 10^5) g$

$  \begin{aligned}  &(23)(8500) \\  &= (2.3 \times 10^1)(8.5 \times 10^3) \\  &= (2.3)(8.5)(10^1)(10^3) \\  &= 19.55 \times 10^4 \\  &= (1.955 \times 10^1) \times 10^4 \\  &= 1.955 \times 10^5  \end{aligned}  $
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An 'adjustment' had to be made, since the # was not between 1 and 10.
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4) Simplify the following. Do not leave any negative exponents.

$$\frac{2x^3(y^{-2})^{-1}}{(8x^{-2}y^{-3})^2}$$

- A  $\frac{x^7y^8}{4}$
- B  $\frac{x^7y^4}{32}$
- C  $\frac{x^3}{32y^2}$
- D  $\frac{x^3y^3}{4}$
- E  $\frac{x^7y^8}{32}$

$$\begin{aligned} \frac{2x^3(y^{-2})^{-1}}{(8x^{-2}y^{-3})^2} &= \frac{2x^3y^2}{64x^{-4}y^{-6}} \\ &= \frac{2x^3x^4y^2y^6}{64} \\ &= \frac{x^7y^8}{32} \end{aligned}$$

5) Evaluate the following expression.  $\left(\frac{27}{8}\right)^{\frac{1}{3}} - 4^{-\frac{1}{2}} + 3^0$

- A  $\frac{9}{2}$
- B  $\frac{7}{2}$
- C 2
- D  $\frac{13}{8}$
- E  $\frac{33}{8}$

$$\begin{aligned} &\left(\frac{27}{8}\right)^{\frac{1}{3}} - 4^{-\frac{1}{2}} + 3^0 \\ &= \left(\frac{27}{8}\right)^{\frac{1}{3}} - \frac{1}{4^{\frac{1}{2}}} + 3^0 \\ &= \sqrt[3]{\frac{27}{8}} - \frac{1}{\sqrt{4}} + 1 \\ &= \frac{3}{2} - \frac{1}{2} + 1 = 2 \end{aligned}$$

Negative exponent:  
Reciprocal to positive  
power

Zero power is always 1.

6) Which statement is **false**?

- A  $3x(2x^2 + 3xy) = 6x^3 + 9x^2y$
- B  $(4x - 2y)(3x - 8y) = 12x^2 - 38xy - 16y^2$
- C  $(5x^2y^3)(-6x^4y^{-2}) = -30x^6y$
- D  $(x + 4)^2 = x^2 + 8x + 16$
- E  $(4x^3 - 5n)(4x^3 + 5n) = 16x^6 - 25n^2$

$$\begin{aligned} &(4x - 2y)(3x - 8y) \\ &= 12x^2 - 32xy - 6xy + 16y^2 \\ &= 12x^2 - 38xy + 16y^2 \end{aligned}$$

This is the false statement.  
The choice had  $-16y^2$ .

- 7) Rationalize the denominator and write the answer in simplest form.  $\frac{3}{\sqrt{18}}$

- A  $\frac{\sqrt{2}}{2}$
- B  $\frac{\sqrt{18}}{6}$
- C  $\frac{1}{\sqrt{2}}$
- D  $\frac{3\sqrt{2}}{6}$
- E  $\frac{3\sqrt{18}}{18}$

$$\begin{aligned} \frac{3}{\sqrt{18}} &= \frac{3}{\sqrt{9 \cdot 2}} \\ &= \frac{3}{3\sqrt{2}} \\ &= \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} \\ &= \frac{\sqrt{2}}{2} \end{aligned}$$

Simplify the radical first!

- 8) Simplify the expression and write the answer as a polynomial in descending order.

$$(3a^2 - 4a + 2) - (4a^2 - 2a + 7) + (2a^2 - 10a + 3)$$

- A  $-3a^2 - 12a - 8$
- B  $a^2 - 12a + 12$
- C  $a^2 - 16a - 2$
- D  $a^2 - 12a - 2$
- E None of the Above

Distribute -1 through second parentheses.

$$\begin{aligned} &= \\ &3a^2 - 4a + 2 - 4a^2 + 2a - 7 + 2a^2 - 10a + 3 \\ &= a^2 - 12a - 2 \end{aligned}$$

- 9) Which trinomial(s) is(are) factored **completely**?

- I  $5x^3 + 15x^2 + 10x = 5x(x + 2)(x + 1)$
- II  $8x^2 - 18x + 4 = (4x - 1)(2x - 4)$
- III  $12x^2 + 36x + 27 = 3(2x + 3)^2$

- A I only
- B III only
- C II and III only
- D I and III only
- E I and II only

I The GCF was factored, then the trinomial. It is completely factored.

II The GCF of 2 was not taken out first. It is **not** factored completely.

III The GCF of 3 was taken out, then the trinomial factored. It is completely factored.

I and III are factored completely.

10) Which is a factor of  $12n^2 - 3mn - 16n + 4m$ ?

- A  $(3n - m)$   
 B  $(4n - m)$   
 C  $(4n + m)$   
 D  $(3n + 4)$   
 E  $(4n - 4)$

$$\begin{aligned} 12n^2 - 3mn - 16n + 4m \\ &= 3n(4n - m) - 4(4n - m) \\ &= (4n - m)(3n - 4) \end{aligned}$$

Grouping was used.  
Remember, the parentheses must 'match'.  
A negative 4 had to be the GCF of the second pair.

11) Multiply and write answer in simplified form.

$$\frac{y^2 + y - 6}{y^2 - 2y} \cdot \frac{y^3 + 3y^2}{y^2 - 9}$$

- A  $-y$   
 B  $\frac{y(y+3)^2}{(y-3)^2}$   
 C  $-y^3$   
 D  $\frac{y(y+3)}{y-3}$   
 E  $\frac{y(y+2)}{y-2}$

Factor each numerator and denominator before cancelling.

$$\begin{aligned} \frac{\cancel{(y+3)}\cancel{(y-2)}}{\cancel{y}\cancel{(y-2)}} \cdot \frac{y\cancel{(y+3)}}{\cancel{(y+3)}(y-3)} \\ = \frac{y(y+3)}{y-3} \end{aligned}$$

12) Add and simplify, if possible.

$$\frac{3}{x+3} + \frac{2}{x-3} + \frac{18}{x^2-9}$$

- A  $\frac{5x+18}{(x+3)(x-3)}$   
 B  $\frac{5}{x+3}$   
 C  $\frac{23}{(x+3)(x-3)}$   
 D  $\frac{5x+15}{(x-3)^2}$   
 E  $\frac{5}{x-3}$

$$\begin{aligned} \frac{3}{x+3} + \frac{2}{x-3} + \frac{18}{(x+3)(x-3)} \\ &= \frac{(x-3)}{(x-3)} \cdot \frac{3}{(x+3)} + \frac{(x+3)}{(x+3)} \cdot \frac{2}{(x-3)} + \frac{18}{(x+3)(x-3)} \\ &= \frac{3(x-3) + 2(x+3) + 18}{(x+3)(x-3)} \\ &= \frac{3x-9+2x+6+18}{(x+3)(x-3)} \\ &= \frac{5x+15}{(x+3)(x-3)} = \frac{5(x+3)}{(x+3)(x-3)} = \frac{5}{x-3} \end{aligned}$$

- 13) Solve this equation:  $\frac{3}{x-2} + \frac{1}{x} = \frac{3}{x-2}$
- A  $x = 0$
  - B  $x = 2$
  - C  $x = -2$
  - D  $x = 1$
  - E No solution

LCD =  $x(x-2)$   $x \neq 0$  or  $2$

$$x(x-2)\left(\frac{3}{x-2} + \frac{1}{x}\right) = x(x-2)\left(\frac{3}{x-2}\right)$$

$$3x + (x-2) = 3x$$

$$4x - 2 = 3x$$

$$-2 = -x$$

$$2 = x$$

However, 2 makes a zero denominator  
No Solution

- 14) The following table represents the number of minutes per day Amanda studied for the 5 days preceding a college algebra exam. The average for those 5 days is also given. Which simplified equation could be used to determine  $x$ , the number of minutes Amanda studied on Tuesday?

DAY	Minutes
Saturday	54
Sunday	35
Monday	70
Tuesday	$x$
Wednesday	135
<b>Average</b>	<b>66</b>

- A  $\frac{294}{5} + x = 66$
- B  $\frac{294 + x}{4} = 66$
- C  $\frac{360}{5} = x$
- D  $\frac{294 + x}{5} = 66$
- E  $294 + \frac{x}{5} = 66$

Sum of Scores  
5 Scores = Average

$$\frac{54 + 35 + 70 + x + 135}{5} = 66$$

$$\frac{294 + x}{5} = 66$$

- 15) Melissa can mow the community center's lawn in 5 hours using a push mower. Her father, Jim, can mow the lawn in 2 hours using a tractor mower. How long would it take them, if they work together? Round to the nearest tenth of an hour.

- A 1.2 hours
- B 1.3 hours
- C 1.4 hours
- D 1.5 hours
- E 1.6 hours

Rate of Melissa + Rate of Jim = Rate together

$$\frac{1}{5} + \frac{1}{2} = \frac{1}{t} \quad \text{where } t = \text{time together} \quad \text{LCD} = 10t$$

$$10t\left(\frac{1}{5} + \frac{1}{2}\right) = 10t\left(\frac{1}{t}\right)$$

$$2t + 5t = 10$$

$$7t = 10$$

$$t \approx 1.4$$