Solutions for **COMPASS** sample questions: **Numerical Skills / Pre-algebra / Algebra**

1-14, Numerical Skills / Pre-algebra

1. $54 - 6 \div 2 + 6 =$

$54 \underline{- 6 \div 2} + 6 =$

$\downarrow$

$\underline{54 - 3} + 6 =$

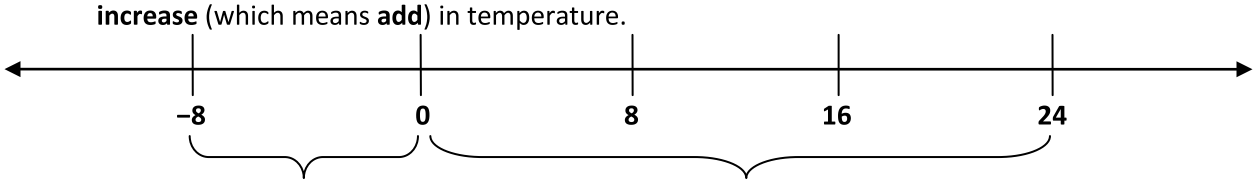
$\downarrow$

$\underline{51 + 6} =$ **57**

Follow steps 3 and 4 of the ORDER OF OPERATIONS:

1. Solve within parentheses or brackets (inner → outer).
2. Simplify items with exponents or radicals.
3. Perform multiplication and division (left → right).
4. Perform addition and subtraction (left → right).

2. Think of the rise in temperature between −8°F and 24°F as a distance on a number line. Since **distances are always positive values**, you will disregard the negative sign on the lowest temperature. Use the **absolute values** (positive values) of −8°F and 24°F to calculate the total **increase** (which means **add**) in temperature.



increase of **8°** + increase of **24°** = total increase of **32°**

$$|-8°| + |24°| = 8° + 24° = \boxed{\mathbf{32°}}$$

3. The denominator is the number below the bar in a fraction. In order to add or subtract fractions, the denominators must be alike. The **common denominator** will be the **least common multiple** of the denominators of fractions to be added or subtracted. Multiply both the denominators and the numerators (numbers above the bar) by the numbers needed to obtain the common denominator. This process is the same as multiplying each fraction by one, so the values of the fractions are not changed.

$$\left(\frac{3}{4} - \frac{2}{3}\right) + \left(\frac{1}{2} + \frac{1}{3}\right) = \left(\frac{3*3}{3*4} - \frac{4*2}{4*3}\right) + \left(\frac{6*1}{6*2} + \frac{4*1}{4*3}\right) =$$

$$\left(\frac{9}{12} - \frac{8}{12}\right) + \left(\frac{6}{12} + \frac{4}{12}\right) =$$

$$\left(\frac{1}{12}\right) + \left(\frac{10}{12}\right) = \boxed{\frac{\mathbf{11}}{\mathbf{12}}}$$

Remember to follow the first rule of the ORDER OF OPERATIONS (see question #1 above)—solve within parentheses.

The resulting fraction is already in lowest terms, and the denominator is **12**

4. $\frac{1}{2} + \left(\frac{2}{3} \div \frac{3}{4}\right) - \left(\frac{4}{5} \times \frac{5}{6}\right) =$

Solve within parentheses first.

$\downarrow$

$\frac{1}{2} + \left(\frac{2}{3} \div \frac{3}{4}\right) - \left(\frac{4}{5} \times \frac{5}{6}\right) =$

Divide fractions by multiplying the numerator of the first by the denominator of the second and the denominator of the first by the numerator of the second.

Multiply fractions simply by multiplying the numerators and denominators. Factors that are the same in the numerator and denominator cancel out.

$\downarrow \quad \downarrow$

$\frac{1}{2} + \left(\frac{2*4}{3*3}\right) - \left(\frac{4*\cancel{5}}{\cancel{5}*6}\right) =$

$\downarrow \quad \downarrow$

$\frac{1*9}{2*9} + \frac{8*2}{9*2} - \frac{4*3}{6*3} =$

Find a common denominator. Then add / subtract numerators from left to right.

$\downarrow \quad \downarrow \quad \downarrow$

$\underbrace{\frac{9}{18} + \frac{16}{18}}_{\frac{25}{18}} - \frac{12}{18} =$

$\frac{25}{18} - \frac{12}{18} = \boxed{\frac{13}{18}}$

5. Since the answer choices are decimal numbers, convert each quantity to decimal form and add.

$7\frac{3}{4} \rightarrow 7$ and $4\,)\,3.00 = 0.75$ (28, 20, 20, 0) $\rightarrow 7.75$

$6\frac{1}{2} \rightarrow 6$ and $2\,)\,1.0 = 0.5$ (10, 0) $\rightarrow 6.5$

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  7.75    Line up decimal points.
 17.85
+ 6.50 ← Use zero to hold hundredths place.
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32.10 total pounds of meat.

6. First, divide the cost of a block of tickets by the number of tickets in the block to find the cost per ticket.

$$\begin{array}{r} 16.00 \\ 5\,\overline{)\,80.00} \\ \underline{5} \\ 30 \\ \underline{30} \\ 0 \end{array}$$

Tickets are **$ 16.00 each** when purchased in a block of five.

Then, subtract $ 16.00 from the cost of a ticket purchased individually to find the amount each student would save.

$$\begin{array}{r} 18.50 \\ -\ 16.00 \\ \hline 2.50 \end{array}$$

Each student would save **<u>$ 2.50</u>** .

7. Scientific notation is a way of writing very large or very small numbers so they are easier to work with. A number expressed in scientific notation will be written as a decimal number between 1 and 10 multiplied by a power of 10.
For more information, go to the Institute for Energy and Environmental Research at http://www.ieer.org/clssroom/scinote.html.

20,000

4 3 2 1

2.0×10^4

Count the number of decimal places you must move to leave only one digit to the left of the decimal.

The number of decimal places you moved is the exponent (or power) of 10.

3,400,000

4 3 2 1

340×10^4

The number to be added must be multiplied by the same power of 10. That's why we use 340×10^4 instead of 3.40×10^6.

Rewrite answer with only one digit to the left of the decimal.

$2.0 \times 10^4 + 340 \times 10^4 = 342 \times 10^4 \rightarrow \boxed{\mathbf{3.42 \times 10^6}}$

2 1

8. $4 < \sqrt{x} < 9$

$4^2 < (\sqrt{x})^2 < 9^2$

$4*4 < (\sqrt{x} * \sqrt{x}) < 9*9$

$\boxed{16 < x < 81}$

Square each term to remove the radical (square root symbol) and see the range of values for x.

$(\sqrt{x})^2 = \sqrt{x} * \sqrt{x} = x^{½} * x^{½} = x^{½+½} = x^1 = x$

Go to Interactive Mathematics at http://www.intmath.com/Exponents-radicals/Exponent-radical.php to review the rules for exponents and roots.

9. $\frac{9}{6} = \frac{x}{8}$

$6x = 72$

$\frac{6x}{6} = \frac{72}{6}$

$\boxed{X = 12}$

Cross Multiply: Numerators **X** Denominators. Cross multiplication is used to find the unknown term of a proportion (two ratios—or fractions—that are equal). **If you do not see an = sign between the two fractions, do not cross multiply. Visit* *http://www.321know.com/g8-rat-prop-crossx.htm* *for more practice with proportions.*

10. Let "cost of *x* apples" = *b*.

Therefore,

the "cost of *each* apple" = $\frac{b}{x}$.

*This is the *unit price*.

Multiply the *unit price* by the new number of apples, *y*.

$$y * \frac{b}{x} = \boxed{\frac{by}{x}}$$

Try out some actual numbers:

Cost of 2 apples = 10 cents.

Therefore,

each apple costs 10 cents / 2 = 5 cents

*This is the *unit price*.

So, 3 apples will cost

$3 * \frac{10}{2} = \frac{3*10}{2} = \frac{30}{2}$, or

15 cents

11. Let x = the total number of students in the class.

Express 25% as a ratio, $\frac{part}{whole}$: $\frac{25}{100}$, or $\frac{1}{4}$.

Set up a proportion, letting *x* represent the total number of students.

$$\frac{1}{4} = \frac{12}{x}$$

$$\frac{1}{4} = \frac{12}{x}$$

Cross multiply to solve for *x*: $\boxed{x = 48 \text{ Total Students}}$

12. 75% had taken ***at least 8*** (8 or more) math courses.

Percentage of ***remaining*** class members = 25% (100% − 75%).

60% ***of*** the 25% had taken 6 or 7 math courses.

"Of" means multiply.

60% (25%) = **15%**
Had taken 6 or 7 math classes.

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   .60
 * .25
   300
  120
 .1500  =  15%
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Move decimal right two places.

75% + 15% = **90%** of students had taken *at least 6* (6 or more) math classes.

Subtract **90%** from the **whole graduating class** to find the percentage of students that had taken ***fewer than 6*** math classes:

$$\boxed{100\% - 90\% = 10\%}$$

13. Let ***x*** = the sum of all test scores.

Average is calculated by ***dividing the sum*** of all scores by the ***number*** of scores.

Set up an equation for ***average*** and solve for ***x***: $\frac{x}{6} = 84$

Multiply both sides of the equation by 6: $6 * \frac{x}{6} = (84)6$, $x = 504$

Divide 504 by 7 tests: $\boxed{504 / 7 = 72 \text{ average}}$

14. Let $\boldsymbol{x}$ = the sum of the juniors' test scores.

Set up an equation and solve for $\boldsymbol{x}$: $\frac{x}{35} = 80$, $35 * \frac{x}{35} = (80)35$

$$X = 2800$$

Let $\boldsymbol{y}$ = the sum of seniors' test scores.

Set up an equation and solve for $\boldsymbol{y}$: $\frac{y}{15} = 70$, $15 * \frac{y}{15} = (70)15$

$$y = 1050$$

Sum of test scores for all 50 students = $x + y = 2800 + 1050 = 3850$

$$\begin{array}{r} 2800 \\ \underline{1050} \\ 3850 \end{array}$$

To find the average for all 50 students, divide sum of test scores by 50.

$$\begin{array}{r} 77 \\ 50\overline{)3850} \\ \underline{350} \\ 350 \\ \underline{350} \\ 0 \end{array}$$

$$\boxed{3850 / 50 = \underline{77 \text{ avg.}}}$$