

Grade 8 MTAP 2015 Elimination Questions with Solutions – Part 1

Posted on [January 16, 2016](#) | [12 Comments](#)

Below is the first part of the Grade 8 MTAP 2015 Elimination Questions with Solutions and answers. If you find any errors, please comment on the box below.

1.) Find the average of the numbers -1 , $3/2$, and $1/2$.

Solution

$$(-1 + 3/2 + 1/2)/3 = 1/3$$

Answer: $1/3$

2.) How much larger is $2/3$ than $1/6$?

Solution

$$2/3 - 1/6 = 4/6 - 1/6 = 3/6 = 1/2$$

Answer: $1/2$

3.) If one ream contains 500 sheets of paper and a sheet of paper is 0.3 mm thick, how thick is one ream in meters?

Solution

$$500 \times 0.3\text{mm} = 150\text{ mm} = 0.15\text{m}$$

Answer: 0.15m

4.) What is the second largest number among numbers $\sqrt{2}$, $3/2$, 1.4 , $\sqrt{3}$ and 1.6 ?

Solution

$\sqrt{2}$ is around 1.41 and $\sqrt{3}$ is around 1.7.

Answer: 1.6

5.) If an inch is about 2.54 cm, what is 1 cm to the nearest hundredth of an inch?

Solution

$$1 : 2.54 = x : 1, x = 0.39$$

Answer: 0.39

6.) If $U = \{1, a, 2, b, 3, c, 4, d\}$ and $A = \{1, 2, c, d\}$, what is A^c ?

Solution

A^c is the complement of A, or the elements of the set that is not in A but in U. So,

$$A^c = \{a, b, 3, 4\}$$

Answer: $A^c = \{a, b, 3, 4\}$

7.) Using the same sets in Item 6 and $B = \{1, 2, 3, 4\}$, how many subsets does $A \cap B^c$ have?

Solution

$A = \{1, 2, c, d\}$ and $B = \{1, 2, 3, 4\}$. The complement of B denoted by B^c are the elements of U not in B. So, $B^c = \{a, b, c, d\}$. Now, $A \cap B^c$ are the elements that are common to A and B^c . Therefore, $A \cap B^c = \{c, d\}$. Now, the number of subsets of a set with n elements is 2^n (this includes the empty set), so there are $2^2 = 4$ subsets.

Answer: 4

8.) If $|P| = 10$, $|Q| = 12$, and $|P \cup Q| = 15$, what is $|P \cap Q|$?

Solution 1

We know that the cardinality of the union of two sets is equal to the sum of the cardinality of these sets less the cardinality of their intersection. That is, if we have sets P and Q, $|P \cup Q| = |P| + |Q| - |P \cap Q|$.

Substituting, we have

$$15 = 10 + 12 - |P \cap Q|$$

$$|P \cap Q| = 7$$

Answer: 7

Solution 2

$$x + y + z = 15 \quad (*)$$

$$x + y = 12 \quad (**)$$

$$y + z = 10 \quad (***)$$

Adding the (**) and (***), we have $x + 2y + z = 22$ (#)

Subtracting (*) from (#),

$$x + 2y + z - (x + y + z) = 22 - 15$$

$$y = 7$$

Answer: 7

9.) If $|M \cap N| = 24$ and $|M \cup N| = 26$, what is $|M| + |N|$?

Solution

From number 8, we know that $|M \cup N| = |M| + |N| - |M \cap N|$. Substituting, we have,
 $26 = |M| + |N| - 24$
 $|M| + |N| = 50$.

Answer: 50

10.) There were 59 participants during the recent math camp. Among them, 37 liked doing projects, 30 liked solving problems, and 13 liked both. How many of the participants did not like at least one of these two activities?

Solution

Solution will be discussed in a separate post.

Answer: 5

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Grade 8 MTAP 2015 Elimination Questions with Solutions – Part 2

Posted on [January 22, 2016](#) | [7 Comments](#)

This is the second part (questions 11-20) of the solutions of the Grade 8 MTAP 2015 Elimination Questions. You can read the solutions for questions 1-10 [here](#). If you found any errors in the solution, please comment in the box below.

11.) If $x = 4$ and $y = -3$, what is $x^2y + xy^2$?

Solution

$$\begin{aligned}x^2y + xy^2 &= (4^2)(-3) + (4)(-3)^2 = (16)(-3) + 4(9) \\ &= (-48) + 36 = -12\end{aligned}$$

Answer: -12

12.) Simplify $x(1 + y) - 2y(x - 2) + xy$.

Solution

$$\begin{aligned}
& x(1 + y) - 2y(x - 2) + xy \\
&= x + xy - 2xy + 4y + xy \\
&= x + 2xy - 2xy + 4y \\
&= x + 4y
\end{aligned}$$

Answer: $x + 4y$

13.) If a and b are positive constants, simplify $\frac{ab\sqrt{ab}}{\sqrt[3]{a^4}\sqrt[4]{b^3}}$.

Solution

Note that $\sqrt{ab} = (ab)^{1/2}$, $\sqrt[3]{a^4} = a^{4/3}$ and $\sqrt[4]{b^3} = b^{3/4}$

$$\begin{aligned}
& \frac{(ab)(ab)^{1/2}}{a^{4/3}b^{3/4}} \\
\text{Now } &= \frac{(ab)(a^{1/2})(b^{1/2})}{a^{4/3}b^{3/4}} \\
&= \frac{a^{3/2}b^{3/2}}{a^{4/3}b^{3/4}} \\
&= a^{(3/2-4/3)}b^{(3/2-3/4)} \\
&= a^{(9/6-8/6)}b^{(6/4-3/4)} \\
&= a^{1/6}b^{3/4}
\end{aligned}$$

This is already correct, but if you want your answer in radical form, the previous expression can be converted to

$$a^{2/12}b^{9/12} = \sqrt[12]{a^2b^9}$$

Answer: $a^{1/6}b^{3/4}$ or $\sqrt[12]{a^2b^9}$

14.) What is the quotient when $6x^4 + x^3 + 4x^2 + x + 2$ is divided by $3x^2 - x + 1$?

Solution

$$\begin{array}{r}
 3x^2 - x + 1 \overline{) 6x^4 + x^3 + 4x^2 + x + 2} \\
 \underline{6x^4 - 2x^3 + 2x^2} \\
 3x^3 + 2x^2 + x \\
 \underline{3x^3 - x^2 + x} \\
 3x^2 + 0x + 2 \\
 \underline{3x^2 - x + 1} \\
 x + 1
 \end{array}$$

Answer: $2x^2 + x + 1$ remainder $x + 1$.

15.) In Item 14, what is the remainder?

Answer: $x + 1$

16.) If $A + B = x - 2y$, what is $A^2 + 2AB + B^2 + 4xy$?

Solution

$$\begin{aligned}
 (A + B)^2 &= (x - 2y)^2 \\
 A^2 + 2AB + B^2 &= x^2 - 4xy + 4y^2 \\
 A^2 + 2AB + B^2 + 4xy &= x^2 - 4xy + 4xy + 4y^2 \\
 A^2 + 2AB + B^2 + 4xy &= x^2 + 4y^2
 \end{aligned}$$

Answer: $x^2 + 4y^2$

17.) If $x + y = 7$ and $xy = 5$, what is $x^3 + y^3$?

Solution

$$\begin{aligned}
 x + y &= 7 \text{ and } xy = 5 \\
 (x + y)^3 &= 7^3 \\
 x^3 + 3x^2y + 3xy^2 + y^3 &= 343 \\
 x^3 + 3xy(x + y) + y^3 &= 343
 \end{aligned}$$

Substituting the given values above,

$$\begin{aligned}
 x^3 + 3(5)(7) + y^3 &= 343 \\
 x^3 + 105 + y^3 &= 343 \\
 x^3 + y^3 &= 238.
 \end{aligned}$$

Answer: 238

18.) If the length, width, and height of an open-top rectangular box are $(x + 3)$ cm, x cm, and $(x - 3)$ cm, what is its surface area?

Solution

The formula for finding the surface area S of a rectangular prism with length l , width w and height h is $S = 2lh + 2lw + 2wh$. Since the box is open, we subtract lw , which is the top face. So, the surface area of the open box is $S = 2lh + lw + 2wh$.

Substituting, we have

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

Answer: $5x^2 - 3x - 18$

19.) A man walked x km for 2.5 hrs, then jogged $(2x + 3)$ km for 3.5 hrs, and finally walked again $(5x - 3)$ km for 4 hrs. If his average speed for the entire exercise was 4 kph, what is x ?

Solution

$$\begin{aligned} \frac{2.5x + 3.5(2x + 3) + 4(5x - 3)}{2.5 + 3.5 + 4} &= 4 \\ \frac{2.5x + 7x + 10.5 + 20x - 12}{8} &= 4 \\ \frac{29.5x - 1.5}{8} &= 4 \\ 29.5x - 1.5 &= 32x \\ 2.5x &= 1.5 \\ x &= \frac{3}{5} = 0.6 \end{aligned}$$

Answer: $3/5$ or 0.6

20.) Simplify $(a - 3)(a + 3)(a^2 + 3a + 9)(a^2 - 3a + 9)$.

Solution

We can group the expressions as sum and difference of two cubes.

$$\begin{aligned} &[(a - 3)(a^2 + 3a + 9)][(a + 3)(a^2 - 3a + 9)] \\ &= (a^3 - 3^3)(a^3 + 3^3) \\ &= (a^3 - 27)(a^3 + 27) \end{aligned}$$

Now, this is in the form of the difference of two squares $(x + y)(x - y) = x^2 - y^2$.

$$\text{So, } (a^3 - 27)(a^3 + 27) = (a^3)^2 - 27^2 = a^6 - 729$$

Answer: $a^6 - 729$

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