MA161 Readiness Quiz

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I will try to post solutions to my quizzes (and possibly other material) on my homepage at `https://www.math.purdue.edu/~salinac` when I get the website up (possibly this weekkend).

Problem R.1. Evaluate

$$\frac{5/6}{1/3} + \frac{2}{9}.$$

Solution. We write this out using the familiar rules of arithmetic, as follows

$$\begin{aligned}\frac{5/6}{1/3} + \frac{2}{9} &= \frac{3}{1} \cdot \frac{5}{6} + \frac{2}{9} \\ &= \frac{5}{2} + \frac{2}{9} \\ &= \frac{45 + 4}{18} \\ &= \boxed{\frac{49}{18}}.\end{aligned}$$

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Problem R.2. Solve the equation $2(x + 1) + x = 5(x + 1)$ for x.

Solution. Using basic algebraic manipulations

$$\begin{aligned}
2(x+1)+x &= 5(x+1)\\
2x+2+x &= 5x+5\\
3x+2 &= 5x+5\\
3x+2-5x-25x+5-5x-2\\
-2x &= 3\\
\frac{-2x}{-2} &= \frac{3}{-2}\\
x &= \boxed{-\frac{3}{2}.}
\end{aligned}$$

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Problem R.3. A total of 151 tickets were sold for a school play. They were either adult tickets or student tickets. There were 61 more student tickets sold than adult tickets. How many adult tickets were sold?

Solution. Let A be the number of the number of tickets sold to adults. Then what the paragraph is saying is that the number of tickets sold to students, which we will denote by S, is $S = A + 61$. Moreover, the total number of tickets sold, that is, the tickets sold to both adults and students, totals 151, i.e., $A + S = 151$. Putting this information together, we have

$$\begin{aligned}
S &= A + 61,\\
A + S &= 151.
\end{aligned}$$

Substituting $S = A + 61$ in the second equation above,

$$\begin{aligned}
151 &= A + S\\
&= A + A + 61\\
&= 2A + 61\\
151 - 61 &= 2A\\
90 &= 2A\\
\boxed{45} &= A.
\end{aligned}$$

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Problem R.4. Simplify the equation $(-2xz^3)^2(-x^2y^4z^3)^3$.

Solution. Using **exponent laws**, we have

$$\begin{aligned}(-2xz^3)^2(-x^2y^4z^3)^3 &= (-1)^2 2^2 x^2 z^{3\cdot 2}(-1)^3 x^{2\cdot 3} y^{4\cdot 3} z^{3\cdot 3}\\ &= -4x^2z^6x^6y^{12}z^9\\ &= -4x^{2+6}y^{12}z^{6+9}\\ &= \boxed{-4x^8y^{12}z^{15}}.\end{aligned}$$

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Problem R.5. Expand (multiply out and simplify) the expression $(2w-3)^2$.

Solution. Again, using simple algebraic methods

$$\begin{aligned}(2w-3)^2 &= (2w-3)(2w-3)\\ &= (2w)^2 - 2(3\cdot 2w) + (-3)^2\\ &= \boxed{4w^2 - 12w + 9}.\end{aligned}$$

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Problem R.6. Completely factor the expression $2y^3 - 13y^2 + 21y$.

Solution. We do this by first, collecting like terms, like the y in the sums above, i.e.,

$$\begin{aligned}2y^3 - 13y^2 + 21y &= y(2y^2 - 13y + 21)\\ &= \boxed{y(y+3)(2y+7)}.\end{aligned}$$

How did we get the factor for $2y^2-13y+21$? One way is to just *see it*. Another way to do this (very methodically) is to find the solutions to $2y^2 - 13y + 21$ using the **Quadratic Formula**, which gives you

$$y = 3 \text{ and } y = 7/2.$$

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Problem R.7. Simplify (cancelling whenever possible) the expression

$$\frac{5+x}{49x^2}\Big/\frac{5x^7}{7-x}.$$

Solution. Again, using simple algebraic methods

$$\begin{aligned}\frac{5+x}{49x^2}\Big/\frac{5x^7}{7-x} &= \frac{(5+x)(7-x)}{(49x^2)(5x^7)}\\ &= \frac{-x^2+2x+35}{245x^9}.\end{aligned}$$

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Problem R.8. Evaluate the following trigonometric expressions,

$$\text{(a) } \sin(\pi/3), \quad \text{(b) } \cos(\pi/3), \quad \text{(c) } \tan(\pi/3).$$

Solution. Part (a) and (b) should be known to you; make sure you memorize the special values of sin and cos on the **unit circle**; the last value, part (c), can be computed from the knowledge that $\tan x = \sin x / \cos x$. Thus,

$$\text{(a) } \sin(\pi/3) = \frac{\sqrt{3}}{2}, \quad \text{(b) } \cos(\pi/3) = \frac{1}{2}, \quad \text{(c) } \tan(\pi/3) = \sqrt{3}.$$

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