MTH 06, Test 1, V. 1, 09/20/21 Prof. Luis Fernández

NAME: SOLUTION

There are 22 questions. Some are multiple choice and some are free response.
Each question is worth 5 points over 100 (so 10 points are extra credit).
For multiple-choice questions, just circle your answer.
For free-response questions, SHOW ALL WORK to receive credit.

1. Evaluate the expression:
$9 + 3 \cdot 7 - (8 + 3 \cdot 6) =$

Solution:

$9 + 3 \cdot 7 - (8 + 3 \cdot 6) = 9 + 21 - (8 + 18) = 30 - 26 = \boxed{4}$

2. Evaluate: $13 - 3(8 - 4) =$

Solution: $13 - 3(8 - 4) = 13 - 3 \cdot (4) = 13 - 12 = \boxed{1}$.

3. Solve: $3(7x + 1) = 4(5x + 1) + 14$.
Circle the answer.

(a) $\frac{21}{41}$

(b) 15

(c) $\frac{9}{20}$

(d) -13

Solution:

$$\begin{aligned} 3(7x+1) &= 4(5x+1)+14 \\ 21x+3 &= 20x+4+14 \quad \text{(distribute)} \\ 21x+3 &= 20x+18 \quad \text{(combine like terms)} \\ 21x &= 20x+15 \quad (-3 \text{ from both sides}) \\ x &= \boxed{15} \quad (-20x \text{ from both sides}) \end{aligned}$$

4. Simplify: $\frac{4}{5} \cdot \frac{7}{16} =$

Solution: $\frac{4}{5} \cdot \frac{7}{16} = \frac{1}{5} \cdot \frac{7}{4} = \boxed{\frac{7}{20}}$.

5. Simplify: $4 \cdot \frac{5}{8} =$

Solution: $4 \cdot \frac{5}{8} = \frac{20}{8} = \boxed{\frac{5}{2}}$

6. Simplify: $\frac{1}{8} + \frac{1}{12} - \frac{1}{16} =$

Solution: The common denominator is 48:
$\frac{1}{8} + \frac{1}{12} - \frac{1}{16} = \frac{6}{48} + \frac{4}{48} - \frac{3}{48} = \boxed{\frac{7}{48}}$.

7. Evaluate the expressions for $x = 6$, $y = 9$, and $z = 5$.

$x + 6 =$ _____

$2z - 6 =$ _____

$xyz =$ _____

$y + z =$ _____

Solution:

$x + 6 = 6 + 6 = \boxed{12}$

$2z - 6 = 2 \cdot 5 - 6 = 10 - 6 = \boxed{4}$

$xyz = 6 \cdot 9 \cdot 5 = \boxed{270}$

$y + z = 9 + 5 = \boxed{14}$

8. Use the formula $F = \frac{9}{5}C + 32$ for converting degrees Celsius into degrees Fahrenheit to find the Fahrenheit measure of the Celsius temperature $C = 25$. **Circle the answer.**

(a) 257

(b) 51.4

(c) 77

(d) 37

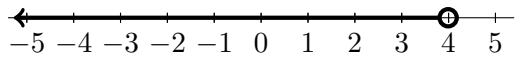
Solution: When $C = 25$,
$F = \frac{9}{5} \cdot 25 + 32 = 9 \cdot 5 + 32 = 45 + 32 = \boxed{77}$

9. Solve the equation $8x - 7 = 2x - 3$.

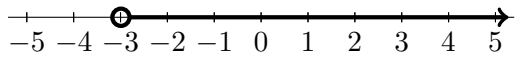
Solution:

$$\begin{aligned} 8x - 7 &= 2x - 3 \\ 8x - 7 &= 2x - 3 \quad (+7 \text{ to both sides}) \\ 6x &= 4 \quad (-2x \text{ from both sides}) \\ x &= \frac{4}{6} \quad (\div 6 \text{ on both sides}) \\ x &= \boxed{\frac{2}{3}} \quad (\text{Simplify.}) \end{aligned}$$

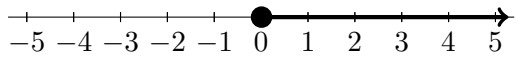
10. Express each graph below as an inequality using the variable x. Enter your answers as "$x >$ number", or "$x <$ number", or "$x \geq$ number", or "$x \leq$ number", as appropriate.



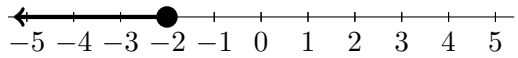
Inequality: $\boxed{x < 4}$



Inequality: $\boxed{x > -3}$



Inequality: $\boxed{x \geq 0}$



Inequality: $\boxed{x \leq -2}$

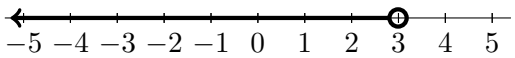
11. Solve the inequality and express the answer on the number line provided

$$6x - 14 + 2(x - 5) < 0.$$

Solution:

$$\begin{aligned} 6x - 14 + 2(x - 5) &< 0 \\ 6x - 14 + 2x - 10 &< 0 \quad (\text{distribute}) \\ 8x - 24 &< 0 \quad (\text{combine like terms}) \\ 8x &< 24 \quad (+24 \text{ to both sides}) \\ x &< 3 \quad (\div 3 \text{ on both sides}) \end{aligned}$$

The solution is therefore



12. Solve the inequality and express the answer as an interval.

$$x - \frac{4}{5} > \frac{6}{5}x - 2.$$

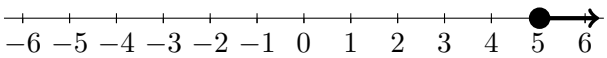
Solution:

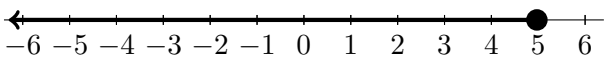
$$\begin{aligned} x - \frac{4}{5} &> \frac{6}{5}x - 2 \\ \frac{5x}{5} - \frac{4}{5} &> \frac{6}{5}x - \frac{10}{5} \quad (\text{common denominators}) \\ 5x - 4 &> 6x - 10 \quad (\text{remove denominators}) \\ 5x &> 6x - 6 \quad (+4 \text{ both sides}) \\ -x &> -6 \quad (-6 \text{ both sides}) \\ x &< 6 \quad (\div(-1) \text{ and swap inequality}) \end{aligned}$$

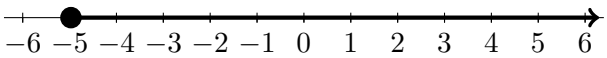
The solution is therefore $\boxed{(-\infty, 6)}$.

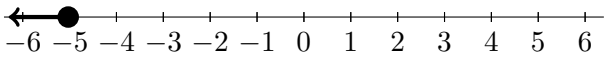
13. **Circle** the graph of the solution to the inequality:

$$-1-(-2+x) \leq 3x+21$$

(a) 

(b) 

(c) 

(d) 

Solution:

$$\begin{aligned}
-1-(-2+x) &\leq 3x+21 \\
-1+2-x &\leq 3x+21 \quad \text{(distribute)} \\
1-x &\leq 3x+21 \quad \text{(combine like terms)} \\
-x &\leq 3x+20 \quad (-1 \text{ from both sides}) \\
-4x &\leq 20 \quad (-3x \text{ from both sides}) \\
x &\geq -5 \quad (\div(-4) \text{ and swap inequality})
\end{aligned}$$

14. Solve for x.

$$\frac{10}{3}x+\frac{1}{6}=\frac{7}{3}x+\frac{37}{6}$$

Solution:

$$\begin{aligned}
\frac{10}{3}x+\frac{1}{6} &= \frac{7}{3}x+\frac{37}{6} \\
\frac{20}{6}x+\frac{1}{6} &= \frac{14}{6}x+\frac{37}{6} \quad \text{(common denominator)} \\
20x+1 &= 14x+37 \quad \text{(remove denominators)} \\
20x &= 14x+36 \quad (-1 \text{ both sides}) \\
6x &= 36 \quad (-14x \text{ both sides}) \\
x &= 6 \quad (\div 6x \text{ both sides})
\end{aligned}$$

Solution: $\boxed{x=6}$

15. Solve for y:

$$z=4x+9y.$$

(a) $y=9(z-4x)$

(b) $y=\dfrac{z-4x}{9}$

(c) $y=\dfrac{z}{9}-4x$

(d) $y=\dfrac{z+4x}{9}$

Solution:

$$\begin{aligned}
z &= 4x+9y \\
z-4x &= 9y \quad (-4x \text{ both sides}) \\
\frac{z-4x}{9} &= y \quad (\div 9 \text{ both sides})
\end{aligned}$$

16. The volume of a pyramid is given by the equation

$$V=\frac{1}{3}Bh.$$

Solve for B.

Solution:

$$\begin{aligned}
V &= \frac{1}{3}Bh \\
3V &= Bh \quad (\cdot 3 \text{ both sides}) \\
\frac{3V}{h} &= B \quad (\div h \text{ both sides})
\end{aligned}$$

Solution: $\boxed{B=\dfrac{3V}{h}}$

17. Solve for s when $tw = 6s - a$.
Circle the answer.

(a) $s = tw - a$

(b) $s = \dfrac{tw + a}{6}$

(c) $s = tw - a$

(d) $s = -\dfrac{tw}{a}$

Solution:

$$\begin{aligned} tw &= 6s - a \\ tw + a &= 6s \quad (+a \text{ to both sides}) \\ \frac{tw+a}{6} &= s \quad (\div 6 \text{ both sides}) \end{aligned}$$

Solution: $\boxed{s = \dfrac{tw + a}{6}}$

18. Find

$$38 - (-30) + (-15) - 63.$$

Solution:

$$\begin{aligned} &38 - (-30) + (-15) - 63 \\ &= 38 + 30 + (-15) - 63 \\ &= 68 + (-15) - 63 \\ &= 53 - 63 \\ &= = \boxed{-10}. \end{aligned}$$

19. Divide or state that the division is undefined:
(Note: Your answer must be a fraction.)

$$-\frac{3}{2} \div \left(-\frac{9}{4}\right) = \boxed{\frac{2}{3}}$$

$$15 \div \left(-\frac{3}{2}\right) = \boxed{-10}$$

Solution:

(a) $-\dfrac{3}{2} \div \left(-\dfrac{9}{4}\right) = \dfrac{3}{2} \cdot \dfrac{4}{9} = \boxed{-\dfrac{2}{3}}$

(b) $15 \div \left(-\dfrac{3}{2}\right) = -15 \cdot \dfrac{2}{3} = \boxed{-10}$

20. Solve the equation $8x + 10 = -7$.

Solution:
If $8x + 10 = -7$,
then $8x = -17$,
which implies $\boxed{x = -\dfrac{17}{8}}$.

21. Solve for C in the formula $F = \frac{9}{5}C + 32$.

Solution:

$$\begin{aligned} F &= \frac{9}{5}C + 32 \\ F - 32 &= \frac{9}{5}C \quad (-32 \text{ on both sides}) \\ 5(F-32) &= 9C \quad (\cdot 5 \text{ on both sides}) \\ \frac{5}{9}(F-32) &= C \quad (\div 9 \text{ on both sides}) \end{aligned}$$

Therefore, the solutions is $\boxed{C = \frac{5}{9}(F-32)}$

22. Solve the equation $|x-2| = 3$.

Solution: If $|x-2| = 3$, then
either $x - 2 = 3$, so $x = 5$,
or $x - 2 = -3$, so $x = -1$.
Therefore there are two solutions: $\boxed{x = 5}$ and $\boxed{x = -1}$.