MPM1DO: Personal Prerequisite Profile

Name: _____

Legend	**0** WTF? I don't have a clue.	**1** I have a very vague idea and very often get stuck.	**2** I have a somewhat vague idea and often get stuck.	**3** I understand reasonably well but often make mistakes.	**4** I understand very well but sometimes make mistakes	**5** I understand fully and rarely make mistakes

Complete the following table.

***What* I Understand and Can Do**	***Show* what I Understand and Can Do**	***Example* of how this Relates to the "Real World"**
I know what an ***integer*** is. 0 1 2 3 4 5		
I can ***add*** and ***subtract*** one-digit integers ***without*** the use of a calculator. 0 1 2 3 4 5		
I can ***multiply*** one-digit integers ***without*** the use of a calculator. 0 1 2 3 4 5		
I can ***divide*** one-digit integers ***without*** the use of a calculator. 0 1 2 3 4 5		
I know what a ***fraction*** is. 0 1 2 3 4 5		

Name: _____

***What* I Understand and Can Do**	***Show* what I Understand and Can Do**	***Example* of how this Relates to the "Real World"**
I can ***add*** and ***subtract*** fractions ***without*** the use of a calculator. 0 1 2 3 4 5		
I can ***multiply*** fractions ***without*** the use of a calculator. 0 1 2 3 4 5		
I can ***divide*** fractions ***without*** the use of a calculator. 0 1 2 3 4 5		
I can convert between ***mixed fraction*** (mixed number) and ***improper*** forms ***without*** the use of a calculator. 0 1 2 3 4 5		
I understand that mathematical ***operations*** must be applied in a specific, standard order (often called **BEDMAS**) unless parentheses (brackets) are used. 0 1 2 3 4 5		
I understand the ***meaning*** of ***percentage*** and can apply what I understand to simple problems such as calculating sales tax. 0 1 2 3 4 5		

Name: _____

Multiply your Knowledge by Adding Meaning to Mathematics

Examples

1. Why is ***division by zero undefined***?

$$100 \div 20$$

MEANS

"How many groups of 20 can be formed from 100 objects?

Since 5 groups of 20 can be formed, the answer is 5.

$$100 \div \frac{1}{2}$$

MEANS

"How many groups of $\frac{1}{2}$ can be formed from 100 objects?

Since 200 groups of $\frac{1}{2}$ can be formed, the answer is 200.

$$100 \div 0$$

MEANS

"How many groups of 0 can be formed from 100 objects?

Any number of groups of zero will always add up to zero! Clearly then, it is ***impossible*** to make 100, or any other value for that matter, from groups of zero! Thus, we say that division by zero is ***undefined***.

LANGUAGE HAS MEANING!

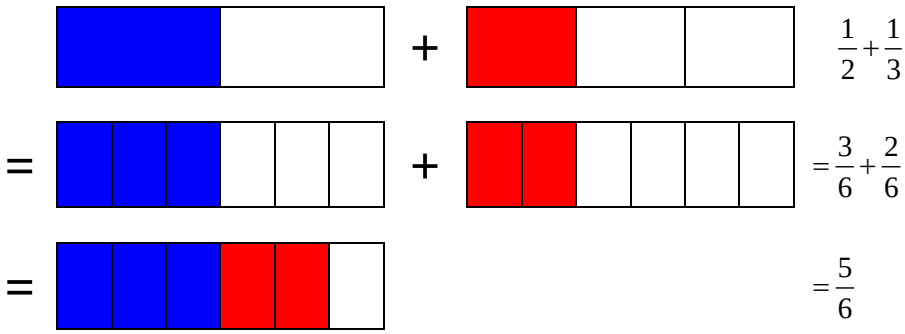
↓

MATH IS A LANGUAGE!

↓

THEREFORE, MATH HAS MEANING!

2. Explain why $\frac{1}{2}+\frac{1}{3}$ ***cannot possibly be equal to*** $\frac{2}{5}$.



$\frac{1}{2}+\frac{1}{3}$

$=\frac{3}{6}+\frac{2}{6}$

$=\frac{5}{6}$

The diagrams at the right clearly show that $\frac{1}{2}+\frac{1}{3}$ must equal $\frac{5}{6}$! Even without the diagrams, we could ***reason*** that $\frac{1}{2}+\frac{1}{3}$ must be ***greater than*** $\frac{1}{2}$ but $\frac{2}{5}$ is obviously ***less than*** $\frac{1}{2}$!

Definition of "Undefined"

Whenever mathematicians ***cannot find a way to give a meaning*** to a mathematical term, operation or other mathematical concept, they say that it is ***undefined***.

Exercises

Complete the following table.

Mathematical Expression	***Meaning***	***Picture***	***Evaluate the Expression***
$-3+5$			
$-3+1$			
$-3-5$			
$-3-(-5)$			
$-3+(-5)$			
$-3-(+5)$			
$\frac{7}{5}-\frac{3}{10}$			
$\frac{7}{15}-\frac{3}{10}$			
$10\div 0.1$			
$10\div 0$			

MPM1D0 – Filling in the Gaps

1. Draw a number line. Label all ***integers*** from −10 to 10 inclusive.

2. ***Evaluate*** each of the following expressions ***without*** using a calculator.

(a) $-3+5$ **(b)** $-3-5$ **(c)** $-3+(-5)$ **(d)** $-3-(-5)$

(e) $-3+5-6+1$ **(f)** $-3-5-6+1$ **(g)** $-3-(-5)+(-6)+1$ **(h)** $3+(-5)+(-6)-(-1)$

Explain the general principle(s) that you used to evaluate each of the ***expressions*** in question 2.

3. ***Evaluate*** each of the following expressions ***without*** using a calculator.

(a) $-3(5)$ **(b)** $-3(+5)$ **(c)** $-3(-5)$ **(d)** $3(-5)$

(e) $-3(5)(-6)(1)$ **(f)** $-3(5)(-6)(-1)$ **(g)** $3(5)(6)(-1)$ **(h)** $-3(-5)(-6)(-1)$

Explain the general principle(s) that you used to evaluate each of the ***expressions*** in question 3.

4. ***Evaluate*** each of the following expressions ***without*** using a calculator.

(a) $\frac{36}{-12}$ **(b)** $\frac{-36}{-12}$ **(c)** $\frac{+49}{+7}$ **(d)** $\frac{-64}{16}$

Explain the general principle(s) that you used to evaluate each of the ***expressions*** in question 4.

5. Draw diagrams to represent each of the following fractions.

(a) $\frac{3}{5}$ **(b)** $\frac{5}{3}$ **(c)** $2\frac{9}{10}$ **(d)** $\frac{6}{2}$

6. ***Evaluate*** each of the following ***expressions***.

(a) $\frac{3}{5}-\frac{2}{5}$ **(b)** $\frac{-5}{3}+\frac{5}{6}$ **(c)** $-\frac{5}{14}+\left(-\frac{8}{21}\right)$ **(d)** $-\frac{5}{14}-\left(-\frac{8}{21}\right)$

Explain the general principle(s) that you used to evaluate each of the expressions in question 5.

_____

_____

_____

7. ***Evaluate*** each of the following ***expressions***.

(a) $\frac{3}{5}\left(-\frac{2}{5}\right)$ **(b)** $\frac{-5}{3}\left(+\frac{5}{6}\right)$ **(c)** $-\frac{5}{14}\left(-\frac{8}{21}\right)$ **(d)** $\frac{5}{14}\left(-\frac{8}{21}\right)$

Explain the general principle(s) that you used to evaluate each of the expressions in question 7.

_____

_____

_____

8. ***Evaluate*** each of the following ***expressions***.

(a) $\frac{3}{5}\div\left(-\frac{2}{5}\right)$ **(b)** $\frac{-5}{3}\div\left(+\frac{5}{6}\right)$ **(c)** $-\frac{5}{14}\div\left(-\frac{8}{21}\right)$ **(d)** $\frac{5}{14}\div\left(-\frac{8}{21}\right)$

Explain the general principle(s) that you used to evaluate each of the expressions in question 7.

_____

_____

_____

1 2 3 4
B E DM AS
Division/Multiplication - tied, left-to-right
Addition/Subtraction - tied, left-to-right

Terms are separated by + and - signs.

Separate each expression into terms. Then apply the operations in the correct order.

+(+) add a positive: GAIN
-(-) subtract a negative: GAIN

+(-) add a negative: LOSS
-(+) subtract a positive: LOSS

Gains more than losses: + answer
Losses more than gains: - answer

Rule for Determining the Sign of the Answer when Multiplying and Dividing

Two Numbers
Signs Same: + answer
Signs Different: - answer

More than Two Numbers
Even # of Negatives: + answer
Odd # of Negatives: - answer

Adding/Subtracting Fractions

- Express each fraction with a common denominator.
- Add/subtract the numerators.
- Keep the denominator!
- If possible, reduce to lowest terms.

$$\frac{3}{10}+\frac{8}{15}=\frac{9}{30}+\frac{16}{30}=\frac{25}{30}=\frac{5}{6}$$

Multiplying Fractions

- Multiply the numerators and multiply the denominators.
- If possible, reduce to lowest terms.

OR

- Reduce first (vertically and diagonally).
- Multiply the numerators and multiply the denominators.

$$\frac{3}{10}\left(\frac{8}{15}\right)=\frac{24}{150}=\frac{4}{25} \quad \textbf{OR} \quad \frac{\cancel{3}^{1}}{\cancel{10}_{5}}\left(\frac{\cancel{8}^{4}}{\cancel{15}_{5}}\right)=\frac{4}{25}$$

Dividing Fractions

- ***Do not*** change the 1st fraction.
- Change ÷ to ×.
- Find the reciprocal of the 2nd fraction (i.e. "***flip***").
- **Summary:** Multiply by the reciprocal (i.e. "flip 'n multiply")

$$\frac{3}{10}\div\frac{8}{15}=\frac{3}{10}\times\frac{15}{8}=\frac{45}{80}=\frac{9}{16}$$

9. ***Evaluate*** each of the following ***expressions***. (The rules for working with integers and fractions are summarized above.)

(a) $-20\div\left(-4-\left(-8\right)\right)$

(b) $-20-4\left(-8\right)^{2}$

(c) $-20+\left(-4-\left(-2\right)^{3}\right)$

(d) $2\left(-7\right)-\dfrac{10}{2^{2}-3^{2}}+2\left(-3\right)^{4}$

(e) $-3\left[-2+2\left(6\right)-4\left(3\right)^{3}\right]^{4}$

(f) $\dfrac{-10+5\left(-3\right)}{\left[2-\left(-3\right)\right]^{2}}$

(g) $-\frac{5}{14}+\left(-\frac{8}{21}\right)\left(\frac{7}{-4}\right)$ **(h)** $-\frac{5}{3}\div\frac{10}{9}+\left(-\frac{8}{21}\right)\left(\frac{3}{-4}\right)^2$ **(i)** $\frac{-10+5(-3)}{\left[2-(-3)\right]^2}-\left(\frac{-5}{3}\right)\left(+\frac{5}{6}\right)$

10. ***Simplify*** each of the following ***expressions***.

(a) $6a+7b-9a+4b$ **(b)** $-6a+7b-9a-4b$ **(c)** $-6a-7b-9a-4b$

(d) $-n^2-7n-9n^2+4n$ **(e)** $-n^2-7n-9m^2+4m$ **(f)** $-11x^2y-7y+9x^2y+6y$

11. ***Substitute*** the given values into each of the following ***expressions***.

(a) $-3a+11b$, $a=-5$, $b=-2$ **(b)** $-10n^2-3n$, $n=-5$ **(c)** $-2x^2y-y$, $x=-3$, $y=-10$

12. ***Solve*** each of the following ***equations***.

(a) $-3a+7=13$ **(b)** $5x-14=13$ **(c)** $\frac{y}{6}-4=3$

add: sum, plus, increased by, more than, greater than, total of
subtract: difference, minus, decreased by, less than
multiply: product, times, of, double (x2), twice (x2), triple (x3)
divide: quotient, ratio of

13. Write each of the following as an ***algebraic expression***.

(a) The difference of a number and 5: _____

(b) A number increased by 3: _____

(c) The quotient of a number and 7: _____

(d) The product of a number and 5: _____

(e) A number decreased by 3: _____

(f) The sum of a number and 9: _____

14. Write each of the following as a ***verbal expression***.

(a) $\frac{x}{2}$: _____

(b) q^2: _____

(c) $n - 14$: _____

(d) $3z$: _____

(e) s^3: _____

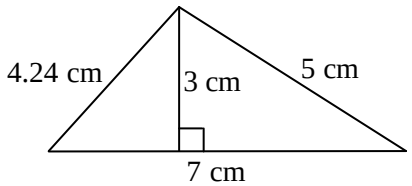
(f) $14 - s$: _____

15. ***Solve*** each problem by writing and solving an ***equation***.

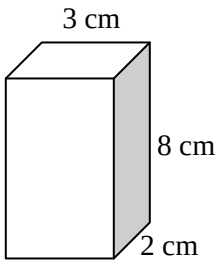
(a) The sum of three consecutive integers is 6142. Find the integers.

(b) Bhav has a pocket-full of nickels and pennies to pay for lunch. If the total number of coins is 103 and their total value is $3.99, how many of each coin does he have?

16. Find the ***perimeter*** and ***area*** of the triangle shown at the right.

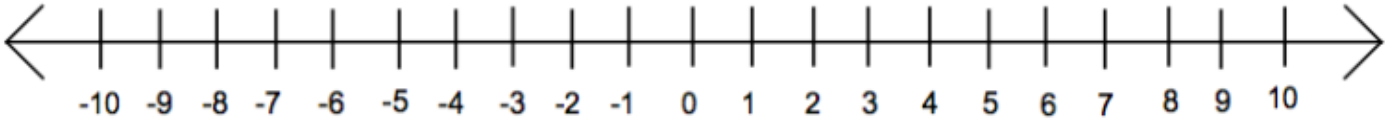


17. Find the ***surface area*** and ***volume*** of the given rectangular prism.



18. Use the given number line to arrange the following numbers in order from smallest to largest.

8.3, –2.9, 0.05, 6.4, –0.8, –2.2 –8.3, 0.5



19. An extraterrestrial being is seeking your help in learning how to use the human number system. He/she/it asks you to explain the meaning of the numbers $2\frac{4}{7}$ and 9.637.

Draw diagrams to help the extraterrestrial understand our number system.