1) Evaluate each of the following.

a) $-1\frac{5}{6}+\left(-2\frac{2}{3}\right)$

$$=-\frac{11}{6}+\left(-\frac{8}{3}\right)$$
$$=-\frac{11}{6}+\left(-\frac{16}{6}\right)$$
$$=-\frac{27}{6}$$
$$=-\frac{9}{2}\ \left(\text{or } -4\frac{1}{2}\right)$$

b) $-2\frac{1}{4}-3\frac{3}{8}$

$$=-\frac{9}{4}-\frac{27}{8}$$
$$=-\frac{18}{8}-\frac{27}{8}$$
$$=-\frac{45}{8}\ \left(\text{or } -5\frac{5}{8}\right)$$

c) $\left(-2\frac{1}{6}\right)^2$

$$=\left(-2\frac{1}{6}\right)\left(-2\frac{1}{6}\right)$$
$$=\left(-\frac{13}{6}\right)\left(-\frac{13}{6}\right)=\frac{169}{36}\ \left(\text{or } 4\frac{25}{36}\right)$$

d) $\left(-1\frac{1}{6}\right)\div\left(-\frac{4}{9}\right)$

$$=\left(-\frac{7}{6}\right)\div\left(-\frac{4}{9}\right)$$
$$=\left(-\frac{7}{6}\right)\times\left(-\frac{9}{4}\right)=\frac{63}{24}$$
$$=\frac{21}{8}\ \left(\text{or } 2\frac{5}{8}\right)$$

2) Evaluate each of the following.

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

$$=\left(\frac{20}{15}-\frac{3}{15}\right)\left(\frac{9}{6}+\frac{5}{6}\right)$$
$$=\left(\frac{17}{15}\right)\left(\frac{14}{6}\right)=\frac{238}{90}$$
$$=\frac{119}{45}\ \left(\text{or } 2\frac{29}{45}\right)$$

b) $\left(-2\frac{1}{4}\right)^2\div\left(-\frac{3}{4}\times\frac{1}{3}\right)$

$$=\left(-\frac{9}{4}\right)\left(-\frac{9}{4}\right)\div\left(-\frac{3}{12}\right)$$
$$=\frac{81}{16}\div\left(-\frac{1}{4}\right)$$
$$=\frac{81}{16}\times\left(-\frac{4}{1}\right)=-\frac{324}{16}$$
$$=-\frac{81}{4}\ \left(\text{or } -20\frac{1}{4}\right)$$

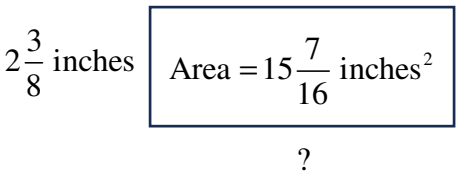
3) A carpenter needs to cut different lengths of wood from a 10 ft plank of wood. The carpenter needs the following lengths of wood: $2\frac{1}{2}$ ft, $1\frac{3}{16}$ ft, $\frac{3}{8}$ ft, and $3\frac{1}{4}$ ft. After making these cuts, what length of the original plank remains?

$$10-2\frac{1}{2}-1\frac{3}{16}-\frac{3}{8}-3\frac{1}{4}$$
$$=\frac{10}{1}-\frac{5}{2}-\frac{19}{16}-\frac{3}{8}-\frac{13}{4}$$
$$=\frac{160}{16}-\frac{40}{16}-\frac{19}{16}-\frac{6}{16}-\frac{52}{16}$$
$$=\frac{43}{16}$$

$\therefore$ the length remaining is $\frac{43}{16}$ ft $\left(\text{or } 2\frac{11}{16}\text{ ft}\right)$

4) The area of a rectangle is $15\frac{7}{16}$ square inches. If the rectangle's width is $2\frac{3}{8}$ inches, determine the length of the rectangle.

$$15\frac{7}{16} \div 2\frac{3}{8}$$
$$= \frac{247}{16} \div \frac{19}{8}$$
$$= \frac{247}{16} \times \frac{8}{19}$$
$$= \frac{1976}{304}$$
$$= \frac{13}{2} \left(\text{or } 6\frac{1}{2} \right)$$



∴ the length of the rectangle is $6\frac{1}{2}$ inches.

5) Use a checkmark (✓) to identify each of the following statements as either true or false.

	TRUE	FALSE
$2x-5x-(-x)$ is equal to $4x$.		✓
The expression $(2x+5)-(-6x+1)$ is equal to $2x+5+6x-1$.	✓	
$-4a^2b^2$ and $3b^2a^2$ are like terms.	✓	
$-3x^2$ is equivalent to $-9x$.		✓
To solve the equation $x-2=8$, we need to subtract 2 from both sides.		✓
$x=-5$ is the solution to $-10x=50$.	✓	

6) Joan claimed that $7x+2y$ is equal to $9xy$. Is Joan's claim correct? Explain.

Joan's claim is incorrect. $7x$ and $2y$ are not like terms and therefore cannot be combined.

7) Simplify each expression by collecting like terms.

a) $8x-4+2x-6$

$= 8x+2x-4-6$
$= 10x-10$

b) $10x^2-(-3x)+4x-6x^2$

$= 10x^2+3x+4x-6x^2$
$= 10x^2-6x^2+3x+4x$
$= 4x^2+7x$

c) $\frac{1}{8}x+\frac{5}{9}y-\frac{3}{8}x+\frac{4}{9}y$

$= \frac{1}{8}x-\frac{3}{8}x+\frac{5}{9}y+\frac{4}{9}y$
$= -\frac{2}{8}x+\frac{9}{9}y$
$= -\frac{1}{4}x+y$

d) $-2x^2-7x-13-4x^2-11x+17$

$= -2x^2-4x^2-7x-11x-13+17$
$= -6x^2-18x+4$

e) $4x-8y-6-3x+7y-5$

$= 4x-3x-8y+7y-6-5$
$= x-y-11$

8) Simplify each expression.

a) $(2x^2-5x+9)+(-4x^2+5x-5)$

$$=2x^2-5x+9-4x^2+5x-5$$
$$=2x^2-4x^2-5x+5x+9-5$$
$$=-2x^2+4$$

b) $(3x-6y+7)-(-5x+2y-2)$

$$=3x-6y+7+5x-2y+2$$
$$=3x+5x-6y-2y+7+2$$
$$=8x-8y+9$$

9) Use your simplified expressions from question #8 to evaluate each for $x=2$ and $y=-1$.

a) $-2(2)^2+4$

$$=-2(4)+4$$
$$=-8+4$$
$$=-4$$

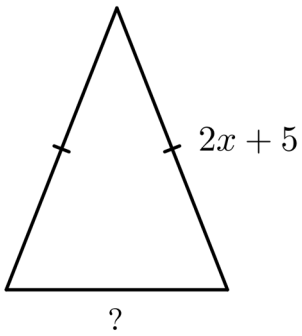
b) $8(2)-8(-1)+9$

$$=16-(-8)+9$$
$$=33$$

10) For the isosceles triangle shown below, an algebraic representation is given for the length of a side. If the perimeter of the triangle is $5x+13$, determine a simplified expression for the length of bottom side.

$$5x+13-(2x+5)-(2x+5)$$
$$=5x+13-2x-5-2x-5$$
$$=5x-2x-2x+13-5-5$$
$$=x+3$$

$\therefore$ **the length of the bottom side is $x+3$.**



11) Solve each equation. Show your work.

a) $x-(-3)=-9$

$$x+3=-9$$
$$x+3-3=-9-3$$
$$x=-12$$

b) $x-9+5=2-16$

$$x-4=-14$$
$$x-4+4=-14+4$$
$$x=-10$$

c) $5x-9x=6-42$

$$-4x=-36$$
$$\frac{-4x}{-4}=\frac{-36}{-4}$$
$$x=9$$

d) $-16+2=-9x+2x$

$$-14=-7x$$
$$\frac{-14}{-7}=\frac{-7x}{-7}$$
$$2=x$$
$$x=2$$

e) $-3-(-12)=2+x-5$

$$9=x+2-5$$
$$9=x-3$$
$$9+3=x-3+3$$
$$12=x$$
$$x=12$$

12) Varsha claims that any equation can have at most one solution. Is Varsha's claim correct? Explain.

Varsha's claim is incorrect. For example, the equation $x^2 = 25$ has solutions of $x = 5$ and $x = -5$.

13) During his hospitality class, Justin baked a certain number of cookies, represented by x. Lily baked three times as many cookies as Justin, and Paige baked twice as many cookies as Lily. Altogether, the three students made a total of 50 cookies. Determine the number of cookies that each student baked.

Justin baked x cookies, so Lily baked $3x$ cookies and Paige baked $6x$ cookies.

$$\begin{aligned} x + 3x + 6x &= 50 \\ 10x &= 50 \\ \frac{10x}{10} &= \frac{50}{10} \\ x &= 5 \end{aligned}$$

$\therefore$ Justin baked 5 cookies, Lily baked 15 cookies, and Paige baked 30 cookies.

14) Will used Python to write a program for calculating the volume of a cylinder based on radius and height values entered by the user. His code is shown below.

```
 1  # Read values for radius and height from user.
 2  radius=input("Enter the radius in metres: ")
 3  height=input("Enter the height in metres: ")
 4
 5  # Calculate the volume of the cylinder.
 6  volume=pi*radius**2*height
 7
 8  # Round the volume to one decimal place.
 9  rounded=round(volume,1)
10
11  # Display the volume of the cylinder.
12  print("The volume of the cylinder is",rounded,"square metres.")
```

a) How many variables are used in Will's program?

4 (the variables are `radius`, `height`, `volume`, and `rounded`)

b) Will's program contains several errors that are preventing it from running properly. Describe the problems with Will's program.

- **The math library must be imported in order to use pi in line #6.**
- **In line #6, pi should be entered as `math.pi`**
- **Will must use `float` (or `int`) in lines #2 and #3 to specify that the radius and height inputs are floating point numbers (or integers).**

c) If Will corrects the problems with his program, what will its output be when a radius value of 6.5 and a height value of 4.2 are entered?

$$\begin{aligned} \text{volume} &= \pi \times \text{radius}^2 \times \text{height} \\ &= \pi \times (6.5)^2 \times (4.2) \\ &\approx 557.5 \end{aligned}$$

$\therefore$ the program's output will be as follows:

```
The volume of the cylinder is 557.5 square metres.
```