SOL HW 1.5

Math 8H Assignment 1.5 Order of Operations

1. Simplify each of the following without a calculator:

a) $6+6\times6$	b) $\dfrac{12-6}{6}$	c) $\dfrac{12\times8-3}{4}$
$6+36$ $=42$	$=1$	$\dfrac{96-3}{4}=\dfrac{93}{4}$
d) $5\times3^2-4$	e) $12-6+10-4$	f) $5-(-3+12)+9$
$5\cdot9-4$ $45-4$ $=41$	$6+10-4$ $=12$	$5-(9)+9$ $=5$ ∕∕
g) -2^4+6	h) $(-2)^4+3$	i) $\dfrac{(4\times6)\times8}{24\div(6-4)}$
$-16+6$ $=-10$	$16+3$ $=19$	$\dfrac{24\times8}{24\div(2)}$ $=16$ ∕∕

2. Calculate. If necessary, express your answer as a fraction in lowest term.

a. $16(23+19)-(2\times8)(19+13)=$

$16(23+19)-16(19+13)$

$16(23+19-19-13)$

$=16(10)$

$=160$

b. $18\div(6\div3)+3^2\times2-9=$

$\dfrac{18}{2}+9\times2-9$

$=9+18-9$

$=18$ ∕∕.

c. $\left[(-7)-(-7)\right]-\left[(-7)-7^2\right]=$

$$\left[-7+7\right]-\left[-7-49\right]$$

$$= \quad 0 \quad - \quad \left[-56\right]$$

$$= \quad 56 \;/\!/$$

d. $5\times11^2-3\left(2^4-4\div2\times3\right)=$

$$5\times121-3\left[16-\frac{8}{3}\right]$$

$$605 - \left[48-8\right]$$

$$605-(40) = 565\;/\!/$$

(top right margin) $\frac{3}{2}\times\frac{5}{8}$ ... $\frac{5}{5}$

g. $\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{2}}}=$ $\dfrac{1}{1+\dfrac{1}{\frac{3}{2}}}$

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

$$= \frac{1}{\left(\frac{5}{3}\right)} = \frac{3}{5}$$

h. $\dfrac{\dfrac{1}{2}+\left(\dfrac{3}{4}\div\dfrac{1}{2}\right)}{\left(\dfrac{1}{6}+\dfrac{2}{3}\right)\div\dfrac{3}{5}}=$

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

$$= \frac{\frac{1}{2}+\frac{3}{8}}{\left(\frac{5}{6}\times\frac{5}{3}\right)} = \frac{\left(\frac{7}{8}\right)}{\left(\frac{25}{18}\right)}$$

$$= \frac{7}{8}\times\frac{18}{25} = \frac{63}{100}.$$

i. $\sqrt{4(5)^2-9\sqrt{\left(5^2-3^2\right)}}=$

$$\sqrt{4(25)-9\sqrt{16}}$$

$$= \sqrt{100-36}$$

$$= \sqrt{64}$$

$$= 8.$$

3. Use the order of operations and the digits 2, 4, 6, and 8 to create as many expressions with a value of 2 as you can.

① $\frac{4}{2}-(6-4)=2$

② $\sqrt{6^2-8\times4}=2$

4. What is the maximum value that can be obtained when grouping symbols are added to the expression below?
$$4+5\times8+4-2\times3$$

① $(4+5)\times((8+4-2)\times3)$

$20\times(10\times3)$

$= 20\times30$

$= 600$

5. Use numbers 1, 2, 3, and 4, each once to replace variables in $a+b\times c^d$. What is the maximum value of the expression?

$1+2\times3^4$

$1+2\times81$

$1+162$

$= 163$

Write a numerical expression to represent the solution to Q5 – 12 prior to solving. Show all your work.

6. A carpenter charges $10 per square foot to lay a floor. If a square-shaped hallway is 6 feet along one side, and the customer has a coupon for $25 off the total, then how much will the floor cost?

① Total AREA
$= 6ft\times6ft$
$= 36 ft^2$

② Cost $= 10\times36-25$
$= 360-25$
$= \$335.00$

7. A certain small factory employs 98 workers. Of these 10 receive a wage of $350 per day and the rest receive $255 per day. To the management, a week is equal to 6 working days. How much does the factory pay out for each week?

① 10 workers paid $350/day
WAGES $= 10\times350$
$= \$3500$

② 88 pairs $255/day
WAGE $= 88\times255$
$= 2\times44\times5\times51$
$= 10\times4\times51\times11$
$= 22,440.$

③ 1week $= 7\times(3500+22440)$
$= \$181,580$

$\begin{array}{r} 22440 \\ 3500 \\ \hline 25940 \end{array}$

$\begin{array}{r} 25940 \\ \times\ 7 \\ \hline 181,580 \end{array}$

8. A certain Math Club makes 35 bars of laundry soap a week and sells these at $20 each. Before the soap can all be sold, the pupils found out that 6 bars were destroyed by mice. How much will be the total sale at the end of the month?

① 35 - 6 = 29 BARS

② Revenue = 29 × 20
= $580

9. The variable n in the expression $3 + 2n$ is replaced by 1, 2, 3, and 4. Find the sum of the resulting numbers.

$n = 1$ $3 + 2(1) = 5$
$n = 2$ $3 + 2(2) = 7$
$n = 3$ $3 + 2(3) = 9$
$n = 4$ $3 + 2(4) = 11$

Sum = 5 + 7 + 9 + 11
= 32.

10. Even numbers from 2 to 242 are placed in a 11×11 grid such that every row, every diagonal, and every column will have an identical sum. Write an expression to represent the sum. Calculate it.

① $S = 2 + 4 + 6 + 8 + 10 + 12 + \cdots \cdots \cdots 240 + 242$

$= 2[1 + 2 + 3 + 4 + 5 + 6 + \cdots \cdots \cdots 120 + 121]$

$= 2\left[\dfrac{121 \times 122}{2}\right]$

$= 121 \times 122$

② Sum of each column

$S_2 = \dfrac{121 \times 122}{11}$ $\dfrac{122}{122}$

$= 11 \times 122$

$= 1342 //.$

11. The gas tank of an automobile holds 16 gallons of fuels. The automobile travels 32 miles on a tank of fuel. Assume that the driver will always fill the gas fully. If the tank is $\dfrac{3}{4}$ full at the beginning of a 192 mile trip, how full will the tank be at the end of the trip?

16 gallons → 32 miles

12 gallons → 24 miles

$\dfrac{192 \text{ miles}}{32}$

16 gallons

8 miles

8 gallons

12. The final grade in a course is the average of the scores on 10 tests. Each test is graded on a scale of zero to 100 inclusive. A student's average on the first 7 tests was 84. The final grade of the student in the course was 63. What was the average student grade on the last 3 tests? Round your answer to the nearest integer.

① LET $\dfrac{A+B+C+D+E+F+G+H+I+J}{10} = 63$

So $A+B+C+D+E+F+G+H+I+J = 630.$

② $\dfrac{A+B+C+D+E+F+G}{7} = 84$

∴ $A+B+C+D+E+F+G = 7(84)$
$= 588.$

So $588 + H+I+J = 630$

$\begin{array}{r} 5\cancel{6}0 \\ 2\cancel{8} \end{array}$

$H+I+J = 42$

$\dfrac{H+I+J}{3} = \dfrac{42}{3}$

$= 14$ //

13. A cube measures $10cm \times 10cm \times 10cm$. Three cuts are made parallel to the faces of the cube as shown creating eight separate solids which are then separated. Write an expression to calculate the increase in the total surface area and find the increase in the total surface area.
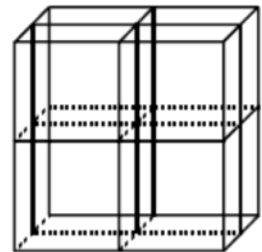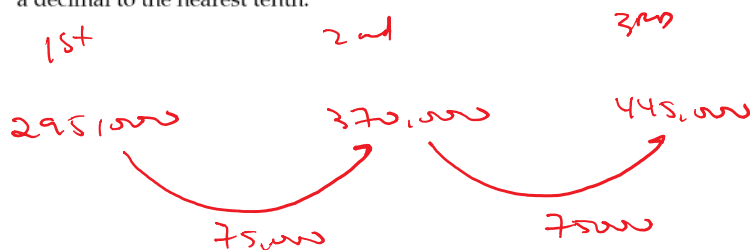

① $SA = 600\ cm^2$ //

② 8 cubes, $5cm \times 5cm \times 5cm$

③ $SA = (5 \times 5 \times 6) \times 8$
$= 1200\ cm^2$ //

④ Increase $= 1200\ cm^2 - 600\ cm^2$
$= 600\ cm^2$ //

14. The minimum starting annual salary for rookies in the NFL is $295,000. The minimum annual salary is $370,000 for second year players and $445,000 for third year players. For a player earning the minimum salary for their experience, what is the positive difference between the percent increase the $75,000 represents from the first to second year and the percent increase the $75,000 represents from the second to third year? Express your answer as a decimal to the nearest tenth.

1st   2nd   3rd

295,000   370,000   445,000

        75,000   75,000

$\% = \dfrac{75,000}{295,000} = 0.254$ $\% = \dfrac{75,000}{370,000} = 0.203$

$= 25.4\%$ // $= 20.3\%$

Diff in % increase
$= 25.4 - 20.3$
$= 5.1\%$

15. Place the numbers from 1 to 9 so that the sum of all the rows, columns, and main diagonals are equal.

8	1	6
3	5	7
4	9	2

16. Place the numbers from 1 to 25 so that the sum of all the rows, columns, and main diagonals are equal.

17	24	1	8	15
23	5	7	14	16
4	6	13	20	22
10	12	19	21	3
11	18	25	2	9

17. Challenge: How many digits are in the value of $2^{2003} \times 5^{1952} \div 4^{27}$?

① $4 = 2^2$

$4^{27} = (2^2)^{27}$

$= 2^{54}$

② $\dfrac{2^{2003} \times 5^{1952}}{2^{54}}$

$= 2^{1949} \times 5^{1952}$

$= 2^{1949} \times 5^{1949} \times 5^3$

$= 10^{1949} \times 125$

$= 125\underbrace{000\cdots000}$

$\underbrace{125}_{3 \text{ digits}} + 1949 \text{ digits} = 1952 \text{ digits}$

③ $3 \times 10^2 \qquad 3 \times 10^3$

$= 3\underline{00} \qquad 3\underline{000}$