



**UNIVERSITY OF
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Grade 6 Math Circles November 3, 2010 Order of Operations

Order of Operations

Steps when calculating mathematical expressions:

1. Perform any **division** or **multiplication** in the order they occur.
2. Perform any **addition** or **subtraction** in the order they occur.

Example

Compute the following:

a) $3 \times 5 + 4$

b) $9 - 24 \div 6 + 7$

Exercise 1

Compute the following:

a) $8 \times 2 - 6$

b) $55 \div 5 + 3$

c) $8 - 21 \div 7 \times 2$

d) $63 \div 9 + 1 \times 3$

e) $13 + 32 \div 4 \times 3 \div 6 - 11$

Exponents Recap

Remember...

$$2^3 = 2 \times 2 \times 2 = 8$$

Exercise 2

Compute the following:

a) 2^4

b) 3^3

c) 10^2

d) 1^8

BEDMAS

Brackets are used in math to tell you a different order of operations must be done. Any expression inside brackets is ALWAYS computed first.

Example

Compute the following:

1. $7 \times (13 + 4)$
2. $25 - 8 \times (11 - 6) \div 2$

Now, if we include exponents and brackets in our order of operations we need to revise our steps.

Steps:

1. Compute any expression inside **brackets** first.
2. Evaluate any **exponents**.
3. Perform any **division** or **multiplication** in the order they occur.
4. Perform any **addition** or **subtraction** in the order they occur.

There is a handy acronym to remind us which operation to complete first. The acronym that represents the correct order of operations is...

B rackets

E xponents

D ivision

M ultiplication

A ddition

S ubtraction

Examples

Compute the following:

a) $9 - (3 + 5) \div 2^2$

b) $1 \times (7 - 10 \div 5) - 1$

Exercise 3

Compute each of the following:

a) $(7 \times 6) - 40 + 7$

b) $5^2 \div (3 + 2) - 4$

c) $(1 + 24 \div 8) \times (2 + 3^2)$

d) $3^3 + (5 \times 6) - 4^2 \div 2 + (8 - 6)^2$

Multiplying Negatives

Rules for multiplying by Negatives:

1. positive \times positive = positive

ie. $2 \times 3 = 6$

2. positive \times negative = negative

ie. $2 \times -3 = -6$

3. negative \times positive = negative

ie. $-2 \times 3 = -6$

4. negative \times negative = positive

ie. $-2 \times -3 = 6$

To avoid confusion we will put brackets around the negative sign and the number in the expression so we can clearly see the negative number.

ie. $2 \times (-3) = -6$

Exercise 4

Determine the product for the following:

a) $(-6) \times 8$

b) $7 \times (-3)$

c) $(-9) \times (-4)$

d) $(-12) \times 3$

Dividing Negatives

Rules for Dividing by Negatives:

1. positive \div positive = positive

ie. $6 \div 3 = 2$

2. positive \div negative = negative

ie. $6 \div -3 = -2$

3. negative \div positive = negative

ie. $-6 \div 3 = -2$

4. negative \div negative = positive

ie. $-6 \div -3 = 2$

As with multiplication we will also use brackets around the negative sign and the number in the expression so we can clearly see the negative number.

ie. $(-6) \div 3 = -2$

Exercise 5

Determine the quotient for the following:

a) $(-16) \div (-2)$

b) $27 \div (-9)$

c) $(-32) \div (-4)$

d) $(-63) \div 7$

Summary with Negatives

In general...

1. a **positive** multiplied or divided by a **positive** will result in a **positive** number.
2. a **positive** multiplied or divided by a **negative** will result in a **negative** number.
3. a **negative** multiplied or divided by a **negative** will result in a **positive** number.

Problem Set

1. Compute the following:

a) $(24 - 13) \div 11 + 97$ b) $47 - 13 - (4^2 - 12) \times 7$ c) $8 \times 7 - 16 + 3^2 \times 2$

d) $2^5 - (59 - 7^2) \div 2 \times 6$ e) $-53 + (56 \div 8) \times 9 + 6^2$ f) $3 \times (6 \times 4 \div 8) + 157 - 11^2$

2. Compute the following:

a) $(-9) \times 8 + (12 + 10^2)$ b) $60 \div 12 + (5^2 - (-2) \times (-11))$

c) $((-54) \div 6 + 33) \div ((-8) \times (-3))$ d) $6 + (8^2 - 5) - (6^2 + 13)$

e) $32 \div (-8) - 9 + (127 - 5^3) \times 2^3$ f) $((-6) \times 7 + (-12) \div (-4) + 3) \div 6$

3. Jolene is twice the age of Andrew. Andrew is 6 years younger than Jim. Jim is half the age of Mike. If Mike is 48, how old is Jolene?

4. When the number 4 is squared and then doubled, what must be added to the answer to have a sum of 7^2 ?

5. A train consists of an engine, freight cars, and passenger cars. The engine is 21 meters in length, each freight car is 11 meters in length, and each passenger car is 12 meters in length. The total length of the whole train is 404 meters and total length, for freight cars only, is 275 meters. How many freight cars and how many passenger cars are there?

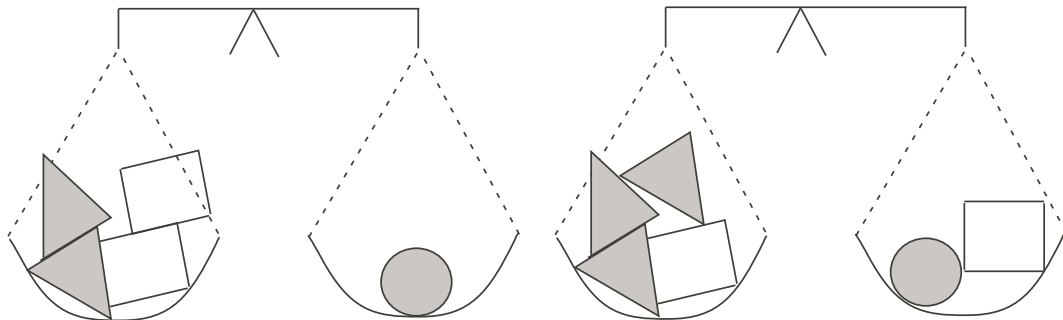
6. The number 52 is halved then has 6 added to it. The answer is then halved again. What is the new number as a power of 2?

7. A burger, an order of fries, and a soft drink cost \$2.90. Two burgers, an order of fries, and a drink cost \$4.40. A burger with a drink costs \$2.10. If Justine orders three burgers, two orders of fries, and a drink, how much will it cost her?

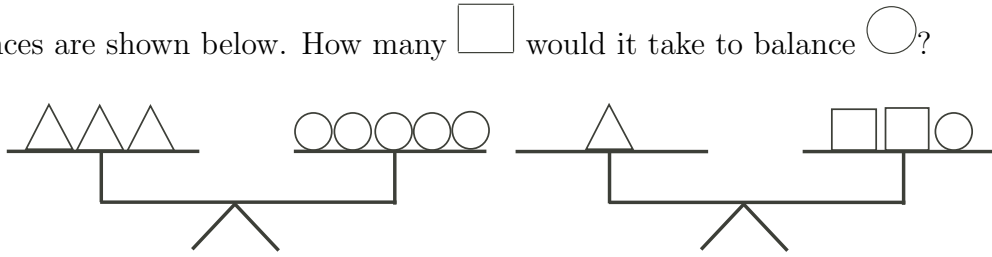
8. At a party, three 8-slice pizzas are ordered for five students. If each student eats the same number of slices, find all the possible number of slices that could be left over.

9. I am a positive 3 digit even number. My tens digit is double my ones digit and my hundreds digit is 5 less than my tens digit. What number am I?

10. Using \triangle , \square , and \circ , two scales are balanced as shown. \triangle , is equivalent to how many \square ?



11. Two balances are shown below. How many \square would it take to balance \bigcirc ?



12. Find the difference if the sum of the first 60 positive even integers is subtracted from the sum of the first 61 positive odd integers.
13. Tim has some spheres, each of which weighs the same. He also has some cubes, each of which weighs the same. He discovered that 4 spheres and 3 cubes weigh 37g and that 3 spheres and 4 cubes weigh 33g. What is the combined weight, in grams, of one sphere and one cube?
14. The symbol Δ represents a positive number. What two possible values for Δ can make $\frac{\Delta}{2}$ equal to $\frac{32}{\Delta}$?
15. Daniel's age is one-ninth of his father's age. One year from now, Daniel's father's age will be seven times Daniel's age. What is the difference between their present ages?
16. The digits 1, 2, 3, 4, 5, and 6 are placed in one of the boxes so that the resulting product is correct. If each of the six digits is used exactly once, what is the digit represented by '?'?

$$\begin{array}{r} \square \quad \square \\ \times \quad \square \\ \hline \square \quad \square \quad \square \end{array}$$

17. Suzanna has a total of \$3.60 in nickels and dimes. If her dimes were nickels and her nickels were dimes, then she would have \$5.40. How many coins does Suzanna have?
18. In the diagram to the right, a positive integer is to be placed in each of the nine boxes so that the products of the numbers in each row, column, and diagonal are equal. Some of the entries are already filled in. What is the number of possible values for N?

N		24
	12	
6		

Problem Set Solutions

1. (a) 98
(b) 6
(c) 58
(d) 2
(e) 46
(f) 45
2. (a) 40
(b) 8
(c) 1
(d) 16
(e) 3
(f) 6
3. 36
4. 17
5. 25 Freight cars and 9 passenger cars.
6. 2^4
7. \$6.70
8. 4, 9, 14, and 19.
9. 384
10. One triangle is equivalent to two squares.
11. Three squares balances one circle.
12. 61
13. 10
14. 8
15. 24
16. 3
17. 60
18. 9