MFM 1P

Foundations of Mathematics
Grade 9 Applied
Mitchell District High School

Unit 1 Numeracy and Algebra

12 Video Lessons

Allow **<u>no more</u>** than 18 class days for this unit!
This includes time for review and to write the test.
This does NOT include time for days absent, including snow days.
You must make sure you catch up on class days missed.

Lesson #	Lesson Title	Practice Questions	Date Completed
1	Adding and Subtracting Integers	Work Sheet	
2	Multiplying and Dividing Integers	Work Sheet	
3	Order of Operations	Work Sheet	
4	Like and Unlike Terms	Page 255 #6, 8, 9, 10, 11	
5	The Sum of Two Polynomials	Page 259 #3, 4, 5, 6a)d), 7, 9, 10	
6	The Difference of Two Polynomials	Page 265 #5-7, 10, 11	
7	The Distributive Law	Page 272 #5-10	
8	The Product of Two Monomials	Page 277 #4, 6 - 11	
9	Multiplying Monomials by Polynomials	Page 282 #7-10	
10	Solving Equations	Page 229 #1, 3, 4, 6, 7, 9	
11	Equations with Variables on Both sides	Page 286 #2-6 + Work Sheet(1-15)	
12	Multistep Equations	Page 286 #7, 8 + Handout (from last lesson)	

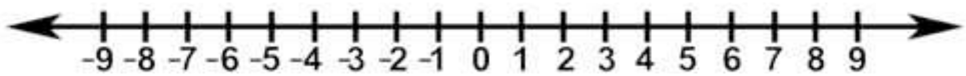
Test Written on : ____

Topic : Integers

Goal : I can write integer operations without a double sign and then add or subtract using a number line and/or the cancellation effect.

Adding and Subtracting Integers

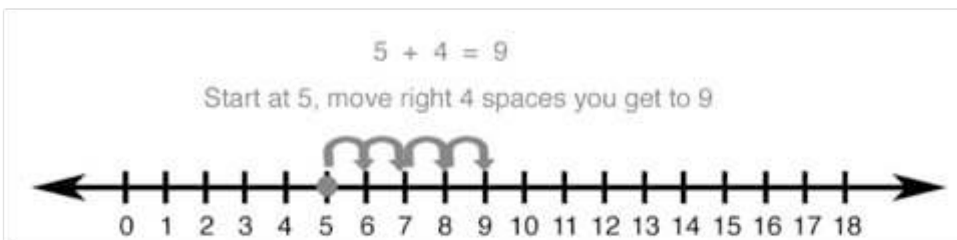
Remember the number line.



Any movement to the _____________ on the number line is a positive movement represented by a "+"

Any movement to the LEFT on the number line is a ________________ movement represented by a "-"

Let's represent simple addition and subtraction statements on the number line.



Double Sign	Net effect	Movement on Number line	Example	Adjusted to get rid of double signs
Add Positives			(-5) + (+ 7)	
Add Negatives			(-7) + (-3)	
Subtract Positives			(7) – (+6)	
Subtract Negatives			(-2) – (-7)	

Rules

When you have two signs that are side by side,

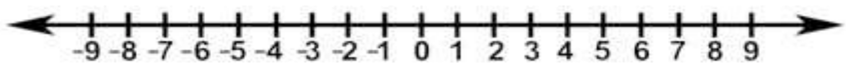
* If the signs are the same - - or ++, replace the two with one ___________ sign.

* If the signs are different + - or - +, replace the two with one ___________ sign.

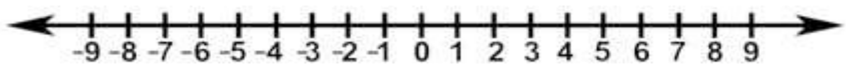
Once you have replaced all the double signs it's just a matter of moving left or right on the number line from your starting point.

Examples : Get rid of the double negative and then show the movement on the number line.

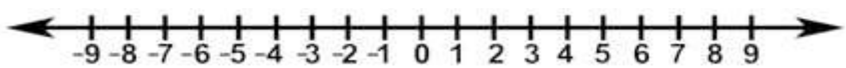
1. (-3) + (-6)



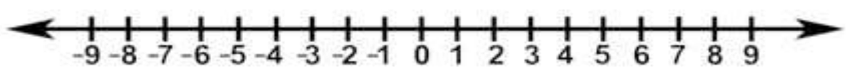
2. 4 + (+3)



3. -5 – (-7)



4. -2 – (-4) + (-6)



A Simpler Way To Look At It!

Do you know that positives and negatives destroy each other?

Like matter and anti-mater. If they get to close to one another...

You are left with nothing. I like to think of this as the CANCELLATION EFFECT.

Think about +1 and -1

When adding and subtracting using the cancellation effect, you still need to get rid of the double signs. But after that, you are going to think of each individual term as being a separate entity, whose sign is the operation in front of it.

$$(-6) - (-9) =$$

You won't always have a cancellation effect. If both terms have the same signs, there is no destruction. They like each other. They all get along and war is avoided.

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

1. 2-(-2)

2. (-12)+(-11)

3. 2-(-9)-8

4. (-1)+(+5)

5. (-8)-(+7)

6. (-10)-(-25)

7. 5+(+7)

8. 5+(-12)

Practice Questions - Handout Page

MFM 1P

Adding and Subtracting Integers

Evaluate each expression.

1) $2+(-4)$

2) $6-(-8)$

3) $(-8)-(-4)$

4) $(-5)+4$

5) $(-1)+(-4)$

6) $2-(-3)$

7) $5-5$

8) $8-5$

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

10) $(-5)+7$

11) $4+(-8)$

12) $8-(-4)$

13) $(-6)-8$

14) $(-3)+(-4)$

15) $(-8)-(-8)$

16) $4-(-4)$

17) $7+(-6)$

18) $(-7)-4$

19) $(-4)+(-3)$

20) $4-2$

21) $3+(-8)+(-3)$

22) $6+4+(-4)$

23) $(-7)-8-(-4)$

24) $(-1)+8+3$

25) $(-4)-(-4)-4$

26) $2+(-4)-3$

27) $(-8)+2+5$

28) $(-8)-(-4)-(-7)$

29) $(-5)-(-1)-5$

30) $(-2)+4+(-8)$

31) $2+2-(-4)$

32) $5+4+(-1)$

33) $8-(-8)+(-1)$

34) $(-6)-4+(-2)$

35) $(-2)-8-(-3)$

36) $1+(-4)+6$

37) $(-2)-(-3)-(-8)$

38) $8-(-4)-4$

39) $(-6)+(-6)+1$

40) $(-3)-(-5)-(-5)$

41) $(-4)+(-6)-5+(-1)$

42) $4+4-(-6)-4$

43) $7-(-1)+(-8)+(-3)$

44) $(-7)-4-1+4$

45) $(-4)-8-8+(-5)$

46) $4-6-3+1$

47) $3+8-8-(-6)$

48) $6+(-4)+7-(-6)$

49) $(-8)+6+(-2)+5$

50) $(-4)-(-5)+6-(-7)$

51) $(-1)-(-1)-(-3)-8$

52) $2+4-(-3)+(-7)$

53) $6-2+5+2$

54) $(-8)-4-(-5)-(-8)$

55) $(-5)-8-4+5$

56) $(-2)-4-3+7$

57) $2-8+2+(-1)$

58) $5+(-4)+(-6)+(-1)$

59) $8+8-(-7)+(-1)$

60) $(-6)-(-4)-(-8)-(-2)$

Answers to Adding and Subtracting Integers

1) −2	2) 14	3) −4	4) −1
5) −5	6) 5	7) 0	8) 3
9) −10	10) 2	11) −4	12) 12
13) −14	14) −7	15) 0	16) 8
17) 1	18) −11	19) −7	20) 2
21) −8	22) 6	23) −11	24) 10
25) −4	26) −5	27) −1	28) 3
29) −9	30) −6	31) 8	32) 8
33) 15	34) −12	35) −7	36) 3
37) 9	38) 8	39) −11	40) 7
41) −16	42) 10	43) −3	44) −8
45) −25	46) −4	47) 9	48) 15
49) 1	50) 14	51) −5	52) 2
53) 11	54) 1	55) −12	56) −2
57) −5	58) −6	59) 22	60) 8

Lesson Topic - Integers

Lesson Goal - I know how to multiply and divide integers.

Multiplying and Dividing Integers

If you know your times tables for positive numbers, you will be fine for negative numbers as well. There is only one simple rule...

Two negatives make a positive. So if you can pair up all the negatives, your total answer will be positive.

In other words.

If you have an ODD number of negatives, you won't be able to pair them up - so your final answer will be NEGATIVE.

If you have an EVEN number of negatives, they can all be paired up - so your final answer will be POSITIVE.

Example: First state whether the answer will be positive or negative, then evaluate (you may use your calculator).

a) $(-3)(-2)$

b) $(-2)(4)$

c) $(-12)\div(4)$

d) $(-24)\div(-6)$

e) $(-1)(-3)(-3)(2)(-4)$

f) $\dfrac{(2)(-10)(-3)}{(-4)}$

g) $(5)(2)(-1)(-3)(2)(6)$

h) $\dfrac{(6)(8)(-2)}{(-4)(-2)}$

Practice Questions - Handout Page

MFM 1P

Multiplying and Dividing Integers

Find each product.

1) $(-3)(3)$
2) $(-9)(9)$
3) $(2)(-8)$
4) $(-3)(-9)$
5) $(10)(-7)$
6) $(-8)(-10)$
7) $(-4)(7)$
8) $(6)(-4)$
9) $(9)(-2)$
10) $(-9)(-6)$
11) $(-6)(-9)(-9)$
12) $(-4)(-10)(-8)$
13) $(4)(-7)(4)$
14) $(-6)(-2)(-1)$
15) $(-7)(-5)(10)$
16) $(-4)(-9)(-5)$
17) $(9)(7)(-3)$
18) $(3)(-3)(-6)$
19) $(6)(-6)(8)$
20) $(9)(3)(-7)$
21) $(-9)(-1)(8)$
22) $(-5)(-4)(-7)$
23) $(-2)(5)(7)$
24) $(2)(-8)(-10)$
25) $(4)(-2)(6)$
26) $(8)(8)(-9)$
27) $(-10)(4)(-2)$
28) $(-7)(-9)(-2)$
29) $(-3)(10)(-3)(8)$
30) $(6)(-10)(-3)(-6)$
31) $(6)(-9)(10)(5)$
32) $(10)(8)(-4)(-6)$
33) $(-8)(5)(10)(5)$
34) $(-5)(-7)(-5)(2)$
35) $(-2)(-10)(9)(-9)$
36) $(5)(-5)(-9)(-2)$
37) $(-10)(9)(-2)(5)$
38) $(-6)(-2)(-7)(9)$
39) $(-3)(-6)(-1)(-2)$
40) $(-10)(-8)(-5)(8)$
41) $(4)(-1)(6)(4)$
42) $(7)(-4)(-8)(-5)$
43) $(-8)(2)(-9)(3)$
44) $(-4)(-2)(-3)(-8)$

Find each quotient.

45) $\frac{5}{-1}$
46) $\frac{8}{2}$
47) $\frac{15}{5}$
48) $\frac{-27}{9}$
49) $\frac{-18}{-6}$
50) $\frac{3}{-3}$
51) $\frac{-45}{9}$
52) $\frac{20}{4}$
53) $\frac{14}{7}$
54) $\frac{-49}{-7}$
55) $\frac{-16}{-4}$
56) $\frac{8}{-1}$
57) $\frac{30}{3}$
58) $\frac{36}{6}$
59) $\frac{-54}{9}$
60) $\frac{81}{-9}$
61) $\frac{-40}{-5}$
62) $\frac{6}{-2}$

Answers to Multiplying and Dividing Integers

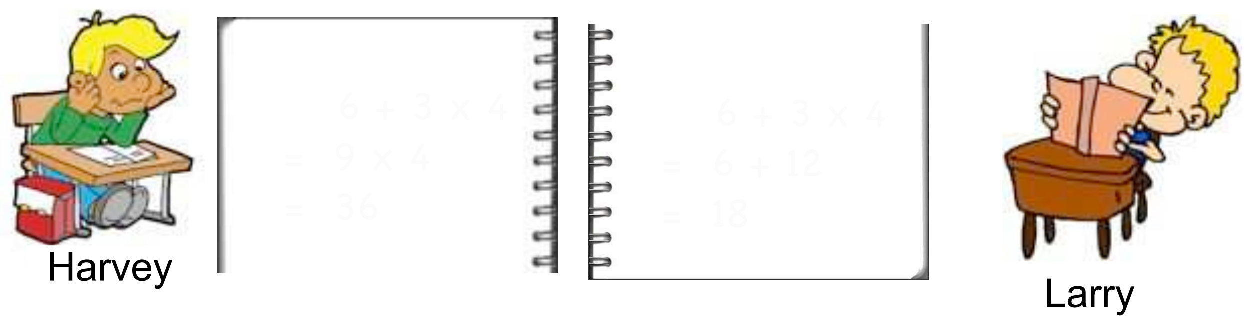
1) −9	2) −81	3) −16	4) 27
5) −70	6) 80	7) −28	8) −24
9) −18	10) 54	11) −486	12) −320
13) −112	14) −12	15) 350	16) −180
17) −189	18) 54	19) −288	20) −189
21) 72	22) −140	23) −70	24) 160
25) −48	26) −576	27) 80	28) −126
29) 720	30) −1080	31) −2700	32) 1920
33) −2000	34) −350	35) −1620	36) −450
37) 900	38) −756	39) 36	40) −3200
41) −96	42) −1120	43) 432	44) 192
45) −5	46) 4	47) 3	48) −3
49) 3	50) −1	51) −5	52) 5
53) 2	54) 7	55) 4	56) −8
57) 10	58) 6	59) −6	60) −9
61) 8	62) −3		

Topic - Order of Operations

Goal - I know which order I must do mathematical operations in a math expression and I know what BEDMAS stands for.

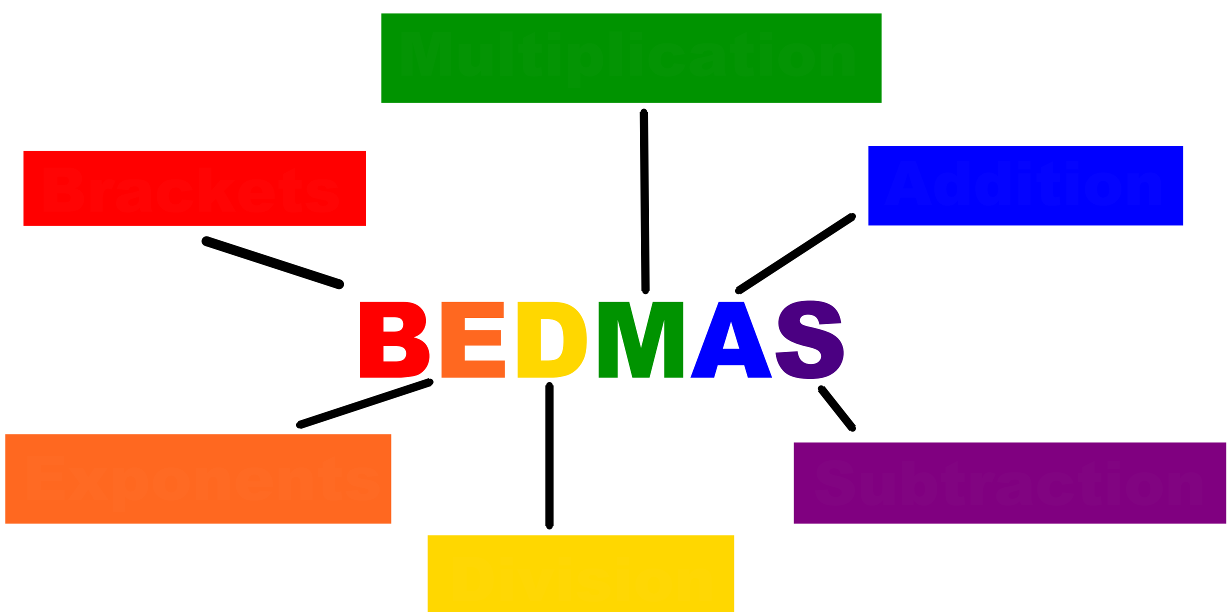
Order of Operations

Why do we need an order for our mathematical operations?



So who is right? They have both performed the operations correctly, just in a different order.

So mathematics eventually evolved a set of rules to take care of those differences, so that everyone gets the same answer. We use the acronym BEDMAS to remind us of that order.



How do I use order of Operations?

Multiplication and division are inter-changeable

BEDMAS

Addition and Subtraction are inter-changeable

Let's Practice!

1. $56 \div (12 - 4) + 3 \times 4 - 8$

2. $17 - 3 \times 5 + (3 + 9) \div 4$

3. $2 \times 8 - 4 \div 2 \times (2 + 4) - 4$

Calculator Riddles!

Let's have some fun. Here are a some riddles that can be solved on your calculator. Follow the correct order of operations - be sure to do every step in your notebook, then when you have the final answer, turn your calculator over to get the answer to the riddle.

1. How do you feel on Monday Morning?

$27 \times 34 - 147$

2. How do you feel most Monday afternoons?

[312 x 97 + 14 229 ÷ 3 - 34 502] ÷ 1000

Calculator Riddles

Practice with Order of Operations

Find the answer to each of the following riddles by evaluating the numerical expression and turning the calculator upside-down. Show each step in your notes. **Remember order of operations.**

1. How do you feel on Monday mornings?
   $27 \times 34 - 147$

2. How do you feel most Monday afternoons?
   $[312 \times 97 + 14\,229 \div 3 - 34\,502] \div 1000$

3. What do you usually hear at the end of each class?
   $93^2 - 89 \times 11 + 68$

4. When you arrive at your homeroom one-minute late, what do you do?
   $68\,886 \div 89 - 1423 + 1287$

5. How do your friends greet you when you get to class?
   (a) $92\,376\,788 \div 6\,598\,342$
   (b) $1973 \times 26 \times 147 - 954 \times 4625 - 3\,123\,042$

6. Name one creature you might study in the Science lab?
   $1256(832 - 751) \div 157 + 85$

7. How would you like the opposing team to describe the outcome of the first school football game of the season?
   $314\,379 \div (789 - 672) + 39 \times 963 - 34\,737$

8. What topic do you study in Geography class?
   $4818 \times 736 \div 48 - 89 \times 188 - 39$

9. How do you react to your best friend's jokes?
   $1.482 \times 17(6.42 - 1.29) - 1.28(98.74 - 3.65) - 0.125\,98$

10. What does the teacher do when you don't complete your homework assignment?
    $39^3 - 416 \div 4 + 13(89 - 18) - 6 \times 505$

11. How is 10 related to 43?
    $53(218 - 189)^3 + 241(648 - 597) - 56\,279 \times 23 - 4954$

12. What kind of mark do you expect to get in your favourite subject?
    $(1493 - 275)^2 - 2361(382 + 225) - 45\,783$

13. What do good musicians and beginning pilots have in common?
    $45\,356 + 21[3(489 - 416)]^2 - 57(819 - 793)^3$

14. If you missed a test, what mark would you get?
    $[81(163 - 138) \div 5]^3 - 310^2 + 981$

15. What do you like most about a mid-week school dance?
    $537(291 + 418) - 275 \div 25 \times 842 - 55\,463$

16. No orchestra would be complete without this:
    $\{ [(64 \times 6 \div 4) \times 75] \div 2\} - (11 \times 7^2) + 19$

17. Something that may be attached to a tap in order to water the lawn:
    $1500 \times 2 + 250 \times 2 + 4$

18. During the winter season this might be used to travel over snow:
    $200\,000 \times 2 + 45\,000 \times 2 + 2\,000 \div 2 + 150 \times 2 + 75$

19. Some people build one of these around themselves so others won't know where they really are. Others associate it with nuts.
    $35\,000 \times 2 + 3\,500 \times 2 + 400 - 55$

20. When math class is over you may find that you have this kind of headache:
    $(12 \times 82) \times 4 \div 3 - 444 + 50$

21. There will be a time, if not already, when you will probably have to pay these:
    $(18^2 \times 357) \div 2 - 116$

22. This is a constructional toy made up of joinable blocks:
    $\{0.00001 \times [(2\,210 \times 3) + 1] \}$

23. The lustre of a polished shine:
    $4^2 + [(5 \times 11) \times 10^3)]$

24. Trouble often comes to people who tell these:
    $5^2 \times 10 \times 20 + 10 \times 30 + 17$

25. When you were a small kid and the cookie jar was out of reach did you look for something that was_______________?
    $[(8 \times 6 \times 12 + 7) \times 8] - 10 \times 5$

Make your own riddles

These are the letters the calculator will show upside down:

0 is O	1 is I	2 is Z	3 is E	4 is h	5 is S	6 is g	7 is L	8 is B	9 is G

Start with the answer. Suppose it is BOIL
Write it backwards ⇒ LIOB
Translate to numbers ⇒ 7108
Then for example, add 12 ⇒ 7180 + 12 = 7120
Then subtract something, for example 120 ⇒ 7120 - 120 = 7000
Now multiply ⇒ 7 000 x 3 = 21 000
Then divide ⇒ 21 000 ÷ 1.5 = 14 000
Now work backwards. Where you divided, multiply
Where you multiplied, divide
Where you subtracted, add
Where you added, subtract
Now you have a riddle: What does water do at 100°C ⇒ 14 000 x 1.5 ÷ 3 + 120 - 12

MFM 1P U1L4 - Like and Unlike Terms

Topic : Algebra

Goal : I understand what variables (unknowns) are and what is meant by like terms.

Sort the following math "terms" into groups that are the same.

3

5

3^2 5 5 5^2

5^2 5

5

3

3^2 3

5

5

5^2

3

3^2 3^2

Now write a math statement, using order of operations, that would make it easy to find the total of all those numbers.

What is a algebra?

When we use algebra, we put a letter (usually x) in place of an unknown number. But many of the operations that we use on numbers, can also be used with this number substitute.

$3 + 3 + 3 + 3$	is like saying	$x + x + x + x$
$3^2 + 3^2 + 3^2 + 3^2$		$x^2 + x^2 + x^2 + x^2$

The expression 4x, is called a term.

A term in math usually has a number (called a coefficient) and a letter (called a variable)

the operation between them is always_______________

Sometimes terms can have more than one variable - $5x^2y$

Sometimes terms can have no variables at all - then it's called a constant term

Like Terms and Unlike Terms

Two terms are considered "like" terms if they have the same variables and those variables have the same exponents.

They do NOT have to have the same coefficients.

Example 1. Match up the like terms, by either underlining or drawing shapes around them.

$5y$ $-2x^3$ 8 $5x$ $-2x^3y$ $4y$ $-4x$ $3x^2$

$11x$ $9x^3y^2$ $-2x^3y^2$ $15x^2$ $-3.2x^3y$

To **combine like terms**, we simply locate all the terms that are the same and then add up their coefficients. You CANNOT combine unlike terms.

$2x + 3x$ is like

all together we have ________________

Example 2. Combine like terms in the following expressions.

a) $3x + 4x$

b) $-12x + 6x - 4x$

c) $5x^2 + 3y - 7x - 11y + 4x^2 - 6x$

c) $3x^2y - 6x^2y^2 - 7x^3y + 2xy - 5x^2y^2 + 8xy + 3$

c) $5x^2 - 6x + 7x^2 + 3x - 2 + 8x + 7$

Practice Questions - Page 255 #6, 8, 9, 10, 11 + Handout

Topic : Adding Polynomials

Goal : I know what a polynomial is and I can add two of them together using the rules of collecting like terms (a.k.a. simplifying)

Adding Two Polynomials

When a bunch of terms are linked by addition or subtraction the expression formed is called a polynomial.

1 term _______________ is a monomial

2 terms _______________ is a _______________

3 terms _______________ is a _______________

A polynomial is in simplified form if there are NO like terms in the string of terms.

Sometimes we want to add two simplified polynomials together.

$$(2x^2 - 5x + 3) + (3x^2 - 6 + 2x)$$

Technique #1

Technique #2

☆ ☆

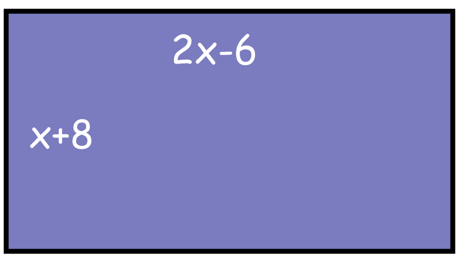
MFM 1P U1L5 - The Sum of Two Polynomials

Example 1. Add the following polynomials.

a) $(2x^2 + 7x - 20) + (-x^2 - 5x - 3)$

b) $(8x^2 - 4x + 9) + (12x^2 + 6x)$

Example 2. a) What is the **perimeter** of the following rectangle.



b) Use your answer from a) to find the perimeter if $x=5$.

Example 3. Can you find two polynomials whose sum is $4x^2-9x$?

Practice Questions - Page 259 #3, 4, 5, 6a)d), 7, 9, 10

Topic : polynomials

Goal : I can subtract two polynomials using the rules of collecting like terms.

Difference of Two Polynomials

Remember when you subtract integers, the sign changes...

$= 5 - (-3)$
$=$

$= 5 - (+3)$
$=$

The sign you end up with is OPPOSITE what was in the bracket!

Subtracting polynomials is similar.

$$(2x^2 - 5x + 3) - (3x^2 + 2x - 6)$$

Technique #1

☆

Technique #2

☆

Example 1.

a) $(-2x - 3) - (5x + 4)$

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

Example 2. When two polynomials are subtracted, the answer is $3x^2 + 6x - 8$. What might have been the polynomials?

Practice Questions - Page 265 #5-7, 10, 11

Topic : the distributive law

Goal : I can multiply a polynomial by a constant using the Distributive Property

The Distributive Property

Remember that multiplying can be thought of as a repeated addition, so...

$3(4x-3)$ means that you have three of the polynomials in the brackets added together.

Can you think of an easier way to do this?

$$3(4x-3)$$

Try this one.

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

But I thought we had to do what is in the brackets before we multiplied! BEDMAS tells us so!

We can't actually do anything in the brackets because we don't know what x is. But let's try a couple of numeric examples of this so that we can see if it matters which we do first.

Example 1. Evaluate the following expression...

Using BEDMAS	Using the Distributive Law
$5(10-2)$	$5(10-2)$

When a question requires that you use the Distributive Law, it will most likely contain the word EXPAND in the instructions for the question.

Example 3. Expand the following expressions.

$3(5x^2+2)$

$-3(x^2+6x-3)$

REMEMBER
multiplying by a negative number will switch the signs.

Example 4. Expand and simplify the following expression.

$$2(2x^2+6x+7) - 5(3x^2-4)$$

Expand each bracket and then collect up like terms once you are done.

Practice Questions - Page 272 #5-10

Topic : Multiplying Monomials

Goal : I know the rules of exponents and can use them to multiply two monomials together.

The Product of Two Monomials

Review of powers

An exponent is a way of representing repeated multiplication.

2 x 2 x 2 x 2 x 2 =

When we write this with an exponent we are finding a power.
A power consists of a base and an exponent.

$$\text{base} \longrightarrow 2^5 \longleftarrow \text{exponent}$$

The base tells us what is being multiplied and the exponent tells us how many of them we have.

Example 1. Write each repeated multiplication as a power.

a) 3 x 3 x 3

b) 5 x 5 x 5 x 5 x 5 x 5 x 5

c) (x)(x)(x)(x)(x)(x)

Example 2. Write each power as a repeated multiplication.

a) 7^4

b) 5^2

c) x^4

Multiply monomials

A monomial consists of a coefficient, a variable(s) and an exponent.

$$3x^2$$

When we multiply two monomials, it is important to remember that BEDMAS tells us we can multiply in any order we want.

$$(2x)(4x^2)=$$

RULE

Example 3. Multiply the following monomials.

a) $x(x^3) =$

b) $(4x^2)(6x^3) =$

c) $(2x)(3x^2)(2x^6) =$

Practice Questions - Page 277 #4, 6 - 11

Topic : Polynomials

Goal : I can multiply a monomial with a polynomial by using the distributive law.

Product of a Polynomial and a Monomial

Yesterday we learned how to multiply monomials...

$5x^2(-6x^4) =$

RULE

The class before that we learned the distributive law...

$-5(-6x^4+3x^3-5x+7) =$

RULE

Now, what happens if we have a monomial out front!

RULE

$-5x^3(-6x^4+3x^3-5x+7) =$

Try These!

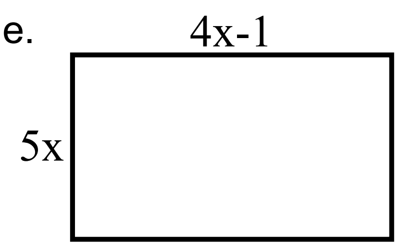
Example 1. Expand. Simplify if possible.

a) $4x(x - 3)$

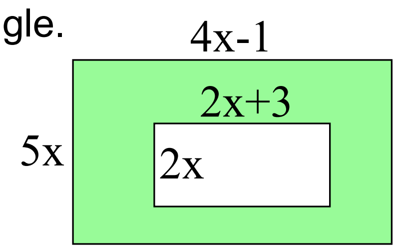
b) $5x^2(x^2 + 2x - 4)$

c) $2x(x + 5) - 7x(x^2 + 8x - 2)$

Example 2. Find the area of the given rectangle.



Example 3. Find the shaded area of the rectangle.



Practice Questions - Page 282 #7-10

Topic : Solving Equations

Goal : I can solve for the unknown value in an equation using algebraic methods (not just by inspection).

Solving Equations

A variable is a letter or symbol that takes the place of a number we don't know.

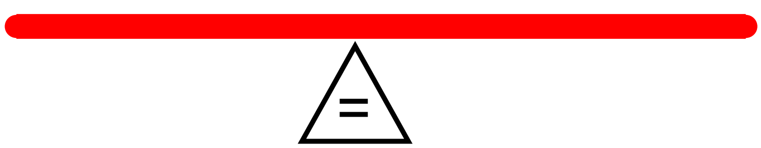
An equation is a math expression involving variables and an equal sign. When we solve an equation we figure out the value of the variable.

$$x + 6 = 10$$

Think of an equation as a balance with the middle as the equal sign.

x

1



Our ultimate goal is to get x all by itself - but as we do that we have to keep the scale balanced. Right now the x has 6 pesky ones with it, so I need to remove them. But if I remove them from one side of the scale , I have to remove them from the other side, so I don't upset the balance of the scale.

This is how that would look like mathematically.

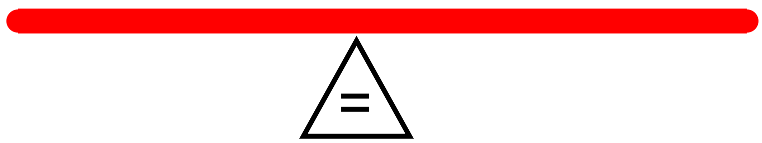
$$x \;+\; 6 \;=\; 10$$

Now with two steps...

$$4x + 2 = 10$$

x

1



Once you get rid of all the pesky ones, split your x's up. You need to divide up your other side into the same number of groups. Each of the individual groups must be equal, so that gives us our answer.

Here's how we usually write it down (without scales)

$$4x + 2 = 10$$

MFM1P U1L10 - Solving Equations

Steps to solving equations

Step 1. First get term that has x in it by itself by adding/subtracting the constants from each side.

Step 2. Then divide by the coefficient to see each individual x is valued at.

Let's work through these ones.

$$x - 2 = -5$$

$$6 = -5 + x$$

$$3p - 2 = -29$$

$$100 = 4 - 12r$$

A word about proper form...

* one equal sign per row
* keep your equal signs lined up
* use different colours to show what step you are adding onto a line.

Practice Questions - Page 229 #1, 3, 4, 6, 7, 9

Topic : Solving Equations

Goal: I can solve an equation when there are unknown values on both sides of the equal sign.

Equations with Variables on Both Sides

Practice : Solve for x

$$6 = 10 - 3x$$

Sometimes we have equations with variables on both sides of the equal sign.

Example 1. Solve for x.

$$7x - 9 = 4x$$

Pick a side to get the variables on. If one side already has only variables, get the variables **off** the other side.

$$7x - 9 = 4x$$

Example 2. Solve for x.

$$10x - 2 = -4x + 40$$

Pick a side to get the variables on. Usually I would pick to keep the x-terms on the left.

$$10x - 2 = -4x + 40$$

Get rid of the constant term on the left

Simplify

Get rid of the variable term on the right

Simplify

Divide both sides by the coefficient of x

Example 3. Solve for x

a) $8x + 10 = 2x - 8$

b) $18 + 2x = 4x - 9$

Practice Questions - Page 286 #2-6 + Handout

MFM 1P

Solving Multistep Equations

Solve each equation.

1) $-2 + 5p = -2 + 2p$

2) $13 - x = 1 - 3x$

3) $-7 + 4x = 1 + 5x$

4) $-5 + 4n = 1 + 5n$

5) $4r + 15 = 7r$

6) $4b - 5 = 13 + 7b$

7) $4v - 3 = -11 + 5v$

8) $8 + 4x = 6x$

9) $6n + 1 = 8n + 15$

10) $10 - 4a = 2 - 8a$

11) $-4 - 4k = 8 - 6k$

12) $10 - 2p = 2 - 3p$

13) $7x = 7 + 8x$

14) $3n + 2n = 6 + 7 + 2n + 2$

15) $3x + 2 = -3x + 8$

16) $-4 + 8(8k - 8) = -4$

17) $50 = -6n + 8(1 + 6n)$

18) $-13 = 7(5x + 3) + 1$

19) $5(2p + 2) = -40$

20) $-2(5n + 5) = 40$

21) $-20 = -5(4 + 6m)$

22) $-4(4 + 8r) = -16$

23) $-8(x - 5) = 64$

24) $22 = -6 - 7(n - 6)$

25) $-40 = 8(-6b - 5)$

26) $-4x - 37 = 5(1 - 2x)$

27) $5(7 - 4v) = -8v - 25$

28) $-2(-7n + 7) = -38 + 8n$

29) $8 - 8k = -4(4k + 8)$

30) $p + 7(p - 3) = -32 - 3p$

31) $-5(6a - 8) - 8 = 5 - 3a$

32) $-8 - 4x = -4(-4 + 2x) - 8$

33) $4(3m - 1) - 3 = 7m + 33$

34) $-r + 8 = -7(r - 8)$

35) $16 + n = -8(-2 + 8n)$

36) $-4 - 6(x - 6) = -2 - 8(x - 2)$

37) $4(-8n + 8) + 8 = -4(4 + 8n) + 8n$

38) $-(6r - 6) = -8(r - 4)$

39) $-4(8x - 4) = -4(5x - 4)$

40) $-2(b + 6) - 4(4b - 3) = -4b + 4b$

41) $-8(n - 6) - 7(6n - 2) = 4 + n + 7n$

42) $-3(1 - 2v) = 4(-5 + v) - 7$

43) $-7x + 3(x - 5) = -3 - 2(x - 2)$

44) $5(a + 3) = 3(7 + 4a) - 8a$

45) $-5(6x + 3) = -3(-3 + 8x)$

Answers to Solving Multistep Equations

1) $\{0\}$	2) $\{-3\}$	3) $\{-8\}$
4) $\{-6\}$	5) $\{5\}$	6) $\{-6\}$
7) $\{8\}$	8) $\{4\}$	9) $\{-7\}$
10) $\{-2\}$	11) $\{6\}$	12) $\{-8\}$
13) $\{-7\}$	14) $\{5\}$	15) $\{1\}$
16) $\{1\}$	17) $\{1\}$	18) $\{-1\}$
19) $\{-5\}$	20) $\{-5\}$	21) $\{0\}$
22) $\{0\}$	23) $\{-3\}$	24) $\{2\}$
25) $\{0\}$	26) $\{7\}$	27) $\{5\}$
28) $\{-4\}$	29) $\{-5\}$	30) $\{-1\}$
31) $\{1\}$	32) $\{4\}$	33) $\{8\}$
34) $\{8\}$	35) $\{0\}$	36) $\{-9\}$
37) $\{7\}$	38) $\{13\}$	39) $\{0\}$
40) $\{0\}$	41) $\{1\}$	42) $\{-12\}$
43) $\{-8\}$	44) $\{6\}$	45) $\{-4\}$

Topic : Solving Equations

Goal : I can solve equations that need to be simplified on one or both sides of the equal sign.

Multistep Equations

Sometimes equations need to be simplified before you can go about solving them.

ALWAYS simplify each side separately until there is at most two terms on each side.

Example 1 . Collecting like terms before solving.

a) $-12 = 2 + 5x + 2x$

b) $10x + 9x + 34 = 3 + x - 5$

Look at each side individually and put together any like terms. Then solve.

Example 2 . Expanding and simplifying before solving.

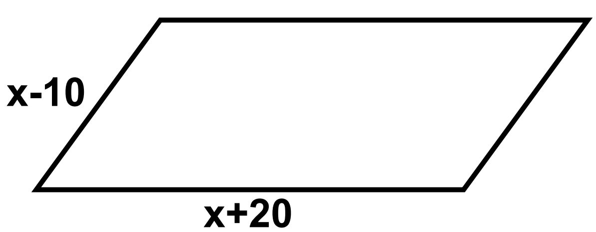
Look at each side individually. Use distributive law to expand the brackets and collect like terms. Then solve.

a) $6(6x + 6) - 5 = 1 + 6x$

b) $-11 + 10(x + 10) = 4 - 5(2x + 11)$

Example 3. Fabulous Fencing (EQAO Prep)

Pauline builds a fence around her garden that is shaped like a parallelogram as shown. If she uses 100 meres of fencing along the perimeter of the garden, find the dimensions of her garden.



Practice Questions - Page 286 #7, 8 + Handout