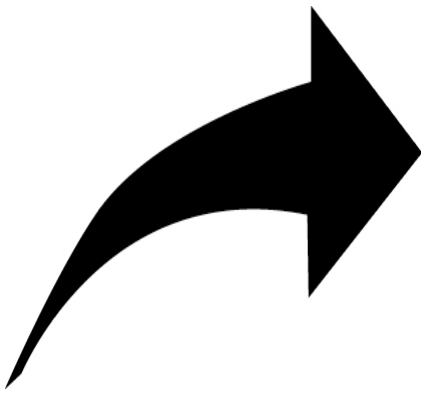
Meet the NWEA Math Challenge



Strategically

ACTION PLAN FOR NWEA PROGRESS

What will you emphasize?

Week	Math Knowledge	Math Strategies	Test Success Strategies

Recommended: Include having students make up their own guide to NWEA test success.

Learning Abilities are NWEA Priorities

Students need to develop abilities that help them learn more in every subject. In the left column, note a learning ability you will strengthen. In the right column, note how you will guide students to strengthen that ability. We put some examples. Make your own plan.

Learning Ability	How to Strengthen It
Students take time to think; students re-think	Students pair to COMPARE, then repair
Students analyze questions before they answer them.	Students restate the question in their own words.
Students evaluate possible responses.	Students rank the responses to a question. Students turn an open-ended question into a multiple choice question.

Meet the Math Challenge

What does NWEA Math require?

It's a three-part map:

- ✓ Knowledge of number value patterns and math rules
- ✓ Ability to solve problems—figure out which rules apply—in contexts that start simple and move to complex and abstract
- ✓ Knowledge and ability to apply math strategies

What to do?

- ✓ Instead of seeing NWEA Math as a set of requirements, view it as a set of steps, a progression.
- ✓ Build diverse learning opportunities into the week, including math integration with science and social studies.
- ✓ Give students responsibilities—in addition to or instead of teacher-made "anchor charts, students construct math displays
- ✓ Use relevant contexts—"use geometry and measurement to build a bridge"
- ✓ Organize projects such as "your own store" (teacher.depaul.edu) to involve students in actively applying a variety of math skills.

The Math Challenge

NWEA asks students to use a wide range of math skills.

The most important skill students need to respond is reading the question.

Students need to ask themselves:

- What is the question asking me?
- What skills will I need to figure out the answer?
- What information from the problem will I use?

THEN they should answer the question after they analyze it instead of rushing to choose one of the multiple choice options.

I can solve a word problem strategically!

Math Practice Standard 1: Make sense of problems and persevere in solving them.

Note to Teachers: This organizer is designed to guide a student. It also is an instant assessment. If students cannot complete steps 1, 2, or 3, the teacher learns what the kinds of help the student needs to comprehend a word problem and decide which strategies and skills to use.

What is the question asking me to figure out? ↘	
How will I solve it? ↘	
What information do I need to solve it?	

Your teacher will tell you how to take the next step.

You may complete it by yourself or…

<u>pair and share</u>—work together with another student to solve it

or

<u>pair to compare</u>—solve it yourself then compare your work with another student's

NWEA Math Skills

Determines probability of an occurrence based on a simple experiment or frequency table—probability problems increase in complexity of data included in the analysis

Geometry: NWEA starts with basics—identification of shapes, classification of angles—then advances to problems of size, including radius, diameter, area, and volume, and problems that require them to compare and contrast geometric shapes. Students use coordinate geometry to figure out distances.

Measurement starts with basic kinds of measures such as elapsed time and moves to more complex levels, including conversion.

Proportion starts with simple fractions and moves to percentages, decimals, and conversion and use of fractions to solve problems.

PROBLEM SOLVING
Solves real-world problems—complexity of the problem increases, including the number of steps required and the level of abstractness

- Length, Distance, other spatial measures; Weight and mass
- Capacity
- Time
- Data from tables and graphs
- Proportion
- Measurement
- Data Analysis
- Prediction based on probability analysis
- Powers (advanced—grades 6-8)

Algebra
Missing elements (basic)
Patterns, sequences, functions, relationships
Expressions and equations of increasing complexity (advanced)

Advanced Students Use Logic as well as Math to:

- Justify a solution
- Construct arguments
- Evaluate a solution

MATH PROGRESS PRIORITIES

In addition to the new math that students learn, it's **important to** revisit math they mastered in the past but have not used recently. Research confirms that if the math curriculum includes "frequent cumulative review" that enables students to retain greater math competence. Among sources supporting this "mix" is the report "Assisting Students Struggling with Mathematics" of the What Works Clearinghouse, IES Practice Guide, US Department of Education. Use this chart to plan focuses on new math content and inclusion of math learned earlier in the school year in activities such as: learning centers; "bell ringers"; homework; integration into science and social science.

Week	**New Math**	**Math "Mix"—Content to Revisit**

Teacher's Choices: Math Activities and Assessments

Formative Assessment Approaches

1. Complete graphic organizer
2. Complete glossary with examples
3. Make self guide
4. Students construct questions and answers
5. Students correct a math problem solution that has errors
6. Solve problem, justify the solution

Activities

1. Create math problems
2. Demonstrate
3. Exchange questions
4. Write math guides
5. Start to solve problems, then exchange start-up part, complete each other's work
6. Students write "rules of the road" for different kinds of math problems
7. Make diagrams
8. Visually represent the parts of a math problem
9. Write or co-author responses to math question
10. Write math poetry
11. Make math money simulations as well as problems—"your own business"
12. Change math questions, provide answer guide

Instruction Strategies

1. Pre-assess to determine initial status
2. Check for misunderstanding and respond immediately
3. Model
4. Post-assess to determine and validate progress
5. Relate to contexts (MPS4—model with mathematics)
6. "Think out loud"
7. Demonstrate strategic use of tools (MPS5)
8. Post "paths"—how to solve a kind of problem
9. Focus on one outcome each week, specify objective for the day, explain how it relates to the BIG outcome
10. Adjust level of challenge to accommodate students needing support and students who can advance
11. Organize practice activities that have game-like features
12. Students demonstrate
13. Students collaborate—pair, compare, repair
14. Math "Bowl"—students solve a variety of problems in teams

MATH VOCABULARY: Grades 3-8

At each of these grade cycles, the following terms should be part of the students' working vocabularies.
Source of the lists of words: ISBE. For more math resources from ISBE, go to ISBE.net.

Students can sort these words into categories such as "operations" words and "size and shape" words. They also can use them as a check-list for their own math glossaries.

By Third Grade

12 inches = 1 foot 12 months = 1 year 2-dimensional 3 feet = 1 yard 365 days = 1 year 366 days = 1 leap year 3-dimensional 52 weeks = 1 year 7 days = 1 week a.m. abbreviations for days and months about above addends addition (+) angle area average bar graph below between capacity cardinal numbers centimeter (cm) cents (50¢ or $0.50) chance/chances change chart circle circle graph cone congruent coordinates corner cube cup	cylinder decimal diameter difference digit distance divisible division (÷, /, fraction bar) dollars ($) dozen drawn to scale edge/edges equal equation estimate/estimation even/even number face/faces factor farthest figure flips folded foot/feet (ft) fraction gallon gram (g) graph greater greatest grid group height hexagon histogram horizontal hour	hundred impossible inch (in.) is equal to (=) kilogram (kg) is greater than (>) is less than (<) is not equal to (≠) kilometer (km) label least least likely length less than likely line line graph line of symmetry line segment long mass measure measurement meter (m) metric mile (mi) milligram (mg) milliliter (mL) millimeter (mm) minus month more than most most likely multiply/multiplication (X) nickel	non-standard unit number cube number line number pair number pattern number sentence octagon odd/odd number operation order ordered pair (*x, y*) ordinal numbers ounce (oz) p.m. pair parallel parallelogram pattern pentagon perimeter pictograph pie graph pint place value plane figure plus point polygon possible pound (lb and #) prediction prism probability probable probably problem solving	product pyramid quadrilateral quart quarter quotient radius/radii ray reasonable rectangle rectangular prism rectangular pyramid represents results rhombus right angle round down round up same scale scale of numbers second segment set shape side/sides similar single size solid figure solve spent sphere spinner square square centimeters square pyramid	standard unit steps subtraction (–) sum survey symbol symmetry/symmetrical table tally tally chart temperature thousand time ton total trapezoid triangle triangular prism triangular pyramid true turns twice unit unknown unlikely value variable Venn diagram vertex/vertices vertical volume week (wk) weight wide width yard (yd)

By Fifth Grade

acute angle	least common multiple
angle	liter (L)
approximately	lowest terms
arc	mean (arithmetic
base	average)
bisect	median
characteristic	midpoint
chord	miles per hour (mph)
circumference	mode
column	multiple
combination	multiply/multiplication (*
composite number	or •)
congruent symbols	nonagon
in	*n*th term
coordinate graph	obtuse angle
correspond	order of operations
cubic units (3)	per
data	percent (%)
decimeter	perpendicular
degrees (°)	pint (pt)
degrees Celsius (°C)	polygons
degrees Fahrenheit	portion
(°F)	prime number
diagonals	proportion
diagram	quart (qt)
dimensions	quotient
dividend	random
divisor	range
elapsed time	ratio (":" or "to")
equilateral triangle	reflections
exactly	regular polygon
expression	right angle symbol
gallon (gal)	right triangle
greatest common	rotations
factor	row
heptagon	scale drawing
intersect	scalene triangle
intersecting lines	sequence
irregular polygon	slides
is approximately	square units (2)
equal to (≈)	stem-and-leaf plot
is congruent to (≅)	time zone
is parallel to (||)	ton (t)
is perpendicular to	triangle (Δ)
(⊥)	value of
is similar to (~)	
isosceles triangle	

By Eighth Grade

adjacent	measure of angle
alternate exterior angles	minimum
alternate interior angles	odds
altitude	permutation
approximate	principle
ascend/ascending order	proportionally
axes	Pythagorean
commission	Theorem
complementary	quadrants
compound inequality	radical
consecutive	random
convert	rate
corresponding angles	real number
decagon	satisfy
descend/descending	scattergram
order	semi-circle
discount	sequence
distinct	simple interest
divisibility	skew
domain	square root
down payment	supplementary
earns	surface area
factorial	transversal
foot (ft or ')	vertical angles
function	*x*-axis
fundamental counting	*y*-axis
girth	
hypotenuse	
inch (in. or ")	
independent	
inequality	
is greater than or equal to	
(≥)	
is less than or equal to	
(≤)	
maximum	

Strategic Thinking

Give students choices of strategies to solve problems.

Here are some strategies to solve a math problem.
They all start with read the problem carefully to figure out what it asks.

- ✓ Read each sentence carefully to make sure you comprehend it.
- ✓ Decide what the problem includes that you need to use to solve it.
- ✓ Notice any numbers written as words—be sure you include them in your problem solution.
- ✓ Look for context--kinds of numbers—money, time, size.

Then use a strategy you know to figure out the answer.
Start by estimating what the size of the answer will be.

Here are some strategies you can use.

- List information you need to use.
- Use a model.
- Use a rule you know.
- Make a table.
- Make a diagram.
- See if it will take just one step to solve it or more steps.
- Choose an operation to start.
- Guess, check, then correct if I need to.
- Look for a pattern.
- Draw a picture so I see what the problem includes.
- Figure out what information I need.
- Underline the information I need and cross out the things I don't need.
- Make a graph.
- Make a list of operations—the steps to take.
- Make a table or chart.
- Work "backwards".
- Think of two different ways to solve it, then choose the one you think will work better.
- Write it as a number sentence.

Most important: Think carefully and clearly.
Work with precision—make sure you know what the words in the problem mean.
Make sure you are careful to check your work.
That is Math Practice Standard 6. Attend to precision.

Math Problem Solvers Make Sense of Problems then Solve them Strategically and Persistently

(CCSS Math Practice Standard 1)

The Problem—What will you figure out?

Your Strategy

The Solution

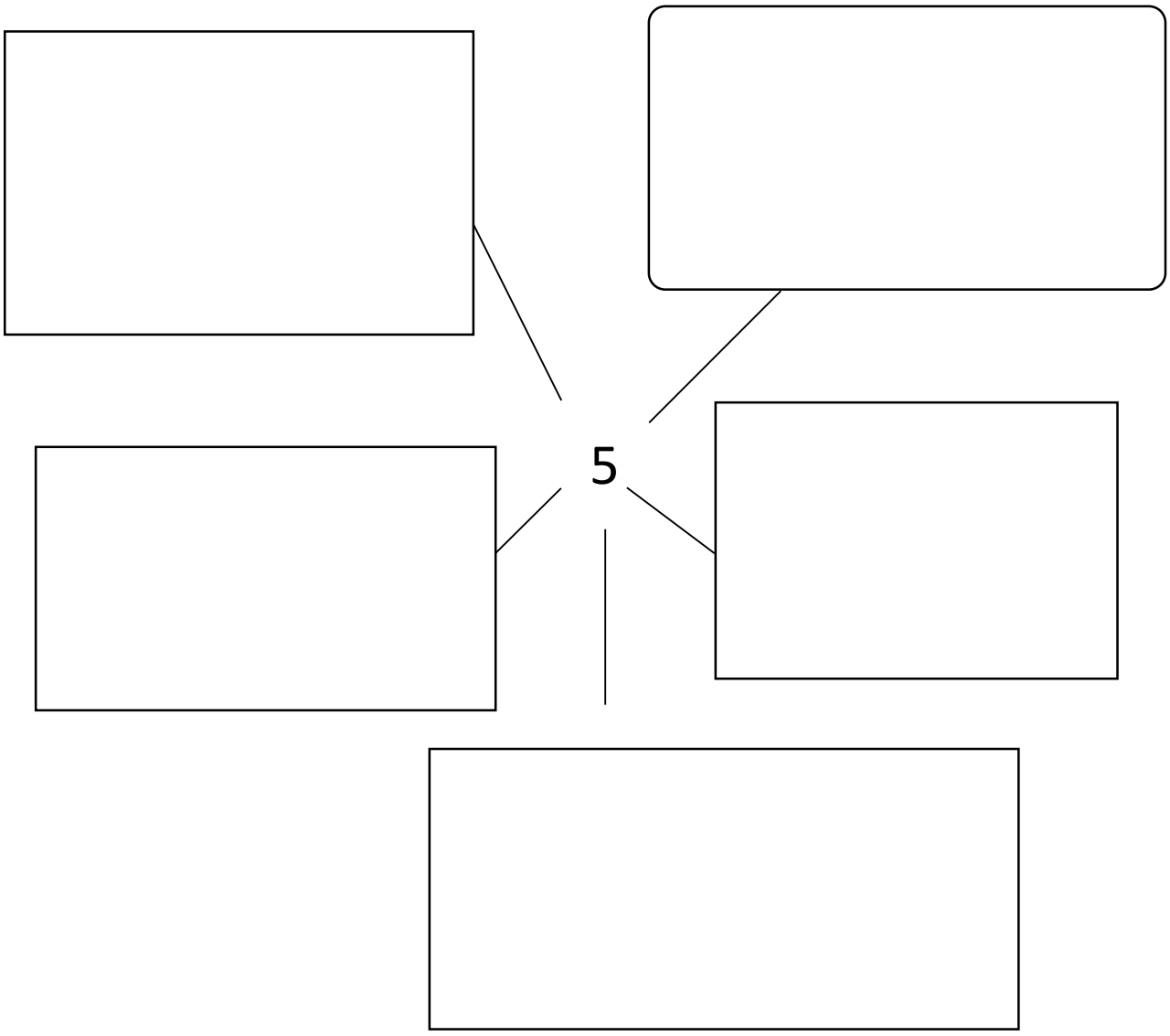
Answer:

Students need to know math facts.

They will learn those facts if they are **interesting.**

CCSS Math Practice Standard 2. Reason abstractly and quantitatively.

Task: Use the math you know to show five different ways to make equations that result in 5. It could be fraction equations or multi-step addition or…



SMART PACK

Put the words, letters, or numbers you want to learn into each rectangle. Then cut them out and use them as flash-cards or to play matching games or card games.

EXAMPLE: TIME TABLE FACTS

Put facts like these on pieces of paper. Cut them out and match them.

2 x 4	8
3 x 4	12
4 x 4	16
5 x 4	20

EXAMPLE: MATH FACTS AND OPERATIONS

Put numbers into the boxes. Then cut them out and make up math problems.
Make more parts with other numbers.
Add percentages and decimal signs or algebra symbols for advanced math.

.

+	-
X	=
10 | 5	15 | 50
%	

Make Math Connect--It's Your Business, and **You Need Math**

CCSS Math Practice Standard 1. Make sense of problems and persevere in solving them.

Choose a business. _____

What workers will you need and how much will you pay them?

WORKER What's the job?	Hourly Wage	Hours Per Week	Weekly Total

How much do you pay in wages each week? $_____

Add 23% to that amount.
That is to pay taxes and benefits to your workers.

Total wages each week: $_____

23% of that total: $_____

Total with Taxes and Benefits
$_____

Added Problem! Your workers demand a 10% increase in their wages. You decide to pay 6%. What will you have to pay them now?

$_____

(Remember that taxes don't change, just the wages.)

$_____

Make up MORE MATH STORIES!

Make Your Own Multiple Choice Question

***Question Maker**: Write your question here.*

?

Write the correct answer and three other possible answers here:

a. c.

b. d.

Question Taker:
Circle the best answer. Then, in the oval, explain why you chose that answer.