

Meeting the Instructional Needs of “Struggling” Learners

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NCTM Annual Meeting 2018

My Saturday morning “elbow” partners



Credit: Caramel and Pixel 2

A Warm-up

Have the revenue from an amusement park Ferris wheel *or* carousel ride?

Would
You
Rather
...?



4 tickets to ride



3 tickets to ride



Your Next 60 Minutes

- Why that warm-up
- Why This Workshop
- What Works (for my students)

What teachers tell me about why their students “struggle”

Anxiety

Lack of
Engagement

Cognitive
Deficits

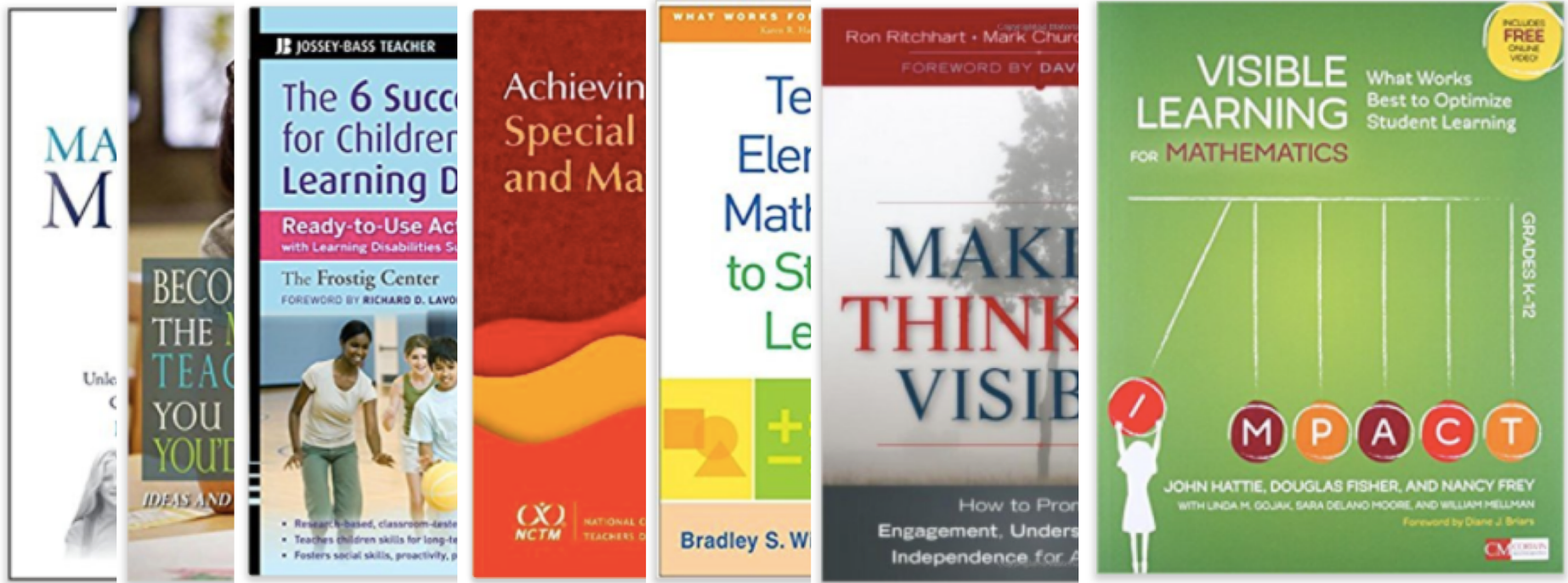
Memory
Difficulties

Attention Difficulties

Processing
Difficulties

Lack of
Independence

I Started Reading





What Works #1

Foster Computational Fluency

Accuracy

Efficiency

Flexibility



What Works #1

Fostering Computational Fluency

Which
One
Doesn't
Belong?

66%

$0.\overline{3}$

$\frac{2}{3}$

$\frac{4}{3}$



What Works #1

Fostering Computational Fluency

Which
One
Doesn't
Belong?

$$2^{-2}$$

$$2^2$$

$$(-2)^2$$

$$-2^2$$



What Works #1

Fostering Computational Fluency

Number
Talks #1

How
would you
solve...?

$$209 \times 101 =$$



What Works #1

Fostering Computational Fluency

Number
Talks #2

How
would you
solve...?

$$6.8 + 9.5 =$$



What Works #1 Fostering Computational Fluency

Number
Talks #3

Which is
greater?

$$\frac{6}{7} \text{ or } \frac{8}{9}$$



What Works #1

Fostering Computational Fluency

Number

Talks #4

Does this
answer
make
sense?

$$3 \% \text{ of } 581 = 105$$



What Works #1

Fostering Computational Fluency

Your turn ~
Write a WODB or Number Talk
example involving ratios.



What Works #2

Hold all students to high expectations

Teacher
Estimates of
Student
Achievement

Effect Size
1.62

Provide
Opportunities
to Succeed ~
Believe in
them!

Spark
Curiosity ~
Encourage
Challenge



What Works #2 Have High Expectations

Topic	Dividing Fractions
OCSS Standard(s)	• 6.NS.1
DOK 1 Example	Evaluate. $\frac{4}{9} \div \frac{2}{5}$

DOK 2 Example

Use the digits 1 to 9, at most one time each, to fill in the boxes to make two different pairs of fractions that have a quotient of $\frac{2}{3}$.

$$\frac{\square}{\square} \div \frac{\square}{\square} = \frac{2}{3}$$

DOK 3 Example

Use the digits 1 to 9, at most one time each, to fill in the boxes to make two fractions that have a quotient that is as close to $\frac{4}{11}$ as possible.

$$\frac{\square}{\square} \div \frac{\square}{\square}$$

Depth of
Knowledge Levels

What Works #2 Have High Expectations

Depth of
Knowledge
Level 2/3

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



What Works #2 Have High Expectations

$$\square (\square + \square) = \square \square + \square \square = \square \square$$

Depth of
Knowledge
Level 3



What Works #2 Have High Expectations

Your turn:
Create an “OpenMiddle” example
involving ratios.



What Works #3

Engagement vs. Compliance

Promote student
engagement



What's the
difference?

Levels of Engagement

ATTENTION + COMMITMENT = LEVEL OF ENGAGEMENT

HIGH ATTENTION	HIGH COMMITMENT	ENGAGEMENT - The student associates the task with a result or product that has meaning and value for the student. The student will persist in the face of difficulty and will learn at high and profound levels.
HIGH ATTENTION	LOW COMMITMENT	STRATEGIC COMPLIANCE - The task has little inherent or direct value to the student, but the student associates it with outcomes or results that do have value to the student (such as grades). Student will abandon work if extrinsic goals are not realized and will not retain what is learned.
LOW ATTENTION	LOW COMMITMENT	RITUAL COMPLIANCE - The student is willing to expend whatever effort is needed to avoid negative consequences. The emphasis is on meeting the minimum requirements. The student will learn at low and superficial levels.
NO ATTENTION	LOW COMMITMENT	RETREATISM - The student is disengaged from the task and does not attempt to comply with its demands, but does not try to disrupt the work or substitute other activities for it. The student does not participate and learns little or nothing from the task.
DIVERTED ATTENTION	NO COMMITMENT	REBELLION - The student refuses to do the work, acts in ways to disrupt others, or substitutes tasks / activities to which he or she is committed. Student develops poor work and sometimes negative attitudes towards formal education and intellectual tasks.



Student Engagement?

No attention
+ Low commitment
Retreatism

RETREATISM - The student is disengaged from the task and does not attempt to comply with its demands, but does not try to disrupt the work or substitute other activities for it. The student does not participate and learns little or nothing from the task.



What Works #3 Promote Student Engagement

High Attention
+ High commitment
Engagement

Desmos Activity Builder

Polygraph: Distance-Time Graphs

Go to student.desmos.com

Type in the class code:

D7HTKZ

ENGAGEMENT - The student associates the task with a result or product that has meaning and value for the student. The student will persist in the face of difficulty and will learn at high and profound levels.

What Works #3 Promote Student Engagement



@MrsParadee

My Ss loved an @Desmos polygraph today. One of the first times Ss asked me for academic vocab. They had the need to communicate more clearly! #rmmsfam #MTBoS #iteachmath



What Works #4

Introduce
relevant
instructional
tools

Manipulatives

Technological tools

Visual models
(Double Line/Bar Diagrams)



What Works #4

Introduce relevant
instructional tools

Visual Models

Forty-five is 30 % of what number?

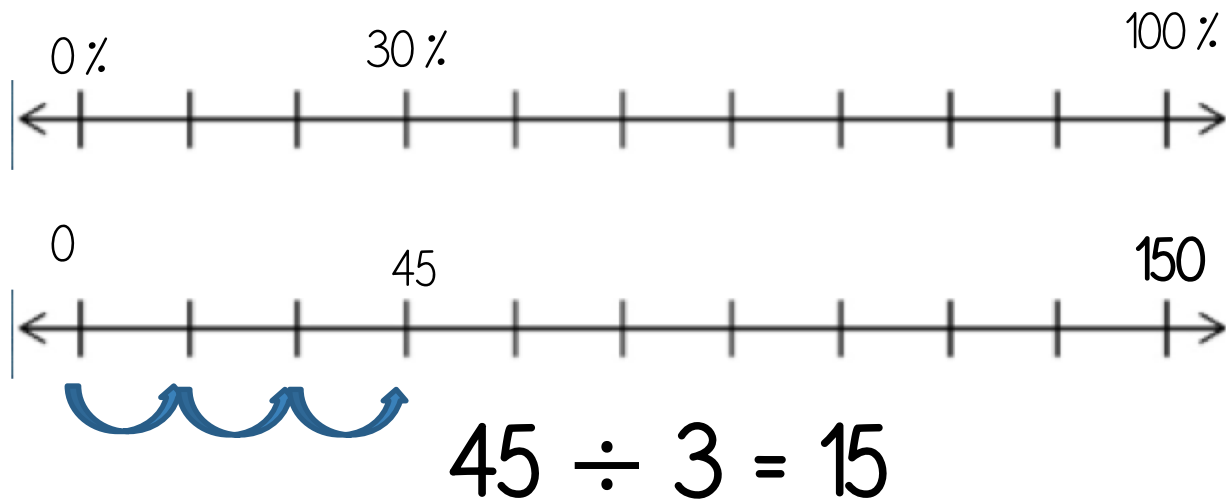
$$\frac{\textit{is}}{\textit{of}} = \frac{\%}{100}$$



What Works #4

Introduce relevant instructional tools

Forty-five is 30 % of what number?



$$15 \times 10 = 150$$



What Works #4

Introduce relevant
instructional tools

Your turn:

Draw a double line
diagram to visualize
“What is 28 % of 160?”

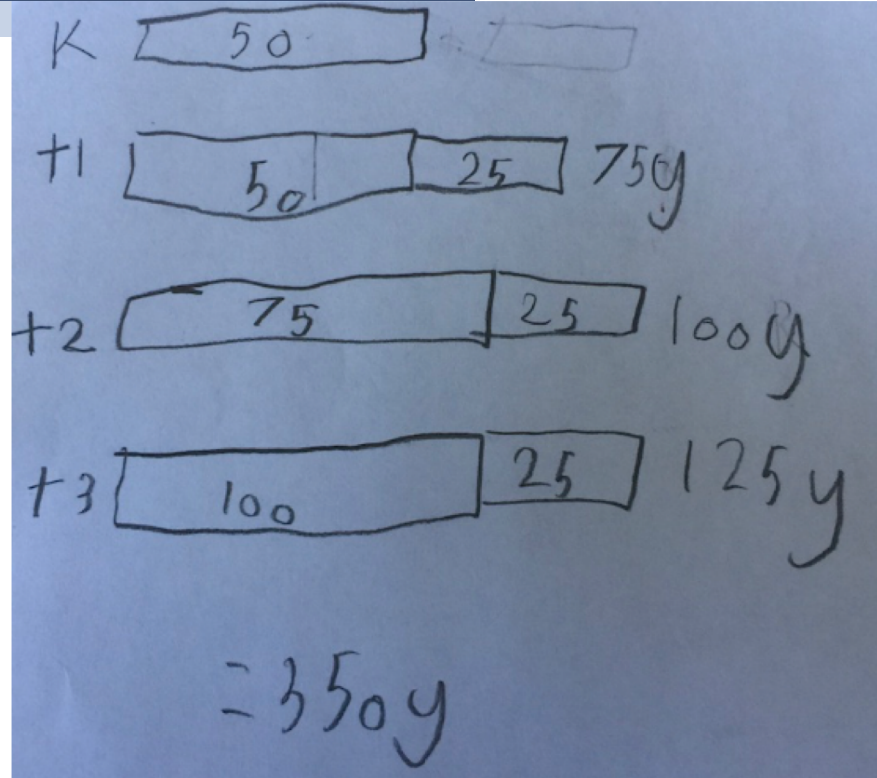


What Works #4

Introduce relevant instructional tools

Visual Models

Katy runs 50 yards in a relay race. Each of her 3 teammates runs 25 more yards than the runner before. How many yards will Katy's team run in all?





What Works #4

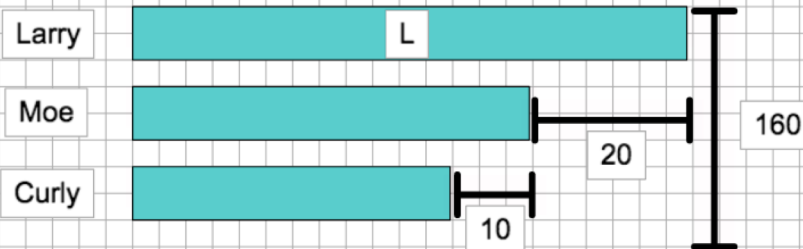
Introduce relevant
instructional tools

Visual Models

I have three dogs. When I take them to the vet I put them all on the scale at once and the scale shows that they weigh 160 pounds. Larry weighs 20 more pounds than Moe. Curly weighs 10 less pounds than Moe.
How much do each of my dog's weigh?

I have three dogs. When I take them to the vet I put them all on the scale at once and the scale shows that they weigh 160 pounds. Larry weighs 20 more pounds than Moe. Curly weighs 10 less pounds than Moe.

How much does each of my dog's weigh?



$$L + (L - 20) + (L - 30) = 160$$



1

ABC 123





What Works #4

Introduce relevant
instructional tools

Your turn:
Draw a Bar model to
visualize the following
problem...



Three eighth-grade homerooms raised a total of \$228 to donate to their favorite charities.

Mr. L's class donated 6 times as much as Mrs. M's class. Mrs. P's class donated \$110 less than Mr. L's class. How much money did Mrs. P's class donate?



What Works #5

Structure

Sequence

Strategy

Minimize barriers

What Works #5

Minimize barriers

Do these
students
understand the
structure

...of the
problem?

...of the
operations?



What Works #5

Minimize barriers

Numberless Word Problems

- ☐ Scaffolded word problems
- ☐ Visualize the situation
- ☐ Consider the structure of the operations
- ☐ Encourage classroom discourse
- ☐ Consider what the question could be



What Works #5 Minimize barriers

19.

M21434

In a store, 1 can of soup costs \$1.80. The store also sells a pack of 6 cans of the soup. A customer who buys 1 pack saves 15% compared to buying 6 cans separately. How much money does a customer save by buying 1 pack instead of buying 6 cans separately?

Enter your answer in the box.

\$



What Works #5

Minimize barriers

Numberless
Word
Problems

A store sells cans of soup. You can either buy one can or you can buy a pack of cans.



What Works #5

Minimize barriers

Numberless
Word
Problems

A store sells cans of soup. You can either buy one can or you can buy a pack of cans.

If you buy the cans in a pack, you will save some money.



What Works #5

Minimize barriers

Numberless Word Problems

A store sells cans of soup. You can either buy one can for \$1.80 or you can buy a pack of 6 cans. If you buy the cans in a pack, you will save some money.



What Works #5

Minimize barriers

Numberless Word Problems

A store sells cans of soup. You can either buy one can for \$1.80 or you can buy a pack of 6 cans.

If you buy the cans in a pack instead of separately, you will save 15 %.



What Works #5

Minimize barriers

Numberless
Word
Problems

A store sells cans of soup. You can either buy one can for \$1.80 or you can buy a pack of 6 cans. If you buy the cans in a pack, you will save 15 %.

How much money will you save if you buy cans by the pack?

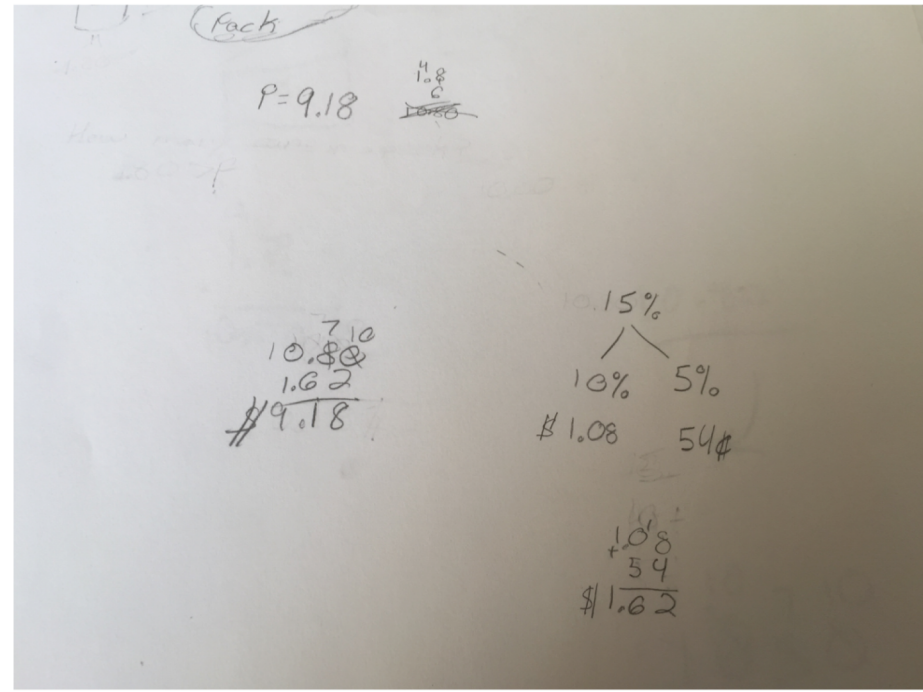


What Works #5

Minimize barriers

A store sells cans of soup. You can either buy one can for \$1.80 or you can buy a pack of 6 cans. If you buy the cans in a pack, you will save 15%.

How much money will you save if you buy cans by the pack?



Your turn:
Turn a problem into a
numberless
word problem.



What Works #5

Minimize barriers

Task

Taylor and Anya are friends who live 63 miles apart. Sometimes on a Saturday, they ride toward each other's houses on their bikes and meet in between. One day they left their houses at 8 am and met at 11 am. Taylor rode at 12.5 miles per hour. How fast did Anya ride?

One Possible Rewrite

Task

Taylor and Anya are friends who live 63 miles apart. Sometimes on a Saturday, they ride toward each other's houses on their bikes and meet in between. One day they left their houses at 8 am and met at 11 am. Taylor rode at 12.5 miles per hour. How fast did Anya ride?

Prompt	Questions
Taylor and Anya live some miles apart from each other. Sometimes they ride their bikes and meet each other part way.	What math do you see? What relationships do you see?
Taylor and Anya live 63 miles apart. One day Taylor rode at 12.5 mph toward Anya's house.	Does this change what we know? So, what does this tell us? What else do you want to know?
They both left at 8 am and met up at 11 am. How fast did Anya ride?	What new information do you see? How does this change your understanding of the situation? So, what questions could I ask you about this situation?

Summing Up

- Foster Computational Fluency
- Hold All Students to High Expectations
- Promote Student Engagement
- Introduce Appropriate Instructional Tools
- Minimize Barriers

“ All means all...children in a classroom are entitled to a full and balanced curriculum that challenges them, that appropriately meets their needs, and for which they should be held accountable.”

~Skip Fennell, Achieving Fluency



Thank You!

Any questions?

You can find me at

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Resources

Books:

1. Mathematical Mindsets, Jo Boaler
2. Visible Learning in Mathematics, John Hattie, Douglas Fisher, and Nancy Frey
3. Becoming the Math Teacher You Wish You'd Had, Tracy Zager
4. The Six Success Factors for Students with Learning Disabilities, Frostig Center
5. Achieving Fluency: Special Education and Mathematics, NCTM
6. Teaching Elementary Mathematics to Struggling Learners, Bradley Witzel
7. Making Thinking Visible, Ron Ritchhart, Mark Church and Karin Morrison
8. Making Number Talks Matter, Cathy Humphreys and Ruth Parker

Websites for:

1. Would You Rather ~ wouldyourathermath.com
2. Which One Doesn't Belong ~ wodb.ca
3. Open Middle ~ openmiddle.com
4. Desmos Polygraphs ~ teacher.desmos.com
5. Numberless Word Problems ~ <https://bstockus.wordpress.com/numberless-word-problems/>
6. Depth of Knowledge ~ Norman Webb and Robert Kaplinsky <https://robertkaplinsky.com/tag/depth-of-knowledge-dok/>
7. Levels of Engagement ~ Philip Schlechty <https://www.schlechtycenter.org/tools/>



PRESENTATION DESIGN

This presentation uses the following typographies and colors:

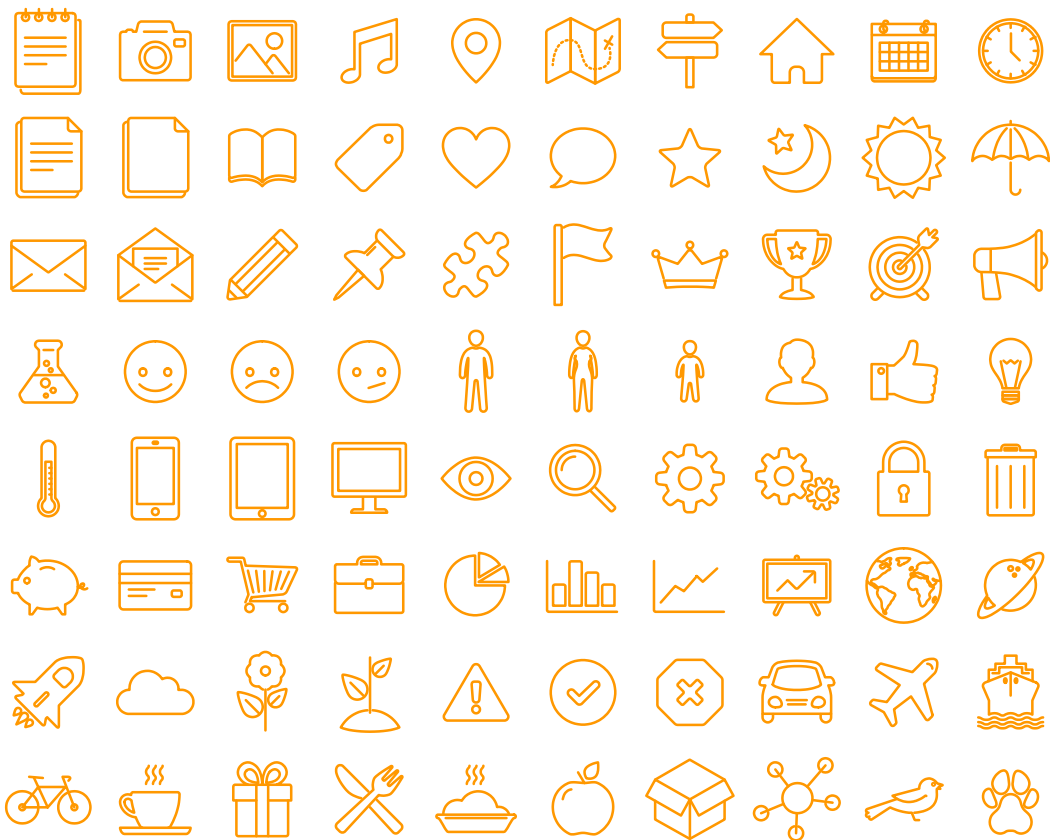
- Titles: Roboto Condensed
- Body copy: Roboto Condensed

You can download the fonts on this page:

<https://material.io/guidelines/resources/roboto-noto-fonts.html>

Navy #3f5378 · Dark navy #263248 · Yellow #ff9800

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SlidesCarnival icons are editable shapes.

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Examples:

