Instructional Routines for Mathematics Intervention

The purpose of these mathematics instructional routines is to provide educators with materials to use when providing intervention to students who experience difficulty with mathematics. The routines address content included in the grades 2-8 Texas Essential Knowledge and Skills (TEKS). There are 23 modules that include routines and examples – each focused on different mathematical content. Each of the 23 modules include vocabulary cards and problem sets to use during instruction. These materials are intended to be implemented explicitly with the aim of improving mathematics outcomes for students.

Instructional Routines for Mathematics Intervention

MODULE 16

Representing Decimals
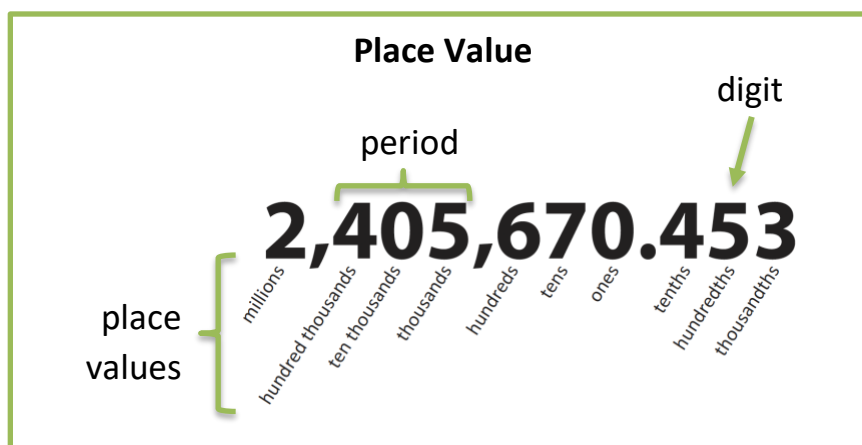
Module 16: Representing Decimals
Mathematics Routines

A. Important Vocabulary with Definitions

Term	Definition
decimal	A number based on powers of ten.
decimal point	A dot used to separate ones from tenths in a number or dollars from cents.
hundreds	The digit representing 100.
hundredths	The digit representing 1/100.
ones	The digit representing 1.
place value	The value of a digit depending on its place in a number.
tens	The digit representing 10.
tenths	The digit representing 1/10.
thousands	The digit representing 1,000.
thousandths	The digit representing 1/1,000.

B. Background Information

In this module, we focus on representing decimals. We use two models: (1) Proportional and (2) Non-Proportional.

When referring to decimals, be sure to emphasize place value.

Place Value

period

digit

2,405,670.453

place values — millions, hundred thousands, ten thousands, thousands, hundreds, tens, ones, tenths, hundredths, thousandths
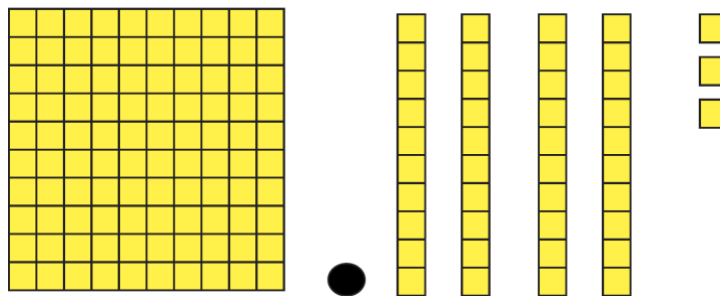
C. Routines and Examples

(1) Proportional Models

Routine

Materials:

- [Module 16 Problem Sets](#)
- [Module 16 Vocabulary Cards](#)
  - o If necessary, review Vocabulary Cards before teaching
- A hands-on tool or manipulative like Base-10 blocks

ROUTINE WITH BASE-10 BLOCKS

Teacher	**Let's show different decimals. What's a decimal?**
Students	A number with tenths, hundredths, thousandths, etc.
Teacher	**A decimal is a number – just like 2 is a number or $\frac{6}{8}$ is a number. Except with a decimal, we have digits after the decimal point in the tenths, hundredths, thousandths, and so on. What does a decimal have?**
Students	A decimal point and tenths, hundredths, thousandths, etc.
Teacher	**So, let's show different decimals. We'll use these Base-10 blocks.** (Show manipulatives.)
Teacher	**When we show decimals with the Base-10 blocks, we can use them in a different way than we used with thousands, hundreds, tens, and ones. Today, with Base-10 blocks, one cube represents tens. What does a cube represent?**
Students	Tens.
Teacher	**The flat represents ones. What does the flat represent?**
Students	Ones.
Teacher	**The rod represents tenths. What does the rod represent?**
Students	Tenths.
Teacher	**And the unit represents hundredths. What does the unit represent?**
Students	Hundredths.
Teacher	**Let's show this decimal.** (Show decimal.)
Teacher	**What number?**
Students	___.

Teacher	**When we read decimals, make sure to only say "and" at the decimal point. So, __** (read number and emphasize "and")**. Let's say that together.**
Students	__.
Teacher	**Let's show the decimal from the greatest place value to the least place value. For this number, what's the greatest place value?**
Students	__.
Teacher	**So, what digit is in the __** (place value)**?**
Students	__.
Teacher	**That means we need to show __** (digit) **__** (place value)**. How many __** (place value)**?**
Students	__.
Teacher	**How could we use the Base-10 blocks to show __** (digit) **__** (place value)**?**
Students	Show __. (Show using Base-10 blocks.)
Teacher	**Did we show the entire number?**
Students	No.
Teacher	**That means we need to look at the next greatest place value. For this number, what's the next greatest place value?**
Students	__.
Teacher	**So, what digit is in the __** (place value)**?**
Students	__.
Teacher	**That means we need to show __** (digit) **__** (place value)**. How many __** (place value)**?**
Students	__.
Teacher	**How could we use the Base-10 blocks to show __** (digit) **__** (place value)**?**
Students	Show __. (Show using Base-10 blocks.)
Teacher	**Did we show the entire number?**
Students	No.
Teacher	**That means we need to look at the next greatest place value. For this number, what's the next greatest place value?**
Students	__.
Teacher	**So, what digit is in the __** (place value)**?**
Students	__.
Teacher	**That means we need to show __** (digit) **__** (place value)**. How many __** (place value)**?**
Students	__.
Teacher	**How could we use the Base-10 blocks to show __** (digit) **__** (place value)**?**
Students	Show __. (Show using Base-10 blocks.)
Teacher	**Did we show the entire number?**
Students	Yes!
Teacher	**What decimal did we show?**
Students	__.

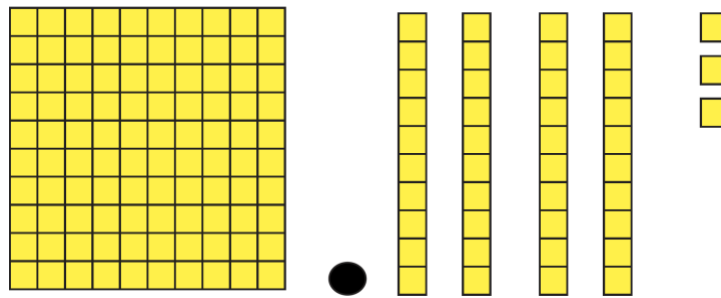|	
Teacher	**Let's count the Base-10 blocks to make sure we showed __ (decimal). Ready?**
Students	__, __, __, …
Teacher	**Great work! Using these Base-10 blocks helps you understand the value of different decimals. How can you use the Base-10 blocks to show a decimal?**
Students	You look at each digit starting with the greatest place value, and show that number of cubes, flats, rods, and units.

Example

1.43

EXAMPLE WITH BASE-10 BLOCKS

Teacher	**Let's show different decimals. What's a decimal?**
Students	A number with tenths, hundredths, thousandths, etc.
Teacher	**A decimal is a number – just like 17 is a number or $\frac{1}{9}$ is a number. Except with a decimal, we have digits after the decimal point in the tenths, hundredths, thousandths, and so on. What does a decimal have?**
Students	A decimal point and tenths, hundredths, thousandths, etc.
Teacher	**So, let's show different decimals. We'll use these Base-10 blocks.** (Show manipulatives.)
Teacher	**When we show decimals with the Base-10 blocks, we can use them in a different way than we used with thousands, hundreds, tens, and ones. Today, with Base-10 blocks, one cube represents tens. What does a cube represent?**
Students	Tens.
Teacher	**The flat represents ones. What does the flat represent?**
Students	Ones.
Teacher	**The rod represents tenths. What does the rod represent?**
Students	Tenths.
Teacher	**And the unit represents hundredths. What does the unit represent?**
Students	Hundredths.
Teacher	**Let's show this decimal.** (Show decimal.)
Teacher	**What number?**
Students	1.43.

Teacher	**When we read decimals, make sure to only say "and" at the decimal point. So, one and forty-three hundredths. Let's say that together.**
Students	One and forty-three hundredths.
Teacher	**Let's show the decimal from the greatest place value to the least place value. For this number, what's the greatest place value?**
Students	Ones place.
Teacher	**So, what digit is in the one place?**
Students	1.
Teacher	**That means we need to show 1 one. How many ones?**
Students	1.
Teacher	**How could we use the Base-10 blocks to show 1 one?**
Students	Show 1 flat. (Show using Base-10 blocks.)
Teacher	**Did we show the entire number?**
Students	No.
Teacher	**That means we need to look at the next greatest place value. For this number, what's the next greatest place value?**
Students	Tenths place.
Teacher	**So, what digit is in the tenths place?**
Students	4.
Teacher	**That means we need to show 4 tenths. How many tenths?**
Students	4.
Teacher	**How could we use the Base-10 blocks to show 4 tenths?**
Students	Show 4 rods. (Show using Base-10 blocks.)
Teacher	**Did we show the entire number?**
Students	No.
Teacher	**That means we need to look at the next greatest place value. For this number, what's the next greatest place value?**
Students	Hundredths place.
Teacher	**So, what digit is in the hundredths place?**
Students	3.
Teacher	**That means we need to show 3 hundredths. How many hundredths?**
Students	3.
Teacher	**How could we use the Base-10 blocks to show 3 hundredths?**
Students	Show 3 units. (Show using Base-10 blocks.)
Teacher	**Did we show the entire number?**
Students	Yes!
Teacher	**What decimal did we show?**
Students	1.43.
Teacher	**Let's count the Base-10 blocks to make sure we showed 1.43. Ready?**
Students	One: 1 tenth, 2 tenths, 3 tenths, 4 tenths, 41 hundredths, 42 hundredths, 43 hundredths. One and forty-three hundredths.

Teacher   **Great work! Using these Base-10 blocks helps you understand the value of different decimals. How can you use the Base-10 blocks to show a decimal?**

Students   You look at each digit starting with the greatest place value, and show the number of cubes, flats, rods, and units.
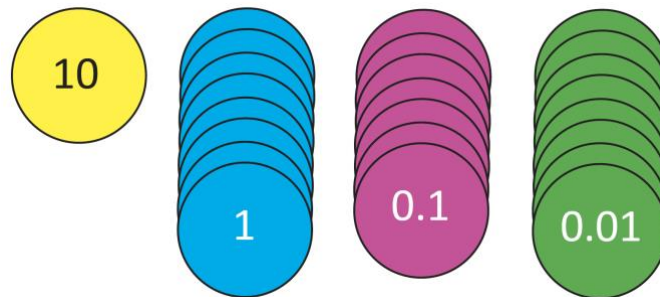
(2) Non-Proportional Models

Routine

Materials:

- [Module 16 Problem Sets](#)
- [Module 16 Vocabulary Cards](#)
  - If necessary, review Vocabulary Cards before teaching
- A hands-on tool or manipulative like money or place value disks

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ROUTINE WITH PLACE VALUE DISKS

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Teacher	**Let's show different decimals. What's a decimal?**
Students	A number with tenths, hundredths, thousandths, etc.
Teacher	**A decimal is a number – just like 17 is a number or $\frac{5}{8}$ is a number. Except with a decimal, we have digits after the decimal point in the tenths, hundredths, thousandths, and so on. What does a decimal have?**
Students	A decimal point and tenths, hundredths, thousandths, etc.
Teacher	**So, let's show different decimals. We'll use these place value disks.** (Show manipulatives.)
Teacher	**When we show decimals with the place value disks, we look at each disk to read the place value of the disk. I'll show you a few disks, and you tell me the place value of the disk.** (Show different colored disks and ask for the place value.)
Teacher	**Let's show this decimal.** (Show decimal.)
Teacher	**What number?**
Students	__.
Teacher	**When we read decimals, make sure to only say "and" at the decimal point. So, __ (read number and emphasize "and"). Let's say that together.**
Students	__.
Teacher	**Let's show the decimal from the greatest place value to the least place value. For this number, what's the greatest place value?**
Students	__.
Teacher	**So, what digit is in the __ (place value)?**
Students	__.

|	
Teacher	**That means we need to show __ (digit) __ (place value). How many __ (place value)?**
Students	__.
Teacher	**How could we use the disks to show __ (digit) __ (place value)?**
Students	Show __.
	(Show using place value disks.)
Teacher	**Did we show the entire number?**
Students	No.
Teacher	**That means we need to look at the next greatest place value. For this number, what's the next greatest place value?**
Students	__.
Teacher	**So, what digit is in the __ (place value)?**
Students	__.
Teacher	**That means we need to show __ (digit) __ (place value). How many __ (place value)?**
Students	__.
Teacher	**How could we use the disks to show __ (digit) __ (place value)?**
Students	Show __.
	(Show using place value disks.)
Teacher	**Did we show the entire number?**
Students	No.
Teacher	**That means we need to look at the next greatest place value. For this number, what's the next greatest place value?**
Students	__.
Teacher	**So, what digit is in the __ (place value)?**
Students	__.
Teacher	**That means we need to show __ (digit) __ (place value). How many __ (place value)?**
Students	__.
Teacher	**How could we use the disks to show __ (digit) __ (place value)?**
Students	Show __.
	(Show using place value disks.)
Teacher	**Did we show the entire number?**
Students	Yes!
Teacher	**What decimal did we show?**
Students	__.
Teacher	**Let's count the disks to make sure we showed __ (decimal). Ready?**
Students	__, __, __, …
Teacher	**Great work! Using these place value disks helps you understand the value of different decimals. How can you use the disks to show a decimal?**
Students	You look at each digit, starting with the greatest place value, and show each place value using the place value disks.

ROUTINE WITH MONEY
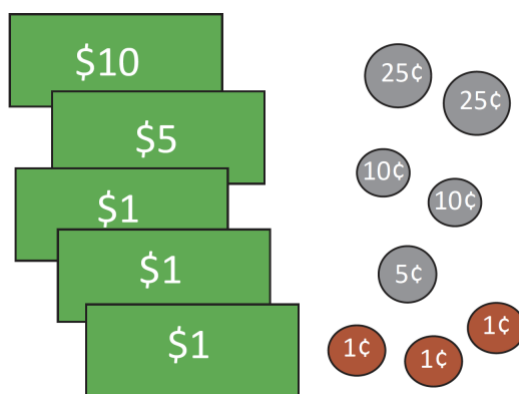
Teacher	**Let's show different decimals. What's a decimal?**
Students	A number with tenths, hundredths, thousandths, etc.
Teacher	**A decimal is a number – just like 43 is a number or $\frac{1}{2}$ is a number. Except with a decimal, we have digits after the decimal point in the tenths, hundredths, thousandths, and so on. What does a decimal have?**
Students	A decimal point and tenths, hundredths, thousandths, etc.
Teacher	**So, let's show different decimals. We'll use this money.** (Show manipulatives.)
Teacher	**When we show decimals with money, we use bills and coins to show the value of a number. Let's show this decimal.** (Show decimal.)
Teacher	**What number?**
Students	__.
Teacher	**When we read decimals, make sure to only say "and" at the decimal point. So, __ (read number and emphasize "and"). Let's say that together.**
Students	__.
Teacher	**Let's show the decimal from the greatest place value to the least place value. For this number, what's the greatest place value?**
Students	__.
Teacher	**So, what digit is in the __ (place value)?**
Students	__.
Teacher	**That means we need to show __ (digit) __ (place value). How many __ (place value)?**
Students	__.
Teacher	**How could we use the money to show __ (digit) __ (place value)?**
Students	Show __. (Show using money.)
Teacher	**Did we show the entire number?**
Students	No.
Teacher	**That means we need to look at the next greatest place value. For this number, what's the next greatest place value?**
Students	__.

Teacher	**So, what digit is in the __ (place value)?**
Students	__.
Teacher	**That means we need to show __ (digit) __ (place value). How many __ (place value)?**
Students	__.
Teacher	**How could we use the money to show __ (digit) __ (place value)?**
Students	Show __. (Show using money.)
Teacher	**Did we show the entire number?**
Students	No.
Teacher	**That means we need to look at the next greatest place value. For this number, what's the next greatest place value?**
Students	__.
Teacher	**So, what digit is in the __ (place value)?**
Students	__.
Teacher	**That means we need to show __ (digit) __ (place value). How many __ (place value)?**
Students	__.
Teacher	**How could we use the money to show __ (digit) __ (place value)?**
Students	Show __. (Show using money.)
Teacher	**Did we show the entire number?**
Students	Yes!
Teacher	**What decimal did we show?**
Students	__.
Teacher	**Let's count the money to make sure we showed __ (decimal). Ready?**
Students	__, __, __, …
Teacher	**Great work! Using money helps you understand the value of different decimals. How can you use money to show a decimal?**
Students	You look at each digit, starting with the greatest place value, and use money to show each place value.

Example

$18.78

EXAMPLE WITH MONEY
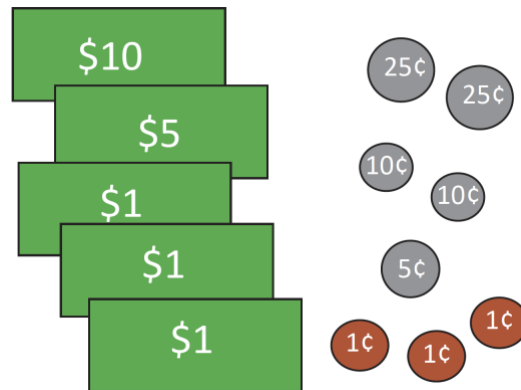
Teacher	Let's show different decimals. What's a decimal?
Students	A number with tenths, hundredths, thousandths, etc.
Teacher	A decimal is a number – just like 9 is a number or $\frac{1}{9}$ is a number. Except with a decimal, we have digits after the decimal point in the tenths, hundredths, thousandths, and so on. What does a decimal have?
Students	A decimal point and tenths, hundredths, thousandths, etc.
Teacher	So, let's show different decimals. We'll use this money.
	(Show manipulatives.)
Teacher	When we show decimals with money, we use bills and coins to show the value of a number. Let's show this decimal.
	(Show decimal.)
Teacher	What number?
Students	18.78.
Teacher	When we read decimals, make sure to only say "and" at the decimal point. So, eighteen and seventy-eight hundredths. Let's read that together.
Students	Eighteen and seventy-eight hundredths.
Teacher	Let's show the decimal from the greatest place value to the least place value. For this number, what's the greatest place value?
Students	Tens place.
Teacher	So, what digit is in the tens place?
Students	1.
Teacher	That means we need to show 1 ten. How many tens?
Students	1.
Teacher	How could we use the money to show 1 ten?
Students	Show 1 $10 bill.
	(Show using money.)
Teacher	Did we show the entire number?
Students	No.

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Teacher	**That means we need to look at the next greatest place value. For this number, what's the next greatest place value?**
Students	Ones place.
Teacher	**So, what digit is in the ones place?**
Students	8.
Teacher	**That means we need to show 8 ones. How many ones?**
Students	8.
Teacher	**How could we use the money to show 8 ones?**
Students	Show 8 $1 bills or 1 $5 bill and 3 $1 bill.
Teacher	**There are different ways to show 8 ones. Let's use the way that requires the fewest bills: 1 $5 bill and 3 $1 bills.** (Show using money.)
Teacher	**Did we show the entire number?**
Students	No.
Teacher	**That means we need to look at the next greatest place value. For this number, what's the next greatest place value?**
Students	Tenths place.
Teacher	**So, what digit is in the tenths?**
Students	7.
Teacher	**That means we need to show 7 tenths. How many tenths?**
Students	7.
Teacher	**How could we use the money to show 7 tenths?**
Students	Show 7 dimes or 2 quarters and 2 dimes.
Teacher	**There are different ways to show 7 tenths. Let's use the way that requires the fewest coins: 2 quarters and 2 dimes.** (Show using money.)
Teacher	**Did we show the entire number?**
Students	No.
Teacher	**That means we need to look at the next greatest place value. For this number, what's the next greatest place value?**
Students	Hundredths place.
Teacher	**So, what digit is in the hundredths?**
Students	8.
Teacher	**That means we need to show 8 hundredths. How many hundredths?**
Students	8.
Teacher	**How could we use the money to show 8 hundredths?**
Students	Show 8 pennies or 1 nickel and 3 pennies.
Teacher	**There are different ways to show 8 hundredths. Let's use the way that requires the fewest coins: 1 nickel and 3 pennies.** (Show using money.)
Teacher	**Did we show the entire number?**
Students	Yes!
Teacher	**What decimal did we show?**
Students	18.78.

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Texas Education Agency

Teacher	**Let's count the money to make sure we showed 18.78. Ready?**
Students	10, 15, 16, 17, 18 dollars. And 25, 50, 60, 70, 75, 76, 77, 78 cents.
Teacher	**Great work! Using money helps you understand the value of different decimals. How can you use money to show a decimal?**
Students	You look at each digit, starting with the greatest place value, and use money to show each place value.

D. Problems for Use During Instruction

See Module 16 Problem Sets.

E. Vocabulary Cards for Use During Instruction

See Module 16 Vocabulary Cards.

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Module 16:
Representing Decimals

Problem Sets

1.4

3.1

16.4

1.8

4.7

8.9

0.2

48.7

79.9

8.2

0.5

A.

93.7

35.2

81.8

0.3

A.

87.2

13.1

36.4

0.4

27.5

0.34

1.52

38.81

2.28

B.

670.04

9.18

0.84

6.19

10.33

89.51

337.69

2.48

0.97

67.23

B.

100.37

B.

0.62

26.75

4.24

51.07

206.36

0.999

2.319

c.

7.751

c.

86.621

9.688

0.617

c.

9.363

33.546

c.

8.514

1.438

c.

2.903

c.

411.523

c.

132.109

c.

0.003

28.052

8.181

c.

674.903

c.

6.813

c.

1.049

234.615

Module 16:
Representing Decimals

Vocabulary Cards

decimal

decimal point

hundreds

hundredths

ones

place value

tens

tenths

thousands

thousandths

decimal

A number based on powers of ten.

34.107

tens ones tenths hundredths thousandths

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decimal point

A dot used to separate ones from tenths in a number or dollars from cents.

4.2

. is the decimal point

hundreds

The digit representing 100.

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hundredths

The digit in representing $\dfrac{1}{100}$.

In the number 4.23, 3 is in the hundredths place.

ones

The digit representing 1.

---

place value

The value of a digit depending on its place in a number.

thousands	hundreds	tens	ones	.	tenths	hundredths	thousandths
8	7	6	5	.	4	3	2

tens

The digit representing 10.

---

tenths

The digit in representing $\frac{1}{10}$.

In the number 4.23, 2 is in the tenths place.

thousands

The digit representing 1,000.

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thousandths

The digit in representing $\dfrac{1}{1,000}$.

In the number 4.238, 8 is in the thousandths place.