Using Animation to Promote Discourse
Animation illustrates that numbers can be described, composed, decomposed, and arranged in many different ways.
When you use animation, what increases in your classroom?
When you use animation, what increases in your classroom?

TEACHER TALK

or

STUDENT DISCOURSE
We cannot expect our students to breathe in learning.
We cannot expect our students to breathe in learning unless
We cannot expect our students to breathe in learning unless they are breathing out learning.
Strategy #1

USE ANIMATION TO ILLUSTRATE MULTIPLE STUDENT PERSPECTIVES
How many cubic units?
How do you know the volume is 20 cubic units?
How do you know the volume is 20 cubic units?
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How do you know the volume is 20 cubic units?
How do you know the volume is 20 cubic units?
How do you know the volume is 20 cubic units?
How do you know the volume is 20 cubic units?

\[(9 - 4) \times 4\]
How do you know the volume is 20 cubic units?

$(2 + 2 + 1) \times 4$
How do you know the volume is 20 cubic units?

$$(2 + 2 + 1) \times 4$$
How do you know the volume is 20 cubic units?

\[(2 + 2 + 1) \times 4\]
How do you know the volume is 20 cubic units?

\[(2 + 2 + 1) \times 4\]
$5 + 5 + 5 + 5$
$5 + 5 + 5 + 5$

$4 + 4 + 4 + 4 + 4$
$5 + 5 + 5 + 5$

$4 + 4 + 4 + 4 + 4$

$5 \times 4$
$5 + 5 + 5 + 5$

$4 + 4 + 4 + 4 + 4$

$5 \times 4$

$8 + 12$
$5 + 5 + 5 + 5$

$4 + 4 + 4 + 4 + 4$

$5 \times 4$

$8 + 12$

$12 + 8$
\[
\begin{align*}
5 + 5 + 5 + 5 &= 20 \\
4 + 4 + 4 + 4 + 4 &= 20 \\
5 \times 4 &= 20 \\
8 + 12 &= 20 \\
12 + 8 &= 20 \\
36 - (2 \times 8) &= 20
\end{align*}
\]
\[
\begin{align*}
5 + 5 + 5 + 5 &= 20 \\
4 + 4 + 4 + 4 + 4 &= 20 \\
5 \times 4 &= 20 \\
8 + 12 &= 20 \\
12 + 8 &= 20 \\
36 - (4 \times 4) &= 20 \\
36 - (2 \times 8) &= 20
\end{align*}
\]
$5 + 5 + 5 + 5$

$4 + 4 + 4 + 4 + 4$

$5 \times 4$

$8 + 12$

$12 + 8$

$36 - (2 \times 8)$

$36 - (4 \times 4)$

$12 + 8$

$4 \times (9 - 4)$
\[
\begin{align*}
5 + 5 + 5 + 5 &= 8 + 12 \\
4 + 4 + 4 + 4 + 4 &= 12 + 8 \\
5 \times 4 &= 36 - (2 \times 8) \\
36 - (4 \times 4) &= 12 + 8 \\
4 \times (9 - 4) &= (2 + 2 + 1) \times 4
\end{align*}
\]
\[5 + 5 + 5 + 5\]
\[4 + 4 + 4 + 4 + 4\]
\[5 \times 4\]
\[8 + 12\]
\[12 + 8\]
\[36 - (2 \times 8)\]
\[36 - (4 \times 4)\]
\[12 + 8\]
\[4 \times (9 - 4)\]
\[(2 + 2 + 1) \times 4\]
5 + 5 + 5 + 5

4 + 4 + 4 + 4 + 4

5 × 4

8 + 12

12 + 8

12 + 8

36 – (2 × 8)

4 × (9 – 4)

(2 + 2 + 1) × 4

36 – (4 × 4)
\[
\begin{align*}
5 + 5 + 5 + 5 &= 20 \\
4 + 4 + 4 + 4 + 4 &= 20 \\
5 \times 4 &= 20 \\
8 + 12 &= 20 \\
36 - (4 \times 4) &= 4 \\
4 + 4 + 4 + 4 + 4 &= 20 \\
12 + 8 &= 20 \\
12 + 8 &= 20 \\
36 - (2 \times 8) &= 8 \\
4 \times (9 - 4) &= 16 \\
(2 + 2 + 1) \times 4 &= 16
\end{align*}
\]
\[
\begin{align*}
5 + 5 + 5 + 5 &= 20 \\
4 + 4 + 4 + 4 + 4 &= 20 \\
4 \times 4 &= 16 \\
\text{if } a = 5, \text{ then } b &= 5 \\
8 + 12 &= 20 \\
\text{if } c = 12 + 8, \text{ then } d &= (36 - (4 \times 4)) \\
\text{if } e = (2 + 2 + 1), \text{ then } f &= (2 + 2 + 1) \times 4 \\
\text{if } g = 12 + 8, \text{ then } h &= 12 + 8 \\
\end{align*}
\]
\[
\begin{align*}
5 + 5 + 5 + 5 &= 20 \\
4 + 4 + 4 + 4 + 4 &= 20 \\
5 \times 4 &= 20 \\
8 + 12 &= 20 \\
36 - (4 \times 4) &= 0 \\
12 + 8 &= 20 \\
12 + 8 &= 20 \\
36 - (2 \times 8) &= 20 \\
4 \times (9 - 4) &= 20 \\
(2 + 2 + 1) \times 4 &= 20
\end{align*}
\]
Strategy #2

USE ANIMATION TO INITIATE MULTIPLE OPPORTUNITIES TO DECOMPOSE NUMBERS
$20 = 4 + 8 + 8$
20 = 4 + 8 + 8
\[ 20 = 4 + 8 + 8 \]

\[ 20 = 6 + 6 + 4 + 4 \]
20 = 4 + 8 + 8
20 = 6 + 6 + 4 + 4
20 = 4 + 8 + 8

20 = 6 + 6 + 4 + 4

20 = 12 + 8
$20 = 4 + 8 + 8$

$20 = 6 + 6 + 4 + 4$

$20 = 12 + 8$
\[
20 = 4 + 8 + 8 \\
20 = 6 + 6 + 4 + 4 \\
20 = 12 + 8 \\
20 = 10 + 10
\]
$20 = 4 + 8 + 8$

$20 = 6 + 6 + 4 + 4$

$20 = 12 + 8$

$20 = 10 + 10$
20 = 4 + 8 + 8
20 = 6 + 6 + 4 + 4
20 = 12 + 8
20 = 10 + 10
20 = 4 + 16
$20 = 4 + 8 + 8$
$20 = 6 + 6 + 4 + 4$
$20 = 12 + 8$
$20 = 10 + 10$
$20 = 4 + 16$
$20 = 8 + 8 + 4$
\[
\begin{align*}
20 &= 4 + 8 + 8 \\
20 &= 6 + 6 + 4 + 4 \\
20 &= 12 + 8 \\
20 &= 10 + 10 \\
20 &= 4 + 16 \\
20 &= 8 + 8 + 4
\end{align*}
\]
$20 = 4 + 8 + 8$  
$20 = 4 + 2(8)$

$20 = 6 + 6 + 4 + 4$  
$20 = 2(6) + 2(4)$

$20 = 12 + 8$  
$20 = 4 + 16$

$20 = 10 + 10$  
$20 = 8 + 8 + 4$
20 = 4 + 8 + 8
20 = 6 + 6 + 4 + 4
20 = 12 + 8
20 = 4 + 2(8)
20 = 2(6) + 2(4)
20 = 12 + (12 - 4)
20 = 10 + 10
20 = 4 + 16
20 = 8 + 8 + 4
\[
\begin{align*}
20 &= 4 + 8 + 8 \\
20 &= 4 + 2(8) \\
20 &= 10 + 10 \\
20 &= 2 \times 10 \\
20 &= 6 + 6 + 4 + 4 \\
20 &= 2(6) + 2(4) \\
20 &= 12 + 8 \\
20 &= 12 + (12 - 4) \\
20 &= 4 + 16 \\
20 &= 8 + 8 + 4
\end{align*}
\]
$20 = 4 + 8 + 8$

$20 = 4 + 2(8)$

$20 = 10 + 10$

$20 = 2 \times 10$

$20 = 6 + 6 + 4 + 4$

$20 = 2(6) + 2(4)$

$20 = 12 + 8$

$20 = 12 + (12 - 4)$

$20 = 4 + 16$

$20 = 4 + (4 \times 4) = 5 \times 4$

$20 = 8 + 8 + 4$
\[
\begin{align*}
20 &= 4 + 8 + 8 \\
20 &= 4 + 2(8) \\
20 &= 10 + 10 \\
20 &= 2 \times 10 \\
20 &= 6 + 6 + 4 + 4 \\
20 &= 2(6) + 2(4) \\
20 &= 12 + 8 \\
20 &= 12 + (12 - 4) \\
20 &= 4 + 16 \\
20 &= 4 + (4 \times 4) = 5 \times 4 \\
20 &= 8 + 8 + 4 \\
20 &= 2.5 \times 8
\end{align*}
\]
\[20 = 4 + 8 + 8\]
\[20 = 6 + 6 + 4 + 4\]
\[20 = 12 + 8\]
\[20 = 10 + 10\]
\[20 = 4 + 16\]
\[20 = 8 + 8 + 4\]
\[20 = 4 + 2(8)\]
\[20 = 2(6) + 2(4)\]
\[20 = 12 + (12 - 4)\]
\[20 = 2 \times 10\]
\[20 = 4 + 16\]
\[20 = 8 + 8 + 4\]
\[20 = 4 + (4 \times 4) = 5 \times 4\]
\[20 = 2.5 \times 8\]
$20 = 12 + 8$

$20 = 5 \times 4$

$20 = 8 + 8 + 4$

$20 = 12 + (12 - 4)$

$20 = 10 + 10$

$20 = 4 + 2(8)$

$20 = 12 + (12 - 4)$

$20 = 2 \times 10$

$20 = 4 + 2(8)$

$20 = 4 + 16$

$20 = 4 + 8 + 8$

$20 = 4 + (4 \times 4)$

$20 = 6 + 6 + 4 + 4$

$20 = 2.5 \times 8$

$20 = 2(6) + 2(4)$
12 Pages to Download
Carving Template
\[
\begin{align*}
20 &= 4 + 8 + 8 \\
    &= 4 + 2(8) \\
20 &= 6 + 6 + 4 + 4 \\
    &= 2(6) + 2(4) \\
20 &= 12 + 8 \\
    &= 12 + (12 - 4) \\
20 &= 10 + 10 \\
    &= 2 \times 10 \\
20 &= 4 + 16 \\
    &= 4 + (4 \times 4) = 5 \times 4 \\
20 &= 8 + 8 + 4 \\
    &= 2.5 \times 8
\end{align*}
\]
What do you notice? What else do you notice?
| What connections do you see? What else? |   |   |
What connections do you see? What else?
<table>
<thead>
<tr>
<th>What connections do you see? What else?</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Diagram 1" /></td>
</tr>
<tr>
<td><img src="image2.png" alt="Diagram 2" /></td>
</tr>
</tbody>
</table>
What connections do you see? What else?
What connections do you see? What else?

<table>
<thead>
<tr>
<th>Expression</th>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>$(3 \times 4) + 3$</td>
<td><img src="image1" alt="Diagram" /></td>
</tr>
<tr>
<td>one-third</td>
<td><img src="image2" alt="Diagram" /></td>
</tr>
<tr>
<td>two-thirds of 9</td>
<td><img src="image3" alt="Diagram" /></td>
</tr>
<tr>
<td>$3 \times 5 = 15$</td>
<td><img src="image4" alt="Diagram" /></td>
</tr>
<tr>
<td>Equation</td>
<td>Diagram</td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>$(3 \times 4) + 3$</td>
<td></td>
</tr>
<tr>
<td>one-third</td>
<td></td>
</tr>
<tr>
<td>two-thirds of 9</td>
<td></td>
</tr>
<tr>
<td>$3 \times 5 = 15$</td>
<td></td>
</tr>
<tr>
<td>three equal groups</td>
<td></td>
</tr>
<tr>
<td>one-fifth</td>
<td></td>
</tr>
</tbody>
</table>
What connections do you see? What else?

(3 \times 4) + 3 

one-third 

two-thirds of 9 

3 \times 5 = 15 

3:1 

4:1 

three equal groups 

one-fifth
What connections do you see?  What else?

\[(3 \times 4) + 3\]

(one-third)

two-thirds of 9

\[3 \times 5 = 15\]

three equal groups

one-fifth

3:1

4:1
What connections do you see? What else?

$(3 \times 4) + 3$

3:1

one-third

two-thirds of 9

three equal groups

4:1

$3 \times 5 = 15$

one-fifth
What connections do you see? What else?

(3 × 4) + 3

one-third

two-thirds of 9

3 × 5 = 15

3:1

4:1

three equal groups

one-fifth
What connections do you see? What else?

(3 × 4) + 3

three equal groups

one-third

two-thirds of 9

three equal groups

one-fifth
What connections do you see? What else?

(3 \times 4) + 3

\text{one-third}

two-thirds of 9

3 \times 5 = 15

3:1

4:1

three equal groups

one-fifth
What connections do you see? What else?

(3 \times 4) + 3

one-third

two-thirds of 9

3 \times 5 = 15

3:1

4:1

three equal groups

one-fifth
What connections do you see? What else?

- $(3 \times 4) + 3$
- one-third
- two-thirds of 9
- $3 \times 5 = 15$
- three equal groups
- one-fifth

3:1

4:1
PROMOTE DISCOURSE BY ILLUSTRATING CHANGE
We don’t know the total number of blue shapes. We do know that because both of the splats are the same color they must have the same number under each of them.
What could the total be?
What are some possibilities?
How are the possibilities connected?
How is the list of possible totals like the picture?
Let’s look under one splat to see how many shapes are there.
Let’s look under one splat to see how many shapes are there.
What is the area of this shape?
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Steve Wyborney
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16 - 2
What is the area of this shape?
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What is the area of this shape?

16 - 2

20 - 1 - 1 - 2

Steve Wyborney
What is the area of this shape?
What is the area of this shape?
What is the area of this shape?
What is the area of this shape?
What is the area of this shape?
What is the area of this shape?
What is the area of this shape?
What is the area of this shape?
What is the area of this shape?

4

1

20

3
What is the area of this shape?
What is the area of this shape?
USE ANIMATIONS TO REVEAL PORTIONS OF QUESTIONS
Strategy #5

USE ANIMATION TO CHANGE FAMILIAR QUESTIONS INTO NOVEL QUESTIONS
<p>| | | | |</p>
<table>
<thead>
<tr>
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<td>30</td>
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<td></td>
<td>38</td>
</tr>
</tbody>
</table>
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