

Programming in Vinyl

Jon Sterling
Engineer, FOBO

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A Question from Grade School

(Illustrating BEAMER's `\pause` command.)

A couple of years ago, a fifth-grade teacher asked me to explain to her the reasoning behind the “invert and multiply” rule for dividing fractions, e.g.

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Let's try to find answers understandable by fifth graders (at least the more patient ones).

Cookie Approach

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If we give $\frac{1}{3}$ of a cookie to each person, how many people can we feed with 1 cookie?
Obviously, the answer is 3.
So we've derived the “invert and multiply” rule in a special case:

$$1 \div \frac{1}{3} = 3$$

Cookie Approach

But what if we give $2/3$ of a cookie, not $1/3$, to each person?

We're giving $2 \times$ as much per person.

So we can feed only $1/2$ as many people.

So we feed $\frac{1}{2} \times 3 = \frac{3}{2}$.¹

So we've derived the “invert and multiply” rule in another case:

$$1 \div \frac{2}{3} = \frac{3}{2}$$

¹One person gets only a half share.

Cookie Approach

Now, suppose we have only $\frac{4}{5}$ of a cookie.
Then we can feed only $\frac{4}{5}$ as many people, i.e.

$$\frac{4}{5} \times \frac{3}{2} \text{ people}$$

Cookie Approach

Now, suppose we have only $\frac{4}{5}$ of a cookie.
Then we can feed only $\frac{4}{5}$ as many people, i.e.

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So we've derived the “invert and multiply” rule in the general case:

$$\frac{4}{5} \div \frac{2}{3} = \frac{4}{5} \times \frac{3}{2}$$

A Geometry Proof

(Illustrating BEAMER's `\uncover` command.)

Theorem

The angles in a triangle sum to 180° .

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Plan: Extend AC past C to D. Draw CE parallel to AB.

Proof.

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Alternate angles of a transversal.



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Consecutive interior angles of a transversal



Proof.

1. $u = y$

2. $v = x$

3. $z + u + v = 180^\circ$

Alternate angles of a transversal.

Consecutive interior angles of a transversal



Proof.

- | | |
|----------------------------|--|
| 1. $u = y$ | Alternate angles of a transversal. |
| 2. $v = x$ | Consecutive interior angles of a transversal |
| 3. $z + u + v = 180^\circ$ | ACD is a straight line. |



Proof.

1. $u = y$

2. $v = x$

3. $z + u + v = 180^\circ$

4. $z + y + x = 180^\circ$

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| 3. $z+u+v = 180^\circ$ | ACD is a straight line. |
| 4. $z+y+x = 180^\circ$ | Substitution from Steps 1 and 2. |



More Advanced Features of BEAMER

- This tour just scratches the surface.

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- **Advanced example:** `http://latex-beamer.sourceforge.net/beamerexample1.pdf`.