

$4(3 + 3)$

$\frac{80}{\square} ?$

$3 \times 4 = 7$

$\frac{20}{\diamond}$

$4(3 + 3)$

$\frac{80}{\square} ?$

FUN AND GAMES

FIREWORKS

Multiplication

Jay Hwang

Table of Contents

Boom! Bang! Bored?.....	4
A Bright Idea.....	6
Welcome to Montréal.....	12
La Ronde.....	14
Meet the Competitors.....	16
It's Showtime!.....	22
The Grand Finale.....	26
Problem Solving.....	28
Glossary.....	30
Index.....	31
Answer Key.....	32

Boom! Bang! Bored?

Bang! Whoosh! Pop! Stella has a gigantic smile on her face as the glow from an orange burst erupts in the night sky. *Hiss! Snap!* The sound of a silver whistling whirl delights Stella's ears. *Boom!* Silence. *Bang!* A giant, blue flower explodes in the air. Stella cheers along with the crowd. Her father's fireworks sure are impressive. Behind the scenes, though, away from the crowd, Stella knows that her father is bored and unhappy.

Stella's father is a **pyrotechnician**. He sets off fireworks for a living, and it is his job to dazzle audiences with his firework show. But lately, Stella's father has become bored. He feels that he knows everything about fireworks. He can identify the exact **proportion** of ingredients needed to make any type of explosion. Barium is used for green fireworks and lithium for red fireworks. Shells loaded with many small, round pieces of metal called **stars** will create one large explosion. Adding more black powder to the **lift charge** at the bottom part of the firework will propel it higher into the sky, and changing the length of the **fuse** will **detonate** the firework at precisely the right time. To him, fireworks are simply careful calculations and measurements, which achieve a consistent, predictable result in color and sound. He feels that he has nothing left to learn.



Pyrotechnicians prepare for a firework show.

LET'S EXPLORE MATH

Professional pyrotechnicians plan for 2 hours to produce 1 minute of a firework show.

1. How many minutes of planning time is this?
2. How many minutes does it take to plan a 30 minute show?

A Bright Idea

Stella decides to help her father love fireworks again. She remembers a story he once told her. He was a young boy celebrating Independence Day with his family. He watched in amazement as a giant red star popped. He gasped as a white pinwheel fizzled. Those glittering explosions **inspired** him.

Suddenly, Stella has an idea. She remembers her father telling her about an event called the Fireworks Festival of Montréal. There, people compete to make the greatest firework displays in the world. Surely, this competition would help **reignite** her father's passion for fireworks.



A child celebrates while watching fireworks.



Chrysanthemum fireworks
light the sky over Montréal.

Montréal
Festival
website



Once the excitement wears off, Stella realizes she hasn't thought her plan through. How can she take her father to a festival in Canada? She doesn't have money for plane tickets, and she can't pay for a hotel. Stella realizes she has a new problem to solve.

Stella decides to search the festival's website for information. She quickly learns that the city of Montréal is holding a poetry contest to promote the festival. The winner will be awarded airfare, a hotel stay, and two free tickets to the festival.

"A poem about fireworks?" Stella wonders aloud. It will be challenging, but she is determined! For the rest of the night, Stella sits on her bed thinking about how fireworks make her feel.

Stella writes and revises. Finally, she's ready to submit. She takes a deep breath and presses the send button.

My Father's Fireworks

He sends round packages of light
into the night sky
where they burst at the seams
into dazzling arrays of colors,
which adults and children see
for miles and miles.

"My father's fireworks,"
I proudly exclaim,
"will bring happiness and joy
for many years to come!"

Math Talk

1. How can place value help you solve multiplication problems?
2. How are multiplication and division related?
3. What is an efficient way to multiply 49×51 mentally?
4. How can you use estimation to determine whether the product of a multiplication equation is reasonable?
5. How does knowing the product of 4×5 help you solve 40×5 and 40×50 ?
6. Does the order of factors in a multiplication equation influence the product? Why or why not?