Contents

About Pearson mathology

Practice Workbook 8

What Is the Purpose of the Workbook?

For students

The Workbook supports students in their learning journey with independent or small-group practice opportunities for

- building on their understanding through a variety of questions, tasks, games, and challenges connecting foundational concepts;
- organizing and representing their thinking and understanding; and
- connecting math concepts to their lived experiences.

For teachers

The Workbook helps you support students by

- offering intentional independent and small-group practice ideas, aligned with your curriculum;
- providing additional assessment opportunities and ways to support learning; and
- allowing parents and caregivers an opportunity to see what their child is learning.

Go to Mathology.ca for comprehensive lesson notes supporting a deep understanding of student thinking and assessment opportunities that help determine the best next steps for your learners.

How To Use the Workbook

After working through lessons with students

- Identify the practice units that correlate with the lessons you've taught.
- Use the Workbook flexibly, as in-class practice (small-group, collaborative, or independent work).
- Discuss the practice tasks and ensure clarity.
- Identify the open-ended tasks and discuss ways for students to represent their understanding.
- Debrief the tasks and ask students to share their strategies.
- Observe students' level of understanding and build on it through additional tasks.

Reaching All Learners (Differentiated Instruction)

Consider the variety of learners in your classroom and how the Workbook can best support them. Key questions to reflect on include:

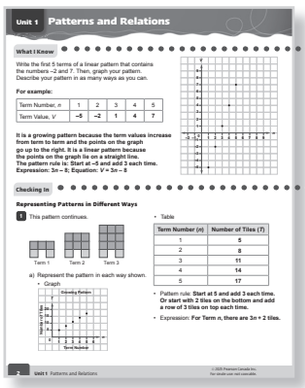
- Are there certain questions that I want all students to complete?
- Do some students need accommodations?
- Which students might benefit from small-group conversations before starting tasks?
- How can I encourage the use of manipulatives and models (e.g., Math Mats, Base Ten Blocks)?
- How can students use the Workbook to recognize their strengths and build a math identity (e.g., self-reflection)?

Curriculum Support

Go to www.pearson.com/ca/en/k-12-education/mathology.html for a detailed alignment of this resource with your curriculum.

How Is the Workbook Organized?

Each unit connects the learning across several lessons.


Unit 1 Patterns and Relations

What I Know

Checking In

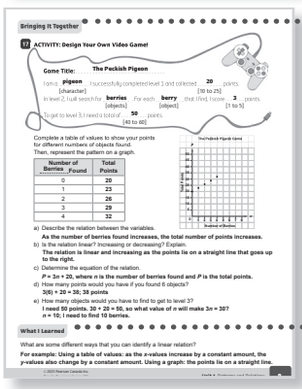
Representing Patterns in Different Ways

What I Know

- activates prior knowledge of major concepts
- provides pre-assessment of students' understanding and knowledge
- helps you identify students who may need additional support

Checking In

- provides opportunities for students to apply their knowledge and understanding of concepts, make connections to math in the real world, reflect and discuss their thinking and strategies, and show what they know


Bringing It Together

ACTIVITY: Design Your Own Video Game!

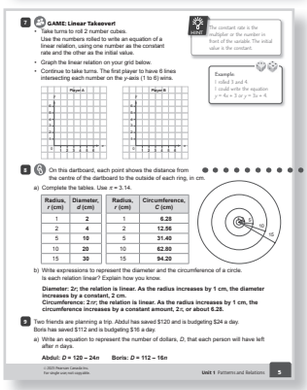
What I Learned

Bringing It Together

- allows students to work together to discuss thinking and strategies
- helps students show what they know
- presents many open-ended tasks or games

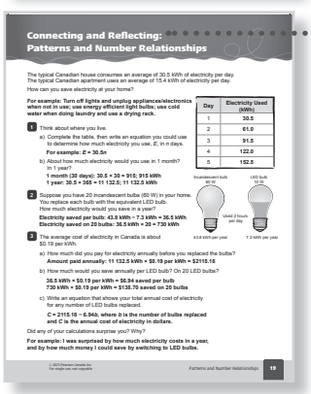
What I Learned

- allows students to reflect on what they have learned and record their understanding
- prompts students to focus on the major understandings and concepts
- provides a snapshot of students' learning


GAME: Linear Takeover

Connections question

- enables students to create their own notes on connections made visible in the moment


Connecting and Reflecting: Patterns and Number Relationships

Connecting and Reflecting

- connects the learning across a practice cluster with students' lived experiences

Sample student answers are included throughout the resource.

Unit 7 Operations with Fractions and Rational Numbers

What I Know

Use 4 digits from 1 to 9 each time. Each digit can only be used once.

Use models if they help.

- Make a sum that is very close to 1. Explain how you know the sum is close to 1.

$\frac{1}{2} + \frac{5}{9}$

For example: I know that $\frac{1}{2} + \frac{1}{2} = 1$.

So, I replaced one of the halves with a fraction close to $\frac{1}{2}$: $\frac{5}{9}$.

$\frac{1}{2} + \frac{5}{9} = \frac{9}{18} + \frac{10}{18} = \frac{19}{18}$, which is a little more than 1.

- Make a difference of 1. Prove that the difference is 1.

$\frac{9}{3} - \frac{8}{4} = 1$

For example: I know that 3 – 2 = 1.

So, I wrote 3 as the improper fraction $\frac{9}{3}$ and 2 as the improper fraction $\frac{8}{4}$.

$\frac{9}{3} - \frac{8}{4} = \frac{36}{12} - \frac{24}{12} = \frac{12}{12}$, or 1

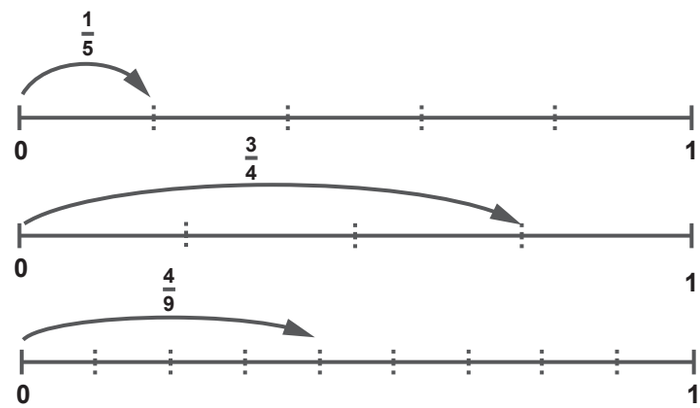
Checking In

Adding and Subtracting Fractions

1 Explain why $\frac{1}{5} + \frac{3}{4} \neq \frac{4}{9}$.

For example: $\frac{3}{4}$ is greater than $\frac{1}{2}$ while $\frac{4}{9}$ is less than $\frac{1}{2}$ so, it can't be true.

Since $\frac{3}{4} > \frac{4}{9}$, the sum of $\frac{1}{5} + \frac{3}{4}$ will be even greater than $\frac{4}{9}$.



2 Use mental math to estimate each sum or difference. Then use common denominators to calculate the sum or difference.

a) $2\frac{4}{10} + 3\frac{9}{10}$

$\frac{9}{10}$ is almost 1, so the answer will be greater than 6.

2 + 3 = 5 and $\frac{4}{10} + \frac{9}{10} = \frac{13}{10}$

$5 + \frac{13}{10} = 5 + 1 + \frac{3}{10}$, or $6\frac{3}{10}$

b) $3\frac{7}{8} - \frac{9}{8}$

I am taking away a little more than 1, so the answer will be less than $2\frac{7}{8}$.

$3\frac{7}{8} = \frac{31}{8}$

$\frac{31}{8} - \frac{9}{8} = \frac{22}{8}$, or $2\frac{6}{8}$, or $2\frac{3}{4}$

c) $1\frac{5}{6} + \frac{1}{9}$

$\frac{1}{9}$ is less than $\frac{1}{6}$, so there isn't quite enough to make 2. The answer will be a little less than 2.

$1\frac{5}{6} = \frac{11}{6}$

$\frac{11}{6} + \frac{1}{9} = \frac{11 \times 3}{6 \times 3} + \frac{1 \times 2}{9 \times 2}$

$= \frac{33}{18} + \frac{2}{18}$

$= \frac{35}{18}$, or $1\frac{17}{18}$

d) $6\frac{1}{5} - 2\frac{1}{3}$

$\frac{1}{3}$ is greater than $\frac{1}{5}$, so the answer will be less than 4.

$6\frac{1}{5} = 5\frac{6}{5}$ and $5 - 2 = 3$

$\frac{6}{5} - \frac{1}{3} = \frac{6 \times 3}{5 \times 3} - \frac{1 \times 5}{3 \times 5}$

$= \frac{18}{15} - \frac{5}{15}$, or $\frac{13}{15}$

$3 + \frac{13}{15} = 3\frac{13}{15}$

3 a) Without adding the given fractions, how do you know that the sum of these fractions is 3?

$\frac{5}{6} + \frac{3}{4} + \frac{2}{3} + \frac{9}{12}$

HINT

Think about how far each of the first three fractions is from 1. Then, compare to the fourth fraction.

For example: I look at how far each of the first 3 fractions is from 1: $\frac{1}{6}$, $\frac{1}{4}$, and $\frac{1}{3}$.

The sum of these fractions is: $\frac{1}{6} + \frac{1}{4} + \frac{1}{3} = \frac{2}{12} + \frac{3}{12} + \frac{4}{12} = \frac{9}{12}$.

This means that the sum of the first three fractions is $\frac{9}{12}$ away from 3.

Since the last fraction added is $\frac{9}{12}$, the sum of the four fractions will be 3.

b) Write your own set of four fractions with different denominators that will have a sum of 3. Explain your thinking.

For example: $\frac{1}{2} + \frac{4}{5} + \frac{3}{4} + ?$

Distance from each fraction to 1: $\frac{1}{2}$, $\frac{1}{5}$, and $\frac{1}{4}$.

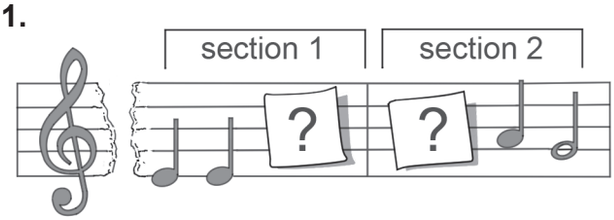
Sum of these fractions: $\frac{1}{2} + \frac{1}{5} + \frac{1}{4} = \frac{10}{20} + \frac{4}{20} + \frac{5}{20} = \frac{19}{20}$.

So, the fourth fraction must be $\frac{19}{20}$: $\frac{1}{2} + \frac{4}{5} + \frac{3}{4} + \frac{19}{20}$.

Type of Note	Fraction of a Whole Note
whole note	1
half note	$\frac{1}{2}$
quarter note	$\frac{1}{4}$
eighth note	$\frac{1}{8}$

4 **Musical Fractions!**

In music, the notes in each section add up to 1.
Help us complete this musical score.
What types of notes could be in each section?



For example:
In section 1, there could be two quarter notes or one half note: $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = 1$ and $\frac{1}{4} + \frac{1}{4} + \frac{1}{2} = 1$.

In section 2, there could be one quarter note or two eighth notes: $\frac{1}{4} + \frac{1}{2} + \frac{1}{4} = 1$ and $\frac{1}{4} + \frac{1}{2} + \frac{1}{8} + \frac{1}{8} = 1$.

5 **GAME: Almost One!** You will need a deck of cards with the face cards removed. Aces are 1.

$\frac{3}{4} + \frac{a}{b}$ is almost one!

HINT

If the sum of your fractions is greater than 1, subtract 1 to find the difference. If the sum is less than 1, subtract it from 1 to find the difference.

- Deal 10 cards each. Place the remaining cards face down in a pile. Each of you use two of your cards to build a fraction $\frac{a}{b}$ so that the sum of your fraction and $\frac{3}{4}$ is as close to 1 as possible without equaling 1.
  Record your value. Determine how far away from 1 your sum is, then record the difference.
- Take two more cards from the pile and play another round.
- After five rounds, add your differences. The player with the smaller difference wins.

Player A

Value of $\frac{a}{b}$	Difference from 1

Player B

Value of $\frac{a}{b}$	Difference from 1

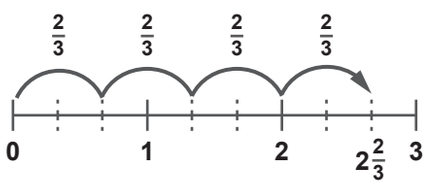
Multiplying and Dividing Fractions

6 Estimate, then multiply or divide. Show your strategy. Use models if they help.

a) $4 \times \frac{2}{3} = \mathbf{\frac{8}{3}}$ **or** $\mathbf{2\frac{2}{3}}$

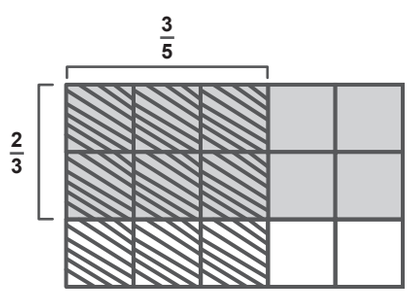
Estimate: $\frac{2}{3}$ is close to $\frac{1}{2}$.

$4 \times \frac{1}{2} = 2$



b) $\frac{2}{3} \times \frac{3}{5} = \mathbf{\frac{6}{15}}$ **or** $\mathbf{\frac{2}{5}}$

Estimate: $\frac{2}{3}$ is close to 1 and $\frac{3}{5}$ is close to $\frac{1}{2}$. $1 \times \frac{1}{2} = \frac{1}{2}$



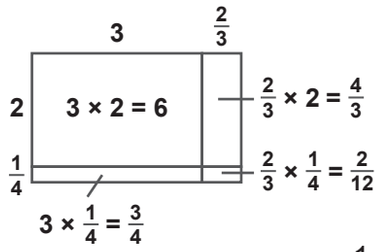
c) $3\frac{2}{3} \times 2\frac{1}{4} = 8\frac{1}{4}$

Estimate: $3\frac{2}{3}$ is close to 4 and $2\frac{1}{4}$ is close to 2; $4 \times 2 = 8$

$6 + \frac{4}{3} + \frac{3}{4} + \frac{2}{12}$

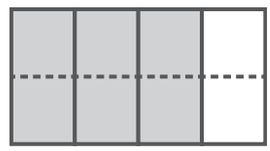
$= 6 + \frac{16}{12} + \frac{9}{12} + \frac{2}{12}$

$= 6\frac{27}{12}$, or $8\frac{3}{12}$, $8\frac{1}{4}$



d) $\frac{3}{4} \div 2 = \frac{3}{8}$

Estimate: $\frac{3}{4}$ is close to 1 and $1 \div 2$ is $\frac{1}{2}$.



I modelled $\frac{3}{4}$, then divided it into 2 equal pieces. Each piece is $\frac{3}{8}$.

e) $\frac{2}{3} \div \frac{4}{5} = \frac{5}{6}$

Estimate: $\frac{2}{3}$ is close to 1 and $\frac{4}{5}$ is close to 1. $1 \div 1 = 1$

$\frac{2}{3} \div \frac{4}{5} = \frac{10}{15} \div \frac{12}{15}$

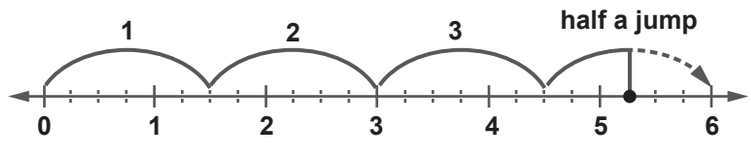
$= \frac{10}{12}$

$= \frac{5}{6}$

f) $5\frac{1}{4} \div 1\frac{1}{2} = 3\frac{1}{2}$

Estimate: $5\frac{1}{4}$ is close to 5 and $1\frac{1}{2}$ is close to 2. $5 \div 2 = 2\frac{1}{2}$

I took 3 jumps of $1\frac{1}{2}$, then half of a jump.



7 Choose one multiplication or division statement from question 6. Describe a situation that it could represent.

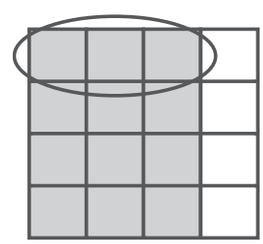
For example: $3\frac{2}{3} \times 2\frac{1}{4} = 8\frac{1}{4}$; A recipe calls for $3\frac{2}{3}$ cups of flour. I am going to make $2\frac{1}{4}$ of the recipe. How much flour will I need? (Answer: $8\frac{1}{4}$ cups of flour)

8 The product of two whole numbers is always a larger number. The quotient when dividing two whole numbers is always a smaller number. Is the same true when multiplying and dividing fractions? Use $\frac{3}{4} \times \frac{1}{4}$ and $\frac{3}{4} \div \frac{1}{4}$, as well as pictures, diagrams, and words to help explain.

For example: I think of $\frac{3}{4} \div \frac{1}{4}$ as 'how many $\frac{1}{4}$s are in $\frac{3}{4}$?'. I know the answer is 3.

Fractions are different because you divide by amounts less than 1 so you get more pieces. This is unlike whole numbers where you divide by amounts greater than 1 which creates fewer pieces.

For multiplication, I use an area model to visualize it. I think of $\frac{3}{4} \times \frac{1}{4}$ as $\frac{1}{4}$ of $\frac{3}{4}$. I have $\frac{3}{4}$ and am taking $\frac{1}{4}$ of that. Since I am not taking all of it, my piece will be smaller than the original amount. This is different than multiplying by a whole number, where you are making more copies of the original amount.



I modelled $\frac{3}{4}$, then divided it into 4 equal parts. $\frac{1}{4}$ of the shaded part is $\frac{3}{16}$.

9 Two fractions are multiplied. The product is greater than either of the fractions being multiplied. What could the fractions be?

For example: I think that any two numbers greater than 1 will result in a larger product. I am going to test it with $1\frac{1}{2} \times 1\frac{1}{3}$.
$\frac{3}{2} \times \frac{4}{3} = \frac{12}{6}$ which equals 2.

10 It takes about $3\frac{5}{6}$ h to fly from Calgary to Toronto.
It takes about two-fifths of that time to fly from Calgary to Victoria, British Columbia.
About how long does it take to fly from Calgary to Victoria?

For example: $\frac{2}{5} \times 3\frac{5}{6} = \frac{2}{5} \times \frac{23}{6}$
$= \frac{46}{30}$
$= 1\frac{16}{30}$ or $1\frac{8}{15}$
$\frac{1}{15}$ of 60 min is 4 min, so $\frac{8}{15}$ is 32 min.
It takes about $1\frac{8}{15}$ h or 1 h 32 min to fly from Calgary to Victoria.

11 **PUZZLE: Multiplying Fractions**
Complete the multiplication chart. Write all fractions in simplest form.
Write improper fractions as mixed numbers.

×	$\frac{2}{3}$	$1\frac{1}{5}$	$1\frac{1}{3}$
$\frac{1}{6}$	$\frac{1}{9}$	$\frac{1}{5}$	$\frac{2}{9}$
$\frac{9}{4}$	$1\frac{1}{2}$	$2\frac{7}{10}$	3
$1\frac{1}{8}$	$\frac{3}{4}$	$1\frac{7}{20}$	$1\frac{1}{2}$

Operations with Fractions

12 Evaluate each expression.

a) $\frac{3}{5} + \frac{5}{6} \times \frac{7}{10}$

$= \frac{3}{5} + \frac{35}{60}$

$= \frac{36}{60} + \frac{35}{60}$

$= \frac{71}{60}$, or $1\frac{11}{60}$

b) $(\frac{7}{8} - \frac{1}{2}) \div \frac{3}{4} \times \frac{5}{6}$

$= (\frac{7}{8} - \frac{4}{8}) \div \frac{3}{4} \times \frac{5}{6}$

$= \frac{3}{8} \times \frac{4}{3} \times \frac{5}{6}$

$= \frac{12}{24} \times \frac{5}{6}$

$= \frac{1}{2} \times \frac{5}{6}$, or $\frac{5}{12}$

c) $2\frac{1}{2} \div 1\frac{1}{3} \times (\frac{2}{5} + \frac{1}{3})$

$= \frac{5}{2} \div \frac{4}{3} \times (\frac{6}{15} + \frac{5}{15})$

$= \frac{5}{2} \times \frac{3}{4} \times \frac{11}{15}$

$= \frac{165}{120}$

$= 1\frac{45}{120}$, or $1\frac{3}{8}$

d) $(\frac{2}{3} + \frac{4}{5} - \frac{5}{6}) \times 2\frac{1}{2}$

$= (\frac{20}{30} + \frac{24}{30} - \frac{25}{30}) \times 2\frac{1}{2}$

$= (\frac{44}{30} - \frac{25}{30}) \times \frac{5}{2}$

$= \frac{19}{30} \times \frac{5}{2}$

$= \frac{95}{60}$, or $1\frac{35}{60}$, or $1\frac{7}{12}$

13 Johanna trains 7 days a week for a triathlon. Here is their training tracker for each day last week. What is the average time that Johanna spent training?

☑ Sunday	☑ Monday	☑ Tuesday	☑ Wednesday	☑ Thursday	☑ Friday	☑ Saturday
$3\frac{3}{5}$ h	$3\frac{1}{4}$ h	$3\frac{1}{10}$ h	$2\frac{3}{4}$ h	$2\frac{7}{10}$ h	$3\frac{1}{2}$ h	$2\frac{4}{5}$ h

Add all the whole numbers, then group fractions with like denominators.

$3\frac{3}{5} + 3\frac{1}{4} + 3\frac{1}{10} + 2\frac{3}{4} + 2\frac{7}{10} + 3\frac{1}{2} + 2\frac{4}{5} = 18 + \frac{3}{5} + \frac{4}{5} + \frac{1}{4} + \frac{3}{4} + \frac{7}{10} + \frac{1}{10} + \frac{1}{2}$

$= 18 + \frac{7}{5} + \frac{4}{4} + \frac{8}{10} + \frac{1}{2}$

$= 20 + \frac{2}{5} + \frac{8}{10} + \frac{1}{2}$ **Use a common denominator of 10.**

$= 20 + \frac{4}{10} + \frac{8}{10} + \frac{5}{10}$

$= 20 + \frac{17}{10}$, or $21\frac{7}{10}$

Average: $21\frac{7}{10} \div 7 = 3\frac{1}{10}$ (I divided 21 by 7, then I knew that $\frac{7}{10} \div 7 = \frac{1}{10}$.)

Johanna spent an average of $3\frac{1}{10}$ h training each day.

Solving Problems with Rational Numbers

14 In Brandon, Manitoba, taxi operators charge $4.20 for the first 100 m of travel and $0.25 for each additional 100 m travelled. Determine the total cost of making two trips, one of 8.5 km and another of 5.8 km.

For example: 1 km = 1000 m
So, 8.5 km = 8500 m and 5.8 km = 5800 m.
Divide to find the number of groups of 100 m in each measure:

8500 m ÷ 100 m = 85
Cost = $4.20 + 84 × $0.25
= $4.20 + $21.00
= $25.20

5800 m ÷ 100 m = 58
Cost = $4.20 + 57 × $0.25
= $4.20 + $14.25
= $18.45

Total cost: $25.20 + $18.45 = $43.65.

15 Craig's chickens laid $3\frac{3}{4}$ dozen eggs. Freda's chickens laid twice as many eggs as Craig's chickens. Freda gives Craig $1\frac{1}{2}$ dozen eggs. How many dozen eggs do they each have now?

$3\frac{3}{4} \times 2 = \frac{15}{4} \times 2$

$= \frac{30}{4}$, or $7\frac{2}{4}$, or $7\frac{1}{2}$; Freda has $7\frac{1}{2}$ dozen eggs.

After Freda gives Craig $1\frac{1}{2}$ dozen, they have 6 dozen left.

Craig has $3\frac{3}{4} + 1\frac{1}{2} = 4 + \frac{3}{4} + \frac{2}{4}$

$= 5\frac{1}{4}$; Craig has $5\frac{1}{4}$ dozen eggs.

16 Did you know that the James Bond character was modelled after Sir William Stephenson, who was born and raised in Winnipeg, Manitoba? He went on to lead a spy school in Canada during WWII.

These are the top 5 grossing James Bond movies.

1. *Skyfall* ($304.4 million)
2. *Spectre* ($200.1 million)
3. *Quantum of Solace* ($168.4 million)
4. *Casino Royale* (2006) ($167.4 million)
5. *Die Another Day* ($160.9 million)

What is the average earning of the top 5 grossing movies?

304.4 + 200.1 + 168.4 + 167.4 + 160.9 = 1001.2

Average = $\frac{1001.2}{5}$

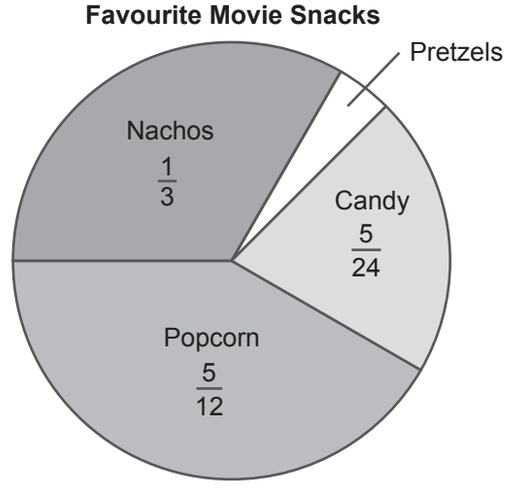
$= 200.24$

The average earning is $200.24 million.

17 This circle graph shows the favourite movie snacks of 148 Grade 8 students.

a) What fraction of the students chose pretzels?

b) How many students chose popcorn or nachos?



a) For example: The circle represents 1 whole.

The fraction of students who chose pretzels is:

$1 - (\frac{1}{3} + \frac{5}{12} + \frac{5}{24}) = 1 - (\frac{8}{24} + \frac{10}{24} + \frac{5}{24})$

$= 1 - (\frac{23}{24})$

$= \frac{1}{24}$

b) Fraction who chose popcorn or nachos:

$\frac{1}{3} + \frac{5}{12} = \frac{4}{12} + \frac{5}{12}$

$= \frac{9}{12}$, or $\frac{3}{4}$

$\frac{1}{4}$ of 148 = 148 ÷ 4, or 37

So, $\frac{3}{4}$ of 148 = 37 × 3, or 111.

One hundred eleven students chose popcorn or nachos.

Bringing It Together

18 CHALLENGE: Operation Challenge!

Use the digits 0 through 9 to make these equations true.
Each digit can only be used once. Use models if they help.

$\frac{2}{3} \times \boxed{5} = 3\frac{1}{\boxed{3}}$

$\frac{\boxed{7}}{\boxed{8}} \div \frac{1}{2} = \frac{7}{4}$

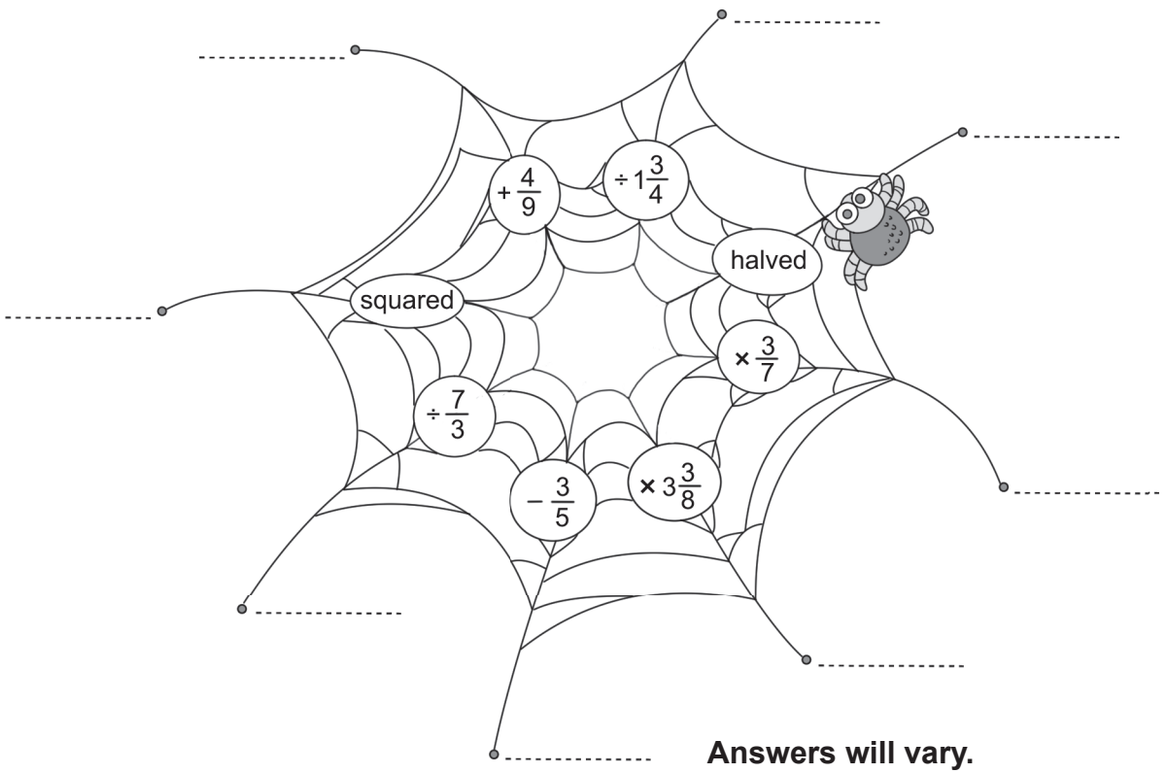
$\frac{5}{10} \times \boxed{0}.25 = 0.\boxed{1}25$

$\boxed{9} \div \frac{3}{2} = \boxed{6}$

$\boxed{2}\frac{1}{4} \times \frac{5}{9} = \frac{5}{\boxed{4}}$

19 ACTIVITY: Fraction Web

Write a fraction of your choice in the centre. Perform the operations.
Write your answers at the ends of the threads.



Answers will vary.

What I Learned

How is multiplying fractions different from adding fractions? How is it the same?
Use examples to explain your thinking.

For example: When I add fractions, I write each fraction with a common denominator, then add the numerators; for example, $\frac{1}{4} + \frac{1}{3} = \frac{3}{12} + \frac{4}{12} = \frac{7}{12}$. When I multiply fractions, I multiply the numerators and multiply the denominators; there is no need to find a common denominator. For example, $\frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$. When adding and multiplying, I divide the numerator and denominator by common factors to write the final answer in simplest form.