Lesson 1: Planning recipes

Goals

- Create a recipe that meets the requirements to be considered low calorie, low fat, or low sodium, and justify (orally) the reasoning.
- Determine whether one serving of a recipe meets the requirements to be considered low calorie, low fat, or low sodium, and explain (orally) the reasoning.
- Use proportional reasoning to calculate nutritional values of one serving of a recipe.

Lesson Narrative

This lesson is optional. In this lesson, students apply proportional reasoning to calculate nutritional values per one serving of a recipe. The second activity asks students to invent another recipe that meets nutritional requirements to be considered low calorie, low fat, or low sodium (salt). Students likely need to perform various multi-step unit conversions to solve each problem. This context provides students with an opportunity to make sense of problems and persevere in solving them.

As with all lessons in this unit, all related standards have been addressed in prior units. This lesson provides an *optional* opportunity to go deeper and to make connections between domains. This lesson can be used as an introduction to the context of students planning their own restaurant, which continues through the next few lessons. However, it is also possible to use other lessons about this context without using this lesson as the introduction.

Addressing

- Use proportional relationships to solve multistep ratio and percentage problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percentage increase and decrease, percentage error.

Instructional Routines

- Stronger and Clearer Each Time
- Compare and Connect
- Discussion Supports

Required Materials

Four-function calculators
Recipes

Required Preparation

Students will need access to a variety of recipes to choose from for this lesson. You can tell students ahead of time to bring in two of their favourite recipes, or have a variety of recipe

pages for students to look through, or give students time at the beginning of the lesson to use an internet-enabled device to search online for recipes.

Student Learning Goals

Let's choose some recipes for a restaurant.

1.1 A Recipe for Your Restaurant

Optional: 15 minutes (there is a digital version of this activity)

The purpose of this activity is for students to apply proportional reasoning to scaling down a recipe and calculating the number of calories in one serving. In the next activity (and, if desired, in the next lesson), students will continue working with the recipe that they select in this activity.

The digital version of this activity includes nutritional information about many more ingredients than were printed in students' books.

Instructional Routines

- Discussion Supports

Launch

If desired, explain to students that they are starting a series of activities that are based on the idea of imagining they could open their own restaurant. Provide multiple recipes for students to choose from.

Reading: Discussion Supports. Use this routine to support student understanding of the situation. Explain the meaning of the nutritional values students must calculate, and discuss reasons why they are important factors to consider. Review directions to ensure students understand the connection between the situation and the mathematics of the task. *Design Principle(s): Support sense-making; Cultivate conversation*

Anticipated Misconceptions

When calculating the amount of calories from each ingredient, some students may struggle with converting between the units in their recipes and the units given in the tables of nutritional information. Consider displaying conversion information that your students may find helpful, for example 1 cup = 16 tablespoons.

Some students' recipes may include an ingredient for which the nutrition information is not listed in their books. Help them research the needed information, either from the digital version of this activity or other websites.

Student Task Statement

Imagine you could open a restaurant.

1. Select a recipe for a main dish you would like to serve at your restaurant.

2. Record the amount of each ingredient from your recipe in the first two columns of the table. You may not need to use every row.

ingredient	amount	amount per serving	calories per serving

3. How many servings does this recipe make? Determine the amount of each ingredient in one serving, and record it in the third column of the table.

4. Restaurants are asked to label how many calories are in each meal on their menu.

   a. Use the nutrition information to calculate the amount of calories from each ingredient in your meal, and record it in the last column of the table.

   b. Next, find the total calories in one serving of your meal.

5. If a person wants to eat 2 000 calories per day, what percentage of their daily calorie intake would one serving of your meal be?

Grains

	mass (g)	calories	fat (g)	sodium (mg)
biscuits, refrigerated dough (1)	58	178	6.14	567
bread crumbs (1 oz)	28.35	112	1.5	208
cornmeal (1 c)	157	581	2.75	11
egg noodles (1 c)	38	146	1.69	8
hamburger or hotdog buns (1)	44	123	1.72	217

oats (1 c)	81	307	5.28	5
pasta (1 c)	91	338	1.37	5
pie crust, refrigerated (1)	229	1 019	58.3	937
pitta bread (1 oz)	28.35	8	0.34	152
quinoa (1 c)	170	626	10.32	8
ramen noodles (1 pkg)	81	356	14.25	1 503
rice flour (1 c)	158	578	2.24	0
rice, brown (1 c)	185	679	5.92	9
rice, white (1 c)	185	675	1.22	9
saltine crackers (5)	14.9	62	1.29	140
taco shells (1)	12.9	61	2.81	42
tortillas (1)	49	146	3.71	364
wholemeal bread (1 slice)	29	79	1.31	137
Wholemeal flour (1 c)	125	455	1.22	2
white bread (1 slice)	29	77	0.97	142

Vegetables

	mass (g)	calories	fat (g)	sodium (mg)
asparagus (1 c)	134	27	0.16	3
avocados (1 c)	150	240	22	10
peppers (1 c)	149	46	0.45	6
broccoli (1 c)	91	31	0.34	30
carrots (1 c)	128	52	0.31	88
cauliflower (1 c)	107	27	0.3	32
celery (1 c)	101	16	0.17	81
chives (1 tbsp)	3	1	0.02	0
corn (1 c)	145	125	1.96	22
cucumber (1 c)	133	16	0.21	3
green beans (1 c)	100	31	0.22	6
lettuce (1 c)	47	8	0.14	7
mushrooms (1 c)	70	15	0.24	4
onions (1 c)	160	64	0.16	6
peas, frozen (1 c)	134	103	0.54	145

potatoes ($\frac{1}{2}$ c)	75	59	0.11	14
spinach (1 c)	30	7	0.12	24
squash (1 c)	113	18	0.2	2
sweet potatoes (1 c)	133	114	0.07	73
tomatoes (1 c)	149	27	0.3	7

Fruit

	mass (g)	calories	fat (g)	sodium (mg)
apple juice (1 c)	248	114	0.32	10
apples (1 c)	110	53	0.14	0
bananas (1 c)	225	200	0.74	2
blueberries (1 c)	148	84	0.49	1
cantaloupe (1 c)	177	60	0.34	28
cherries (1 c)	138	87	0.28	0
cranberries, dried ($\frac{1}{4}$ c)	40	123	0.44	2
grapes (1 c)	151	104	0.24	3
lemon juice (1 c)	244	54	0.59	2
Mandarin oranges (1 c)	252	154	0.25	15
mangoes (1 c)	165	99	0.63	2
orange juice (1 c)	249	122	0.3	5
oranges (1 c)	180	85	0.22	0
peaches (1 c)	154	60	0.38	0
pears (1 c)	140	80	0.2	1
pineapple, canned (1 c)	181	109	0.2	2
pomegranate juice (1 c)	1249	134	0.72	22
raisins (1 c)	165	493	0.76	18
raspberries (1 c)	123	64	0.8	1
strawberries (1 c)	152	49	0.46	2

Meat

	mass (g)	calories	fat (g)	sodium (mg)
bacon (1 slice)	26	106	10.21	122
chicken thigh (1)	193	427	32.06	156

chicken, light meat (3 oz)	85	100	1.45	60
cob (3 oz)	85	61	0.17	93
crab (3 oz)	85	73	0.82	251
ground beef (4 oz)	113	375	33.9	75
ground turkey (4 oz)	113	172	9.44	80
halibut (3 oz)	85	77	1.13	58
ham (1 oz)	28.35	38	1.53	319
hot dogs (1)	51	141	12.33	498
lobster (1)	150	116	1.12	634
pepperoni (3 oz)	85	428	39.34	1 345
pork sausage (1)	25	72	6.2	185
pork tenderloin (3 oz)	85	102	3	44
salmon (1 fillet)	108	373	12.34	55
shrimp (3 oz)	85	72	0.43	101
tofu ($\frac{1}{2}$ c)	126	98	5.25	15
trout (1 fillet)	79	111	4.88	40
tuna, canned (1 oz)	28.35	24	0.27	70
turkey (3 oz)	85	92	2.12	105

Nuts, Beans, and Seeds

	mass (g)	calories	fat (g)	sodium (mg)
almonds (1 c)	143	828	71.4	1
black beans (1 c)	240	218	0.7	331
cashews (1 oz)	28.35	157	12.43	3
chickpeas (1 c)	240	211	4.68	667
coconut (1 c)	80	283	26.8	16
fava beans (1 c)	256	182	0.56	1 160
flaxseed (1 tbsp)	10.3	55	4.34	3
white beans (1 c)	262	299	1.02	969
kidney beans (1 c)	256	215	1.54	758
lentils (1 c)	192	676	2.04	12
lima beans (1 c)	164	216	0.72	85
macadamia nuts (1 c)	134	962	101.53	7

peanut butter (2 tbsp)	32	191	16.22	136
peanuts (1 oz)	28.35	166	14.08	116
pecans (1 c)	109	753	78.45	0
pinto beans (1 c)	240	197	1.34	643
pistachios (1 c)	123	689	55.74	1
pumpkin seeds (1 c)	129	721	63.27	9
sesame seeds (1 c)	144	825	71.52	16
sunflower seeds (1 c)	46	269	23.67	4

Dairy

	mass (g)	calories	fat (g)	sodium (mg)
almond milk (1 c)	262	39	2.88	186
blue cheese (1 oz)	28.35	100	8.15	325
butter (1 pat)	5	36	4.06	1
cheddar cheese (1 c)	132	533	43.97	862
coconut milk (1 c)	226	445	48.21	29
cream cheese (1 tbsp)	14.5	51	4.99	46
egg white (1)	33	17	0.06	55
egg yolk (1)	17	55	4.51	8
eggs (1)	50	72	4.76	71
evaporated milk (1 c)	252	270	5.04	252
whipping cream (1 c)	120	408	43.3	32
margarine (1 tbsp)	14.2	101	11.38	4
milk, skim (1 c)	245	83	0.2	103
milk, whole (1 c)	244	149	7.93	105
mozzarella cheese (1 c)	132	389	26.11	879
Parmesan cheese (1 c)	100	420	27.84	1804
sour cream (1 tbsp)	12	16	1.27	10
soy milk (1 c)	243	80	3.91	90
Swiss cheese (1 c)	132	519	40.91	247
yogurt (6 oz)	170	107	2.64	119

Sauces and Other Liquids

	mass (g)	calories	fat (g)	sodium (mg)

barbecue sauce (1 tbsp)	17	29	0.11	175
chicken broth (1 c)	249	15	0.52	924
cream of chicken soup ($\frac{1}{2}$ c)	126	113	7.27	885
gravy (1 c)	233	1	5.5	1 305
honey (1 c)	339	25	0	14
Italian dressing (1 tbsp)	14.7	35	3.1	146
jams and jellies (1 tbsp)	20	56	0.01	6
ketchup (1 tbsp)	17	17	0.02	154
mayonnaise (1 tbsp)	15	103	11.67	73
mustard (1 tsp)	5	3	0.17	55
pasta sauce ($\frac{1}{2}$ c)	132	66	2.13	577
ranch dressing (1 tbsp)	15	64	6.68	135
salsa (2 tbsp)	36	10	0.06	256
soy sauce (1 tbsp)	16	8	0.09	879
vanilla extract (1 tsp)	4.2	12	0	0
vegetable broth (1 c)	221	11	0.15	654
vegetable oil (1 tbsp)	14	124	14	0
vinegar (1 tbsp)	15	3	0	0
water (1 fl oz)	29.6	0	0	1
Worcestershire sauce (1 tbsp)	17	13	0	167

Spices and Other Powders

	mass (g)	calories	fat (g)	sodium (mg)
baking powder (1 tsp)	4.6	2	0	488
baking soda (1 tsp)	4.6	0	0	1 259
black pepper (1 tsp)	2.3	6	0.07	0
chicken bouillon (1 cube)	4.8	10	0.23	1 152
chilli powder (1 tsp)	2.7	8	0.39	77
cinnamon (1 tsp)	2.6	6	0.03	0
cocoa powder (1 c)	86	196	11.78	18
cornstarch (1 c)	128	488	0.06	12
cumin (1 tsp)	2.1	8	0.47	4
garlic (1 clove)	3	4	0.01	0.5

garlic powder (1 tsp)	3.1	10	0.02	2
onion powder (1 tsp)	2.4	8	0.02	2
onion soup mix (1 tbsp)	7.5	22	0.03	602
oregano (1 tsp)	1	3	0.04	0
paprika (1 tsp)	2.3	6	0.3	2
parsley (1 tsp)	0.5	1	0.03	2
powdered sugar (1 c)	120	467	0	2
salt (1 tsp)	6	0	0	2 325
sugar (1 tsp)	2.8	11	0	0
taco seasoning (2 tsp)	5.7	18	0	411

Student Response

Answers vary. Sample responses:

1. spaghetti with meat sauce

ingredient	amount	amount per serving	calories per serving
spaghetti noodles	6 c	1 c	338
ground beef	1 lb	$\frac{1}{6}$ lb	250
pasta sauce	3 c	$\frac{1}{2}$ c	66
onion	$\frac{1}{2}$ c	$\frac{1}{12}$ c	5.3
garlic	2 cloves	$\frac{1}{3}$ clove	1.5
olive oil	$1\frac{1}{2}$ tbsp	$\frac{1}{4}$ tbsp	30
basil	2 tsp	$\frac{1}{3}$ tsp	0.7
oregano	2 tsp	$\frac{1}{3}$ tsp	1

2. 6 servings
   a. see table
   b. 692.5 calories, because $338 + 250 + 66 + 5.3 + 1.5 + 30 + 0.7 + 1 = 692.5$
3. about 35%, because $692.5 \div 2\,000 = 0.34625$

Are You Ready for More?

The labels on packaged foods tell how much of different nutrients they contain. Here is what some different food labels say about their sodium content.

- cheese crackers, 351 mg, 14% daily value
- apple chips, 15 mg, <1% daily value
- granola bar, 82 mg, 3% daily value

Estimate the maximum recommended amount of sodium intake per day (100% daily value). Explain your reasoning.

Student Response

Answers vary. Sample response: Somewhere around 2 500 mg, because $351 \div 0.14 = 2\,507\frac{1}{7}$.

Activity Synthesis

Ask students to swap with a partner and check each other's work. Poll the class on the amount of calories in one serving of their meal.

Consider asking the following questions:

- "What was the most difficult part of calculating the amount of calories in one serving of your meal?"
- "Did anything surprise you while you were doing your calculations?"

1.2 Health Claims

Optional: 20 minutes

The purpose of this activity is for students to apply proportional reasoning to calculate the calories, fat, and sodium content of one serving of a recipe.

Instructional Routines

- Stronger and Clearer Each Time
- Compare and Connect

Launch

Tell students they will continue using the tables of nutrition information from the previous activity. Point out that the qualifications for a food to be considered "low calorie," "low fat," or "low sodium" are all stated per 100 grams of food. Before students start working, consider giving them 30 seconds of quiet think time and then having them share their ideas on how they could solve the first problem.

Representation: Internalise Comprehension. Activate or supply background knowledge. Allow students to use calculators to ensure inclusive participation in the activity.
Supports accessibility for: Memory; Conceptual processing

Anticipated Misconceptions

Some students may find the total calories, fat, and sodium in one serving of their recipe and ignore the specification about per 100 grams of food. Prompt them to tabulate the grams of each ingredient in one serving of their recipe.

Student Task Statement

For a meal to be considered:

- "low calorie"—it must have 120 calories or less per 100 grams of food.
- "low fat"—it must have 3 grams of fat or less per 100 grams of food.
- "low sodium"—it must have 140 milligrams of sodium or less per 100 grams of food.

1. Does the meal you chose in the previous activity meet the requirements to be considered:
   a. low calorie?
   b. low fat?
   c. low sodium?

   Be prepared to explain your reasoning.

2. Select or invent another recipe you would like to serve at your restaurant that does meet the requirements to be considered either low calorie, low fat, or low sodium. Show that your recipe meets that requirement. Organise your thinking so it can be followed by others.

ingredient	amount per serving	calories per serving	fat per serving	sodium per serving

Student Response

1. Answers vary. Sample response: One serving of the spaghetti with meat sauce recipe (from the previous activity) is 316.5 grams of food because $91 + 75.3 + 132 + 13.3 + 1 + 3.4 + 0.2 + 0.3 = 316.5$.

   a. No. It has 218.8 calories per 100 grams of food because $692.5 \div 3.165 = 218.8$.

   b. No. It has 15.4 grams of fat per 100 grams of food because $48.7 \div 3.165 = 15.4$.

   c. No. It has 200 milligrams of sodium per 100 grams of food because $633 \div 3.165 = 200$.

2. Answers vary. Sample response: Southwest salad meets the requirements for all 3 categories.

ingredient	amount per serving	calories per serving	fat per serving	sodium per serving	grams
lettuce	3 c	24	0.4	12	141
black beans	$\frac{1}{2}$ c	109	0.3	165	120
corn	$\frac{1}{2}$ c	63	1	11	72
tomatoes	$\frac{1}{2}$ c	14	0.1	3.5	75
avocado	$\frac{1}{8}$	30	2.8	1.3	19
shallots	$\frac{1}{2}$ tbsp	4	0	0.5	5
garlic	$\frac{1}{4}$ clove	1	0	0.1	1
lime juice	$\frac{1}{2}$ tsp	1	0.01	0.04	5
yogurt	1 tbsp	9	0.2	10	14
cilantro	$\frac{1}{8}$ c	0.5	0.01	1	2

One serving of the Southwest salad is 454 grams of food because $141 + 120 + 72 + 75 + 19 + 5 + 1 + 5 + 14 + 2 = 454$. It has only 56.3 calories per 100 grams of food because $255.5 \div 4.54 = 56.3$. It has only 1.06 grams of fat per 100 grams of

food because $4.82 \div 4.54 = 1.06$. It has only 45 milligrams of sodium per 100 grams of food because $204.4 \div 4.54 = 45$.

Activity Synthesis

Ask students to take turns explaining to a partner how they know that their meal meets the requirements to be considered either "low calorie," "low fat," or "low sodium." If time permits, consider using *Stronger and Clearer Each Time*.

Consider asking:

- "What strategies did you find helpful for making sure that your meal met the requirements to be considered either 'low calorie,' 'low fat,' or 'low sodium.'?"

Representing, Conversing: Compare and Connect. After students complete the calculations for their new recipe, use this routine to help students compare recipes with the same requirements. Group students according to requirement they selected ("low calorie," "low fat," or "low sodium"). Invite groups to share how they completed recipe tables and ask, "What is the same and what is different?" about their strategies. This will help students connect language and reasoning when creating their menus and calculating the nutritional information.
Design Principle(s): Cultivate conversation; Maximise meta-awareness