



Introduction to Teamworthy Tasks - Counting

PURPOSE & HIGHLIGHTS

This activity introduces **team-based work** in mathematics using team-worthy problems requiring collaboration, strategizing, and discussion, and **combinatorial (set-based) thinking**.

Highlights: Students discover the fun and value of teamwork and community-building. They also discover that much of doing math is not just about having the right answer.

LESSON OVERVIEW

Plan for the lesson

Teamwork Preparation (10 min): Assign groups and roles (Reporter, Documenter, Facilitator, Monitor).

Introduction Activity (5 min): Have students watch a short video on the value of working in teams and get to know each other (icebreaker). Explain roles to students and tips on working together.

Core Activity (40 min): Students work on combinatorics (counting) word problems. Each team works ONE problem and documents work publicly (e.g., on a part of the board). Afterwards, each team shares reasoning and results at the board. Students reflect on feedback received from other students.

Throughout the activity, move among groups to observe/prompt collaboration and orchestrate the teams sharing, feedback, and discussion.

Formative Activity (5 min):

Students reflect on which aspects of teamwork were successful for them and which aspects they want to work on in the future.

Wrap Up (10 min):

Summarize the different types of combinatorial problems encountered in the activity. Students do feedback survey.

Class Time Estimate:

- Core + Formative Activities: 50 min
- Longer Introduction + Core + Formative Activities: 65-75 min

Key Ideas for Instructors

- Problems are under-determined on purpose. Students must make and state assumptions. There are different correct interpretations of each problem, as well as different correct final answers; the important thing is justification and reasoning.
- Emphasize teamwork, process and reasoning over "the final answer" or "the right method".

Student Prerequisites

None! This lesson can be used on the first day of class; it is in fact designed for that purpose.

INTRO RESOURCES



[Instructor Roadmap HOT COPY](#)



[Student Handout HOT COPY](#)



[Collaboration Video](#)
[Team Roles Handout](#)



[User Guide](#)

Introduction to Teamworthy Tasks - Counting

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Introduction to Teamworthy Tasks

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Purpose

This activity is designed to

- **introduce** students to teamwork;
- **connect** students with their intuitive ideas about combinatorics;
- **prompt alternative ways** to think about a problem; and
- **layer combinatorial** vocabulary and techniques over intuitive experiences.

Lesson Fit and Student Prerequisites

No previous knowledge beyond what is common among high school students is assumed. This lesson might even be used on the first day of class. It is recommended that you use this lesson **before** any other team-based activity lesson from the materials. Students get to know each other a bit in this lesson; using another team-based lesson within 2 weeks will build on that.

Instructor Preparation

Reminder: see the [User Guide](#) for suggestions on how to create and assign groups, how to orchestrate active engagement by students in their in-class teams, and other teaching tips.

- Read this entire Instructor Roadmap before planning or doing your class meeting.
- Do (work on) each of the problems in the [Student Activity Handout](#) and be aware of the larger category in which each problem fits (e.g., selection with repetition, Pigeonhole).
- Decide the number of student groups based on class size. Groups of 3 are ideal but groups of 4 can work with more effort on your part to keep people interacting.
- Be equipped to show the [short video about collaboration](#) in class.
- Provide multiple colors of markers/chalk for student use.

Handouts

Use the Team Roles handout and [Student Activity Handout](#), with at least one copy for each team. The handout contains the student activity and a QR code for the end-of-session survey to gather student feedback.

Checklist before heading to class

- Student handouts on paper - at least 1 per team. Suggest also making handout available on LMS in time for in-class use.
- Confirm you have a way to play a short video (with audio) in the classroom
- Confirm at least 8 square feet of vertical space for each team in the classroom. Get large sheets of writing surface to put on the walls if there is not enough board space for all students to **stand up** (as possible) and work together (e.g., one or two 3'x2' "Post-it" type pages or static-cling portable whiteboard surfaces for each team).
- Timekeeping device (e.g., watch, phone, clock on the wall)
- Have a way to view this document during class
- Review the [User Guide](#)
- Recommended: Colored markers/chalk/pens for student use

Lesson Overview

This lesson contains an icebreaker activity, the main activity, and a formative feedback activity.

Set-up [pre-class]	Make sure boards are clear and markers in multiple colors are available. Post static cling whiteboards as needed to increase workspace. Once teams are made, students can move chairs away from the walls to make space to be right at the writing surfaces (e.g., standing room).
Launch ~15 min	1. Review with the whole class the idea of teamwork. 2. Show the 4 minute short video about collaboration. 3. Introduce yourself (see below - you are illustrating the icebreaker) 4. Announce roles and “Roles Rules” for teams (Team Roles handout) 5. Students count off or otherwise form teams of 4 or 3. 6. Have teams move to their shared board space. 7. Distribute the Student Activity Handout on paper. At least 1 per team. <i>Suggestion: Have each Facilitator come to you for handout and pens/chalk.</i> 8. Students do the icebreaker activity (first thing on the Handout). 9. Have teams record role assignments on their boards AND the handout (Suggestion: collect one handout per team at the end of class).
Activity 1 Problem Task ~15 min	Each team works on a different counting situation. ANNOUNCE: The situations are intentionally under-determined as problems, so teams must make and describe assumptions in order to propose a solution. Suggestion: Assign problems to multiple teams (e.g., Team 1 gets #1, Team 2 - #2, ... Team 5 - #5 then Team 6 also gets #1, Team 7 - #2, etc.)
Share Out ~25 min	After working on the situations and proposing solutions in groups, a Reporter from each group leads that team’s presentation of their thinking and solution(s) to the whole class (a few minutes per group). Pause between presentations when appropriate and ask students to compare the assumptions and approaches that lead to different solutions to the same problem.
Wrap-up ~15 min	Students reflect on the activity and make notes as a formative task (~5 minutes). Follow up or uncompleted work could be assigned as homework, possibly to be discussed in the next class. Students complete the anonymous feedback survey.

Lesson Details (~70 minutes of class time)

The timings recommended are guidelines and **approximations**. See the [User Guide](#) for more information on philosophy and instructional approach.

Launch – BEFORE breaking into groups

1. Video about collaboration (5 min)

Start the lesson by having students watch the first 4 minutes of this [short video about collaboration](#) (ideally, you project it OR you can have students gather around a few student computers to watch because you have posted the link in your learning management system). This video is essential and is referred to later, near the end of the lesson.

2. Demonstrate the Icebreaker (5 min)

Note: This icebreaker approach is intended to create a learning environment that enables everyone to engage deeply with many ideas in a short time.

Share the intentions for the lesson and then model the **name & place** activity.

Intentions: The purpose of the lesson is to get to know each other a bit, do math in teams, and get experience with reasoning and explanation, rather than by searching for answers or applying formulas. Direct student attention to the *Purpose* statement on the handout:

You will succeed in this activity when you

- *Get to know each other a bit.*
- *Collaborate with your teammates to make sense of a problem situation.*
- *Make decisions with your team about reasonable assumptions for the situation.*
- *Respond to your team's particular problem situation.*

Other activities will focus on getting "right" answers; this activity has many correct outcomes.

Keep your modeling of name & place short! Students will only have 1 minute each.

- **Name:** Share any story or history about the meaning of your name, maybe a family story about it, and give your preferred name and pronouns. Be sure to tell students how to address you.
- **Place:** Where is it that you like to spend time? Say a little about why you like to do that.

Let students know they will do the **name & place** icebreaker activity you just modeled once they are in groups.

3. Describe Roles, Explain "Roles Rules" and Form Teams (5 min)

Display or distribute the descriptions of the four roles in the [Teamwork Preparation handout](#).

Review the roles. Speak and/or show a slide as you explain the roles and the rules for deciding on roles ([slides link](#)).

Roles

If groups of 3: Facilitator, Documenter, Reporter. For bigger groups, add 1-2 Questioners. After introductions, students decide each member's role within the team using the Roles Rules given by the instructor. The roles are described in more detail on the Team Roles handout:

- **Facilitator:** manages resources and keeps team on task
- **Documenter:** records team's work, creates *final* version for presentation w/ visual aids
- **Reporter:** refers to documented work and leads the team's presentation to the class
- **Questioner:** asks/nudges the group about ideas, asks questions of teacher/other teams

Have students **label their shared workspace with Question # as well as name+role** AND documenter prints clearly the full names for each role on the handout. **Collect the handout.**

TIP: The Facilitator and Questioner roles can be confusing. Here are examples of oral communication that can clarify these roles:

- **Facilitator:** How do you know you are succeeding as a facilitator? You are successful if everyone has the resources they need and is participating actively, such as by talking or questioning or writing.
- **Questioner:** The questioner succeeds when everyone in the team can answer the question: "Why does that make sense?"

Roles Rules Examples (select one method)

- **Length of given names:** count the number of letters in your first name; the smallest number is Facilitator, next smallest is Documenter, next is Reporter. For larger groups, longer name(s) take the Questioner role.

- **Order of birthdays in the year;** earliest birthday in the year is Facilitator, then Documenter, Reporter, Questioner(s).
- If you used the **playing cards** method to form groups, assign spade–Facilitator, heart–Documenter, diamond–Reporter, club–Questioner.

4. Form teams

It is best, for this first time working in teams, to use a random assignment to groups. Students will be doing this entire lesson in a team of 3 or 4 (decide how big you want the teams for the whole activity to be). As noted in the User Guide, there are many options for creating groups. Below are three examples:

Method 1: Estimate the number of teams needed, say 8, and have students count off 1, 2, 3, 4, 5, 6, 7, 8, 1, 2, Then have students move around the room to locations you indicate, preferably at the part of the board where they will write: 1s over here! 2s over here, etc.

Method 2: Assign students to work in 3s or 4s as they are sitting and point out wall/board spaces where they will do their work. This is less random, so some students will end up working with their friends, but it takes less time.

Method 3: Figure out exactly the number of teams needed based on how many students are in attendance, say 5 teams of 4 and 3 teams of 3 for 29 students. Shuffle and hand out playing cards, with (for example) Ace through 5 (the 5 teams of 4) keep all four suits in the deck you will use, and 6 through 8 (the 3 teams of 3) keep just three suits: spades, hearts, and diamonds. As with Method 1, have students move around the room to locations you indicate. Note: Method 3 requires you to do the combinatorics problem of figuring out how many teams of 3 you need while simultaneously managing the classroom. That takes practice, but if you can do that successfully, it becomes easier to assign roles later.

Distributing the Student Handout (at least 1 per team) can happen in several ways once students are located at their team spaces. You might distribute handouts and pens by walking around the room or (preferred for large classes) announce BEFORE breaking into groups that once the team roles are decided, the Facilitator will come gather resources needed by the team.

Allow time (~4 min) for all students to have a chance to share within their groups.

- **Name:** Share a story about your name (e.g., about how to say it, the history or meaning of it). Provide your preferred name. If you want, give your pronouns.
- **Place:** Briefly describe where you like to spend time and a little about why.

Problem Task Activity – Working in Groups (15-20 min)

- Students already have the full list of problems in the handout. If you want to minimize printing on paper, you can post the [Student Activity Handout](#) electronically on your learning management system (e.g., Canvas).
- Assign each team a particular problem to work on (“Team 1 does #1, Team 2 does #2,...”).
Suggestion: Double assign problems – Problems 1 through 5 are problems where students are least likely to be certain of “the answer” and may not even get an answer at all. If you have more than 5 teams, assign problems 1 through 5 *again* to additional teams to generate more interesting discussion.
- Each team concentrates on its assigned problem, discusses and refines that problem, solves it, and prepares a presentation for the class. (~10-15 min)

TIP: Demonstrate and encourage large writing. When teams are working at the board, ask them to write large enough to be readable everywhere in the room and to **label their work with question # and names/roles**. If teams are working on paper that will later be shown on an overhead projector, encourage them to write larger than usual and to print clearly. If students are using slides (e.g., in an online class) the slides need to be simple, clear, not crowded, and include easy to follow visuals. Whatever the mechanism chosen to capture the team's work, make sure that it is clearly visible to every student in the class during share-out presentations.

Orchestrating teamwork (excerpted from the User Guide). As teams work on their problems, remember that people have a pretty good intuitive idea about how to count things. The problem situations are designed to stir up those good ideas.

- Do not be an evaluator. Do not say “yes you are right” – the goal is for students to take responsibility for convincing themselves and each other.
- As you observe/nudge with the teamwork, here are examples of what to say (wait for students to respond!):
 1. How are things going?
 2. What are you working on?
 3. If a student asks if they are right, ask: “Is that a team question or your question? If it is your question, ask the team.” For a team that does not find a way to answer your prompts (e.g., #1 or #2 above): Share a correct **partial** next step (not complete solution) and ask students to explain why it is correct (this takes the load off for producing correct answers and encourages self-explanation in the group).
 4. Someone tell me what you’ve come up with so far?
 5. What is the problem asking you to show?
 6. Are you convinced your answer is correct? How can you be sure?
 7. Is this everyone’s answer? If not, say: Keep talking and convince each other which answer(s) you want to share with the class.
- *If no one responds to your prompts*, identify and ask the Reporter in particular. Wait. If still no response, be encouraging and say something like: “Talk amongst yourselves and I’ll come back in a minute and ask again.”
- *Students might have different interpretations of their problem and might attempt to solve it in multiple ways.* The problems are ambiguous by design to encourage such discussions. Ask students to explain their assumptions, decide on a team interpretation, clearly explain the shared assumptions, and justify their answers
- *If a team completes its assigned problem and there is more time*, ask that team to go on and do the related extension problem. Teams only present the problem they were initially assigned, so make sure they don’t erase or discard their work on their initial problem. (Sometimes, when teams work at the board, the first thing they do when they start a new problem is to erase their old work.)
- *If a team doesn’t finish or doesn’t agree on a final answer*, that’s OK! They can present whatever progress they have made, or present both/all sides of the debate they had about the final answer.

As a guide for the instructor, there is a classification of the problems by type, along with some typical/expected answers [near the end of this document](#). Note, however, that some teams may find ways to solve the problems using different ideas, and some teams may come up with different final answers based on different assumptions.

Encourage students to use “common sense” and direct counting if that’s the direction in which they choose to go; remember, the goal of the activity is more about learning to work together and trying to make sense of problems in context. In fact, if you use the activity before counting techniques are introduced formally, you can use the same activity again after you have discussed those techniques, so students can compare what they know now versus what they knew previously.

Sharing Out Presentations – Whole-Class (20-25 min)

- **Each team has 2 to 3 minutes to share.** Let teams know that you will be a timekeeper.
- Tell them you will raise your hand to let them know when they have one minute remaining and will thank them when time is up so the class can move on to the next team.
- The Reporter introduces themselves and their teammates, then explains the problem, the approach, and the final solution. If another team has already presented on the problem, ask the class what they notice is similar and what is different between the two solutions.
- If time permits, reserve 1-2 minutes per team for Q&A with the class.

Formative Activity Reflection (5 min)

Depending on how you want your students to keep notes or records for the class, have them include their responses to the reflection questions in their personal notes. See the User Guide for more on ideas to support student accountability. *Note: If time is short, give this reflection activity as homework.* Instructions (also in the student handout):

Take a moment to reflect on the interactions you just had.

In the video you watched earlier, characteristics of good collaboration were mentioned, namely,

- *Identify and build on each other’s strengths*
- *Fill in each other’s weaknesses*

On your own, reflect on the questions given below and record your answers for future reference:

1. *Which of these are you confident you did well today and can do again?*
2. *Which are areas of future growth for you?*
3. *Which one will you focus on the next time the class does teamwork?*

Wrap-up (5-15 min)

- Summarize the types of problems (ordered/unordered, sampling with/without repetition).
- Re-emphasize
 - the value of teamwork,
 - storytelling and working on sense-making,
 - formula-generating approaches (instead of seeking an existing formula).
- If you have additional time:
 - (10 min or more): Have teams discuss in their groups some of the additional problems and identify one they find challenging and attempt to solve it.
 - (5 min or more) See the last (hidden) slide in the [instructor google slide deck](#) for one possible wrap-up, listing the problem types.

Student Survey (5 min)

To gather student feedback, give the link to the following survey:

<https://forms.gle/t98BA78VxqFRysoaA>.

Ideally, this should be done in class to maximize participation. If time runs out for students to do the survey in-class, you could create an email or a course learning management system page (e.g., Canvas, Blackboard, Moodle) to distribute the student survey link. Send it or publish it as the lesson is approaching the end.



Quiz Questions/Assessment

Use any unused questions from the list of 10 problems in the student handout (see below for those questions again, and likely solutions).

1. It's Free Comic Book day at the local comic book store! The store is offering free copies of five different comics published by Distinguished Comics, seven different titles published by Marble Comics, and four different titles published by Imago Comics. If you take one free comic, how many possible choices do you have? If you take two free comics, but you don't take two comics from the same publisher (e.g., one from Marble and one from Distinguished is possible, but not two from Marble), how many possible choices do you have?

Extension to 1. What if you take two free comics, but with no restrictions on the publisher(s)? Can you find two different ways to solve this problem?

Classifications and Answers: Addition and direct counting; addition and multiplication for extension. Likely answer: One comic: $5 \text{ DC} + 7 \text{ Marble} + 4 \text{ Imago} = \mathbf{16 \text{ possibilities}}$; Two comics: $5 \cdot 7 \text{ (DC/Marble)} + 7 \cdot 4 \text{ (Marble/Imago)} + 5 \cdot 4 \text{ (DC/Imago)} = \mathbf{83}$.

2. The specialty at Zinger's Café is the Zinger's Stack Sandwich, where you get to pick three layers of fillings, chosen from among broccoli, eggplant, roasted red peppers, asparagus, and mushrooms. Food enthusiasts know that the flavor of the Zinger's Stack Sandwich changes with the top to bottom order of the stack ingredients (e.g., broccoli-eggplant-eggplant is different from eggplant-eggplant-broccoli). How many different Zinger's Stack Sandwiches can you order?

Extension to 2. If you add avocado to the list of possible stack ingredients, how many different Zinger's Stack Sandwiches can you order? What if you don't repeat ingredients?

Classifications and Answers: Choosing with repetition, order matters. Likely answer: 3 independent choices so $5^3 = \mathbf{125 \text{ possibilities}}$.

3. Zinger's Café serves the Zinger's Stir-fry Special, for which you choose three ingredients from among broccoli, eggplant, roasted red peppers, asparagus, and mushrooms. How many different Zinger's Stir-fry Specials can you order? What if you can repeat ingredients (e.g., two asparagus and one mushroom), how many Zinger's Stir-fry Specials are possible?

Extension to 3. Suppose you add bok choy to the list of possible ingredients. How many different Zinger's Stir-fry Specials can you order, either with or without repeats?

Classifications and Answers: Choosing with and without repetition, order doesn't matter. Likely answer without repetition: $(5 \text{ choose } 3) = \mathbf{10 \text{ possibilities}}$; with repetition = 10 specials with no repeats + $5 \cdot 4$ specials with two repeated and one other + 5 specials with all three repeated = **35**. *Note:* Later on, if you cover selection with repetition: the [dots-and-dividers](#) method gives $(7 \text{ choose } 3) = (7 \text{ choose } 4) = 35$.

4. The Antioch Aardvarks, Bayfair Bats, Fruitvale Ferrets, and Millbrae Mammoths form a local youth soccer league. If each team plays each other team exactly once, how many games are played?

Extension to 4. If the Hayward Hippos join the league, and each team plays each other team once, how many games are played? Generalize both your answer and your explanation to a league with n teams.

Classifications and Answers: Handshake (each team plays each other once, divide by 2 because A plays B is the same as B plays A) OR combinations ($n \text{ choose } 2$) OR complete graph OR direct counting. Likely answer: $4 \cdot 3 / 2 = \mathbf{(4 \text{ choose } 2) = 6 \text{ games}}$

5. The University of Maine system is choosing a focus group of students randomly from among thousands of volunteers at its Augusta and Fort Kent campuses. How many students do they need to have in the focus group to ensure that at least two of the students come from the same campus? How many students do they need to have in the focus group to ensure that at least seven of the students come from the same campus?

Extension to 5. Suppose the University of Maine adds students from its Portland campus to its focus groups. How many students do they need in the focus group to ensure that at least two students come from the same campus? At least seven students from the same campus?

Classifications and Answers: Pigeonhole (generalized). Likely answer: At least 2 students from one campus: Worst case is 1 from each campus, so **3** in the focus group ensures at least 2 from one campus. At least 7 from one campus: Worst case is 6 from each campus, so $6+6+1=\mathbf{13}$ in the focus group.

6. In the role-playing game Forbidden Realms, to choose a basic character type, you choose a species (human, elf, dwarf, orc, or halfling), class (warrior, cleric, mage, thief), and morality (good, evil, ambiguous). How many different basic character types are there? What if you're allowed to choose your class to be either a single class (warrior, cleric, mage, thief) or a hybrid of two different classes (e.g., warrior-mage)?

Extension to 6. Suppose you're choosing a Forbidden Realms basic character with no hybrids, but you don't want to play an evil mage. How many choices do you have?

Classifications and Answers: Multiplication; with hybrid classes allowed, multiplication and choosing without repetition, order doesn't matter/direct counting. Likely answers: $5 \text{ species} * 4 \text{ classes} * 3 \text{ moralities} = \mathbf{60 \text{ types}}$. If hybrid classes are also allowed in addition to single classes, there are $\mathbf{(4 \text{ choose } 2) = 6}$ hybrid classes, and therefore $5 \text{ species} * 10 \text{ classes} * 3 \text{ moralities} = \mathbf{150 \text{ types}}$.

7. The Whiffle House serves its famous hash browns with optional toppings, and you're allowed to order as many, or as few, toppings as you like. If the optional toppings are salsa, onions, and cheese, how many ways are there to order Whiffle House hash browns? What if you're also allowed to choose gravy? (Note that when you order hash browns, the toppings all end up getting blended together, so the sequence in which you order them doesn't matter.)

Extension to 7. Suppose the Whiffle House is offering only salsa and onions as toppings, but the order in which you choose the toppings now makes a difference. How many possible orders are there? What if you can choose salsa, onions, and cheese, and the order matters?

Classifications and Answers: Multiplication (yes/no for each topping) OR choosing without repetition plus addition OR direct counting. Likely answer: One binary choice of whether to include each topping = $\mathbf{2^3 = 8}$ ways to order OR enumerate all subsets of {salsa, onions, cheese} OR $(3 \text{ choose } 0) + \dots + (3 \text{ choose } 3)$. Similarly, for 4 ingredients, there are $\mathbf{2^4 = 16}$ ways to order..

8. The pop group Thrive (members Alisha, Binna, Charlie, Danni, Eunice, and Flora) has 6 songs that it can perform at an upcoming radio show where they have been asked to perform a two-song set list. (A set list is a list of songs to be performed, in a particular order, without repeats.)
- How many two-song set lists could they choose?
 - They are also supposed to send a delegation of two representatives to meet fans. How many possible choices do they have for this delegation?
 - How are (a) and (b) related, both as problems and numerically?

Extension to 8. What if we consider *three*-song set lists and a choosing a delegation of *three* members of the group? How are those two answers related?

Classifications and Answers: More permutations vs combinations. Likely answers:

- 6 choices for song 1 * 5 choices for song 2 = **30 set lists**.
 - $(6 \text{ choose } 2) = \mathbf{15 \text{ possible delegations}}$ to meet fans.
 - P(6,2) vs C(6,2)**; order matters vs. order doesn't; answer to b is the answer to a divided by 2.
9. California State University at San Fernando takes a survey of its students and finds that 78% of them drive to campus every day and 46% of them live within five miles of campus. What is the smallest possible percentage of students who live within five miles of campus and drive to school? What is the *largest* possible percentage of students who live within five miles of campus and drive to school?

Extension to 9. Of the students who live within five miles of campus, what's the largest possible percentage of *just those students* who drive to school every day? What's the smallest possible percentage of students living within five miles of campus who drive to school every day?

Classifications and Answers: Venn diagram counting: A, B, A union B; extension is about conditional probability. Likely answers: $78\% + 46\% = 124\%$ so **there must be at least 24% overlap**, i.e., smallest is 24%; **largest possible** is if everyone who lives within 5 miles of campus also drives, so **46%**.

10. Norway's most popular pickup truck, the Fjord F(150), comes with many possible snow and water-related features. If you buy the snow-plowing package, you can choose to add on a snow blower (or not), and you can choose one of chains, medium treads, or heavy-duty treads to put on the wheels. If you buy the boat-towing package, you can either get a trailer hitch attachment, a chain attachment, or neither, or both. How many overall possibilities are there when you buy a Fjord F(150), assuming that you buy only a snow-plowing package, only a boat-towing package, neither, or both?

Extension to 10. What if you can only buy at most one of the snow-plowing and boat-towing packages, but not both? What if you have to buy *exactly* one of the snow-plowing and boat-towing packages? (Are those two questions the same?)

Classifications and Answers: Combining multiplication and addition OR direct counting. Likely answers: 2 (snow blower or not) * 3 types of wheels = 6 snow packages; 4 possible boat packages. Total number of options: 1 option with nothing + 6 snow only + 4 boat only + $6*4$ snow-boat combos = 35 possibilities OR (7 options for snow or not)*(5 options for boat or not) = **35**.

Team Roles

Across the weeks of class and activities, make sure each student takes each role at least once. Teams of 3: Facilitator, Documenter, and Reporter. Everyone is also a Questioner. For teams of 4 or more: Facilitator, Documenter, Reporter, and all others are Questioners.

Facilitator • Collects & returns supplies for the team • Organizes the team to start work • Keeps team on task to keep working • Supports the use of norms • Keeps track of time • Negotiates with team to assign substitutes for absent roles Example phrases: “X will read the instructions aloud...” “Let’s keep moving so we can...” “What do we need to assume (and why) to move forward...?”	Documenter • Records the team’s ideas as they emerge • Checks in with each team member to document their thinking • Organizes final version of solution and visual aids for presentation Example phrases: “Did I get what you said right...?” “What’s a really clear way to express that idea...?” “We need more information here, what do we change/add to make it clearer?”
Reporter • Responds to questions about the team’s progress (e.g., from instructor, other teams) • Ensures team members have a record of their work • Introduces/leads presentation of team efforts Example phrases: “Did you get that in your notes?” <i>In response to questions from outside the team:</i> “We made some assumptions that...” <i>In preparing for presentation:</i> “I’ll introduce the report, then...”	Questioner • Asks questions about individual contributions & group ideas • Supports participation by each team member • Calls on teacher for a team question • Can ask questions of other teams Example phrases “Could you explain that?” “What is an example of that?” “What’s another way to show that?” “Let’s take a minute to hear what <Name> is thinking about this...?” “Do we want to check with another team...?”