

# Geometry Sub Plans Week, High School

Week-long sub plans: five days of print and go work for grades 9 to 12, planned Monday to Friday.

## PREVIEW

### What is included

- Sub binder: notes, the filled-in week plan, a blank schedule, class list, Monday opener (11 pages)
- Geometry sets for five days (15 pages)
- Calm puzzles and reset sheets (10 pages)
- Geometry team tasks (9 pages)
- Geometry games (10 pages)
- Answer keys (6 pages)

### How it works

1. Open the week plan. Every set already has its day and page number.
2. Each day: one geometry set per period (a lesson with worked examples, practice and a challenge), a calm puzzle, a team task and an optional game for the last 15 minutes.
3. Every set stands alone: swap sets between days, or use one with another class when it fits.
4. No prep, no tech: print and go. The sub needs no geometry knowledge. Every answer is in the key.
5. Print in color or ink-saver black and white, US Letter or A4.

**What this preview shows:** the week at a glance, the filled-in week plan, the note to the substitute, the Monday opener, and all of Day 1 (the geometry set, the calm block, the team task and the game), one answer-key page and one ink-saver page. Every product page is watermarked. The full kit has 62 pages.



Every geometry set of the week, with its page and what it reviews. The day's set runs in every period you teach; any set works on any day.

### MONDAY (DAY 1)

|                        |                                                                                                                                                                                                                |                |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <b>Opener</b>          | <b>Meet Your Sub</b> Fifteen minutes at the top of every period on Monday: the sub sheet, three questions, the class agreement and the voice levels.                                                           | p. 10 · 15 min |
| <b>Geometry set 1</b>  | <b>Angles, Parallel Lines and Transversals</b> Reviews: naming angle pairs, solving for x with vertical angles, linear pairs and parallel lines cut by a transversal, triangle angle sums and exterior angles. | p. 13 · 50 min |
| <b>Calm puzzle</b>     | <b>Word Search and Reset Sheet</b> A quiet subject word search and a two-minute reset sheet for a loud day, a long wait or anyone who finishes early.                                                          | p. 16 · 20 min |
| <b>Team task</b>       | <b>The Steepness Contest</b> Groups of four rank twelve ramps, roofs, trails and ladders from steepest to gentlest by gut, then by slope, and score the gap.                                                   | p. 18 · 40 min |
| <b>Game (optional)</b> | <b>Whiteboard Quiz Game</b> Optional fun to end the class.                                                                                                                                                     | p. 19 · 15 min |

### TUESDAY (DAY 2)

|                        |                                                                                                                                                                                                          |                |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <b>Geometry set 2</b>  | <b>Triangle Congruence and Similarity</b> Reviews: naming congruence shortcuts (SSS, SAS, ASA, AAS, HL), solving with matching parts, similar triangle proportions, the side splitter, similarity tests. | p. 21 · 50 min |
| <b>Calm puzzle</b>     | <b>Sudoku and Grounding Sheet</b> A hard sudoku with exactly one answer and a 5-4-3-2-1 grounding sheet for anyone who needs to come back into the room.                                                 | p. 24 · 20 min |
| <b>Team task</b>       | <b>The Courtyard Plan</b> Groups of four find the area of eight courtyard features, from circles to trapezoids, and build the most fun plan inside two limits.                                           | p. 26 · 40 min |
| <b>Game (optional)</b> | <b>Paper Password</b> Optional fun to end the class.                                                                                                                                                     | p. 28 · 15 min |

### WEDNESDAY (DAY 3)

|                        |                                                                                                                                                                                              |                |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <b>Geometry set 3</b>  | <b>Right Triangle Trigonometry</b> Reviews: sine, cosine and tangent ratios (SOH CAH TOA), finding sides and angles with a trig table, 45-45-90 and 30-60-90 triangles, angles of elevation. | p. 30 · 50 min |
| <b>Calm puzzle</b>     | <b>Secret Codes and Control Sheet</b> Two coded sayings to crack in silence and a sheet that sorts what you can and cannot control this week.                                                | p. 33 · 20 min |
| <b>Team task</b>       | <b>The Fold-Only Angle Kit</b> Groups of four fold and tear five angle templates from two sheets of paper, then measure eight printed angles with no protractor.                             | p. 35 · 40 min |
| <b>Game (optional)</b> | <b>Class Feud</b> Optional fun to end the class.                                                                                                                                             | p. 37 · 15 min |

### THURSDAY (DAY 4)

|                        |                                                                                                                                                                          |                |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <b>Geometry set 4</b>  | <b>Circles</b> Reviews: central and inscribed angles, arc length and sector area in terms of pi and rounded, tangent and radius facts, chords, inscribed quadrilaterals. | p. 39 · 50 min |
| <b>Calm puzzle</b>     | <b>Maze and Brain Dump</b> A long maze with exactly one true path and a brain dump sheet that turns a crowded head into one next step.                                   | p. 42 · 20 min |
| <b>Team task</b>       | <b>The Time Capsule Hunt</b> Four role cards each hold one location clue: a circle, a perpendicular bisector and two boundaries.                                         | p. 44 · 40 min |
| <b>Game (optional)</b> | <b>Classroom Millionaire</b> Optional fun to end the class.                                                                                                              | p. 46 · 15 min |

## FRIDAY (DAY 5)

|                        |                                                                                                                                                                                                               |                |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <b>Geometry set 5</b>  | <b>Transformations and Coordinate Geometry</b> Reviews: the distance and midpoint formulas, slopes of parallel and perpendicular lines, translations, reflections, rotations and dilations, coordinate proof. | p. 48 · 50 min |
| <b>Calm puzzle</b>     | <b>Word Ladders and Three Good Things</b> Four five-letter word ladders, three scrambled words and a three good things sheet to close out the week.                                                           | p. 51 · 20 min |
| <b>Team task</b>       | <b>The Courtyard Garden Debate</b> Groups of four check circle and square areas in a shared evidence bank, then debate the shape of a new garden two against two.                                             | p. 53 · 40 min |
| <b>Game (optional)</b> | <b>Mystery Box</b> Optional fun to end the class.                                                                                                                                                             | p. 55 · 15 min |

## How the sets work

- One set per day covers every period you teach: Monday's set runs in every Monday class.
- Every set stands alone. Swap sets between days, or use one with another class when it fits.
- Each set opens with a line that says what it reviews, so you can match it to what your class covered.
- The calm puzzle fits any gap, the team task fills a block period, and the game is optional fun for the last 15 minutes.
- No prep, no tech. Every answer is in the keys at the back, so the sub needs no geometry knowledge.



## This Week's Plan

You teach one subject to several classes, so every period you teach runs this same plan, first period to last: Monday's column in every Monday period, Tuesday's in every Tuesday period. Planning, lunch and duty periods: nothing to do. List your periods and classes on the blank schedule on the next page. This order is a sample: every set stands alone, so swap any set into any slot or any day.

| WHEN                                                                             | MONDAY                                                                         | TUESDAY                                                                                                        | WEDNESDAY                                                                                                      | THURSDAY                                                                                                       | FRIDAY                                                                                                         |
|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <b>First 15 minutes: attendance, voice level, then</b>                           | <b>Meet Your Sub</b><br>p. 10 · 15 min                                         | <b>Go over yesterday's answers</b><br>Read them out from the key at the back; students mark their own (10 min) | <b>Go over yesterday's answers</b><br>Read them out from the key at the back; students mark their own (10 min) | <b>Go over yesterday's answers</b><br>Read them out from the key at the back; students mark their own (10 min) | <b>Go over yesterday's answers</b><br>Read them out from the key at the back; students mark their own (10 min) |
| <b>Rest of the period: the day's set (one copy per student)</b>                  | <b>Geometry 1</b><br>Angles, Parallel Lines and Transversals<br>p. 13 · 50 min | <b>Geometry 2</b><br>Triangle Congruence and Similarity<br>p. 21 · 50 min                                      | <b>Geometry 3</b><br>Right Triangle Trigonometry<br>p. 30 · 50 min                                             | <b>Geometry 4</b><br>Circles<br>p. 39 · 50 min                                                                 | <b>Geometry 5</b><br>Transformations and Coordinate Geometry<br>p. 48 · 50 min                                 |
| <b>If a class finishes early or gets loud</b>                                    | <b>Word Search and Reset Sheet</b><br>p. 16 · 20 min                           | <b>Sudoku and Grounding Sheet</b><br>p. 24 · 20 min                                                            | <b>Secret Codes and Control Sheet</b><br>p. 33 · 20 min                                                        | <b>Maze and Brain Dump</b><br>p. 42 · 20 min                                                                   | <b>Word Ladders and Three Good Things</b><br>p. 51 · 20 min                                                    |
| <b>Block period (90 minutes) only</b>                                            | <b>The Steepness Contest</b><br>p. 18 · 40 min                                 | <b>The Courtyard Plan</b><br>p. 26 · 40 min                                                                    | <b>The Fold-Only Angle Kit</b><br>p. 35 · 40 min                                                               | <b>The Time Capsule Hunt</b><br>p. 44 · 40 min                                                                 | <b>The Courtyard Garden Debate</b><br>p. 53 · 40 min                                                           |
| <b>Last 15 minutes (optional): a fun way to end the class, or for extra time</b> | <b>Whiteboard Quiz Game</b><br>p. 19 · 15 min                                  | <b>Paper Password</b><br>p. 28 · 15 min                                                                        | <b>Class Feud</b><br>p. 37 · 15 min                                                                            | <b>Classroom Millionaire</b><br>p. 46 · 15 min                                                                 | <b>Mystery Box</b><br>p. 55 · 15 min                                                                           |

### How this week works

- You are covering a teacher who teaches one subject to several classes. Each class comes to this room once a day, for one period.
- So every class gets the same set on the same day: Monday's set in every Monday period, Tuesday's set in every Tuesday period.
- One set per day covers all your classes. Copy that day's set once per student in the morning. Planning, lunch and duty periods: nothing to run.
- Each set fills one period (45 to 55 minutes); the challenge at the end stretches it to a 90-minute block.

### How to use this plan

- Page numbers point to the first page of each set. Copy one per student.
- The calm block is always allowed: a period that runs short, a loud class, or anyone who finishes early.
- The game is optional: a fun way to end the class, or something for extra time.



## Note to the Substitute

Grades 9 to 12 · five days · every set runs from the printout alone

### Thank you for covering my classes this week

Everything you need is in this binder. The front pages (important information, weekly schedule, class list) are filled in for this week. After them come the work sets, one per day: **Geometry 1** is Monday's set, **Geometry 2** is Tuesday's, and so on to **Geometry 5** on Friday. Run the day's set in every period you teach that day. Each set is one period (45 to 55 minutes), stands alone, and has its own answer key at the back of the binder, so you never have to make anything up or know the subject. The first page of every set tells you what to say. Every set ends with a challenge, so it stretches to a 90-minute block when you need it.

After the subject sets come the shared blocks, one of each per day. The **calm block** is always allowed: for a period that runs short, a loud class, or anyone who finishes early. The **team task** fills a period on its own. The **game** is optional: a fun way to end the class, or something for extra time. Fifteen minutes, from the script.

### Each day has

- One Geometry set (one period, with a challenge to stretch it)
- A calm and quiet block: a puzzle page and a reset sheet
- A team task for groups of four
- A paper game from the script

### If the class is loud

- Set a voice level with a number, 0 to 3, and use it all week (the Day 1 opener explains it).
- Switch to the calm block. Nobody needs to move.
- Every set has a challenge at the end, so fast finishers always have something.
- If a set is not working, stop it and use the calm block or the team task. Every set starts cold.

### At the end of each day

Please fill in that day's line on the "How it went" page. It takes two minutes and I read every word.

Did this kit work well for your class? A quick review helps other teachers find it and earns you TpT credits. Thank you!



## Meet Your Sub

Day 1 opener, 15 minutes at the start of every period on Monday, before the set. Nothing to prepare.

Opener

### Sub script (the same five minutes in every class)

1. **Before first period, fill in the introduction sheet** on the next page, once, for the whole day. Keep it short and honest. A high school class reads a sub in about ten seconds, so give them something real to read.
2. **Introduce yourself from the sheet** in two minutes. Then hold up the Ask the Sub list and take three questions from raised hands. Three, not ten. Say when you are done taking questions.
3. **Read the class agreement out loud** and ask this period to add one line of their own. Write that line on the board for the period. The line they wrote is the one they keep.
4. **Set the voice level with a number** from 0 to 3, using the box at the bottom of the sheet. Say which level today's set needs, and use the same numbers in every class all week.
5. **Start the set** with one sentence: this is today's work, it has a challenge at the end, and the calm block is always allowed when you are finished.

### If the room is loud

- Skip the questions. Keep the agreement and the voice level, and say the number out loud.
- Start the set sooner. Work on the desk beats a speech about behavior every time.
- Name the level again after four minutes. A number is easier to follow than a lecture.

### If a period runs ten minutes short

- Run Common Ground in groups of four. Six minutes of work, four minutes of reading out.
- Or hand out the reset sheet from the calm block and let the room go quiet early.
- Or have each student write one question they would ask the teacher when they get back.

### Monday checklist (before first period)

- ☐ Read the Important Information page: office extension, exits, the nurse, the teacher next door.
- ☐ Check the class list for allergies, medical needs, early releases and students who carry a pass.
- ☐ Find today's set on the weekly schedule and count copies for every period, plus five spares.
- ☐ Fill in the About Your Sub sheet once and post it where the back row can read it.
- ☐ Write the voice levels 0 to 3 on the board and leave them there all week.
- ☐ Keep the answer keys inside the binder, not face up on the desk.



# Geometry Set 1: Angles, Parallel Lines and Transversals

Geometry • Day 1

Read the four worked examples and the rules, then do the quick check from the figure. Show the equation you solve every time.

**This set reviews:** naming angle pairs, solving for  $x$  with vertical angles, linear pairs and parallel lines cut by a transversal, triangle angle sums and exterior angles

## 1 Vertical angles

Two vertical angles measure  $(3x + 10)^\circ$  and  $(5x - 30)^\circ$ . Vertical angles are equal, so  $3x + 10 = 5x - 30$ . Then  $40 = 2x$ .

$x = 20$ ;  $70^\circ$

## 2 A linear pair

$(2x + 15)^\circ$  and  $(4x + 45)^\circ$  form a linear pair, so they add to 180:  $6x + 60 = 180$ , and  $6x = 120$ .

$x = 20$ ;  $55^\circ$  and  $125^\circ$

## 3 Alternate interior angles

Parallel lines, and  $(3x + 14)^\circ$  and  $(5x - 22)^\circ$  are alternate interior angles, so they are equal:  $3x + 14 = 5x - 22$ , and  $36 = 2x$ .

$x = 18$ ;  $68^\circ$

## 4 Same-side interior angles

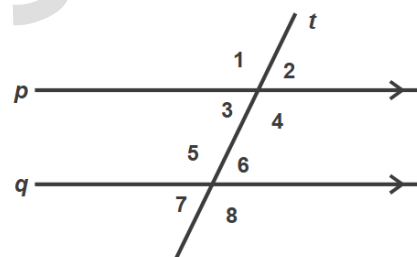
Parallel lines, and  $(3x + 20)^\circ$  and  $(2x + 10)^\circ$  are same-side interior angles, so they add to 180:  $5x + 30 = 180$ .

$x = 30$ ;  $110^\circ$  and  $70^\circ$

## Remember

- Vertical angles** are equal. A **linear pair** adds to  $180^\circ$ . **Complementary** angles add to  $90^\circ$ , **supplementary** angles add to  $180^\circ$ .
- When two parallel lines are cut by a transversal:** corresponding angles, alternate interior angles and alternate exterior angles are **equal**. Same-side interior angles and same-side exterior angles are **supplementary**.
- Interior** means between the two parallel lines, **exterior** means outside them. **Alternate** means on opposite sides of the transversal.
- Triangles:** the three angles add to  $180^\circ$ . An exterior angle equals the sum of the two remote interior angles.
- Polygons:** the interior angles of an  $n$ -sided polygon add to  $(n - 2) \times 180^\circ$ .
- Solve, do not measure.** Write the equation the angle fact gives you, solve for  $x$ , then put  $x$  back in to get each angle.

## Lines $p$ and $q$ are parallel



In this figure  $\angle 2 = 64^\circ$ .

## Quick check: use the figure above

1.  $\angle 2$  and  $\angle 3$ . Name the pair, then find  $\angle 3$ . \_\_\_\_\_

2.  $\angle 2$  and  $\angle 4$ . Name the pair, then find  $\angle 4$ . \_\_\_\_\_

3.  $\angle 3$  and  $\angle 7$ . Name the pair, then find  $\angle 7$ . \_\_\_\_\_

4.  $\angle 2$  and  $\angle 8$ . Name the pair, then find  $\angle 8$ . \_\_\_\_\_



## Geometry Set 1: Practice

Sixteen problems in four blocks. Write the equation, solve for  $x$ , then find the angles. Every answer is a whole number of degrees.

Geometry • Day 1

### A. Angle pairs: find $x$

1. Complementary angles:  
 $(2x + 6)^\circ$  and  $(3x - 1)^\circ$

\_\_\_\_\_

2. Supplementary angles:  
 $(6x + 10)^\circ$  and  $(4x - 10)^\circ$

\_\_\_\_\_

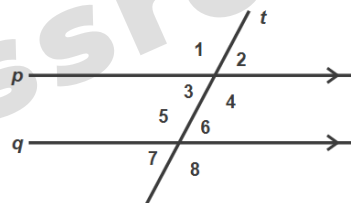
3. Vertical angles:  $(7x - 18)^\circ$  and  $(4x + 24)^\circ$

\_\_\_\_\_

4. An angle is  $24^\circ$  more than twice its complement. Find the angle.

\_\_\_\_\_

### B. Parallel lines $p$ and $q$ : find $x$



1.  $\angle 2 = (5x - 17)^\circ$ ,  $\angle 6 = (3x + 21)^\circ$

\_\_\_\_\_

2.  $\angle 3 = (4x + 6)^\circ$ ,  $\angle 5 = (6x + 24)^\circ$

\_\_\_\_\_

3.  $\angle 1 = (9x - 7)^\circ$ ,  $\angle 8 = (7x + 19)^\circ$

\_\_\_\_\_

4.  $\angle 4 = (2x + 40)^\circ$ ,  $\angle 5 = (4x - 30)^\circ$

\_\_\_\_\_

### C. Triangles and polygons

1. A triangle's angles are  $x^\circ$ ,  $(2x)^\circ$  and  $(3x - 12)^\circ$ . Find all three.

\_\_\_\_\_

2. An exterior angle of a triangle is  $(4x + 2)^\circ$ . The remote interior angles are  $(x + 20)^\circ$  and  $57^\circ$ . Find  $x$ .

\_\_\_\_\_

3. An isosceles triangle has a vertex angle of  $40^\circ$ . Find each base angle.

\_\_\_\_\_

4. Find the measure of each interior angle of a regular octagon.

\_\_\_\_\_

### D. Name the pair (use the block B figure)

1.  $\angle 3$  and  $\angle 6$

\_\_\_\_\_

2.  $\angle 4$  and  $\angle 6$

\_\_\_\_\_

3.  $\angle 2$  and  $\angle 7$

\_\_\_\_\_

4.  $\angle 1$  and  $\angle 5$

\_\_\_\_\_

Block B: the figure shows where each numbered angle sits; it is not drawn to scale, so work from the angle facts. Block D: write the name of the pair and whether the angles are equal or supplementary.



## Geometry Set 1: Word Problems and Challenge

Geometry • Day 1

Six word problems. Sketch the situation, write the angle fact as an equation, then solve. Three challenges follow.

- 1** A ladder leans against a vertical wall and makes a  $68^\circ$  angle with the level ground. What angle does the ladder make with the wall?

- 2** Two straight streets cross. One of the four angles is 3 times as large as the angle next to it. Find both angles.

- 3** The lines painted in a parking lot are parallel, and the curb crosses them. Two alternate interior angles measure  $(6x - 4)^\circ$  and  $(4x + 22)^\circ$ . Find  $x$  and the angle.

- 4** The angles of a triangular roof truss are in the ratio  $2 : 3 : 4$ . Find the largest angle.

- 5** An exterior angle of a triangle measures  $128^\circ$ . The two remote interior angles differ by  $16^\circ$ . Find both of them.

- 6** The supplement of an angle is  $30^\circ$  more than twice its complement. Find the angle.

### Challenge

- 1** Lines  $p$  and  $q$  are parallel. Find  $x$ , the angle at the bend. *Hint: draw a third line through the bend, parallel to  $p$  and  $q$ .*

Not drawn to scale.



- 2** Explain why same-side interior angles are supplementary, using only corresponding angles and a linear pair.

- 3** Parallel lines are cut by a transversal. Corresponding angles measure  $(3x + y)^\circ$  and  $75^\circ$ . An angle of  $(x + 2y)^\circ$  forms a linear pair with a  $105^\circ$  angle. Find  $x$  and  $y$ .



## Calm Block, Day 1: Word Search

Calm • Day 1

Find all 12 geometry words. Any direction, including backward and diagonal. Pencils only, voices at 0.

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C | I | B | W | T | A | N | G | E | N | T | D | Z | F |
| K | F | Q | K | Z | R | J | F | V | F | R | P | X | S |
| I | M | Y | E | H | H | P | A | X | C | O | O | T | B |
| O | X | M | S | W | O | C | G | N | P | T | L | R | B |
| X | X | U | U | V | M | O | N | J | W | C | Y | A | L |
| Y | D | I | N | D | B | N | J | S | L | E | G | P | E |
| A | E | B | E | S | U | G | J | U | I | S | O | E | L |
| M | G | P | T | Q | S | R | A | I | Y | I | N | Z | L |
| I | R | H | O | Z | E | U | P | D | W | B | Z | O | A |
| A | E | K | P | X | Q | E | I | A | U | C | G | I | R |
| V | E | S | Y | L | G | N | O | R | K | Z | W | D | A |
| N | Q | A | H | H | J | T | C | M | U | X | J | X | P |
| B | F | Z | M | T | B | T | R | I | A | N | G | L | E |
| D | A | K | C | D | R | O | H | C | Z | Q | S | Y | S |

HYPOTENUSE

CONGRUENT

PARALLEL

TRIANGLE

BISECTOR

TANGENT

POLYGON

RHOMBUS

TRAPEZOID

DEGREE

RADIUS

CHORD

### Faster than reading every square

- Hunt the rare letters first. Only one word in the list has a Z in it, so every Z in the grid is worth a second look.
- Scan one row at a time for a word's first two letters, then check all eight directions from that square.
- Cross a word off the list the second you circle it, or you will search for it twice.



## Calm Block, Day 1: Reset Sheet

For one person, at your own pace. Nobody collects this and nobody reads it but you.

Calm • Day 1

### Two minutes, then back to it

This is not a mood test and it is not therapy. It is a short routine for the moments when your head is somewhere else and the work in front of you is going nowhere: slow the breath, put a name on the feeling, pick the next five minutes. Work down the page and stop at the bottom.

### Step 1: make the breath out longer

Breathe in through your nose while you count to four, then out through your mouth while you count to six. The long breath out is the part that slows your heart rate down. Six rounds, then stop.

Check a box for each round so you are not counting in your head.

□ □ □ □ □ □

### Step 2: name it

A feeling you can name gets smaller. Tired, annoyed, behind, worried, bored, flat, wired. One word is enough, and it does not have to be the right word.

Write yours on the first line below.

### Name it in one word, then write the sentence your head keeps repeating

.....

.....

### What is actually true right now, in this room, that I could check in ten seconds

.....

.....

### The next five minutes: what I will do the moment I put this sheet down

.....

.....

### What usually helps me

- ☐ Water and a real breath of air
- ☐ Writing the thing down instead of holding it
- ☐ Two minutes of a puzzle or a doodle
- ☐ Starting the smallest piece of the work
- ☐ Standing up and stretching my shoulders
- ☐ Putting my phone face down in my bag
- ☐ Asking one person one question
- ☐ Deciding to deal with it after school

### My own line

Something that works for you that is not on that list.

.....

.....

### Right now I feel (circle one)

1 2 3 4 5 6 7 8 9 10

1 = settled, 10 = about to boil over. Check the same number again in ten minutes. Down by one is the whole point.



## Team Task, Day 1: The Steepness Contest

Groups of four. Voice level 2. No calculators and no phones. One sheet per group, one person writes, and no group rank goes down until all four agree.

Team • Day 1

### The challenge

Twelve slopes, described in many different ways: angles, pitches, percent grades, steps and slanted lengths. **Your job:** rank them from 1 (**steepest**) to 12 (**gentlest**).

**Step 1:** alone, in three minutes, fill in "My rank" by instinct. **Step 2:** split the items, three each, work out every slope as a decimal, check each other's, and agree on the group rank. Every rank from 1 to 12 is used once. The sub then reads out the true order. The rule for the true order has no judgment calls: **the slope, rise divided by run, steepest first.**

| ITEM                                                                  | MY RANK | GROUP RANK | RISE ÷ RUN | TRUE RANK | DIFFERENCE |
|-----------------------------------------------------------------------|---------|------------|------------|-----------|------------|
| <b>A</b> A wheelchair ramp: up 1 in for every 12 in across            |         |            |            |           |            |
| <b>B</b> A ski run that makes a 30° angle with level ground           |         |            |            |           |            |
| <b>C</b> School stairs: each step rises 7 in and runs 11 in           |         |            |            |           |            |
| <b>D</b> A mountain road with an 8 percent grade                      |         |            |            |           |            |
| <b>E</b> A skate ramp: sloped surface 10 ft long, top edge 8 ft high  |         |            |            |           |            |
| <b>F</b> A house roof with a 6 in 12 pitch (6 in up per 12 in across) |         |            |            |           |            |
| <b>G</b> A hiking trail: climbs 150 ft over 1,000 ft of level ground  |         |            |            |           |            |
| <b>H</b> A ladder that makes a 60° angle with the ground              |         |            |            |           |            |
| <b>I</b> Bleachers: each row rises 12 in and steps back 20 in         |         |            |            |           |            |
| <b>J</b> A playground slide 13 ft long, top 5 ft above the bottom     |         |            |            |           |            |
| <b>K</b> A loading ramp that makes a 45° angle with the ground        |         |            |            |           |            |
| <b>L</b> A barn roof with a 10 in 12 pitch                            |         |            |            |           |            |
| <b>Total difference (lower is better)</b>                             |         |            |            |           |            |

### Shortcuts and scoring

- Slope** = rise ÷ run. A percent grade is the rise for every 100 across.
- 45°** rises 1 for every 1 across. In a **30-60-90** triangle the legs are 1 and  $\sqrt{3} \approx 1.732$ , so 30° rises 1 for every 1.732 across and 60° rises 1.732 for every 1.
- Slanted length and rise given?** Find the run with  $a^2 + b^2 = c^2$  first.

Difference = group rank minus true rank, sign dropped, added over the twelve rows. **0 to 6:** excellent. **7 to 14:** good. **15 to 24:** fair. **25 or more:** redo the slopes together.

### Gut versus geometry

Which item fooled your instinct the most, and why?

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.....

**Challenge:** a wheelchair ramp may rise at most 1 for every 12 across. Which of the twelve would pass that rule? Show the comparison.

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## Game, Day 1: Whiteboard Quiz Game

Sub script and questions. 15 minutes at the end of the period, or for extra time. Optional.

Game • Day 1

### Set up (2 minutes)

1. Draw a 5 by 5 grid on the board, or tape up the board sheet. Write the five category names across the top and the values 100 to 500 down each column.
2. Teams of four to six. Team 1 picks a category and a value.
3. Read the question. The team gets 15 seconds and one answer. Right: they take the points and pick again.  
Wrong: the next team may steal, then play moves on.
4. Cross the square off. Highest total when time is up wins.

### Read this out

"One voice per team: pick a captain who says the final answer. Shouted answers do not count and the square is dead. Team 1, choose a category and a value."

Keep the running score in a corner of the board. If a team argues a call, the script wins and the game moves on. The bold answer is the one to accept, but take a clear equivalent too (negative 0.5 for  $-1/2$ , 25 pi for 25 times pi).

### Angles

- 100 What is the complement of 35 degrees?  
**55 degrees**
- 200 What is the supplement of 112 degrees?  
**68 degrees**
- 300 Vertical angles are  $3x$  plus 10 and  $5x$  minus 20 degrees. What is  $x$ ?  
**15**
- 400 What do a hexagon's interior angles add up to?  
**720 degrees**
- 500 A regular polygon's exterior angles are 24 degrees. How many sides?  
**15 sides**

### Circles

- 100 What is the diameter of a circle with radius 9?  
**18**
- 200 An inscribed angle cuts off a 140 degree arc. How big is it?  
**70 degrees**
- 300 What is the area of a radius 5 circle, in terms of pi?  
**25 pi**
- 400 Tangent from P: 12. Radius: 5. How far is P from the center?  
**13**
- 500 What is the area of a 90 degree sector of radius 4, in pi?  
**4 pi**

### Triangles

- 100 A triangle has angles of 50 and 60 degrees. What is the third?  
**70 degrees**
- 200 An isosceles vertex angle is 100 degrees. What is each base angle?  
**40 degrees**
- 300 Scale factor 3, small to large. A small side is 7. The large side?  
**21**
- 400 An exterior angle is 130. One remote interior angle is 55. The other?  
**75 degrees**
- 500 Scale factor 2: how many times the area is the larger triangle?  
**4 times**

### Coordinates

- 100 How far apart are (1, 1) and (4, 5)?  
**5**
- 200 What slope is perpendicular to a slope of 2?  
 **$-1/2$**
- 300 Reflect (3, 5) over the x-axis. What is the new y?  
**-5**
- 400 What is the x of the midpoint of (2, 4) and (8, 10)?  
**5**
- 500 Dilate (4, -2) by 3 about the origin to (12, y). What is y?  
**-6**

### Trigonometry

- 100 What is  $\sin 30$  degrees, as a decimal?  
**0.5**
- 200 A 30-60-90 triangle's hypotenuse is 16. What is its short leg?  
**8**
- 300 What is the tangent of 45 degrees?  
**1**
- 400 A right triangle has legs 9 and 12. What is the hypotenuse?  
**15**
- 500 In a right triangle,  $\sin A = 3/5$ . What is  $\cos A$ , as a decimal?  
**0.8**

### Final Wager: Arc Length

Play this when the board is clear, or when two minutes are left. Announce the category, then every team writes a secret wager of up to the points it already has. Read the question. Teams get 60 seconds of silent writing, then hold their answers up together.

A circle has a radius of 6. How long is the arc of a 60 degree central angle, in terms of pi?

**2 pi**

Right: add the wager. Wrong: subtract it. That is the final score.



## Game, Day 1: The Board

Tape this to the whiteboard or copy it. Cross squares off as they are played.

Game • Day 1

| ANGLES | TRIANGLES | TRIGONOMETRY | CIRCLES | COORDINATES |
|--------|-----------|--------------|---------|-------------|
| 100    | 100       | 100          | 100     | 100         |
| 200    | 200       | 200          | 200     | 200         |
| 300    | 300       | 300          | 300     | 300         |
| 400    | 400       | 400          | 400     | 400         |
| 500    | 500       | 500          | 500     | 500         |

### Scores

Team 1

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Team 2

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Team 3

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Team 4

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Team 5

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.....

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Team 6

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.....

.....

### Final Wager: Arc Length

Write your wager before you hear the question. A team may bet any amount up to the points it already has. Right answer: add the wager. Wrong answer: subtract it.

Team 1

WAGER .....

ANSWER .....

Team 2

WAGER .....

ANSWER .....

Team 3

WAGER .....

ANSWER .....

Team 4

WAGER .....

ANSWER .....

Team 5

WAGER .....

ANSWER .....

Team 6

WAGER .....

ANSWER .....



## Answer Keys (1 of 6)

Teacher copy. Keep these pages out of the student sets.

### Geometry Set 1: Angles, Parallel Lines and Transversals

**Quick check:** 1. vertical angles;  $64^\circ$ ; 2. a linear pair;  $116^\circ$ ; 3. corresponding angles;  $64^\circ$ ; 4. same-side exterior angles;  $116^\circ$

**Angle pairs:** 1.  $x = 17$  ( $40^\circ$  and  $50^\circ$ ); 2.  $x = 18$  ( $118^\circ$  and  $62^\circ$ ); 3.  $x = 14$  ( $80^\circ$ ); 4.  $68^\circ$

**Triangles and polygons:** 1.  $x = 32$ ;  $32^\circ$ ,  $64^\circ$ ,  $84^\circ$ ; 2.  $x = 25$  (exterior angle  $102^\circ$ ); 3.  $70^\circ$ ; 4.  $135^\circ$

**Parallel lines:** 1.  $x = 19$  ( $78^\circ$ ); 2.  $x = 15$  ( $66^\circ$ ,  $114^\circ$ ); 3.  $x = 13$  ( $110^\circ$ ); 4.  $x = 35$  ( $110^\circ$ )

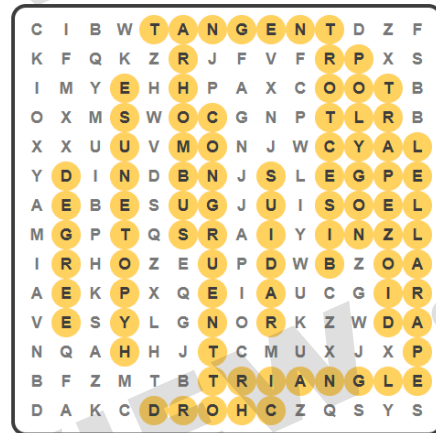
**Name the pair:** 1. alternate interior angles, equal; 2. same-side interior angles, supplementary; 3. alternate exterior angles, equal; 4. corresponding angles, equal

**Word problems:** 1.  $22^\circ$ ; 2.  $45^\circ$  and  $135^\circ$ ; 3.  $x = 13$ ;  $74^\circ$ ; 4.  $80^\circ$ ; 5.  $72^\circ$  and  $56^\circ$ ; 6.  $30^\circ$

**Challenge:** 1.  $x = 95^\circ$ , since the new parallel line splits  $x$  into  $40^\circ$  and  $55^\circ$  (alternate interior angles); 2. answers vary; accept: the angle corresponding to one interior angle forms a linear pair with the other, so the two add to  $180^\circ$ ; 3.  $3x + y = 75$  and  $x + 2y = 75$ , so  $x = 15$  and  $y = 30$

Give full credit for the right  $x$  with a correct equation. Students who measured the challenge 1 figure get a wrong answer: it is not drawn to scale.

### Calm block, Day 1: word search solution (geometry words)



All 12 words are marked. Words run in all eight directions, so a student who only searched across and down will be missing several.

Reset sheet: private, answers vary, nothing to grade. If a student hands it in anyway, thank them and leave it for the teacher.

### Geometry Set 2: Triangle Congruence and Similarity

**Quick check:** 1. SSS; 2. ASA; 3. AAS; 4. HL

**Shortcuts:** 1. not enough (SSA); 2. AAS; 3. HL; 4. not enough (AAA)

**Similar sides:** 1.  $EF = 15$ ; 2.  $TU = 8$ ; 3.  $EC = 12$ ; 4.  $MN = 15$

**Congruent parts:** 1.  $x = 5$ ,  $AB = 17$ ; 2.  $x = 15$ ,  $\angle K = 72^\circ$ ; 3.  $60^\circ$ ; 4.  $y = 7$

**Similar or not:** 1. similar by SSS,  $k = 3/2$ ; 2. similar by AA; 3. not similar; 4. similar by SAS,  $k = 2$

**Word problems:** 1.  $6/4 = h/30$ , so 45 ft; 2.  $1.5/2 = h/8$ , so 6 m; 3.  $2/10 = h/4$ , so 0.8 ft; 4. 15 in; 5. 36 cm; 6.  $10/5 = 12/EC$ , so 6 ft

**Challenge:** 1. 180 square cm, because area grows by the square of the scale factor,  $3 \times 3 = 9$ ; 2. SAS:  $AM = DM$  and  $BM = CM$  (M is the midpoint of each), and  $\angle AMB = \angle DMC$  (vertical angles); 3.  $x/4 = 6/3$ , so  $x = 8$

Accept any correct proportion. In block D accept  $k$  written the other way round (for example  $2/3$ ) if the student says which way it goes.



## Geometry Set 1: Practice

Sixteen problems in four blocks. Write the equation, solve for  $x$ , then find the angles. Every answer is a whole number of degrees.

**Geometry • Day 1**

### A. Angle pairs: find $x$

1. Complementary angles:  
 $(2x + 6)^\circ$  and  $(3x - 1)^\circ$

\_\_\_\_\_

2. Supplementary angles:  
 $(6x + 10)^\circ$  and  $(4x - 10)^\circ$

\_\_\_\_\_

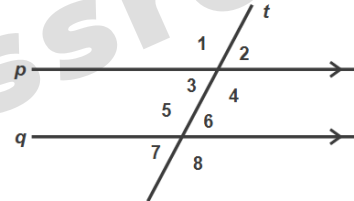
3. Vertical angles:  $(7x - 18)^\circ$  and  $(4x + 24)^\circ$

\_\_\_\_\_

4. An angle is  $24^\circ$  more than twice its complement. Find the angle.

\_\_\_\_\_

### B. Parallel lines $p$ and $q$ : find $x$



1.  $\angle 2 = (5x - 17)^\circ$ ,  $\angle 6 = (3x + 21)^\circ$

\_\_\_\_\_

2.  $\angle 3 = (4x + 6)^\circ$ ,  $\angle 5 = (6x + 24)^\circ$

\_\_\_\_\_

3.  $\angle 1 = (9x - 7)^\circ$ ,  $\angle 8 = (7x + 19)^\circ$

\_\_\_\_\_

4.  $\angle 4 = (2x + 40)^\circ$ ,  $\angle 5 = (4x - 30)^\circ$

\_\_\_\_\_

### C. Triangles and polygons

1. A triangle's angles are  $x^\circ$ ,  $(2x)^\circ$  and  $(3x - 12)^\circ$ . Find all three.

\_\_\_\_\_

2. An exterior angle of a triangle is  $(4x + 2)^\circ$ . The remote interior angles are  $(x + 20)^\circ$  and  $57^\circ$ . Find  $x$ .

\_\_\_\_\_

3. An isosceles triangle has a vertex angle of  $40^\circ$ . Find each base angle.

\_\_\_\_\_

4. Find the measure of each interior angle of a regular octagon.

\_\_\_\_\_

### D. Name the pair (use the block B figure)

1.  $\angle 3$  and  $\angle 6$

\_\_\_\_\_

2.  $\angle 4$  and  $\angle 6$

\_\_\_\_\_

3.  $\angle 2$  and  $\angle 7$

\_\_\_\_\_

4.  $\angle 1$  and  $\angle 5$

\_\_\_\_\_

Block B: the figure shows where each numbered angle sits; it is not drawn to scale, so work from the angle facts. Block D: write the name of the pair and whether the angles are equal or supplementary.

# In the full kit

Five days, planned and ready to print.

**62** pages in color and ink-saver  
B&W, US Letter and A4

**5** days, each with its own sets, calm  
puzzle, team task and optional  
game

**15** pages of geometry sets with  
worked examples

**6** answer-key pages, every answer  
checked

**Thank you!** If this works for your class, a quick review helps other teachers find it, and earns you TpT credits.

