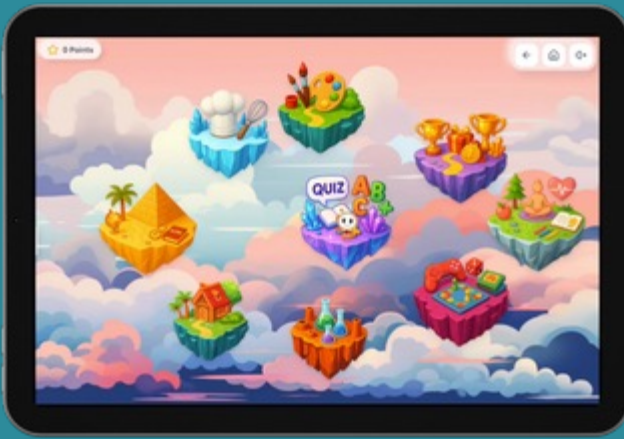


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Angle Reasoning Chains – Year 6

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Teacher Preparation – Lessons 1 and 2

Focus and evidence

Students combine marked parts, apply vertically opposite equality and straight-line sums, then check all four sectors around a point. Evidence is a valid reason at every step and a corrected invalid claim.

Before the week

Provide rulers, pencils, paper half/full-turn models, R1 display, R2 cards, R3 practice, R4 game, R5 rehearsal and R6/R7 assessment tools. A protractor can support exploration, but measurement alone is not the answer.

Entry check

Without showing answers, ask learners to combine 25° and 40° in a split sector and find who completes 65° to a straight angle. Record whether notation, half/full turns or arithmetic needs a short refresh.

Lesson 1 – Mark known relationships

Show R1 and the first R2 examples. Identify genuinely straight pairs of rays and an opposite sector before calculating. Contrast touching angles whose outside arms are not straight. Partners work two more R2 cases; collect one visible or oral reason from each learner.

Lesson 2 – Choose the first deduction

Use R3 page 1. Think aloud: combine adjacent marked parts first, then choose a second justified relationship. Ask how one changed condition alters the next step. Check that every learner can name the reason for the first calculation.

Teacher Preparation – Lessons 3 and 4

Lesson 3 – Use a second relationship

Model one complete R4 turn: read a claim, mark givens, decide valid or unjustified, explain or repair, then check the teacher key. Use R3 page 2 and the R4 cards. Observe the mathematical reason, not just turn-taking or a correct number.

Lesson 4 – Check the full diagram

Introduce a fresh rotated crossing from R5. Students use R3 page 3 and R5 rehearsal. Ask them to compute whole, opposite and neighbours, then verify 360° . Give one precise correction tied to an error and ask them to apply it to a new case.

Support route

Use a physical half, full-turn model and a partly labelled crossing. Prompt the learner to mark the two straight lines, combine given parts, then name the relationship. Reduce writing if it is not the target; accept a clear oral chain.

Core route

Learners solve all four sectors with an equation and reason for each, then check the full turn without nearby worked answers.

Extension route

Learners evaluate an invalid inference or compare two valid deduction orders. Do not introduce parallel-line rules unless the diagram explicitly establishes them.

Teacher Preparation – Lesson 5 and Next Steps

Lesson 5 – Independent evidence

Retrieve the success criteria without revealing the assessment answer. Give R6 independently, with accessible response modes where needed. Learners must produce a multi-step solution, a reason for every deduction and a corrected invalid claim.

Mark with R7

Look for correct use of marked adjacent parts, vertically opposite equality, straight-line sums and a 360° consistency check. Record actual learner evidence in the rubric. Accept another correct sequence of justified deductions. Do not judge handwriting effort or an accepted dialect instead of the reasoning target.

Feedback and next teaching steps

If the first steps in evidence, revisit the marked parts and the diagram. If a student knows 65° but guesses the neighbour, revisit straight-line pairs. If arithmetic is secure but a claim is unexamined, ask which geometric relationship actually justifies it. Move to a fresh rotated case only after the learner can name the reason.

Answer and activity handling

Each practice/rehearsal/assessment answer page immediately follows its student page. R4 cards 1–12 and its teacher key provide repeatable partner practice. Hide or fold the R4 key during play.

Success checklist

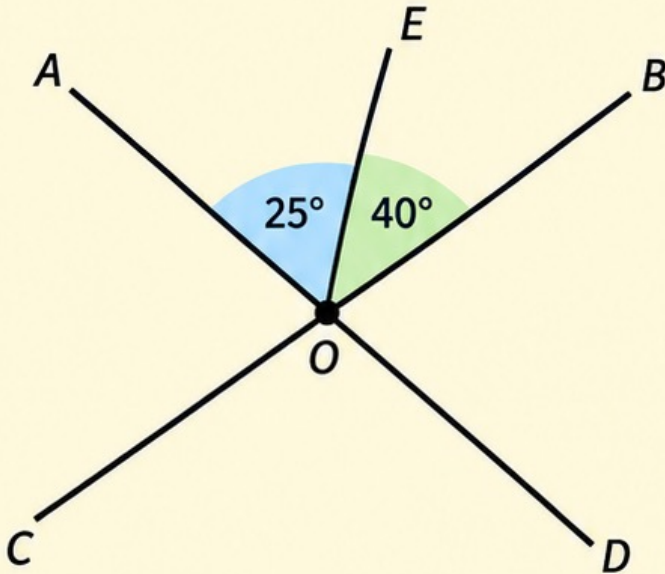
☐ Mark givens and straight lines. ☐ Combine parts. ☐ Name the next

Mark the relationship first

When you know how the angles are related, you can reason step by step. Look for parts, straight lines, vertically opposite angles and the full turn around a point.

Example 1

Ray OE splits angle AOB into 25° and 40° .

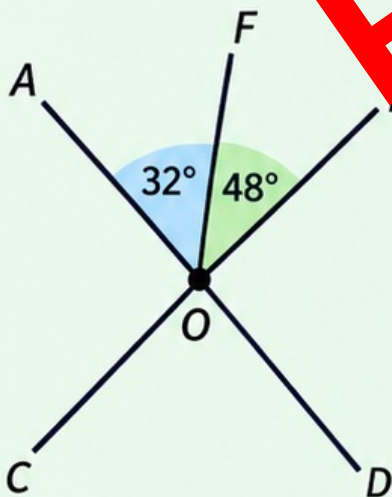


Reasoning chain

- 1 Combine the parts in angle AOB.
 $25^\circ + 40^\circ = 65^\circ$
- 2 The angle opposite AOB is equal (vertically opposite angles).
Opposite = 65°
- 3 Each angle next to 65° is on a straight line, so it is $180^\circ - 65^\circ = 115^\circ$.
Neighbour = 115°
- 4 Check that all turn around point O.
 $65^\circ + 115^\circ + 65^\circ + 115^\circ = 360^\circ$ ✓
All angles around a point add to 360° .

Example 2

Ray OF splits the top angle into 32° and 48° .



Whole angle at the top:

$$32^\circ + 48^\circ = 80^\circ$$

Opposite angle:

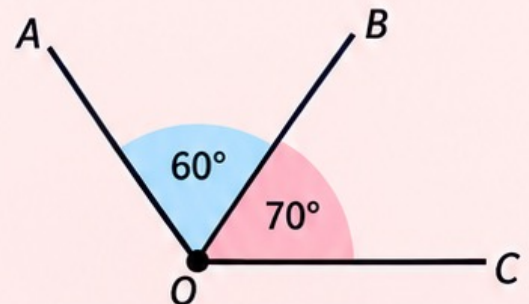
$$80^\circ$$

Each straight-line neighbour:

$$180^\circ - 80^\circ = 100^\circ$$

Important: touching is not enough

Two angles may touch at a point without their outside arms forming a straight line. So touching alone does not prove a 180° sum.



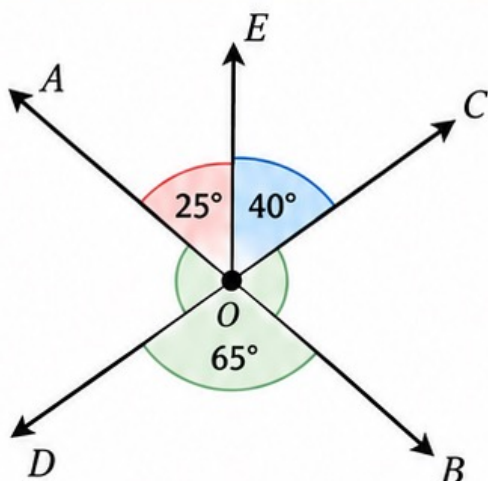
These two angles touch at O, but $60^\circ + 70^\circ = 130^\circ$, not 180° , because the outside arms are not a straight line.

The key idea

Always identify the angle relationship first, then use it to build a clear reasoning chain. Known relationships help you find missing angles with confidence.

1 Intersecting lines with a split angle

Worked example



Step 1: Find the top angle.

$$25^\circ + 40^\circ = 65^\circ$$

The two angles make up the top angle at O.

Step 2: Use vertically opposite angles.

The angle opposite the top angle is 65° .

Vertically opposite angles are equal.

Step 3: Find each neighbour on a straight line.

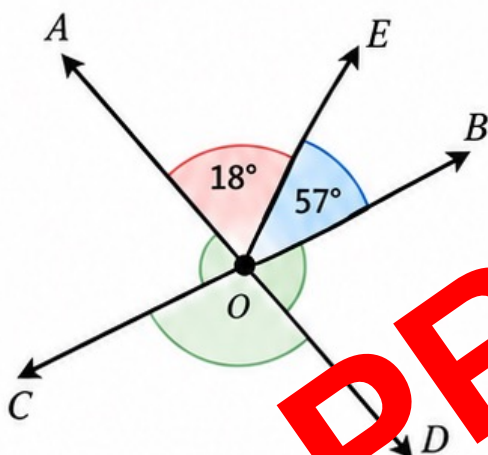
Each angle next to 65° is $180^\circ - 65^\circ = 115^\circ$.

Angles on a straight line sum to 180° .

So, the four angles around O are 65° , 115° , 65° and 115° .

2 Intersecting lines with a given split angle

Worked example



Step 1: Find the top angle.

$$18^\circ + 57^\circ = 75^\circ$$

The two angles make up the top angle at O.

Step 2: Find the opposite angle.

The angle opposite the top angle is 75° .

Vertically opposite angles are equal.

Step 3: Find a neighbouring angle.

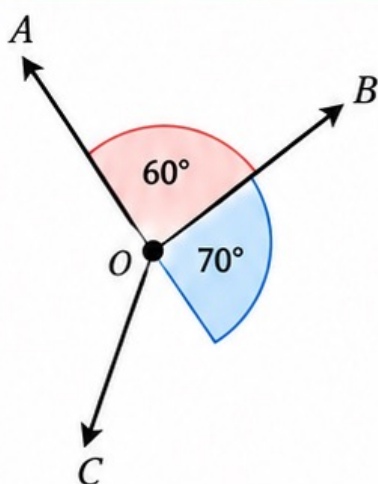
Each angle next to 75° is $180^\circ - 75^\circ = 105^\circ$.

Angles on a straight line sum to 180° .

So, the four angles around O are 75° , 105° , 75° and 105° .

3 Touching angles are not always a straight line

Worked example



Step 1: Identify the given angles.

The two adjacent angles are 60° and 70° .

Step 2: Consider what we can conclude.

The angles touch at O, but the outside arms (OA and OC) do not form a straight line.

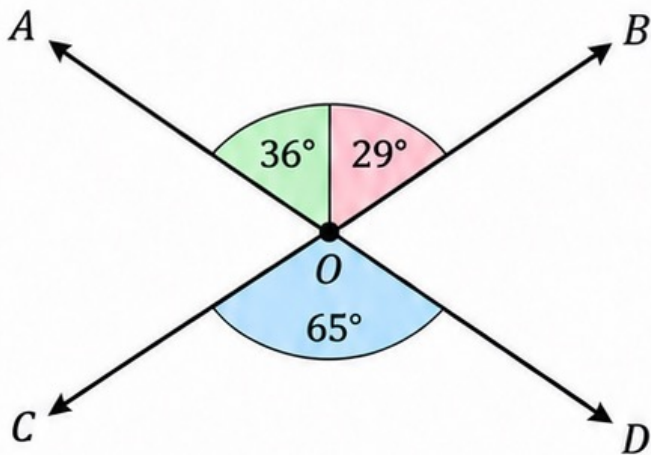
Step 3: Add the angles.

$$60^\circ + 70^\circ = 130^\circ$$

So, touching alone does not justify a total of 180° .
These two angles add to 130° , not 180° .

Card 4**Vertically opposite angles (with a split angle)**

Reasoning chain

**Work out the missing angle and explain.**

The top angle is split into 36° and 29° .

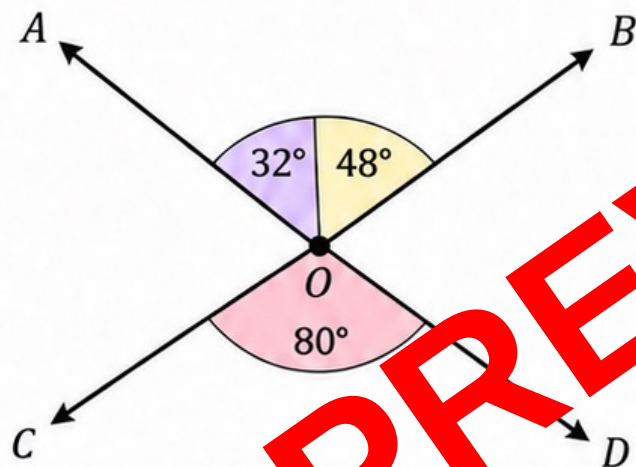
So the whole top angle is $36^\circ + 29^\circ = 65^\circ$.

Angles opposite each other at a crossing are equal (vertically opposite angles).

Therefore, the bottom angle is also 65° .

Bottom angle = 65° .**Card 5****Angles on a straight line (with a split angle)**

Reasoning chain

**Find the neighbouring angle and explain.**

The top angle is split into 32° and 48° .

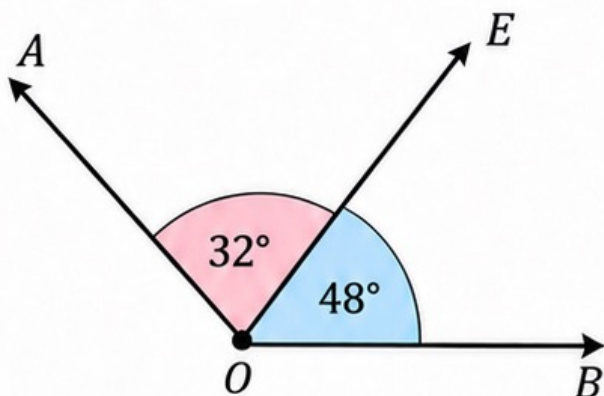
So the whole top angle is $32^\circ + 48^\circ = 80^\circ$.

The angle next to it on a straight line adds to 180° .

So the neighbouring angle is $180^\circ - 80^\circ = 100^\circ$.

Neighbouring angle = 100° .**Card 6****Which angle? (vertex notation)**

Reasoning chain

**Look at the diagram and compare the angles.**

$\angle AOB$ has **vertex O** (the middle letter).

It is $32^\circ + 48^\circ = 80^\circ$.

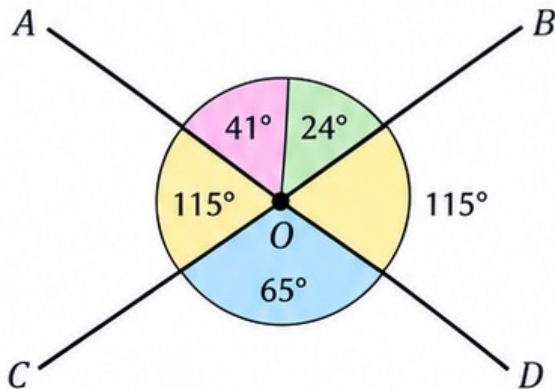
$\angle OAB$ has **vertex A** (the middle letter).

Its value is not shown in this diagram.

The middle letter names the vertex.

Card 7**Angle reasoning chain: find all four angles**

Two straight lines intersect at point O .
One of the angles is split into 41° and 24° as shown.

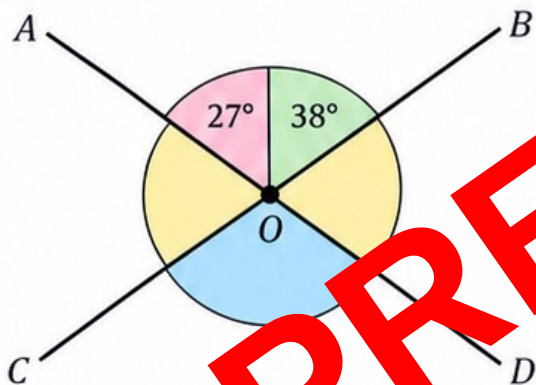
**Work through the reasoning**

- 1 The two given angles make the whole top angle.
 $41^\circ + 24^\circ = 65^\circ$
- 2 Vertically opposite angles are equal, so the bottom angle is also 65° .
- 3 Angles on a straight line add to 180° , so each neighbouring angle is $180^\circ - 65^\circ = 115^\circ$.
- 4 Check the total around point O :
 $65^\circ + 115^\circ + 65^\circ + 115^\circ = 360^\circ$

All four angles are 65° , 115° , 65° and 115° .

Card 8**Angle reasoning chain: make a deduction**

Two straight lines intersect at point O .
One angle is split into 27° and 38° as shown.

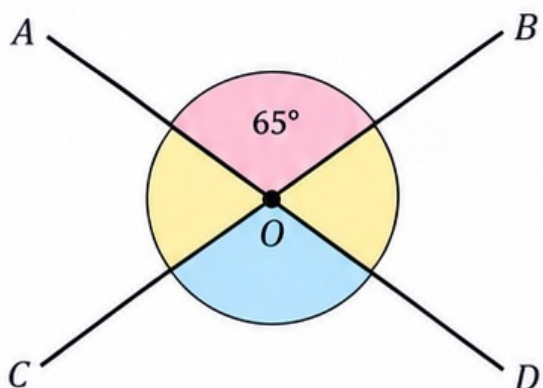
**What can you deduce from this?**

- 1 The two parts make the whole top angle.
 $27^\circ + 38^\circ = 65^\circ$
so the top angle is 65° .
- 2 Vertically opposite angles are equal,
so the bottom angle is also 65° .

**First deduction: the top angle is 65°
(because the two parts combine).
Then the opposite angle is also 65° .**

Card 9**Angle reasoning chain: evaluate a claim**

Two straight lines intersect at point O .
The top angle is 65° .



A pupil claims: "All four sectors are 65° ."
Is this correct? Explain.

Reasoning

- 1 The angle opposite the 65° angle is equal to it,
so the bottom angle is 65° .
- 2 Angles on a straight line add to 180° .
Each neighbour of 65° is $180^\circ - 65^\circ = 115^\circ$.
- 3 Therefore the four angles are 65° , 115° , 65° and 115° .

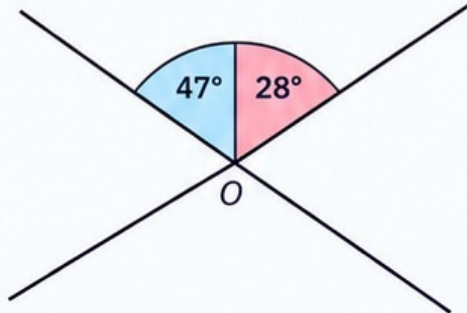
The claim is not correct.

Only two opposite angles are 65° ; the other two are 115° .

10 Split angle at a crossing

Two straight lines intersect at point O . One of the angles is split into 47° and 28° as shown.

Work out the sizes of the other three angles, giving reasons.



Worked solution

- Find the whole top angle.**
 $47^\circ + 28^\circ = 75^\circ$ (angles that meet add)
- Find the opposite angle.**
 Opposite angles are equal, so the bottom angle is 75° . (vertically opposite angles)
- Find a neighbouring angle.**
 An angle on a straight line sums to 180° .
 So the left angle is $180^\circ - 75^\circ = 105^\circ$.
- Find the remaining angle.**
 It is vertically opposite to the left angle, so it is 105° .

Answer

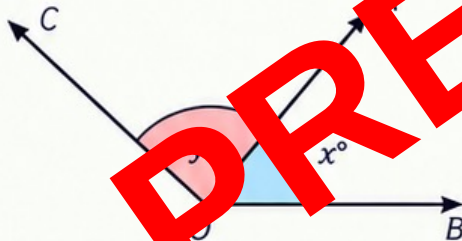
The angles are 75° (top), 75° (bottom), 105° (left) and 105° (right).

11 Two touching angles

Angles $\angle COA$ and $\angle AOB$ share vertex O and side OA , as shown.

The two angles touch, but their outside arms OC and OB are not a straight line.

Is it justified to say that the two angles add to 180° ? Explain your answer.



Worked solution

The two angles do touch and share a side, OA , but their outside arms, OC and OB , are **not** opposite rays, so they do not form a straight line.

Therefore, it is **not** justified to say that $x + y = 180^\circ$ just from the fact that the angles touch.

The sum would be 180° only if OC and OB were opposite rays, making a straight line.

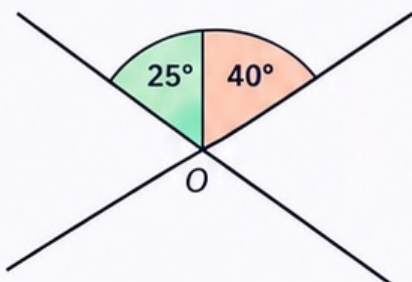
Answer

No. Touching angles do not have to add to 180° unless their outside arms form a straight line.

12 Two ways to reason from a split angle

Two straight lines intersect at point O . One of the angles is split into 25° and 40° as shown.

Use this information to find the other three angles. Show two valid orders of reasoning, and give a reason for each step.



Worked solution

Method (a)

- Find the whole top angle.**
 $25^\circ + 40^\circ = 65^\circ$
 (angles that meet add)
- Find the opposite angle.**
 It is 65° .
 (vertically opposite angles)
- Find a neighbouring angle.**
 $180^\circ - 65^\circ = 115^\circ$
 (straight line)

Answer (a)

Angles are 65° (top), 65° (bottom), 115° (left) and 115° (right).

Method (b)

- Find the whole top angle.**
 $25^\circ + 40^\circ = 65^\circ$
 (angles that meet add)
- Find a neighbouring angle.**
 $180^\circ - 65^\circ = 115^\circ$
 (straight line)
- Find the opposite neighbour.**
 It is 115° .
 (vertically opposite angles)

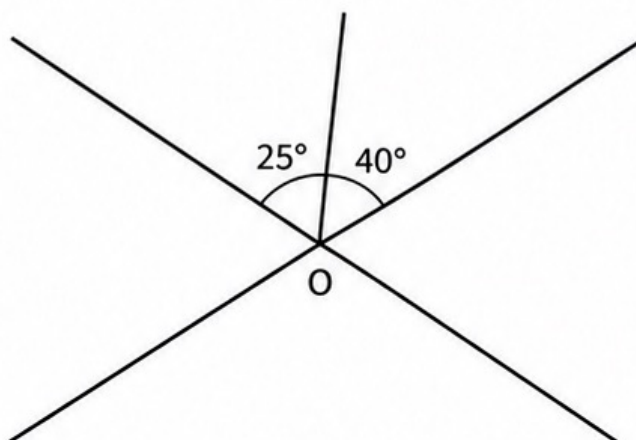
Answer (b)

Angles are 65° (top), 65° (bottom), 115° (left) and 115° (right).

Angle Reasoning Chains

Reason-per-step chain — guided

Use the diagram to complete the steps below. Give a reason at each step.



- 1** Combine the marked parts.

Whole top angle = _____ because _____.

- 2** Find the angle vertically opposite the top angle.

Opposite angle = _____ because _____.

- 3** Find either neighbour on a straight line.

Neighbour = _____ because _____.

- 4** Check all four sectors around O:

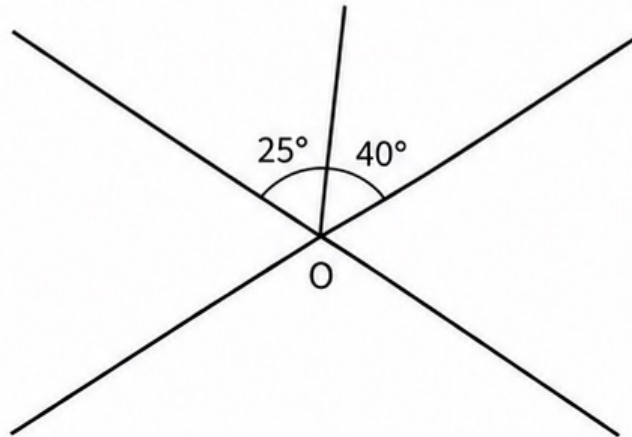
_____ + _____ + _____ + _____ = _____ ;

this check works because _____.

Angle Reasoning Chains

Reason-per-step chain — guided

Use the diagram to complete the steps below. Give a reason at each step.



- 1** Combine the marked parts.

Whole top angle = **65°** because **$25^\circ + 40^\circ$ are adjacent parts of one angle.**

- 2** Find the angle vertically opposite the top angle.

Opposite angle = **65°** because **vertically opposite angles are equal.**

- 3** Find either neighbour on a straight line.

Neighbour = **115°** because **$180^\circ - 65^\circ$ on a straight line.**

- 4** Check all four sectors around O:

65° + **115°** + **65°** + **115°** = **360°** ;

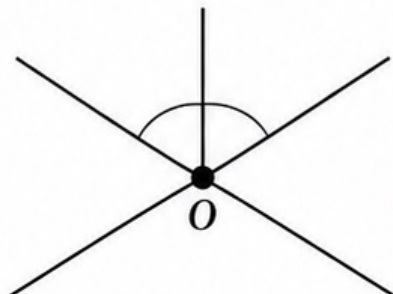
this check works because **angles around a point make a full turn.**

Name: _____

Angle Reasoning Chains

Reason-per-step chain — core practice

For every case, two straight lines cross at O and a ray splits one sector into the two given angles.
Use the named relationships, not appearance.



1. $18^\circ + 57^\circ$: whole sector and straight-line neighbour.

Equation: _____

Reason: _____

2. $36^\circ + 29^\circ$: whole sector and vertically opposite sector.

Equation: _____

Reason: _____

3. $32^\circ + 48^\circ$: whole sector and neighbour.

Equation: _____

Reason: _____

4. $41^\circ + 24^\circ$: opposite and neighbour.

Equation: _____

Reason: _____

5. $27^\circ + 38^\circ$: all four sectors.

Equation: _____

Reason: _____

6. $47^\circ + 28^\circ$: explain a 360° full-turn check.

Equation: _____

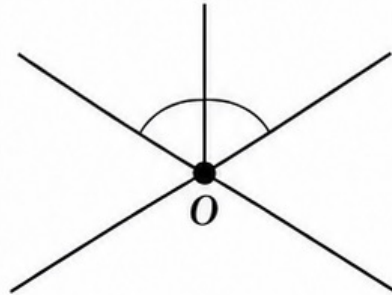
Reason: _____

Name: ANSWERS

Angle Reasoning Chains

Reason-per-step chain — core practice

For every case, two straight lines cross at O and a ray splits one sector into the two given angles.
Use the named relationships, not appearance.



1. $18^\circ + 57^\circ$: whole sector and straight-line neighbour.

Equation: $18^\circ + 57^\circ = 75^\circ$
 $75^\circ + 105^\circ = 180^\circ$

Reason: Parts add to 75° (whole sector).
Angles on a straight line add to 180° .

2. $36^\circ + 29^\circ$: whole sector and vertically opposite sector.

Equation: $36^\circ + 29^\circ = 65^\circ$
Opposite angle = 65°

Reason: Parts add to 65° (whole sector).
Vertically opposite angles are equal.

3. $32^\circ + 48^\circ$: whole sector and neighbour.

Equation: $32^\circ + 48^\circ = 80^\circ$
 $80^\circ + 100^\circ = 180^\circ$

Reason: Parts add to 80° (whole sector).
Angles on a straight line add to 180° .

4. $41^\circ + 24^\circ$: opposite and neighbour.

Equation: $41^\circ + 24^\circ = 65^\circ$
 $65^\circ + 115^\circ = 180^\circ$

Reason: Parts add to 65° (whole sector).
Vertically opposite angles are equal.
Angles on a straight line add to 180° .

5. $27^\circ + 38^\circ$: all four sectors.

Equation: $27^\circ + 38^\circ = 65^\circ$
Angles: $65^\circ, 115^\circ, 65^\circ, 115^\circ$

Reason: Parts add to 65° (whole sector).
Vertically opposite angles are equal.
Angles on a straight line add to 180° .

6. $47^\circ + 28^\circ$: explain a 360° full-turn check.

Equation: $47^\circ + 28^\circ = 75^\circ$
Neighbours = 105° , opposite = 75°

Reason: Parts add to 75° (whole sector).
Angles on a straight line add to 180° .
 $75^\circ + 105^\circ + 75^\circ + 105^\circ = 360^\circ$ (full turn).

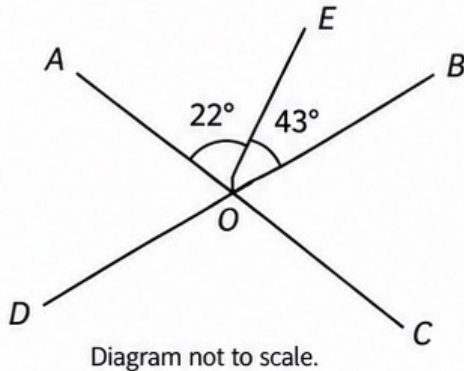
Name: _____

Reason-per-step chain — transfer

Mark relationships before calculating. A rotated diagram does not change angle facts.

1. Case 1: $22^\circ + 43^\circ$

In the diagram, two straight lines AC and BD cross at O. Ray OE lies between OA and OB, splitting angle AOB into 22° and 43° as shown.



First fact and reason:

Equation: _____

Reason: _____

Second relationship and reason:

Equation: _____

Reason: _____

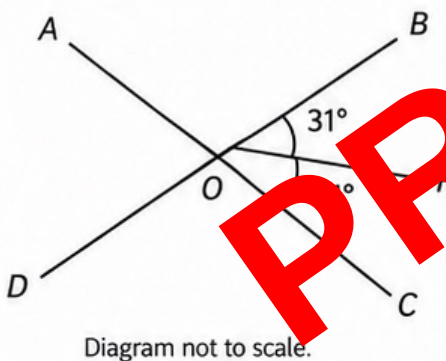
Full-turn check:

Equation: _____

Reason: _____

2. Case 2: $31^\circ + 44^\circ$

In the diagram, two straight lines AC and BD cross at O. Ray OF lies between OB and OC, splitting angle BOC into 31° and 44° as shown.



First fact and reason:

Equation: _____

Reason: _____

Second relationship and reason:

Equation: _____

Reason: _____

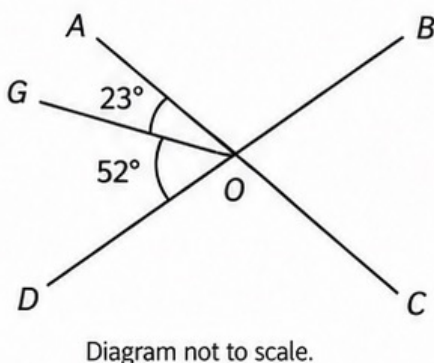
Full-turn check:

Equation: _____

Reason: _____

3. Case 3: $52^\circ + 23^\circ$

In the diagram, two straight lines AC and BD cross at O. Ray OG lies between OD and OA, splitting angle DOA into 52° and 23° as shown.



First fact and reason:

Equation: _____

Reason: _____

Second relationship and reason:

Equation: _____

Reason: _____

Full-turn check:

Equation: _____

Reason: _____

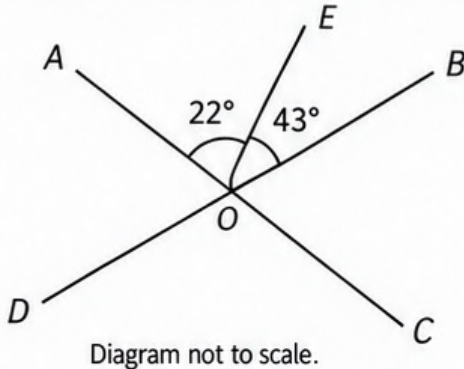
Name: **ANSWERS**

Reason-per-step chain — transfer

Mark relationships before calculating. A rotated diagram does not change angle facts.

1. Case 1: $22^\circ + 43^\circ$

In the diagram, two straight lines AC and BD cross at O. Ray OE lies between OA and OB, splitting angle AOB into 22° and 43° as shown.



First fact and reason:

Equation: $22^\circ + 43^\circ = 65^\circ$

Reason: Angles add to give the whole angle (angle AOB).

Second relationship and reason:

Equation: Opposite angles are equal, so the angle opposite

Reason: 65° is 65° .

Vertically opposite angles are equal.

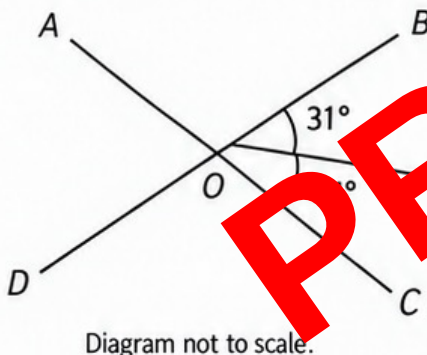
Full-turn check:

Equation: $65^\circ + 115^\circ + 65^\circ + 115^\circ = 360^\circ$

Reason: Angles around a point (full turn) sum to 360° .

2. Case 2: $31^\circ + 44^\circ$

In the diagram, two straight lines AC and BD cross at O. Ray OF lies between OB and OC, splitting angle BOC into 31° and 44° as shown.



First fact and reason:

Equation: $31^\circ + 44^\circ = 75^\circ$

Reason: Angles add to give the whole angle (angle BOC).

Second relationship and reason:

Equation: Opposite angles are equal, so the angle opposite

Reason: 75° is 75° .

Vertically opposite angles are equal.

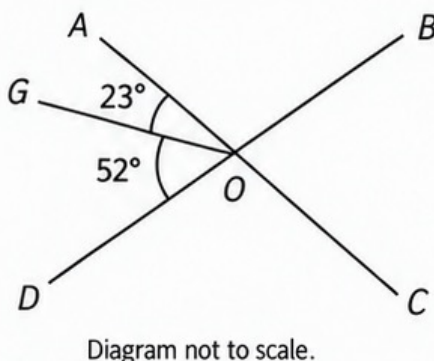
Full-turn check:

Equation: $75^\circ + 105^\circ + 75^\circ + 105^\circ = 360^\circ$

Reason: Angles around a point (full turn) sum to 360° .

3. Case 3: $52^\circ + 23^\circ$

In the diagram, two straight lines AC and BD cross at O. Ray OG lies between OD and OA, splitting angle DOA into 52° and 23° as shown.



First fact and reason:

Equation: $52^\circ + 23^\circ = 75^\circ$

Reason: Angles add to give the whole angle (angle DOA).

Second relationship and reason:

Equation: Opposite angles are equal, so the angle opposite

Reason: 75° is 75° .

Vertically opposite angles are equal.

Full-turn check:

Equation: $75^\circ + 105^\circ + 75^\circ + 105^\circ = 360^\circ$

Reason: Angles around a point (full turn) sum to 360° .



Find the Unjustified Inference

Read the claim. Decide if it is valid or unjustified.
Explain your reasoning and, if needed, repair the claim.



Aim

Be the first player to reach 6 points with at least 2 repaired claims.

What You Need

- Work in pairs
- 12 challenge cards (face down)
- A pencil
- Two score tracks (one for each player)

How to Play

- 1 Draw a card.**
Take the top card from the pile and read the given information and the claim aloud.
- 2 Identify the angle relationship.**
Decide which angle relationship is involved (for example, straight line, full turn, or vertically opposite).
- 3 Say valid or unjustified.**
State whether the claim is valid or unjustified.
- 4 Explain or repair.**
Give a mathematical reason for your decision. If the claim is unjustified, repair it by stating the correct claim and give a reason.
- 5 Check the key.**
After you have given your response, check the teacher key to see if you are correct.

Scoring

- You earn **1 point** for a correct reason (whether you accept or reject the claim).
 - If the claim is unjustified and you give a correct repair, you earn **extra point**.
 - Keep track of your score on the score track below.
- The first player to reach **6 points** with at least 2 repaired claims wins.

Response Stem



I accept/reject because ...

Worked Turn (no diagram)

Given: two straight lines cross; one sector is split into 25° and 40° .

Claim: its straight-line neighbour is 65° .

Your response:

Verdict: Unjustified.

Reason: Whole sector = $25^\circ + 40^\circ = 65^\circ$. Neighbour = $180^\circ - 65^\circ = 115^\circ$
because the two sectors form a straight line.

Repair: The straight-line neighbour is 115° .

Player 1 Score Track

1	2	3	4	5	6
---	---	---	---	---	---

Repaired claims (must be at least 2): _____

Player 2 Score Track

1	2	3	4	5	6
---	---	---	---	---	---

Repaired claims (must be at least 2): _____



Look closely. Think logically. Justify your answer!



Find the Unjustified Inference — cards 1–6

Each card shows some given information about two straight lines crossing.
Decide whether the claim is valid or unjustified. Explain or repair.

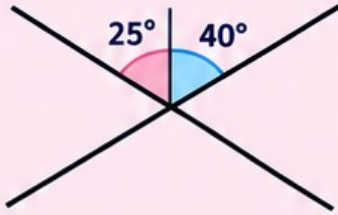
1

Given:

Two straight lines cross. One of the angles is split into 25° and 40° .

Claim:

The opposite sector is 65° .



Valid or unjustified? Explain or repair.

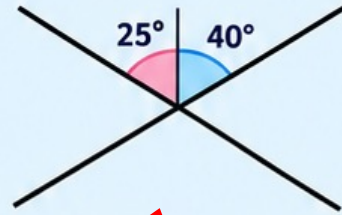
2

Given:

Two straight lines cross. One of the angles is split into 25° and 40° .

Claim:

A straight-line neighbour is 65° .



Valid or unjustified? Explain or repair.

3

Given:

Two straight lines cross. One of the angles is split into 18° and 57° .

Claim:

A straight-line neighbour is 105° .



Valid or unjustified? Explain or repair.

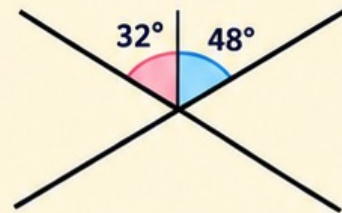
4

Given:

Two straight lines cross. One of the angles is split into 32° and 48° .

Claim:

The opposite sector is 100° .



Valid or unjustified? Explain or repair.

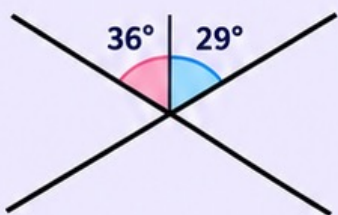
5

Given:

Two straight lines cross. One of the angles is split into 36° and 29° .

Claim:

All four sectors are 65° .



Valid or unjustified? Explain or repair.

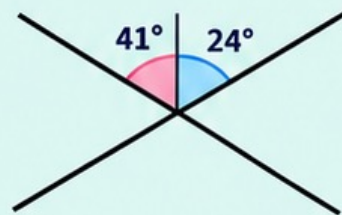
6

Given:

Two straight lines cross. One of the angles is split into 41° and 24° .

Claim:

All four sectors sum to 360° .



Valid or unjustified? Explain or repair.



Find the Unjustified Inference – cards 7–12

Read each card. Decide whether the claim is valid or unjustified.
Explain your reasoning or repair the claim so that it is correct.



7

Given:

Two straight lines cross; one sector is split into 27° and 38° .

Claim:

The sector vertically opposite it is 65° .

Valid or unjustified? Explain or repair.

8

Given:

One sector at a crossing is split into 47° and 28° .

Claim:

A straight-line neighbour is 105° .

Valid or unjustified? Explain or repair.

9

Given:

Two angles touch but their outside arms are not known to form a straight line.

Claim:

Their sum must be 180° .

Valid or unjustified? Explain or repair.

10

Given:

The angle is named $\angle AOB$.

Claim:

O is its vertex because O is the middle letter.

Valid or unjustified? Explain or repair.

11

Given:

The angle is named $\angle OAB$.

Claim:

Its vertex is O.

Valid or unjustified? Explain or repair.

12

Given:

At a crossing, a sector is split into 25° and 40° . The complete crossing is rotated.

Claim:

The vertically opposite sector remains 65° .

Valid or unjustified? Explain or repair.

Teacher key
(fold here)

7

Valid — $27 + 38 = 65$ and vertically opposite angles are equal.

8

Valid — $47 + 28 = 75$, so $180 - 75 = 105$.

9

Unjustified — need the outside arms to form a straight line.

10

Valid — the middle letter O is the vertex.

11

Unjustified — the middle letter is A, so the vertex is A.

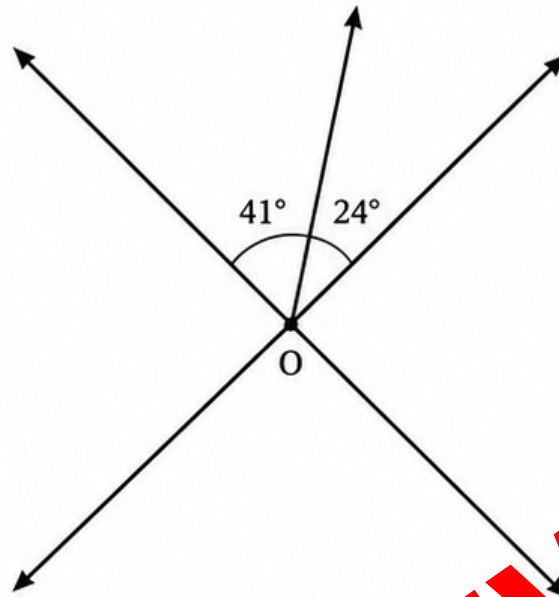
12

Valid — rotation preserves angle facts, so the vertically opposite sector remains 65° .

Name: _____

Multi-step solution — rehearsal 1

Use the diagram below to answer the questions. Show your working and give reasons for each step.



1. Find the size of the whole top sector (the sector split into 41° and 24°). Give a reason for your method.

2. Find the size of the sector vertically opposite to the top sector. Give a reason for your method.

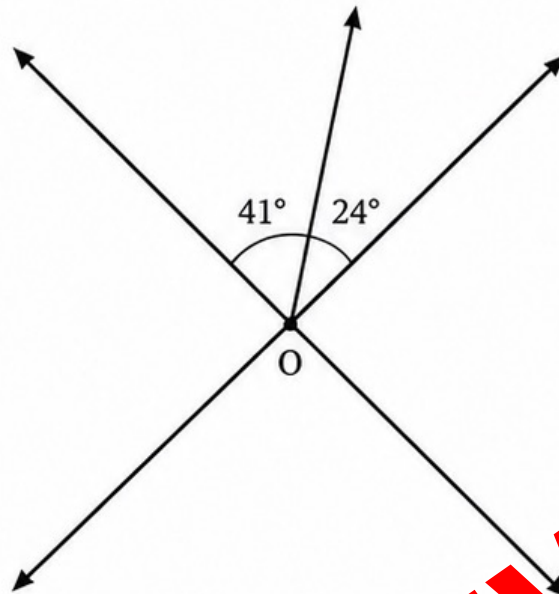
3. Find the sizes of the two sectors that are next to the top sector on a straight line. Give a reason for your method.

4. Check that the four sector values add up to a full turn. Show your working.

Name: **ANSWERS**

Multi-step solution — rehearsal 1

Use the diagram below to answer the questions. Show your working and give reasons for each step.



1. Find the size of the whole top sector (the sector split into 41° and 24°). Give a reason for your method.

$$41^\circ + 24^\circ = 65^\circ$$

The two marked parts are adjacent angles, so they add to give the whole top sector.

2. Find the size of the sector vertically opposite to the top sector. Give a reason for your method.

$$65^\circ$$

Vertically opposite angles are equal, so the bottom sector is also 65°.

3. Find the sizes of the two sectors that are next to the top sector on a straight line. Give a reason for your method.

Each of the left and right neighbouring sectors is 115°.

$$180^\circ - 65^\circ = 115^\circ$$

Each forms a straight line with the top sector (65°), so they add to 180°.

4. Check that the four sector values add up to a full turn. Show your working.

$$65^\circ + 115^\circ + 65^\circ + 115^\circ = 360^\circ$$

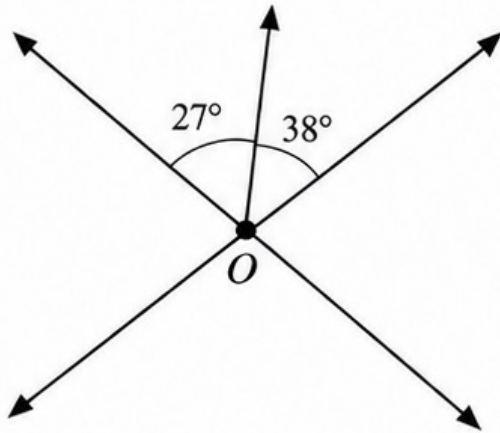
The angles around a point make a full turn, which is 360°.

Name: _____

Date: _____

Repair the reasoning — rehearsal 2

Two straight lines cross at O . One sector is split into 27° and 38° .



A student makes this claim:

“The next angle is 65°
because touching angles are equal.”

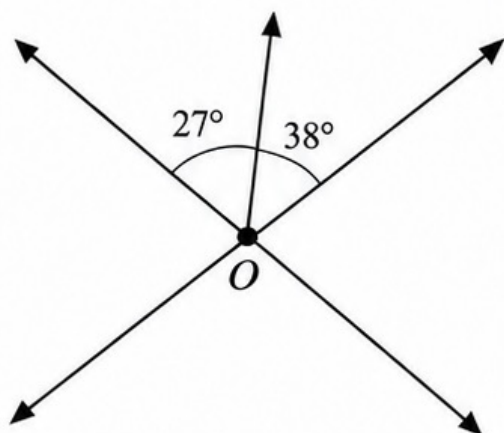
1. What is not justified in the student's claim?

2. Find a straight-line neighbour of the whole sector.
Explain why it is 180° minus the whole sector.

3. Write a better, multi-step chain of reasoning to find all four angles around O .
Include a check using the fact that a full turn is 360° .

Repair the reasoning — rehearsal 2

Two straight lines cross at O . One sector is split into 27° and 38° .



A student makes this claim:

“The next angle is 65°
because touching angles are equal.”

1. What is not justified in the student's claim?

**Touching or sharing a side does not make angles equal;
the claim gives no valid reason.**

2. Find a straight-line neighbour of the whole top sector.
Explain why it is 180° minus the whole sector.

Whole top sector: $27^\circ + 38^\circ = 65^\circ$

**A straight-line neighbour is $180^\circ - 65^\circ = 115^\circ$ because its outside arms
form a straight line with the top sector.**

3. Write a better, multi-step chain of reasoning to find all four angles around O .
Include a check using the fact that a full turn is 360° .

The whole top sector is $27^\circ + 38^\circ = 65^\circ$.

The angle opposite the top sector is also 65° (vertically opposite angles are equal).

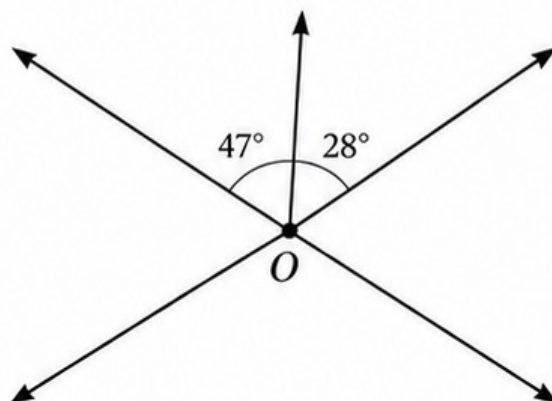
**Each of the other two angles (left and right) is a straight-line neighbour of 65° ,
so each is $180^\circ - 65^\circ = 115^\circ$.**

Check: $65^\circ + 115^\circ + 65^\circ + 115^\circ = 360^\circ$ (a full turn).

Angle Reasoning Chains – independent assesement

Name: _____

A. Use the diagram to complete the reasoning chain. Give a reason for each step.



1. Find the size of the whole split sector (at the top).

Reason:

2. Find the size of the vertically opposite sector (at the bottom).

Reason:

3. Find the sizes of the two neighbouring sectors (left and right).

Reason:

4. Check that the angles around a point add to a full turn.

Reason:

B. A student makes the following claim about the diagram.

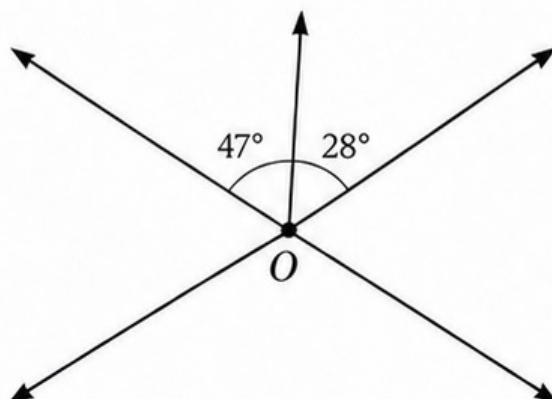
“The adjacent angle is also 75° because it shares a side.”

Identify the **invalid** inference in this claim and write a correct explanation.

Angle Reasoning Chains – independent assesement

Name: **ANSWERS**

A. Use the diagram to complete the reasoning chain. Give a reason for each step.



1. Find the size of the whole split sector (at the top). Reason:	$47^\circ + 28^\circ = 75^\circ$ They are adjacent parts of one sector.
2. Find the size of the vertically opposite sector (at the bottom). Reason:	The bottom sector is 75° . Vertically opposite angles are equal.
3. Find the sizes of the two neighbouring sectors (left and right). Reason:	The left sector is 105° and the right sector is 105° . Each is $180^\circ - 75^\circ = 105^\circ$ because they form a straight line with the top sector.
4. Check that the angles around a point add to a full turn. Reason:	$75^\circ + 105^\circ + 75^\circ + 105^\circ = 360^\circ$ Angles around a point add to a full turn.

B. A student makes the following claim about the diagram.

“The adjacent angle is also 75° because it shares a side.”

Identify the **invalid** inference in this claim and write a correct explanation.

Sharing a side does not make angles equal.

The adjacent whole sector is 105° because it and 75° form a straight angle of 180° .

Angle Reasoning Chains — Learning Evidence Rubric

	Needs teaching	Developing with support	Target met independently
Concept/accuracy	inaccurate representation or misconception	familiar model correct with prompt but contrast insecure	applies angle relationships correctly to fresh case
Application/procedure	cannot complete meaningful chain yet	completes with model or step prompts	completes full chain and consistency check independently
Reason/evidence	guesses or merely names rule	relevant detail but connection needs prompt	valid specific reason for every deduction
Transfer/communication	response unclear or transfer insecure	clear with support but fresh context insecure	coherent explanation and correction in fresh context

Evidence observed:

Next teaching step:

Use accessible response modes; judge the angle reasoning, not handwriting.

Angle Reasoning Chains

Year 6



Our goal and starting point

Combine angle facts in a chain, with a reason at every step.

Success: mark the relationship → calculate → check the whole diagram.

Quick check: What is $25^\circ + 40^\circ$? What completes 65° to 180° ?



The words we need

Straight angle: 180° . Full turn around a point: 360° .

Adjacent angles share a vertex and arm without overlap.

Vertically opposite angles face across two intersecting lines.

Justify: name the relationship that supports each deduction.



Mark the model

Two straight lines cross at O. One sector is split into 25° and 40° .

Mark the whole split sector, its opposite, and its straight-line neighbours.

Which relationship would you use first?



The fixed reasoning chain

Parts of one sector: $25^\circ + 40^\circ = 65^\circ$.

Vertically opposite sector: 65° .

Each straight-line neighbour: $180^\circ - 65^\circ = 115^\circ$.

Check: $65^\circ + 115^\circ + 65^\circ + 115^\circ = 360^\circ$.



Contrast: touching is not enough

Two angles can touch without making a straight angle.

Before using 180° , check that their outside arms form one straight line.

In $\angle AOB$, O is the vertex because it is the middle letter.



Pause and decide

At a crossing, one sector is split into 32° and 48°

What is the first justified deduction?

Name the relationship before and calculate



A reasoned answer

$32^\circ + 48^\circ = 80^\circ$ because adjacent parts make the whole sector.

The opposite sector is 80° because vertically opposite angles are equal.

A neighbour is 100° because $180^\circ - 80^\circ = 100^\circ$.



Choose the first step

At a new crossing, one sector is split into 18° and 57° .

First: $18^\circ + 57^\circ = 75^\circ$ (parts combine)

Next: opposite 75° ; neighbour 105° (straight-line sums).



Model one game turn

Claim: "A neighbour of a 65° sector is also 65° ."

Reject the claim. Touching does not imply equality.

Correct chain: $180^\circ - 65^\circ = 115^\circ$ because the other forms a straight line.



Try a challenge

A split sector is $36^\circ + 29^\circ$.

Could its opposite be 65° and its neighbour 115° ?

Explain each decision using a named relationship.



Repair the misconception

Wrong: "Every angle at O is 65° ."

Right: only the vertically opposite sector is also 65°

Each straight-line neighbour is 115° . Check with a full turn.



Transfer to a rotated crossing

One sector is split into 41° and 24° .

Find the whole, opposite and both neighbours.

A rotated diagram does not change the marked relationships.



Choose a route

Support: mark straight lines and combine adjacent points.

Core: find every sector with a reason and full turn back.

Extension: locate and repair an unjustified claim.



Independent assessment

Solve a new split crossing without measuring as your only evidence.

Write one valid reason for every deduction.

Correct the claim that sharing a side makes two angles equal.



Check your own explanation

Did I identify the two straight lines?

Did I name a valid reason for each value?

Do all four sectors total 360° ?

What is my next learning step?



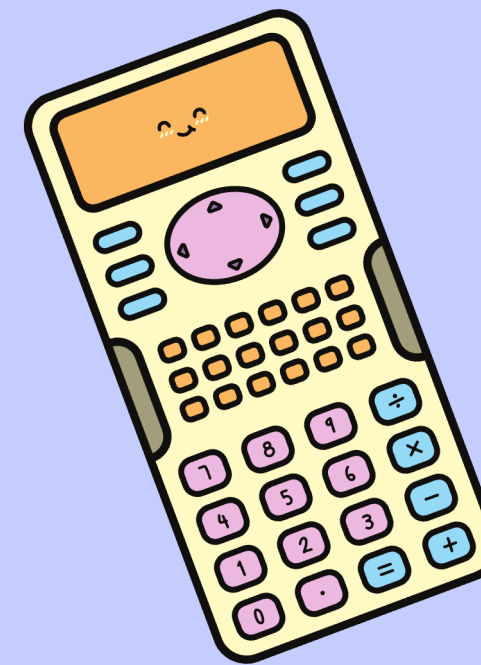
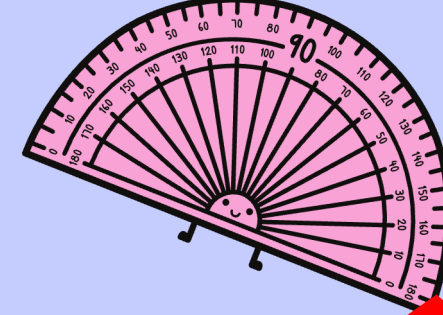
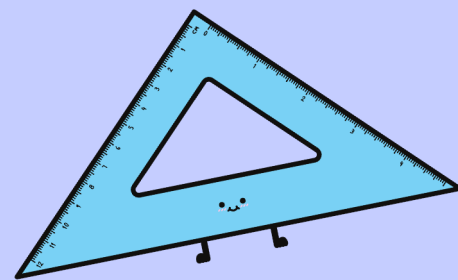
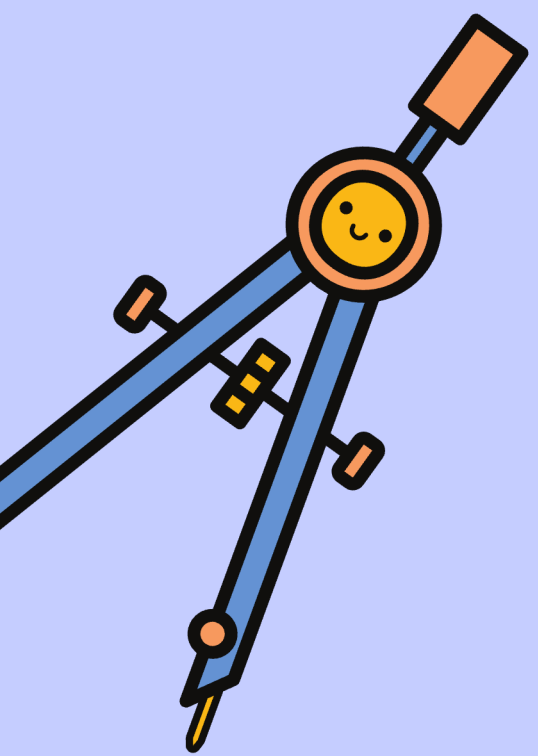
The chain to remember

Combine marked parts → use opposite equality → use straight line sum.

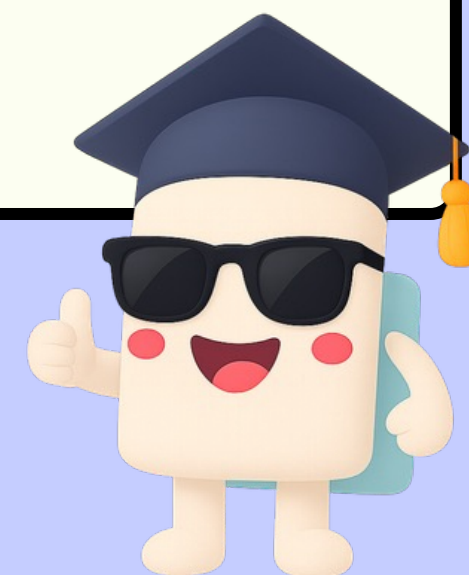
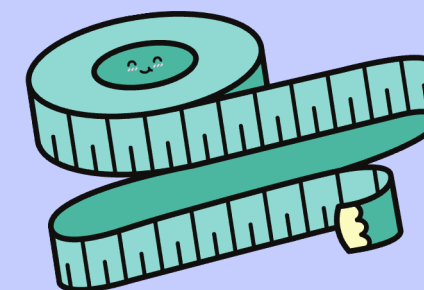
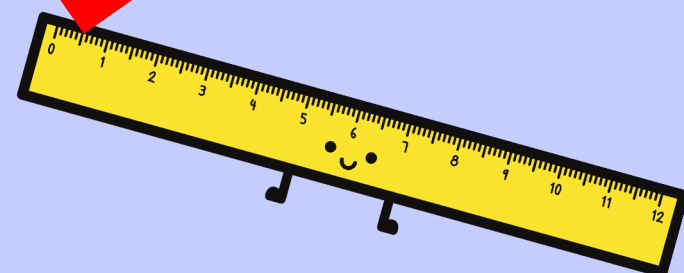
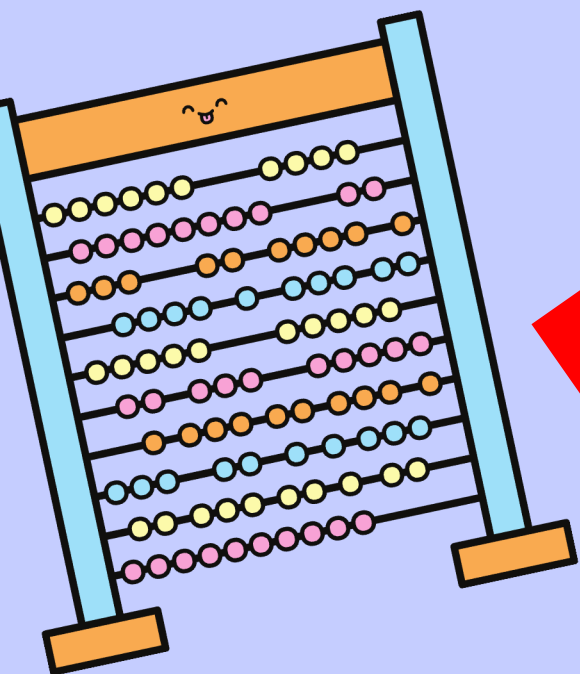
Check all sectors around the point.

If a claim skips a relationship explain the gap and repair it.





Well Done!
Explain every deduction.



Angle Reasoning Chains

Year 6



Question 1

25° and 40° partition one sector. What is the whole sector?

Pause. State a reason before revealing the answer.



Answer 1

65°. The marked adjacent parts add: $25^\circ + 40^\circ$

PREVIEW



Question 2

What is the vertically opposite sector to the 65° sector?

Pause. State a reason before revealing the answer.



Answer 2

65°. Vertically opposite angles are equal

PREVIEW



Question 3

What justifies 115° for a straight-line neighbour of 65° ?

Pause. State a reason before revealing the answer.



Answer 3

The two sectors make 180° on a straight line $180^\circ - 65^\circ = 115^\circ$.



Question 4

A sector is split into 18° and 57° . What can you deduce from this?
Pause. State a reason before revealing the answer.



Answer 4

The whole sector is 75° because $18^\circ + 57^\circ = 75^\circ$



Question 5

The same split sector has a straight-line measure of 180° . Find x .

Pause. State a reason before revealing the answer.



Answer 5

105°. The whole sector is 75°, then $180^\circ - 75^\circ = 105^\circ$



Question 6

Claim: "Every sector at O is 65° ." What is wrong?

Pause. State a reason before revealing the answer.



Answer 6

Only the opposite sector is also 65° . Each neighbour is 115° by a straight-line sum.



Question 7

A split sector is $36^\circ + 29^\circ$. Is its opposite 5° ?
Pause. State a reason before revealing the answer.



Answer 7

Yes. The whole is 65° and its vertically opposite angle is equal.



Question 8

Compare $32^\circ + 48^\circ$ with $41^\circ + 24^\circ$ at separate crossings.

Pause. State a reason before revealing the answer.



Answer 8

Wholes: 80° and 65° . Neighbours: 100° and 5° . Each chain starts by combining parts.



Question 9

A rotated crossing has a sector split $27^\circ + 3^\circ$. Find opposite and neighbour.

Pause. State a reason before revealing the answer.



Answer 9

Whole 65° ; opposite 65° ; straight-line neighbour 115° . Rotation changes
no angle fact.



Question 10

Why is the neighbour in Question 9 equal to 15° ?
Pause. State a reason before revealing the answer.



Answer 10

Its outside arms and the 65° sector make a straight angle and $180^\circ - 65^\circ = 115^\circ$.



Question 11

Claim: "These two touching angles must sum to 180° ." What must be checked?

Pause. State a reason before revealing the answer.



Answer II

Check that their outside arms form one straight line. Touching alone is insufficient.



Question 12

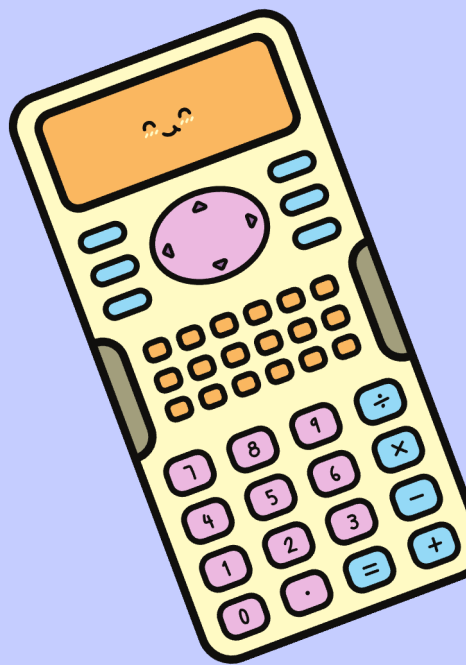
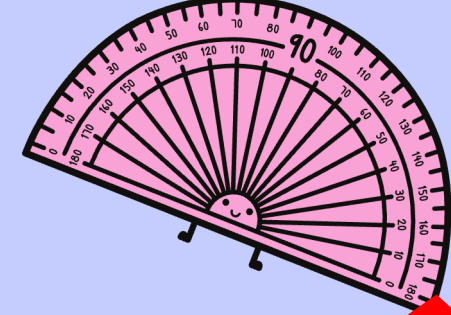
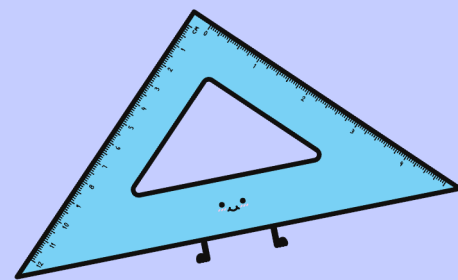
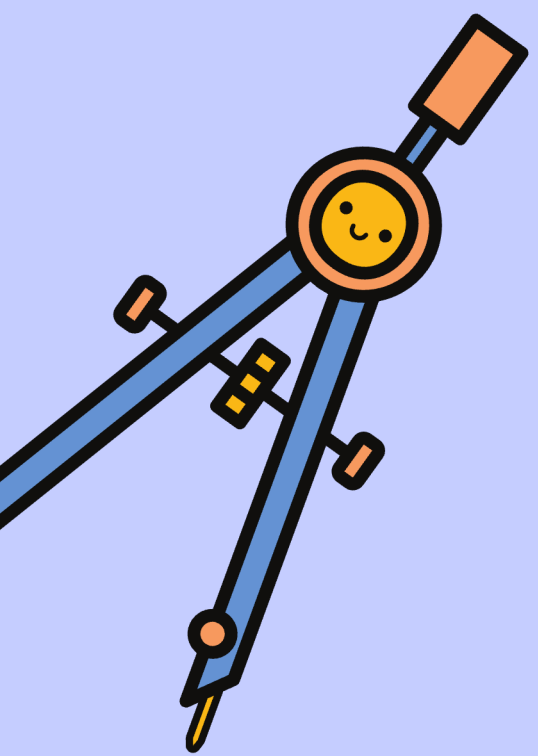
A sector is split $47^\circ + 28^\circ$. Make a two-step plan and check.
Pause. State a reason before revealing the answer.



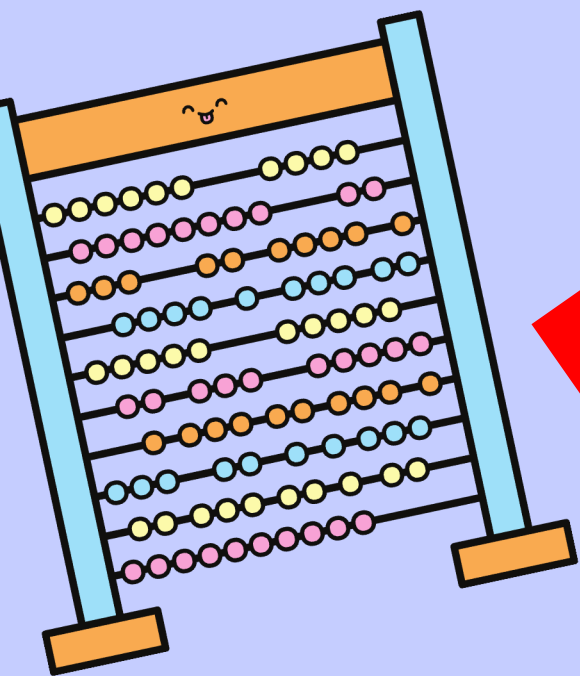
Answer 12

Whole and opposite 75° ; neighbours 105° . Check: $105^\circ + 105^\circ + 75^\circ + 105^\circ = 360^\circ$.





Well Done!
Explain every deduction.



PREVIEW

