Intersections, perpendiculars and distance — Teacher answers

Year 7, lower volume • text pp. 1–8 • textbook lessons 1–4

Use the worked and guided tasks selectively. The eight core paper tasks are prerequisites, independent tasks and exits; further practice and extensions are optional.

Ordinary route: prerequisites 4, short inquiry 5, worked/guided 8, independent 15, correction 5, exit 3 minutes. Advanced route: inquiry 18, organise 4, selected practice 13, exit 5 minutes.

Prerequisites: Recognise points, rays, straight angles, right angles and degree measures.

Ordinary route: use the first fixed case for the five-minute demonstration. Advanced route: complete the full investigation.

Inquiry and discussion: 18 minutes, paper and ruler: mark P above a horizontal line l and predict the shortest segment from P to l (3 min). Draw the perpendicular foot H, with A and B on l four equal grid squares to the left and right of H. Use the given lengths PH=3 and PA=PB=5 to compare distance with an arbitrary segment (7 min). Change only the visible segment: its left endpoint is one square right of H and its right endpoint four squares right of H. H is outside that segment but remains on line l (5 min). State the distance definition and explain why measuring a few cases is not a general proof (3 min); no coordinate notation is needed.

Worked example 1

One angle is 58°. Find its vertically opposite angle; state the reason.

Reference answer

58 °.

$$58$$

1. Use the angle relation stated in the question.
2. The required angle is $58 = 58$ degrees.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Guided attempt 2

One angle is 34°. Find its other part of the right angle; state the reason.

1. Let the missing angle be x: $x + 34 = 90$.
2. Subtract the known part: $x = 90 - \square$.
3. Complete $x = \square^\circ$ and check the sum.

Reference answer

56 °.

$$90 - 34$$

1. Use the angle relation stated in the question.
2. The required angle is $90 - 34 = 56$ degrees.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Prerequisite 3

One angle is 120°. Find its adjacent supplementary angle; state the reason.

Reference answer

60 °.

$$180 - 120$$

1. Use the angle relation stated in the question.
2. The required angle is $180 - 120 = 60$ degrees.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Prerequisite 4

Two straight lines AB and CD meet at O. Which angle is vertically opposite to $\angle AOC$?

A. $\angle BOD$ B. $\angle AOD$

C. $\angle COB$

Reference answer

$\angle BOD$

1. OA and OB are opposite rays; OC and OD are opposite rays.
2. The opposite pair is AOC and BOD.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Independent practice 5

One angle is 137°. Find its vertically opposite angle; state the reason.

Reference answer

137 °.

$$137$$

1. Use the angle relation stated in the question.
2. The required angle is $137 = 137$ degrees.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Independent practice 6

One angle is 31°. Find its other part of the right angle; state the reason.

Reference answer

59 °.

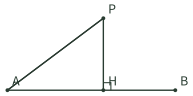
$$90 - 31$$

1. Use the angle relation stated in the question.
2. The required angle is $90 - 31 = 59$ degrees.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Independent practice 7

P is 3 cm above line AB. PH is perpendicular to AB at H, PH=3 cm and PA=5 cm. What is the distance from P to AB? Explain your choice.



Geometry diagram; not drawn to scale except for construction tasks.

Reference answer

3 cm.

$$3$$

1. Distance to a line is the perpendicular segment length, not an oblique segment.
2. PH is perpendicular, so the distance is 3 cm; PA is irrelevant to this distance.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Independent practice 8

A transversal cuts two lines. Two marked angles lie between the lines and on opposite sides of the transversal. Name the pair; no parallelism is given.

A. Same-side interior angles; always supplementary.
B. Alternate interior angles; equality is not yet justified.
C. Corresponding angles; always equal.

Reference answer

Alternate interior angles; equality is not yet justified.

1. Position identifies alternate interior angles.
2. Equal size requires an additional condition such as parallelism.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Exit question 9

Which segment length defines the distance from a point to a line?

A. Any segment ending on the line.
B. The longest segment visible in the drawing.
C. The perpendicular segment to the line.

Reference answer

The perpendicular segment to the line.

1. Distance is defined using the perpendicular foot.
2. An oblique segment is generally longer.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Exit question 10

One angle is 47°. Find its adjacent supplementary angle; state the reason.

Reference answer

$133\ ^\circ$.

$$180 - 47$$

1. Use the angle relation stated in the question.
2. The required angle is $180 - 47 = 133$ degrees.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Further practice 11

One angle is 82°. Find its vertically opposite angle; state the reason.

Reference answer

$82\ ^\circ$.

$$82$$

1. Use the angle relation stated in the question.
2. The required angle is $82 = 82$ degrees.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Further practice 12

One angle is 151°. Find its adjacent supplementary angle; state the reason.

Reference answer

29 °.

$$180 - 151$$

1. Use the angle relation stated in the question.
2. The required angle is $180 - 151 = 29$ degrees.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Further practice 13

One angle is 55°. Find its other part of the right angle; state the reason.

Reference answer

35 °.

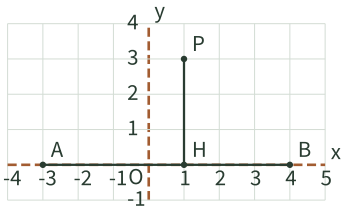
$$90 - 55$$

1. Use the angle relation stated in the question.
2. The required angle is $90 - 55 = 35$ degrees.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Further practice 14

On the coordinate grid, draw the perpendicular from P(1,3) to the horizontal line through A(−3,0), B(4,0). Label the foot H.



Use the labelled axes and unit grid.

Reference answer

$H(1, 0)$; PH is vertical.

1. A horizontal line has a vertical perpendicular through P.
2. Keep x=1 and set y=0 to reach the line.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Extension 15

A learner says PA=5 cm must be the distance to AB because A lies on AB. Use PH=3 cm, PH perpendicular to AB, to correct the claim.

Reference answer

The distance is 3 cm. An endpoint on the line does not make the segment perpendicular.

1. Compare the perpendicular with the oblique segment.
2. The given counterexample has lengths 3 and 5; only PH meets the definition.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Extension 16

Q lies on line AB. What is its distance to AB? Explain without inventing a positive gap.

Reference answer

0 cm.

$$0$$

1. Q already lies on the line.
2. The minimum distance is zero.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.