Unit 1 · Lines and Angles

HARDER PRACTICE QUESTIONS · ANSWER KEY

Full marks 35

Give the marks for the points in the marking scheme; an answer in other words that says the same is right.

1 Spot the error

ANSWER U · 3

i. QR points to the right, so its 0 is on the **inner** row. He read the outer row.
ii. $\angle PQR = \mathbf{52}°$. (The two rows always add up to 180: $180 - 128 = 52$.)
iii. The angle looks smaller than a square corner, so it must be **less than 90°**. 128° is more than 90°, so it can't be right.

MARKING SCHEME

✓ The inner row, whose 0 is on QR.
✓ 52°.
✓ An acute-looking angle must be less than 90°, and 128° isn't.

2 Angles on a clock

ANSWER A · 4

i. $360° \div 12 = \mathbf{30}°$.
ii. From 12 to 4 is 4 gaps: $4 \times 30° = \mathbf{120}°$. It is more than 90° and less than 180°, so it is **obtuse**.
iii. A right angle is $90° = 3$ gaps: **3 o'clock and 9 o'clock**.
iv. Acute means less than 90°, so fewer than 3 gaps, but not 0 gaps: **1, 2, 10 and 11 o'clock** (30° or 60°). At 12 o'clock both hands point the same way, so there is no angle.

MARKING SCHEME

✓ 30° between two numbers.
✓ 120°, obtuse.
✓ 3 o'clock and 9 o'clock.
✓ 1, 2, 10 and 11 o'clock.

3 On a straight line

ANSWER A · 4

i. The two angles on a straight line add up to 180°: $\angle BOC = 180° - 35° = \mathbf{145}°$.
ii. **Obtuse**: more than 90° and less than 180°.
iii. **Acute.** An obtuse $\angle AOC$ is more than 90°, so less than 90° is left for $\angle BOC$.
iv. **No.** Two acute angles are each less than 90°, so together they make less than 180°. They can't fill the straight line.

MARKING SCHEME

✓ 145°, from $180° - 35°$.
✓ Obtuse.
✓ Acute, since less than 90° is left.
✓ No: two acute angles make less than 180°.

4 Corners of the set squares

ANSWER

i. **Yes**: 45° and 30° side by side.
ii. **Yes**: 45° and 60° side by side.
iii. **Yes**: 90° and 30° side by side.
iv. **Yes**: the 30° corner on top of the 45° corner leaves $45° - 30° = 15°$.
v. **No.** The corners are 30°, 45°, 60° and 90°. Try every pair: no sum and no difference of two of them is 100°. With one corner of each, the nearest are $45 + 60 = 105$ and $45 + 30 = 75$.

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MARKING SCHEME HA · 5

- ✓ $75° = 45° + 30°$.
- ✓ $105° = 45° + 60°$.
- ✓ $120° = 90° + 30°$.
- ✓ $15° = 45° - 30°$.
- ✓ $100°$ can't be made, with a reason.

5 Fold it

ANSWER A · 3

i. Half of 90° is **45°**, the same as a corner of the **45° set square**.
ii. $45° + 90° = \mathbf{135°}$.
iii. **Obtuse**: more than 90° and less than 180°.

MARKING SCHEME

- ✓ 45°, the 45° set square.
- ✓ 135°.
- ✓ Obtuse.

6 Letters on squared paper

ANSWER U · 3

- **L**: perpendicular only. **H**: both (two parallel uprights, each perpendicular to the bar).
- **T**: perpendicular only. **V**: neither. Its two lines meet, but not at 90°.
- **Z**: parallel only (the top and the bottom). **N**: parallel only (the two uprights). The slanting line in Z and N meets the others, but not at 90°.

MARKING SCHEME

- ✓ L and H right.
- ✓ T and V right.
- ✓ Z and N right.

7 Slanting lines

ANSWER HA · 3

i. **PQ and RS.** Both go 3 squares across for every 2 squares up, so the gap between them stays the same all along: 4 squares straight down.
ii. **Yes.** TU goes 2 across for every 3 up, a different slant from PQ and RS. Made longer, it crosses both of them.

MARKING SCHEME

- ✓ PQ and RS are parallel.
- ✓ They go the same squares across for each square up.
- ✓ TU meets both, since its slant is different.

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8 Is it possible?

ANSWER HA · 4

i. **No.** At the two right angles, both sides go up at 90° from the base. They are perpendicular to the same line, so they are parallel and never meet. There is no third corner.
ii. **Yes.** A triangle with every side the same length has three angles of 60°.
iii. **Yes.** Every rectangle and every square has four right angles.
iv. **No.** Two lines perpendicular to the same line are parallel, like two upright lines on squared paper. Parallel lines never meet.

MARKING SCHEME

- ✓ i. No, the two sides would be parallel.
- ✓ ii. Yes, for example three angles of 60°.
- ✓ iii. Yes, a rectangle or a square.
- ✓ iv. No, they are parallel.

9 Make your own

ANSWER HA · 3

For example: A 5 squares left of B, C 2 squares left of B and 3 squares up, D 3 squares straight up from A. AB and DC are level, so **AB** ∥ **DC**. AD is upright, so $\angle A = \angle D = 90°$. BC slants, so AD and BC are not parallel.
Then $\angle B$ is about **56**°, **acute**, and $\angle C$ is about **124**°, **obtuse**. Any quadrilateral that fits both conditions is right. Its other two angles will always be one acute and one obtuse.

MARKING SCHEME

- ✓ A quadrilateral with exactly two right angles.
- ✓ Exactly one pair of parallel sides.
- ✓ The other two angles measured and named, one acute and one obtuse.

10 Think

ANSWER HA · 3

Way 1: use the **inner** row. Its 0 is at the right end, which isn't broken. Draw the base arm pointing right, put the center on the vertex, and count up the inner row to 50.
Way 2: start from another mark. Lay the base arm along the line of the outer row's 30, then count 50 more, to the outer row's 80, and mark the dot there. The angle between the two lines is $80° - 30° = 50°$.

MARKING SCHEME

- ✓ Way 1: the inner row, base arm to the right.
- ✓ Way 2: count 50 on from another mark, such as 30 to 80.
- ✓ Each way explained so it gives exactly 50°.

See it at Science Playground

Exhibits and plants at the center, Bhaktapur, that go with this unit. Book a class visit at science-playground.com/booking.

- **The Unit Circle** (exhibit): Find 0°, 90°, 180° and 270° around this circle: a whole turn is 360°. A protractor is just its top half, 0° to 180°.
- **The Compass Rose** (exhibit): Stand in the middle and turn: N to E is a right angle, N to NE an acute angle, N to SE an obtuse angle.
- **Tangram Puzzle** (exhibit): Look at the corners of the seven pieces. Each triangle has one right angle and two acute angles. Only the parallelogram has obtuse angles.

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	0	6	11	18	**35**

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