Unit 14 · Lines and Angles

HARDER PRACTICE QUESTIONS

Full marks 33

Write your answers on separate paper. Show your working, and give a reason for each answer. Use a ruler, a protractor, set squares and a compass where they help. The people and places on this sheet are made up.

1 Clock hands off the hour [4]

Shishir says: "At 3:30 the minute hand points at 6 and the hour hand at 3. That is 3 hour marks apart, so the hands make a right angle."

i. Where does the hour hand really point at 3:30?
ii. How many degrees does the hour hand turn in half an hour?
iii. Find the angle between the hands at 3:30. What kind of angle is it?
iv. At 9:15, are the hands in a straight line? Find the smaller angle between them, and the reflex angle on the other side.

2 Work backwards [3]

At a point, a reflex angle and the angle on its other side together make a full turn.

i. The reflex angle is 5 times the angle on its other side. Find both angles.
ii. The reflex angle is 100° more than the angle on its other side. Find both angles.
iii. Can the angle on the other side of a reflex angle ever be obtuse? Give a reason.

3 Two bisectors on a straight line [4]

O is a point on the straight line AB. The line OC makes $\angle AOC = 40°$. OD bisects $\angle BOC$, and OE bisects $\angle AOC$.

i. Find $\angle BOC$ and $\angle COD$.
ii. Find $\angle AOD$.
iii. Find $\angle EOD$. What kind of angle is it?
iv. Do the same with $\angle AOC = 70°$. What do you notice? Draw the figure and check with a protractor.

4 Angles from a compass [5]

With a compass and a ruler you can draw 60°, 120°, 30°, 90° and 45°, and bisect any angle you have drawn. Explain how you would draw each of these angles with a compass and a ruler only.

i. 15°
ii. 75°
iii. 135°
iv. 150°
v. Draw 75° with a compass and a ruler, then measure it with a protractor.

5 A health post for two villages [4]

Two villages, Kalpur and Simle, are 8 km apart on a straight road. A health post is to be built the same distance from both villages, and 3 km from the road.

i. Draw the road as a line segment KS = 8 cm, with 1 cm for 1 km. Construct the perpendicular bisector of KS.
ii. Why must the health post be on this perpendicular bisector?
iii. Mark the health post H on the bisector, 3 cm from KS. Measure HK and HS. How far is the health post from each village?
iv. How many places are there for the health post?

6 Lines that follow from lines [3]

p, q, r and s are straight lines drawn on one page. For each, say what you can be sure of, and why. Then draw it with set squares to check.

i. $p \perp r$ and $q \perp r$. What about p and q?

ii. $p \parallel q$ and $r \perp p$. What about r and q?

iii. $p \perp q$, $q \perp r$ and $r \perp s$. What about p and s?

7 Spot the error [3]

Niraj has to measure a reflex angle $\angle PQR$. He measures the angle on the other side of the arms with a protractor and reads 140°. He writes: reflex $\angle PQR = 180° + 140° = 320°$.

i. What did he do wrong?

ii. What is the reflex angle?

iii. Check your answer the other way: make the arm QP longer past Q. How big is the part of the reflex angle past the straight line?

8 Make your own [3]

Aisha wants an acute angle and an obtuse angle side by side on a straight line, with one arm shared.

i. The acute angle is 75°, drawn with a compass as in Question 4. What is the obtuse angle?

ii. Explain how the obtuse angle could also be drawn with a compass and a ruler, on its own.

iii. Make up your own pair that can be drawn with a compass and a ruler only, and say how.

9 Think: count the angles [4]

O is a point on the straight line AB. Three lines OC, OD and OE start from O, all on the same side of AB, in that order from A, with $\angle AOC = 30°$, $\angle COD = 50°$ and $\angle DOE = 60°$.

i. Find $\angle EOB$.

ii. How many angles less than 180° can you name at O, using any two of the lines OA, OC, OD, OE and OB? Copy and complete the table with each one and its size.

Angle	$\angle AOC$	$\angle AOD$	.....	.....	.....	.....	.....	.....	.....
Size	30°	80°	.....	.....	.....	.....	.....	.....	.....

iii. How many of them are acute, and how many obtuse?