Unit 13 · Lines and Angles

HARDER PRACTICE QUESTIONS

Full marks 35

Write your answers on separate paper. Give a reason for every angle you find: "vertically opposite", "on a straight line", "round a point". Draw a rough figure for each question first. For a construction, use only a ruler, a pencil and a compass; keep the arcs.

1 Spot the errors [4]

Monika wrote these four. Each one is wrong. Correct it, and say what went wrong.

i. The complement of 35° is 145°.

ii. The supplement of an obtuse angle is always obtuse.

iii. $\angle PQR$ lies inside $\angle PQS$. They share the vertex Q and the arm QP, so they are adjacent angles.

iv. To construct 75°, I bisected the angle between my 90° and 120° arms.

2 New angles with a compass [4]

In the unit you made 15°, 75°, 105°, 135° and 150° with a compass. Go further.

i. Explain how to construct 165°, and construct it.

ii. Explain how to construct 67.5°, and construct it.

iii. Explain how to construct 52.5°.

iv. How many times do you bisect for each of i, ii and iii? Count the bisection that makes 90° too.

3 Angle puzzles [4]

i. An angle is 4 times its complement. Find the angle.

ii. The supplement of an angle is 3 times its complement. Find the angle.

iii. Two supplementary angles differ by 36°. Find them.

iv. Can two angles be complementary if one of them is obtuse? Give a reason.

4 Three lines through one point [4]

Three straight lines AB, CD and EF all pass through O. Going round O, the arms come in the order OA, OC, OE, OB, OD, OF. $\angle AOC = 40°$ and $\angle COE = 75°$.

i. Draw the figure.

ii. Find $\angle EOB$.

iii. Find $\angle BOD$, $\angle DOF$ and $\angle FOA$.

iv. Add all six angles. Is the total what you expect?

5 The clock [4]

i. What is the angle between the lines from the center of a clock to two numbers next to each other, such as 1 and 2?

ii. Find the smaller angle between the hands at 4 o'clock and at 8 o'clock.

iii. At half past two, the hour hand is halfway between 2 and 3. Find the angle between the hands.

iv. At 3 o'clock the hands make a right angle. At which other o'clock time do they make one?

6 Four angles round a point [4]

Four angles round a point are x, $2x$, $3x$ and $4x$, in that order.

i. Find x.

ii. Find the four angles.

iii. Which pairs of them are supplementary?

iv. The arm between the x and $2x$ angles is turned so that those two angles become equal, and the other arms stay put. Find the two angles now.

7 Judge the measuring [4]

i. Prashant draws four arms OA, OB, OC and OD in that order from O, and measures $\angle AOB = 47°$, $\angle BOC = 68°$ and $\angle COD = 64°$. He says AOD is a straight line. Is he right?

ii. If $\angle COD$ had been $65°$, would he be right?

iii. Mijash measures the four angles where two straight lines cross: $62°$, $119°$, $62°$ and $117°$. They add up to $360°$. Which two measures can't both be right? Give a reason.

iv. What are the right four angles if the two $62°$ measures are correct?

8 Think: two bisectors [4]

AB is a straight line, O a point on it, and OC an arm above it. OP bisects $\angle AOC$ and OQ bisects $\angle COB$.

i. Take $\angle AOC = 50°$. Find $\angle AOP$, $\angle COQ$ and $\angle POQ$.

ii. Take $\angle AOC = 110°$ and find $\angle POQ$ again.

iii. Take $\angle AOC = x°$. Show that $\angle POQ$ is always $90°$.

iv. Draw it: a straight line, any arm OC, and both bisectors constructed with a compass. Check with a protractor.

9 Make your own [3]

i. Write a puzzle like those in Angle puzzles, about an angle and its complement or supplement, and solve it.

ii. Choose four angles round a point that can all be constructed with a compass. Check that they add up to $360°$.

iii. Draw two adjacent angles that are complementary, and give their sizes.