Unit 16 · Circle

HARDER PRACTICE QUESTIONS

Full marks 28

Write your answers on separate paper. Give a reason for each answer. Use a compass, a ruler and a protractor where they help. The people and sizes on this sheet are made up.

1 Coins in a box [3]

Coins of radius 2 cm are packed in a rectangular box, touching each other and the sides of the box.

i. Three coins lie in one row. How long and how broad is the box?

ii. Six coins lie in two rows of three, each coin of the second row straight behind one of the first. How long and how broad is the box?

iii. How many coins of radius 1.5 cm fit in one row in a box 30 cm long?

2 Two circles, one center [3]

Draw two circles with the same center O, of radius 5 cm and 3 cm.

i. How wide is the ring between them, measured along a radius?

ii. How long is the longest chord of the big circle?

iii. Can you draw a chord of the small circle 7 cm long? Why or why not?

3 Spot the error [3]

i. Rahul sets his compass with the needle on 0 and the pencil on 6 cm of his ruler, and draws a circle. He says its diameter is 6 cm. What is wrong, and what is its diameter?

ii. Shivani draws a circle of radius 4 cm and says the points P, Q and R, which are 2 cm, 4 cm and 5 cm from its center, are all on the circle. Is she right?

iii. Sana says, “Every chord is a diameter, because it goes from one side of the circle to the other.” Draw a chord to show her she is wrong.

4 Two goats [4]

Two goats are tied with ropes 3 m long to two pegs that are 5 m apart in a field. Make a drawing with 1 cm for 1 m.

i. What shape is the patch of grass each goat can reach? Draw both.

ii. Can the two goats meet? How can you tell from your drawing?

iii. Would they meet with ropes 2 m long?

iv. Both ropes are the same length. How long must they be, at least, for the goats to just meet?

5 Stepping round a circle [4]

Draw a circle of radius 3 cm. Keep the compass open at 3 cm. Put its needle on any point of the circle and mark where the pencil cuts the circle. Move the needle to that mark and do it again, all the way round.

i. How many marks do you make before you are back at the start?

ii. Join each mark to the next. What is the length of each side of the shape you get?

iii. Join each mark to the center. What is the angle between two of these radii next to each other?

iv. Join every second mark. What shape do you get?

6 Cutting a round cake [4]

A round cake is cut with straight cuts, each through the center, so that all the pieces are the same.

i. With one cut, what is each piece called?
ii. With 3 cuts, how many pieces are there? What is the angle at the center of each piece?
iii. How many cuts give 12 equal pieces? What is the angle of each piece?
iv. What is the name of each piece in ii and iii?

7 Square in a circle [3]

Draw a circle with center O and radius 4 cm. Draw a diameter AC. With a compass, draw the perpendicular bisector of AC, and mark where it meets the circle as B and D. Join A, B, C and D in order.

i. Measure the sides and the angles of ABCD. What shape is it?
ii. What can you say about its two diagonals, AC and BD?
iii. How long is the side of ABCD, to the nearest millimeter?

8 Think: find the lost center [4]

Sudarshan draws round a plate on paper, but the plate is glued down, so he can't fold the paper. He has a ruler and a compass.

i. He draws a chord PQ of the circle and its perpendicular bisector. Why must the center be somewhere on this bisector?
ii. How can he find exactly where the center is?
iii. How can he then find the plate's radius?
iv. Try it: draw round a round lid, and find its center this way.