

Instructions

- There is a 'cool off' time of 15 minutes in addition to the writing time. Use this time to get familiar with questions and plan your answers.
- Read the instructions carefully before answering the questions.
- Keep in mind, the score and time while answering the questions. Give explanations wherever necessary.
- No need to simplify irrationals like $\sqrt{2}, \sqrt{3}, \pi$ etc., using approximations unless you are asked to do so.

Answer any 3 Questions from 1 to 4. Each question carries 2 scores. ($3 \times 2 = 6$)

1. a) Write an arithmetic sequence with first term 3.
b) Find its 10th term?
2. If the length of sides of a square is increased by 2 metres, its area becomes 81 square metres. What is the length of the side of the original square?
3. In the figure, small squares of equal size are drawn and shaded in a larger square.

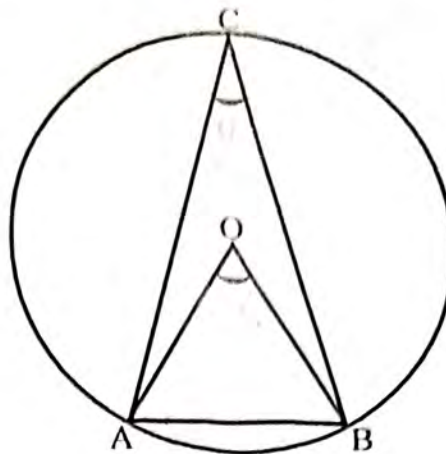


- a) How many squares can be drawn in this larger square with the same size as that of the small squares (including the shaded squares).
- b) If we put a dot in this figure without looking in to it, what is the probability that the dot would be within the shaded part?

4. In the figure $OA = AB$

a) Find $\angle AOB$.

b) Find $\angle ACB$.



Answer any 4 Questions from 5 to 10. Each question carries 3 scores. ($4 \times 3 = 12$)

5. In the arithmetic sequence 4, 7, 10, ...

a) How many times the common difference is to be added to the first term to get the 20th term?

b) Is 103 a term in this arithmetic sequence? Why?

6. The product of two consecutive multiples of 8 is 384.

a) Form a second degree equation by taking a number as x .

b) What are the numbers?

7. Numbers from 1 to 10 are written on slips of paper and put in a box. A slip is to be drawn from it.

a) What is the probability of getting a prime number?

b) What is the probability of getting a multiple of 3?

c) A slip numbered 11 is also put in this box. Then find the probability of getting an odd number?

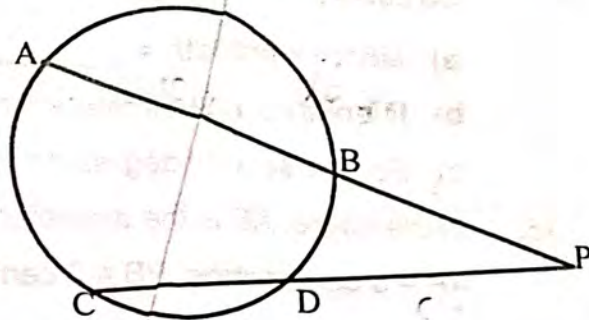
8. Draw a triangle of circumradius 4 centimetres and two of the angles are 60° and 80° .

9. a) Find the sum of first 30 natural numbers.

b) Find $2 + 4 + 6 + \dots + 60$.

c) Find $5 + 7 + 9 + \dots + 63$.

10. In the figure, chords AB and CD of the circle are extended to meet at P. AB = 10 centimetres, PD = 8 centimetres and PA = 16 centimetres.



- What is the length of PB?
- $PC \times PD =$ _____
- Find PC.

Answer any 8 Questions from 11 to 21. Each question carries 4 scores. (8 x 4 = 32)

11. A box contains 27 beads of colours red and green. If you take one bead without looking in it, the chance of it being green bead is $\frac{1}{3}$. Then,

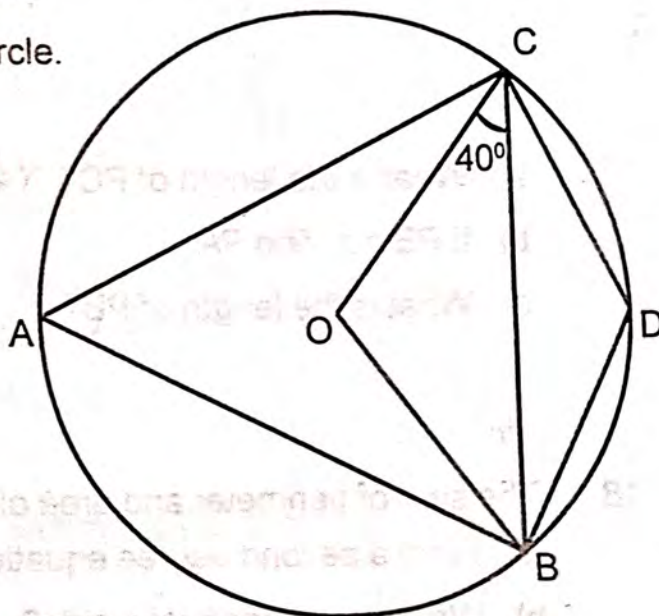
- What is the probability of getting a red bead?
- What is the number of green beads?
- What is the probability of getting a green bead, if 5 more blue beads are put in this box?

12. The 5th term of an arithmetic sequence is 21 and the 9th term is 37,

- Find the 7th term.
- Find the sum of 1st and 13th terms.
- Find the sum of first 13 terms. 442

13. In the figure, O is the centre of the circle.

$\angle OCB = 40^\circ$, then

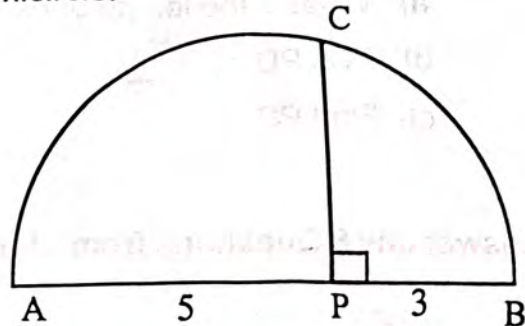


- $\angle CBO =$ _____
- $\angle BOC =$ _____
- $\angle BAC =$ _____
- $\angle BDC =$ _____

14. The perimeter of a rectangle is 24 centimetres and its area is 35 square centimetres.
- length + breadth = _____
 - If length is x centimetres, find breadth.
 - Form a second degree equation and find its length and breadth.

15. In the figure, AB is the diameter of the semicircle.

AP = 5 centimetres, PB = 3 centimetres



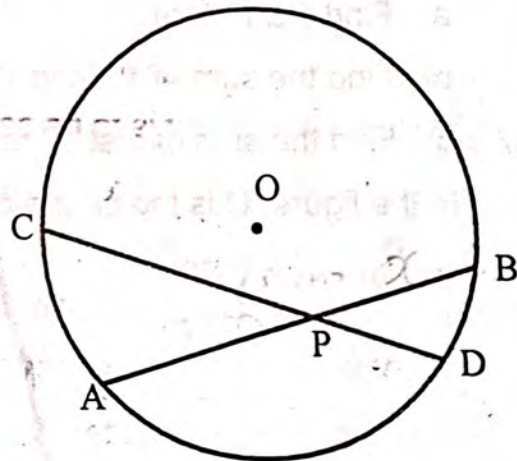
- Find PC. *15*
 - Draw an equilateral triangle with PC as a side.
16. The algebraic expression of an arithmetic sequence is $5n-3$.

- Write the arithmetic sequence.
- What is the position of 122 in this arithmetic sequence?
- Find the sum of first 25 terms.

17. In the figure chords AB and CD intersect at P.

AB = 13 centimetres, CD = 15 centimetres

PD = 3 centimetres, then



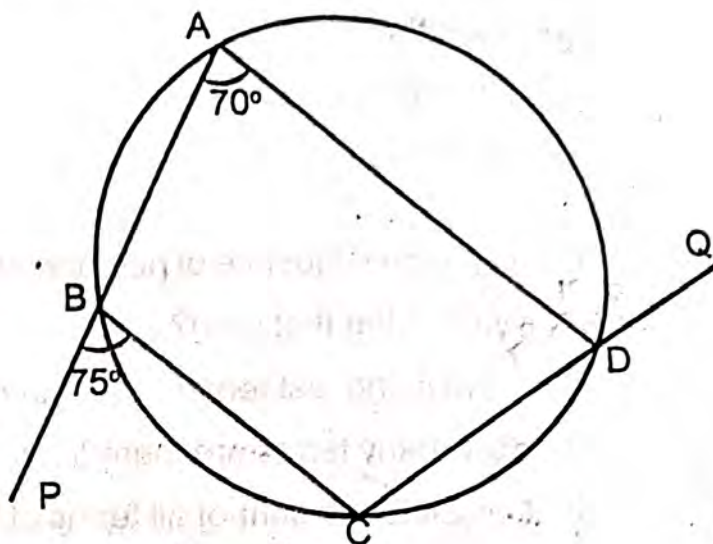
- What is the length of PC? *12*
- If $PB = x$, find PA.
- What is the length of PB?

18. The sum of perimeter and area of a square is 221.

- Form a second degree equation by taking a side as x centimetres.
- What is the length of a side?
- Calculate the area of the square.

19. In a stadium, chairs are arranged in 15 semicircles. In the first semicircle 100 chairs are arranged, in the second semicircle 110 chairs and in the third semicircle 120 chairs and so on.
- How many chairs are there in the 15th semicircle?
 - What is the total number of chairs in the stadium?
20. In the figure ABCD is a cyclic quadrilateral.

$$\angle PBC = 75^\circ, \angle BAD = 70^\circ.$$



- Find $\angle ABC$.
- Find $\angle BCD$.
- Find $\angle ADC$.
- Find $\angle ADQ$.

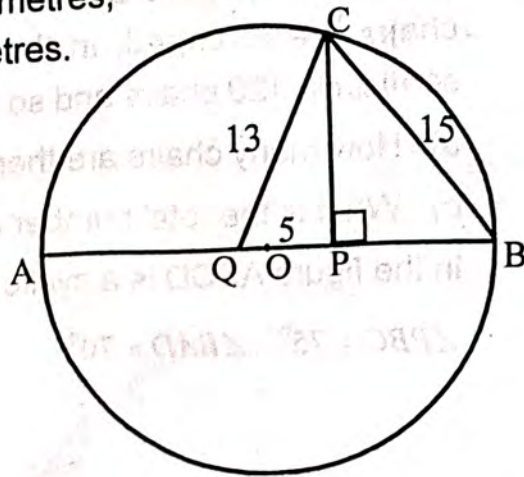
21.
 - Find the sum of first 15 terms of the arithmetic sequence 4, 9, 14, ...
 - Calculate the difference between the sum of the first 15 terms of the arithmetic sequence of 4, 9, 14, ... and 7, 12, 17, ...

Answer any 6 Questions from 22 to 29. Each question carries 5 scores. (6 x 5 = 30)

22. In a class of 60 students, 30 are boys. In another class of 50 students 20 are girls. If one student is to be selected from each class,
- How many pairs are possible?
 - What is the probability of one boy and one girl?
 - What is the probability of both being boys?
 - What is the probability of at least one girl?
23. Draw a rectangle of sides 6 centimetres and 4 centimetres. Draw a square of area equal to the area of this rectangle.
24. Consider the arithmetic sequence 7, 11, 15, ...
- Write its algebraic expression.
 - What is the remainder when each terms of the sequence is divided by the common difference?
 - Prove that the square of all the terms of the arithmetic sequence 4, 7, 10, ... do not belong to this sequence.

25. In the figure, AB is the diameter of the circle of centre O.

PC is perpendicular to AB. QC = 13 centimetres,
CB = 15 centimetres and PQ = 5 centimetres.

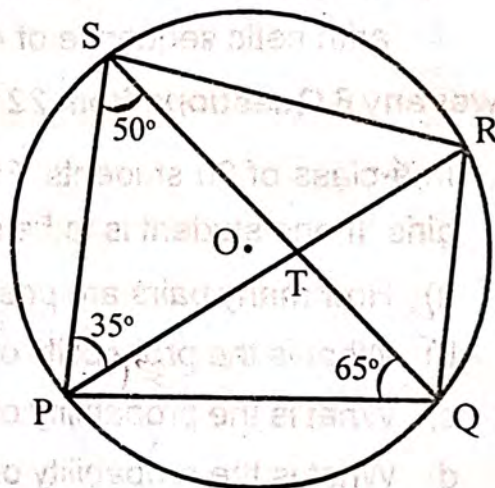


- Find PC.
- Find PB.
- $PA \times PB =$ _____
- Find AB.

26. Consider the sequence of numbers between 5 and 250 which are multiples of 4.

- What is the first term?
- What is the last term?
- How many terms are there?
- Calculate the sum of all terms of the sequence.

27. In the figure PQRS is a cyclic quadrilateral. Chords PR and QS intersect at a point T. $\angle PSQ = 50^\circ$, $\angle SPR = 35^\circ$, $\angle PQS = 65^\circ$



- Find $\angle PRQ$.
- Find $\angle PRS$.
- Find $\angle RQS$.
- Find $\angle QPR$.
- Find $\angle PSR$.

28. The algebraic expression of the sum to n terms of an arithmetic sequence is $2n^2 + 3n$.

- Find the first term of this arithmetic sequence.
- Find the common difference.
- Write the algebraic expression of this arithmetic sequence.
- Find the sum of the first 25 terms of this arithmetic sequence.

29. The powers of 2 cannot be written as the sum of consecutive natural numbers.
 $2^0=1, 2^1=2, 2^2=4, 2^3=8, 2^4=16, \dots$

Look at the pattern given below.

$$\begin{aligned}2^0 + 2^1 &= 1 + 2 &= 3 &= 2^2 - 1 \\2^0 + 2^1 + 2^2 &= 1 + 2 + 4 &= 7 &= 2^3 - 1 \\2^0 + 2^1 + 2^2 + 2^3 &= 1 + 2 + 4 + 8 &= 15 &= 2^4 - 1 \\..... \\..... \\.....\end{aligned}$$

Continuing like this,

a) Write the next line of the pattern.

b) $2^0 + 2^1 + 2^2 + 2^3 + \dots + 2^{10} = \underline{\hspace{2cm}}$

c) $2^0 + 2^1 + 2^2 + 2^3 + \dots + \underline{\hspace{2cm}} = 2^{21} - 1$

d) $2^0 + 2^1 + 2^2 + 2^3 + \dots + 2^n = \underline{\hspace{2cm}}$

e) $2^0 + 2^1 + 2^2 + 2^3 = 2^4 - 1 = 16 - 1 = 15$

15 is written as the sum of powers of 2, similarly,
write 63 as the sum of powers of 2.