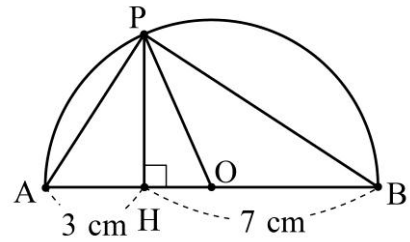


[Pre-2nd Kyu] Section 2: Application Test

1

The diagram on the right shows a semicircle whose center is O and diameter is line segment AB . Point P lies on arc AB and point H lies on AB such that PH is perpendicular to AB , $AH=3$ cm and $BH=7$ cm.



- (1) Find the lengths of line segments OP and PH . Write only your answer.
- (2) Find the ratio of the lengths of line segment PA to line segment PB , $PA : PB$.

2

Answer the following.

- (3) For two consecutive odd numbers, prove that the square of the smaller odd number subtracted from the square of the larger odd number is equal to 4 times the even number between the two odd numbers. *(Proof skill)*

3

Consider the quadratic equation $x^2 + x + a = 0$, where a is a constant.

- (4) If one of the roots of the quadratic equation is 5, find the value of a and the other root. Write only your answer.

4

Let x cm be the radius of a sector whose perimeter is 20 cm.

- (5) Express the length of the arc using x . Write only your answer.
- (6) Find the radius of the sector such that the area of the sector has the maximum value. Also find the maximum area.

5

A die numbered 1 to 6 is rolled 3 times.

- (7) Find the probability that the same number is on the top face on the 1st and 2nd rolls and a different number is on the top face on the 3rd roll.

6

For $\triangle ABC$, $AB=2$, $AC=3$ and $\sin A = \frac{\sqrt{15}}{4}$ for $90^\circ < A < 180^\circ$.

(8) Find the area of $\triangle ABC$. Write only your answer.

(9) Find the length of side BC.

7

Answer the following.

(10) Find all sets of integers, (x, y, z) , satisfying the following equality. Write only your answer. *(Organizing skill)*

$$x^6 + y^6 + z^6 = 3xyz$$