Mathematics

M.M: 25
Time: 1 Hour

1 The diagram shows a regular octagon of side length 1 metre. In square metres, what is the area of the shaded region? (1)

A) $1 + \sqrt{2}$ B) $\frac{1}{2}(1 + \sqrt{2})$

C) $\sqrt{2}$ D) 4
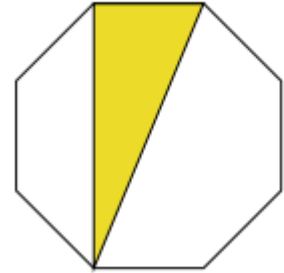
2 Cards marked with numbers 3, 4, 5, ………… 50 are placed in a box and mixed thoroughly. One card is drawn at random from the box. Find the probability that number on the drawn card is divisible by 7. (1)

A) $\frac{9}{48}$ B) $\frac{7}{52}$ C) $\frac{7}{48}$ D) $\frac{6}{48}$

3 The diagram shows a square with sides of length a . The shaded part of the square is bounded by a semicircle and two quarter-circle arcs. What is the shaded area? (1)
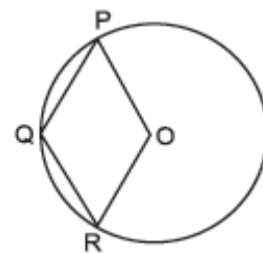
A) a^2 B) $\frac{a^2}{4}$ C) $\frac{a^2}{8}$ D) $\frac{1}{2} a^2$
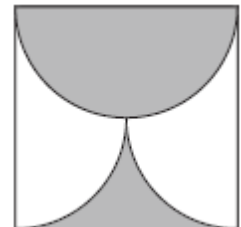
4 What is the unit digit of the number? $2015^2 + 2015^0 + 2015^1 + 2015^5$ (1)

A) 1   B) 6   C) 5   D) 7

5   In the given figure, OPQR is a rhombus, three of whose vertices lie on a circle with centre O. If the area of the rhombus is $32 \sqrt{3}$ cm^2, find the radius of the circle. (1)

A) 5   B)   4   C) 8   D) $2\sqrt{3}$

6   The radii of two cylinders are in the ratio 2 : 3 and their heights are in the ratio 5 : 3. Find the ratio of their volumes. (1)

    A) 2 : 7   B) 5 : 9   C) 20 : 27   D) 20 : 9

7   Find the sum: $(-5) + (-8) + (-11) + \ldots \ldots\ldots + (-230)$. (1)

    A) -8930 B) -8030 C) 8930   D) -8900

8   The numbers x and y satisfies the equation $x(y + 2) = 100$, $y(x + 2) = 60$. Find $x - y$. (1)

    A) 20   B) 25   C) 21   D) 18

9   $P(x) = x + \sqrt{x^2 + 1} + \dfrac{1}{x - \sqrt{x^2 + 1}}$. What is the value of $P(2022)$? (1)

   A) 1   B) 2022   C) 2021   D) 0

10   One of the following number is prime . Which is it? (1)
    A) $2021 - 3$ B) $2021 - 2$ C) $2021 - 4$ D) $2021 + 1$

11.   What value of x makes the mean of the first three numbers in this list equal to the mean of the last four?   15,   5, x,   7,   9,   17. (1)
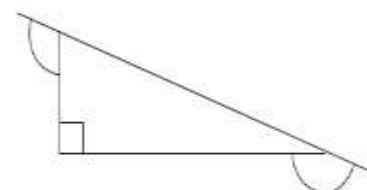
    A) 18   B) 17   C) 19   D) None of these

12   In the number pyramid shown each number is the sum of the two numbers immediately below. What number should appear in the left hand cell of the bottom row? (1)
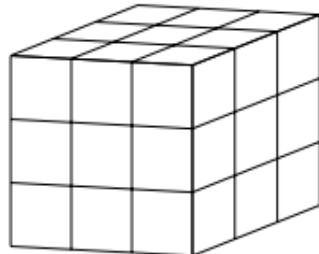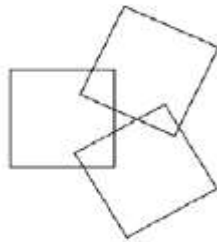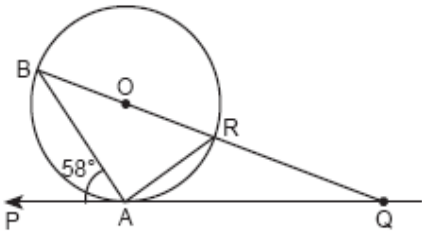
             2039
                2020
        ?   2017
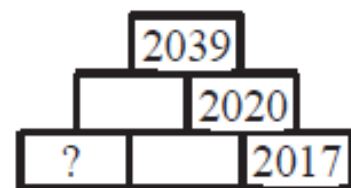
    A) 21   B) 20   C) 22   D) 16

13   The triangle in the diagram contains a right angle. What is the sum of the other two marked angles on the diagram? (1)

    A) 270°   B) 250°
    C) 230°   D) 260°

14 How many integers are greater than $20 + 18$ and also less than 20×18 ?   (1)

   A) 320   B) 321   C) 322   D) 319

15 This solid is built from small cubes. How   (1)
   many small cubes cannot be seen from this
   view?

   A) 4   B) 8
   C) 16   D) None of these

16 Point P divides the line segment joining the points A (2, –5) and B (5, 2) in the   (1)
   ratio 2 : 3. Name the quadrant in which P lies.

   A) II quadrant   B) III quadrant   C) IV quadrant   D) I quadrant

17 If $\dfrac{4^7 + 4^7 + 4^7 + 4^7}{2^7 + 2^7} = 2^x$ then $x = ?$ (1)

   A) 4   B) 8   C) 6   D) 1

18 Three congruent squares overlap as shown. The   (1)
   area of the three overlapping sections are 2 cm^2,
   5cm^2 and 8 cm^2 respectively. The total area of
   the non-overlapping parts of the square is 117
   cm^2 . What is the side-length of each square?

   A) 3   B) 5   C) 7   D) 9

19 In figure, O is the centre of the circle; PQ is a   (1)
   tangent to the circle at A. If $\angle$ PAB = 58°, find
   $\angle$ ABQ.

   A) 52°   B) 32°
   C) 42°   D) None of these

20

Inside a square of area $36\ cm^2$, there are shaded regions as shown. The total shaded area is 27 cm^2 . What is the value of $p + q + r + s$?
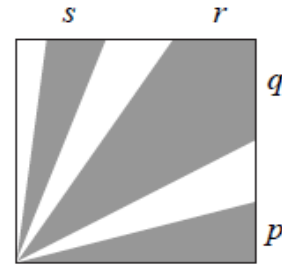
A) 9   B) 8   C) 10   D) 11

(1)

21 A cube of side 4 cm contains a sphere touching its faces. Find the volume of the gap in between.

A) $64\left(\frac{6-\pi}{3}\right)$ B) $32\left(\frac{2-\pi}{3}\right)$ C) $32\left(\frac{3-\pi}{3}\right)$ D) None of these

(1)

22 Find the value of x such that $(x + 2^{2020})^2 - (x - 2^{2020})^2 = 2^{2021}$
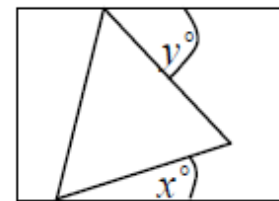
A) $\frac{1}{2021}$ B) $\frac{1}{2}$ C) $\frac{1}{4}$ D) 2020

(1)

23 Four identical small rectangles are put together to form a large rectangle as shown. The length of a shorter side of each small rectangle is 10 cm. What is the length of a longer side of the large rectangle?
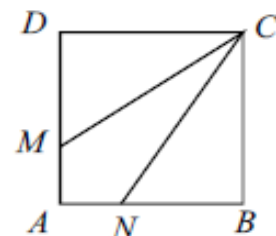

A) 20   B) 30   C) 40   D) 50

(1)

24

The diagram shows an equilateral triangle inside a rectangle. What is the value of $x + y$?

A) 120°   B) 90°   C) 60°   D) 300°

(1)

25 Square ABCD has sides of length 3 cm. The points M and N lie on AD and AB so that CM and CN split the square in to three pieces of the same area. What is the length of DM?

A) 2 cm   B) 1 cm   C) 0.5 cm   D) 1.5 cm

(1)