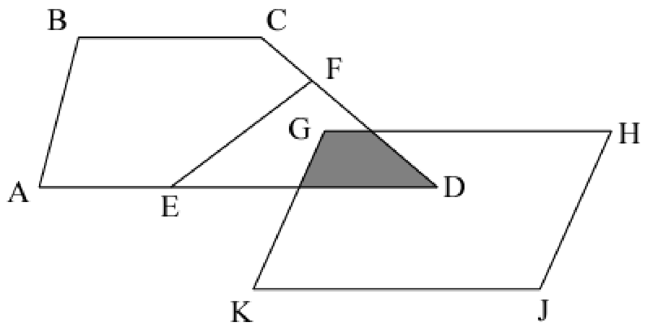
SECTION A : 30 QUESTIONS (+4, 0)

In this section, only one option is correct and correct answer will fetch +4 marks, NO answer or wrong answer will fetch zero marks.

1. Given that $xyz = 2015$, and x, y and z are positive integers, how many possible triples (x, y, z) are there?
(A) 5 (B) 15 (C) 27 (D) 2015

2. In the figure below, the ratio of the trapezium ABCD to the area of the triangle DEF to the area of parallelogram GHJK is 4 : 2 : 3. Given that $\frac{1}{3}$ of the area of ΔDEF is shaded, find the ratio of the area of the shaded region to the total area of the unshaded regions of the figure.



(A) 2 : 11 (B) 2 : 17 (C) 2 : 21 (D) 2 : 27

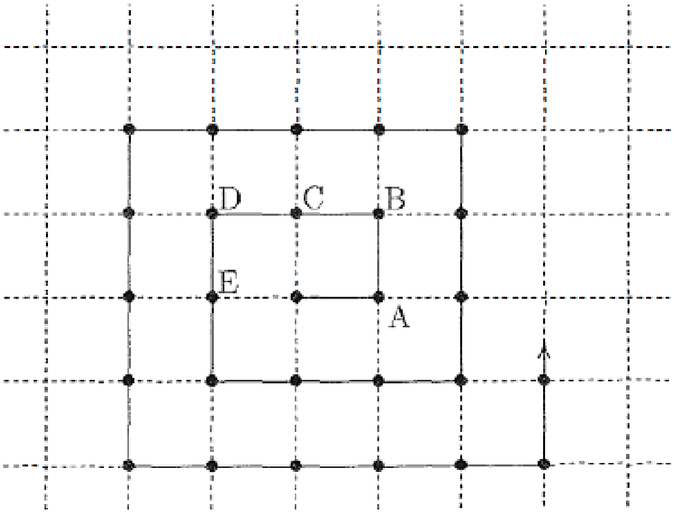
3. How many four-digit numbers of the from X56Y are divisible by 24?
(A) 1 (B) 3 (C) 4 (D) 6

4. Johnny has 35 toys. He divides them into 5 piles to that each pile has a different number of toys. Find the smallest possible number of toys in the biggest pile.
(A) 7 (B) 8 (C) 9 (D) 10

SPACE FOR ROUGH WORK

5. Suppose 3 distinct numbers are chosen from 1, 2, ……, $3n$ with their sum equal to $3n$. What is the largest possible product of those 3 numbers?
(A) $n^3 - n$ (B) $n^3 + n$ (C) $n^3 - 7n + 6$ (D) $n^3 - 7n - 6$

6. You walk a spiraling maze on the Cartesian plane as follows: starting at (0, 0) and the first five stops are at A (1, 0), B (1, 1), C (0, 1), D (–1, 1) and E (–1, 0). Your ninth stop is at the point (2, –1) and so on (seet he diagrma below). What is the x-coordinate of the point which out would arrive at on your 2005-th stop?



(A) (3, 22) (B) (3, –22) (C) (–3, 22) (D) None

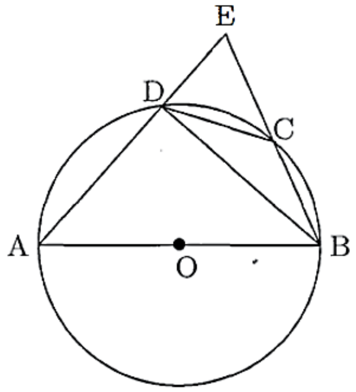
7. Suppose that a, b, c are distinct numbers such that $(b-a)^2 - 4(b-c)(c-a) = 0$, then the value of $\frac{b-c}{c-a}$ is
(A) 1 (B) 2
(C) –1 (D) Can't be determined uniquely

SPACE FOR ROUGH WORK

8. Let $m \neq n$ be two real numbers such that $m^2 = n+2$ and $n^2 = m+2$.
Find the value of $4mn - m^3 - n^3$.
(A) 1 (B) 0 (C) –1 (D) None

9. How many pairs of integers (*x*, *y*) satisfy the equaiton $\sqrt{x}+\sqrt{y}=\sqrt{200600}$?
(A) 10 (B) 11
(C) 1 (D) No integral pair possible

10. In the following figure, *AB* is the diameter of a circle with centre at *O*. It is given that $AB = 4$ cm, $BC = 3$ cm, $\angle ABD = \angle DBE$. Suppose the area of the quadrilateral *ABCD* is x cm^2 and the area of ΔDCE is y cm^2. Find the value of the ratio $\frac{x}{y}$.



(A) 7 (B) 8 (C) 4 (D) 5

SPACE FOR ROUGH WORK

11. *ABCD* is a rectangle. Through *C* a variable line is drawn so as to cut *AB* at *X* and *DA* produced at *Y*. Then $BX \times DY$ is
(A) twice the area of the rectangle *ABCD*.
(B) equal to the area of the rectangle *ABCD*.
(C) a variable quantity which lies between the area of rectangle *ABCD* and twice the area of the rectangle *ABCD*.
(D) always a constant less than the area of rectangle *ABCD*.

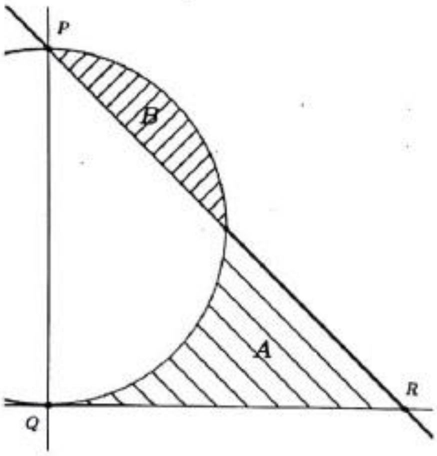
12. The number of positive integral values of (*x*, *y*) which satisfy the equations $\sqrt[3]{x}+\sqrt[3]{y}=4, x+y=28$ simultaneously is
(A) 1 (B) 2 (C) 0 (D) 3

13. The number of real solutions of the equaiton $x+\sqrt{x^2+\sqrt{x^3+1}}=1$ is
(A) 1 (B) 2 (C) 3 (D) 0

14. Nine numbers are written in ascending order. The middle number is the average of the nine numbers. The average of the five largest numbers is 68 and the average of the five smallest numbers is 44. The sum of all numbers is
(A) 560 (B) 504 (C) 112 (D) 122

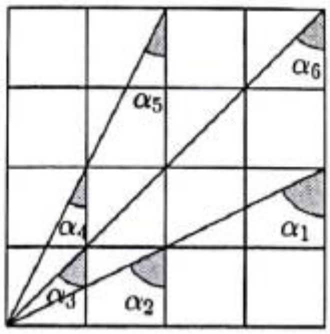
SPACE FOR ROUGH WORK

15. In the figure, $PQ = 42$ cm. QR is the tangent to the semicircle at Q. If the differneece of the area of regions A, B is 357, then the base QR of the right triangle PQR is (in cm). Take $\pi = \frac{22}{7}$.



(A) 42 (B) 48 (C) 52 (D) 50

16. Observe the angles $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5$ and α_6 in the square grid shown in figure below. The measure of $(\alpha_1 + \alpha_2 + \alpha_3 + \alpha_4 + \alpha_5 + \alpha_6)$ is



(A) 180° (B) 270° (C) 360° (D) 225°

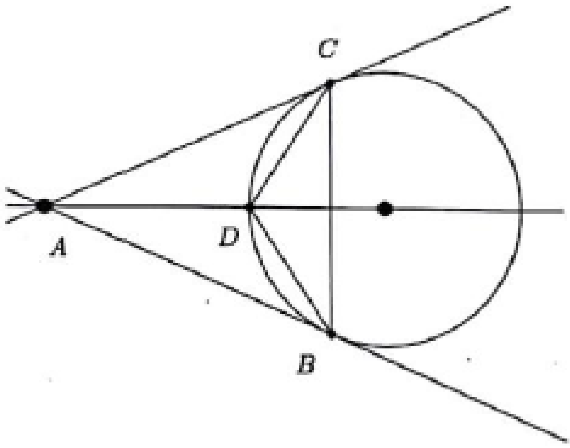
SPACE FOR ROUGH WORK

17. A, B and C run for a race on a straight road of x meters. A beats B by 30 meters B beats C by 20 meters, A beats C by 48 meters. Then x (in meters) is
(A) 150 (B) 200 (C) 300 (D) 500

18. When a = 2015 and b = 2016, the value of $\dfrac{a\sqrt{a}+b\sqrt{b}}{\left(\sqrt{a}+\sqrt{b}\right)(a-b)}+\dfrac{2\sqrt{b}}{\sqrt{a}+\sqrt{b}}-\dfrac{\sqrt{ab}}{a-b}$ is
(A) 0 (B) 1 (C) $(2015)^2$ (D) $\sqrt{2016}$

19. The probability that a given positive integer lying between 1 and 100 (both inclusive) is NOT divisibel by 2, 3 or 5 is ______.
(A) 0.26 (B) 0.45 (C) 0.35 (D) 0.22

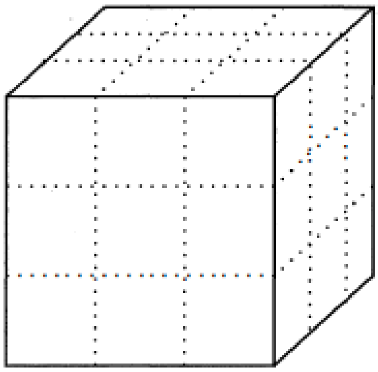
20. AB and AC are tangents at B and C to a circle. D is the mid point of the minor arc BC. For the triangle ABC, D is



(A) orthocenter (B) circumcenter (C) incenter (D) centroid

SPACE FOR ROUGH WORK

21. A carpenter wishes to cut a wooden $3\times3\times3$ cube into twenty seven $1\times1\times1$ cubes. He can do this easily by making 6 cuts thorugh the cube, keeping the pieces together in the cube shape as shown:



What is the minimum number of cuts needed if he is allowed to rearrange the pieces after each cut?

(A) 3 (B) 4 (C) 5 (D) 6

22. Find the value of $\dfrac{(1\times2\times3)+(2\times4\times6)+(3\times6\times9)+....+(335\times670\times1005)}{(1\times3\times6)+(2\times6\times12)+(3\times9\times18)+....+(335\times1005\times2010)}$.

(A) $\frac{1}{3}$ (B) $\frac{2}{3}$ (C) $\frac{1}{6}$ (D) $\frac{1}{2}$

23. If a, b, c and d are real numbers such that $\dfrac{b+c+d}{a}=\dfrac{a+c+d}{b}=\dfrac{a+b+d}{c}=\dfrac{a+b+c}{d}=r$, find the value of r.

(A) 1 (B) –1 (C) 3 or 1 (D) 3 or –1

SPACE FOR ROUGH WORK

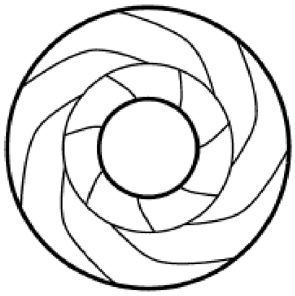
24. Suppose $N_1, N_2, ... N_{2011}$ are positive integers. Let

$$X = (N_1 + N_2 + ... + N_{2010})(N_2 + N_3 + ... + N_{2011}),$$
$$Y = (N_1 + N_2 + ... + N_{2011})(N_2 + N_3 + ... + N_{2010}).$$

Which one of the following relationships always holds?

(A) $X = Y$ (B) $X > Y$ (C) $X < Y$ (D) $X - N_1 < Y - N_{2011}$

25. The following annulus is cut into 14 regions. Each region is painted with one colour. What is the minimum number of colours needed to paint the annulus so that any no two adjacenet regions share the same colours?



(A) 3 (B) 4 (C) 5 (D) 6

26. Among the four statements on integers below,

"If $a < b$ then $a^2 < b^2$"; "$a^2 > 0$ is always true";

"$-a < 0$ is always true"; "If $ac^2 < bc^2$ then $a < b$",

How many of them are correct?

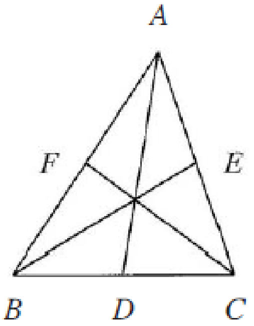
(A) 0 (B) 1 (C) 2 (D) 3

27. In a school, all 300 secondary 3 students study either Geography, Biology or both Geography and Biology. If 80% study Geography and 50% study Biology, how many students study both Geography and biology?

(A) 30 (B) 60 (C) 80 (D) 90

SPACE FOR ROUGH WORK

28. How many triangles can you find in the followign figure?



(A) 7 (B) 10 (C) 12 (D) 16

29. Let x, y and z be non-negative numbers. Suppose $x+y=10$ and $y+z=8$. Let $S=x+z$.
What is the sum of the maximum and the minimum value of S ?
(A) 16 (B) 18 (C) 20 (D) 24

30. If $p=\frac{11233456}{12233456}$ & $q=\frac{11233466}{12233466}$, then identify the correct statement
(A) $p<q$ (B) $p>q$ (C) $p=q$ (D) None

SPACE FOR ROUGH WORK