INTERNATIONAL MATHEMATICS OLYMPIAD 2014

Class IX

Questions : 50 Time: 60 Minutes

There are 4 sections, 15 questions in Section-1, 20 questions in Section-2, 10 questions in Section-3, 5 question in Section-4.

SET A

Section-1 - Logical Reasoning

1. Two rows of numbers are given. The resultant of each row is to be worked out separately based on the following rules, and the question below the rows of numbers is to be answered. The operations of numbers in each row progress from left to right.

Rules:

(i) If an odd number is followed by another odd number, they are to be multiplied.

(ii) If an even number is followed by another even number, the first number is to be divided by the second even number.

(iii) If an even number is followed by the perfect square of an odd number, the first number is to be subtracted from the second number.

(iv) If an odd number is followed by an even number, the two are to be added.

(v) If an even number is followed by an odd number which is not a perfect square, the square of the odd number is to be added to the even number.

9	15	50
12	25	24

If the resultant of first row is x and that of second row is y, then find the value of $x + y$.

A. 18 B. 8

C. 5 D. 6

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2. A cube of side 10 cm is coloured red with a 2 cm wide green strip along all the sides on all the faces. Now, the cube is cut into 125 smaller cubes of equal size. How many cubes have three green faces each?

A. 0

B. 4

C. 6

D. 8

3. Pointing to a woman in a photograph, a man says "She is the grandmother of the son of my daughter-in-law's mother-in-law." How is the woman related to the man?

A. Mother
B. Mother-in-law
C. Sister
D. Wife

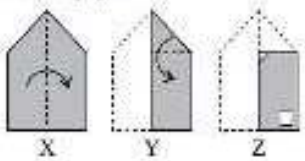
4. *P*, *Q* and *R* are three points on the ground. Point *P* is North of point *Q* and $\angle PQR$ is 135° in anticlockwise direction. In what direction is point *R* from point *Q*?

A. North-East
B. North-West
C. South-East
D. South-West

5. If all the consonants starting from B are given sequentially the value of even numbers such as B = 2, C = 4 and so on, and all the vowels are given double the value of the preceding vowel and the value of A is 5, then what is the value of REASONING?

A. 162 B. 177
C. 185 D. 187

6. A set of three figures X, Y and Z shows a sequence of folding of a piece of paper. Figure (Z) shows the manner in which the folded paper has been cut. Select the figure from the options which would resemble the unfolded form of paper.



A. 

B. 

C. 

D. 

7. Select the figure in which Figure (X) is exactly embedded as one of its part.

Figure (X)

A. 

B. 

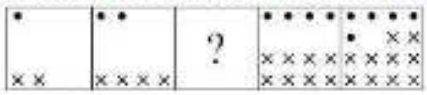
C. 

D. 

8. Two positions of a dice are shown below. What number will be opposite to the number 4?

A. 5
B. 6
C. 3
D. 1

9. Select a figure from the options which will replace the question mark to complete the given series.



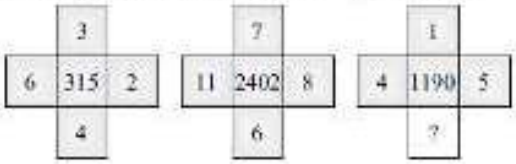
A. 

B. 

C. 

D. 

10 A set of figures carrying certain characters, is given. Assuming that the characters in each set follow a similar pattern, then find the missing character.



A. 1
B. 2
C. 6
D. 10

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11. Find the odd one out.
A. 18 : 108
B. 42 : 132
C. 22 : 112
D. 26 : 156

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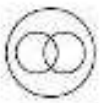
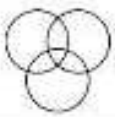
12 Which of the following Venn diagrams best represents the relationship amongst, "Honesty, Intelligence, Aptitude"?

A. 

B. 

C. 

D. 

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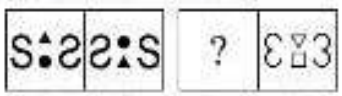
13. There is a definite relationship between figures P and Q. Establish a similar relationship between figures R and S by selecting a suitable figure from the options that would replace (?) in figure R.



P Q R S

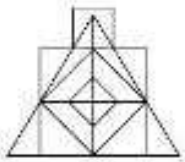
A. 

B. 

C. 

D. 

14. Count the number of straight lines and squares in the given figure.



A. 21 straight lines, 7 squares
B. 18 straight lines, 8 squares
C. 17 straight lines, 8 squares
D. 19 straight lines, 8 squares

15. Select a figure from the options which satisfies the same conditions of placement of the dots as in Figure (X).

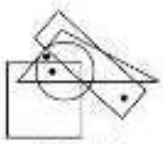
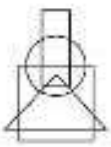
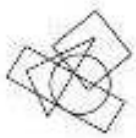
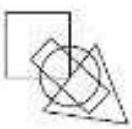
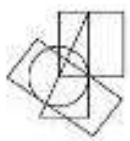


Figure (X)

A. 

B. 

C. 

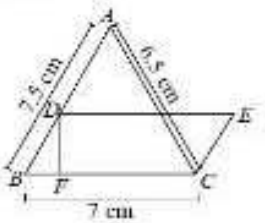
D. 

16. Find the value of $\dfrac{9^{3/2}-3\times 5^{0}-\left[\frac{1}{81}\right]^{-1/2}}{\left(\frac{64}{125}\right)^{-2/3}+\frac{1}{\left(\frac{256}{625}\right)^{1/4}}-\left(\frac{\sqrt{25}}{\sqrt[3]{64}}\right)}$

A. $\frac{15}{13}$
B. 0
C. $\frac{16}{5}$
D. $\frac{48}{13}$

17. Evaluate:
$(2x - y + 3z)(4x^2 + y^2 + 9z^2 - 2xy + 3yz - 6xz)$
A. $8x^3 - y^3 + 27z^3 - 18xyz$
B. $8x^3 - y^3 - 27z^3 + 18xyz$
C. $8x^3 + y^3 + 27z^3 + 18xyz$
D. $8x^3 + y^3 - 27z^3 + 18xyz$

18. In the given figure, ΔABC has sides $AB = 7.5$ cm, $AC = 6.5$ cm and $BC = 7$ cm. On the base BC a parallelogram $DBCE$ of area same as that of ΔABC is constructed. Find the height DF of the parallelogram.



A. 3 cm
B. 5 cm
C. 6 cm
D. 7 cm

19. If $x^2 + \frac{1}{x^2} = 98$, then find the value of $x^3 + \frac{1}{x^3}$.

A. 890
B. 970
C. 990
D. 1110

20. Simplify: $\frac{2}{\sqrt{5}-\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{2}}-\frac{3}{\sqrt{5}+\sqrt{2}}$

A. 3
B. 2
C. 4
D. 0

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21. Euclid stated that all right angles are equal to each other in the form of a/an _____

A. Axiom
B. Defination
C. Postulate
D. Proof

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22. If $2^x = 4^y = 8^z$ and $\left(\frac{1}{2x}+\frac{1}{4y}+\frac{1}{6z}\right)=\frac{24}{7}$, then the value of z is

A. $\frac{7}{16}$
B. $\frac{7}{32}$
C. $\frac{7}{48}$
D. $\frac{7}{64}$

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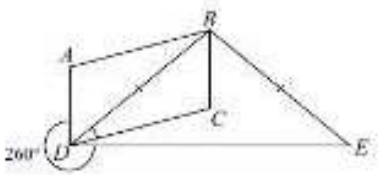
23. In the given figure, $ABCD$ is a rectangle. $BD = BE$, $\angle BED = 40°$ and $\angle EDA = 260°$. Find $\angle CDB$.



A. 25°
B. 30°
C. 40°
D. 45°

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24. Fill in the blanks:
If a straight line falling on two straight lines makes the interior angles on the same side of it taken together _____ than two right angles, then the two straight lines, if produced indefinitely, meet on that side on which the sum of angles is less than _____ right angles.

A. Less, three
B. More, two
C. Less, two
D. More, one

25. The weight, in kg, of 50 students are given below.

40	45	55	62	50	51	56	69	61	36
60	56	69	38	35	63	57	50	57	48
40	63	53	64	47	42	56	51	42	60
55	39	64	57	61	44	66	35	59	59
73	62	49	63	37	63	54	72	44	60

Find the mean, median and mode respectively for the given data

A. 55 kg, 57 kg, 64 kg
B. 55 kg, 57 kg, 62 kg
C. 53.92 kg, 56 kg, 63 kg
D. None of these

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26. Select the correct match.

A. When $x = 5$, $y = 2.5$ and when $y = 5$, $x = 10$, then x and y are inversely proportional.
B. When $x = 10$, $y = 5$ and when $x = 20$, $y = 2.5$, then xy = constant.
C. If x and y vary inversely, then on decreasing x, y will decrease in proportion.
D. If x and y vary directly, then on decreasing x, y will increase in proportion.

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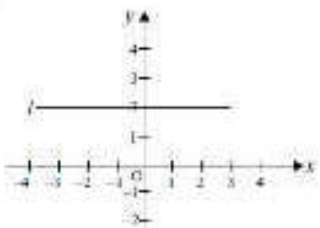
27. Study the given graph and answer the following question.



Calculate the area enclosed by the lines l, $x = -3$, $y = -2$ and $y = -x + 2$.

A. 16 sq. units
B. 19 sq. units
C. 20 sq. units
D. 22 sq. units

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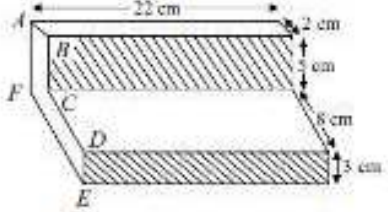
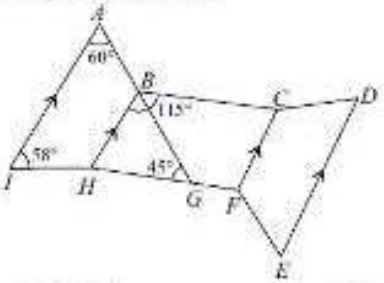
28. In the given figure, the shape of a solid copper piece (made up of two pieces with dimensions as shown in the figure) is shown. The face $ABCDEFA$ is the uniform cross-section. Assume that the angles at A, B, C, D, E and F are right angles. Calculate the volume of the piece.



A. 528 cm^2 B. 880 cm^2
C. 580 cm^2 D. 940 cm^2

29. Study the figure shown here (not drawn to scale). If ABG is a straight line, then find $\angle ABH$ and reflex $\angle ABC$ respectively.



A. 110°, 220° B. 120°, 225°
C. 120°, 235° D. 110°, 215°

30. The value of π upto 35 decimal places is given below

3.14159265358979323846264338327950288

Find the probability of occurring 8 in it.

A 1/3 B 1/5
C 5/36 D 1/7

31. John is of the same age as Mohan. Ram is also of the same age as Mohan. State the Euclid's axiom that illustrates the relative ages of John and Ram.

A. First Axiom B. Second Axiom
C. Third Axiom D. Fourth Axiom

32. The given question is followed by three statements. You have to study the question and all the three statements to decide whether any information provided in the statement(s) is/are redundant and can be dispensed with while answering the given question.
What is the marked price of the suitcase?

I. When a discount of 15% is offered, the profit earned is 10.5%.

II. The cost price of the suitcase is ₹ 1500.

III. The marked price is 30% above the cost price.

A. I only

B. Either I or III

C. Any one of the three

D. All I, II and III are required

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33. The area of the triangle formed by the points $A(2, 0)$, $B(6, 0)$ and $C(4, 6)$ is _____.

A. 24 sq. units B. 12 sq. units

C. 10 sq. units D. None of these

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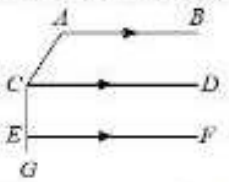
34. In the given figure, $AB \parallel CD \parallel EF$. CE is joined and produced to G. If $\angle BAC = 130°$, $\angle ACE = 140°$, then find $\angle DCE$ and $\angle FEG$ respectively.



A. 50°, 130° B. 90°, 90°

C. 140°, 40° D. 45°, 135°

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35. Find the value of a and b respectively, if

$$\frac{5+\sqrt{3}}{7-4\sqrt{3}} = 47a + \sqrt{3}b$$

A. 2, 1

B. 1, 27

C. 11, 28

D. 2, 38

36. A alone can complete a work in 16 days and B alone in 12 days. Starting with A, they work on alternate days. The total work will be completed in

A. 12 days
B. 13 days
C. $13\frac{5}{7}$ days
D. $13\frac{3}{4}$ days

37. A sum of ₹ 1550 is lent out into two parts, one at 8% and another one at 6%. If the total annual income is ₹ 106, then find the money lent at each rate.

A. ₹ 750, ₹ 800
B. ₹ 600, ₹ 950
C. ₹ 650, ₹ 900
D. ₹ 850, ₹ 750

38. If 6 years are subtracted from the present age of Gagan and the remainder is divided by 18, then the present age of his grandson Anup is obtained. If Anup is 2 years younger to Madan whose age is 5 years, then what is Gagan's present age?

A. 48 years
B. 60 years
C. 84 years
D. 96 years

39. A certain factory employed 600 men and 400 women and the average wage was ₹ 25.50 per day. If a woman got ₹ 5 less than a man, then what is the daily wage of a man and woman respectively?

A. ₹ 25; ₹ 20
B. ₹ 27.50, ₹ 22.50
C. ₹ 30, ₹ 25
D. ₹ 32.50, ₹ 27.50

40. A man earns ₹ 20 on the first day and spends ₹ 15 on the next day. He again earns ₹ 20 on the third day and spends ₹ 15 on the fourth day. If he continues to save like this, then how soon will he have ₹ 60 in hand?

A. On 17th day
B. On 27th day
C. On 30th day
D. On 24th day

41. The price of rice is reduced by 2% per kg. How many kilograms of rice can now be bought for the money which was sufficient to buy 49 kg of rice earlier?

A. 48 kg
B. 49 kg
C. 50 kg
D. 51 kg

42. In a bag, there are coins of 25 paise, 10 paise and 5 paise in the ratio of 1 : 2 : 3. If there are ₹ 30 in all, then how many 5 paise coins are there?

A. 50
B. 100
C. 150
D. 200

43. A man, a woman and a boy can complete a job in 3, 4 and 12 days respectively. How many boys must assist 1 man and 1 woman to complete the job in $\frac{1}{4}$ of a day?

A. 1
B. 4
C. 19
D. 41

44. The average age of 15 students of a class is 15 years. Out of these, the average age of 5 students is 14 years and that of the other 9 students is 16 years. The age of the 15th student is _____.

A. 11 years
B. 14 years
C. 15 years
D. $15\frac{2}{7}$ years

45. Village X has a population of 68000, which is decreasing at the rate of 1200 per year. Village Y has a population of 42000, which is increasing at the rate of 800 per year. In how many years will the population of the two villages be equal?

A. 12
B. 13
C. 14
D. 15

Section-4 – Achievers Section

46. Which of the following statements is INCORRECT?

A. If the altitudes of a triangle are equal, then it is equilateral.
B. If in a triangle, two sides are unequal, then the angle opposite to the longer side is greater than the angle opposite to the shorter side.
C. In a triangle, side opposite to the larger angle is longer than the side opposite to the smaller angle.
D. In a triangle, altitude from the vertex bisects the base.

47. The polynomial $p(x) = x^3 - 2x^2 + 3x^2 - ax + 3a - 7$ when divided by $x + 1$ leaves the remainder 19. Find
(a) the value of a.
(b) the remainder when $p(x)$ is divided by $x + 2$.

	(a)	(b)
A.	1	13
B.	3	48
C.	5	62
D.	8	43

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48. Fill in the blanks
In coordinate geometry, the coordinate axes divide the plane into four parts called __P__. The point of intersection of the axes is called __Q__. The sign of abscissa and ordinate will be same in __R__ and __S__ quadrants.

	P	Q	R	S
A.	Quadrant	x axis	II	III
B.	Quadrant	origin	I	III
C.	Quadrant	origin	I	IV
D	Quadrant	origin	I	II

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49. Which of the following options hold?
Statement-1 : If any two angles and non-included side of one triangle are equal to the corresponding angles and side of another triangle, then the triangles are congruent (AAS congruence criterion)
Statement-2 : If in two right triangles, hypotenuse and one side of a triangle, are equal to the hypotenuse and one side of other triangle, then the two triangles are congruent (RHS congruence criterion).
A. Statement-1 is true but statement-2 is false.
B. Statement 1 is false but statement 2 is true.
C. Both the statements are true.
D. Both the statements are false.

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50. Which of the following statements is INCORRECT for a parallelogram?
A. Opposite sides are equal.
B. Opposite angles are equal.
C. Opposite angles are bisected by the diagonals.
D. Diagonals bisect each other.