MATHS

BOOKS - HT Olympiad Previous Year Paper

IMO QUESTION PAPER 2016 SET A

Mathematical Reasoning

1. The factors of $8a^3 + b^3 - 6ab + 1$ are

$$(2a + b - 1)(4a^2 + b^2 + 1 - 3ab - 2a)$$

$$(2a - b + 1)(4a^2 + b^2 - 4ab + 1 - 2a + b)$$

$$(2a + b + 1)(4a^2 + b^2 + 1 - 2ab - b - 2a)$$

$$(2a - 1 + b)(4a^2 + 1 - 4a - b - 2ab)$$

A. $(2a + b - 1)(4a^2 + b^2 + 1 - 3ab - 2a)$

B.

$$(2ab - b + 1)(4a^2 + b^2 - 4ab + 1 - 2a + b)$$

C.

$$(2a + b + 1)(4a^2 + b^2 + 1 - 2ab - b - 2a)$$

D. $(2a - 1 + b)(4a + 1 - 4a - b - 2ab)$

Answer: C

2. If $x^4 + \dfrac{1}{x^4} = 47$, Find the value of $x^3 + \dfrac{1}{x^3}$

A. 7

B. 18

C. 6

D. 12

Answer: B

3. A solid iron rectangular block of dimensions $(2.2m \times 1.2m \times 1m)$ is cast into a hollow cylindrical pipe of internal radius $35cm$ and thickness $5cm$. Find the length of the pipe

A. 20.5 m

B. 24.5 m

C. 22.4 m

D. 18.4 m

Answer: C

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4. Which of the following is a true statement?

A. Only a unique line can be drawn to pass

through a given point

B. Infinitely many lines can be drawn to pass

through two given points.

C. If two circles are equal, then their radii are

equal.

D. A line has a definite length.

Answer: C

5. The mean of 25 numbers is 8. If 2 is added to every number, what will be the new mean?

A. 10

B. 6

C. 8

D. 12

Answer: A

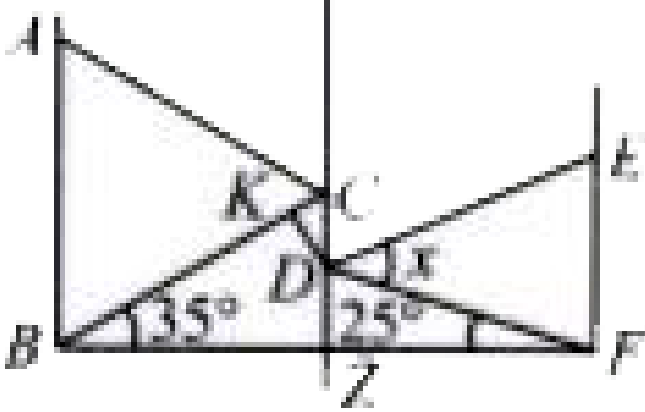**6.** In the given figure, it is given that

(i) $AB \perp BF, CZ \perp BF$ and $EF \perp BF$

(ii) AC= BC

(iii) KD is perpendicular to BC and DE.

Find the measure of x.

A. $75°$

B. $30°$

C. $60°$

D. $45°$

Answer: C

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7. The perimeter of a triangle is $6p^2 - 4p + 9$ and two of its sides are $p^2 - 2p + 1$ and $3p^2 - 5p + 3$. Find the third side of the triangle.

A. $8p^2 + 11p - 7$

B. $2p^2 + 3p + 5$

C. $3p^2 + 5p - 4$

D. $5p^2 - 5p + 9$

Answer: B

8. Each edge of a cube is increased by 50%. Find the percentage increase in the surface area of the cube.

A. 125

B. 50

C. 100

D. 150

Answer: A

9. Three statements are given below:

I. In a ||gm, the angle bisectors of two adjacent angles enclose a right angle.

I. The angle bisectors of a ||gm form a rectangle.

III. The triangle formed by joining the midpoints of the sides of an isosceles triangle is not necessarily an isosceles triangle.

Which is true?

    A. (i) only

    B. (ii) only

C. (i) and (ii) only

D. (ii) and (iii) only

Answer: C

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10. $\sqrt{\dfrac{9^{\left(r+\frac{I}{4}\right)}\sqrt{3.3^{-r}}}{3.\sqrt{3^{-r}}}} = k$, then the value of k is

A. 3

B. 3^2

C. 3^3

D. $r\sqrt{3}$

Answer: B

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11. Based on the given information, find the probability of people with age 60, 61 & 64 who

can drive

Age (in years)	Number of persons of different age who can drive the car
60	16090
61	11490
62	8012
63	5448
64	3607
65	2320

A. $\dfrac{36071}{41490}$

B. $\dfrac{31187}{46967}$

C. $\dfrac{31232}{41149}$

D. $\dfrac{31232}{41609}$

Answer: B

12. In the given figure ABCD and EF∥DQ. Determine $\angle QDP$, $\angle AED$ and angleDEF` respectively.
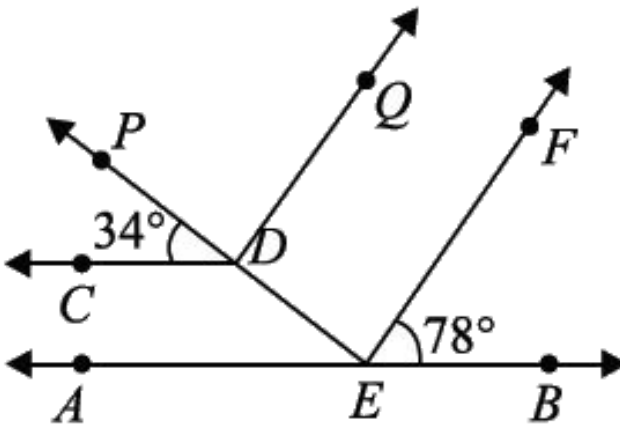
A. $34°$, $68°$, $68°$

B. $68°$, $34°$, $68°$

C. $68°$, $68°$, $68°$

D. $34°$, $34°$, $68°$

Answer: B

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13. Water flows in a tank $150m$ x $100m$ at the base, through a pipe whose cross-section is $2dm$ by $1.5dm$ at the speed f $15\ km\ per\ hour$. In what time, will the water be $3\ metres\ deep$?
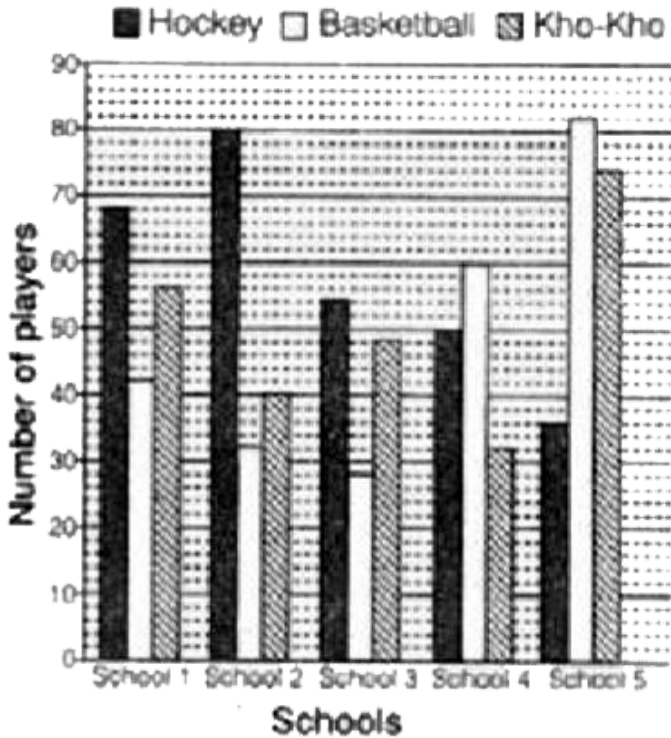
A. 50 hrs

B. 150 hrs

C. 100 hrs

D. 200 hrs

Answer: C

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Hockey ☐ **Basketball** ▨ **Kho-Kho**

Number of players vs Schools

14.

Number of players participating in Kho Kho from school 4 is what percent of number of player participating in hockey from school 2
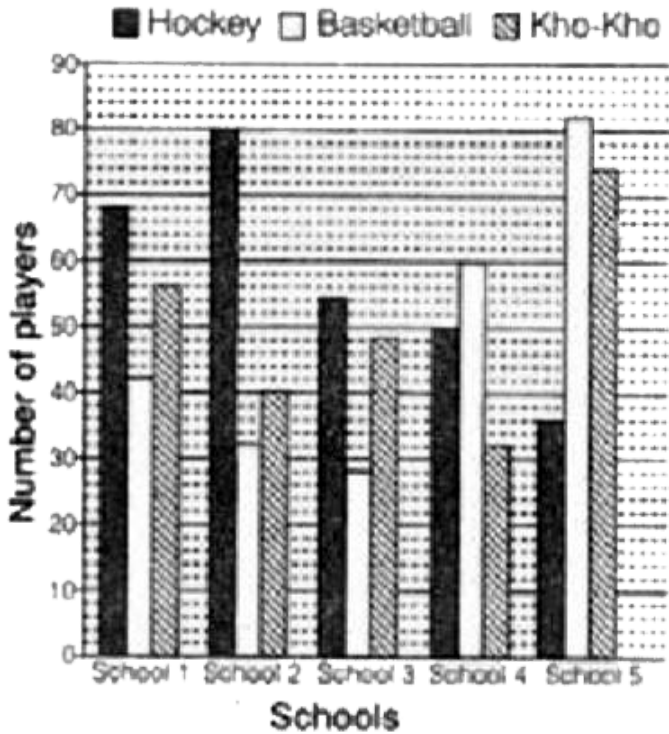
A. 42

B. 48

C. 36

D. 40

Answer: D

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Hockey ◼ Basketball ☐ Kho-Kho ◪

Number of players (y-axis), Schools (x-axis): School 1, School 2, School 3, School 4, School 5

15.

25% of the numbers of the players participating in hockey from school 5 are females. What is the number of the hockey players who are males in school 5
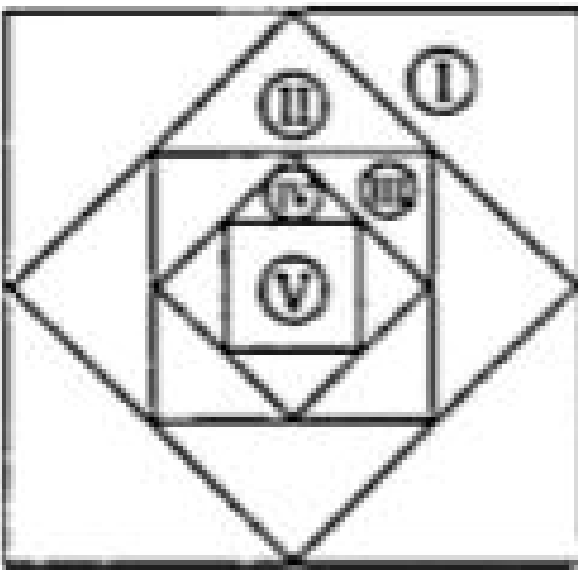
A. 15

B. 18

C. 30

D. 27

Answer: D

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16. In the figure shown square II is formed by joining the mid-points of square I

and so on . In this way total five squares are drawn . The sides of the square I is 'a' cm.

What is the perimeter of all the five squres ?

A. $\dfrac{\left(4\sqrt{2}+1\right)a}{\left(\sqrt{2}+1\right)}$

B. $\dfrac{5}{6}a$

C. $\left(7+3\sqrt{2}\right)a$

D. None of these

Answer: C

17. Two men start from points A and B respectively, 42 km apart. One walks from A to B at 4 km/hr and another walks from B to A at a certain uniform speed. They meet each other after 6 hours. Find the speed of the second man.

A. 3 km/hr

B. 5 km/hr

C. 7 km/hr

D. 8 km/hr

Answer: A

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18. The sides of a triangle are in the ratio 13:14: 15 and its perimeter is 84 cm. Find the area of the triangle.

A. $226cm^2$

B. $412cm^2$

C. $162cm^2$

D. $336cm^2$

Answer: C

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19. If $x = \dfrac{1}{2 - \sqrt{3}}$, find the value of $x^3 - 2x^2 - 7x + 5$
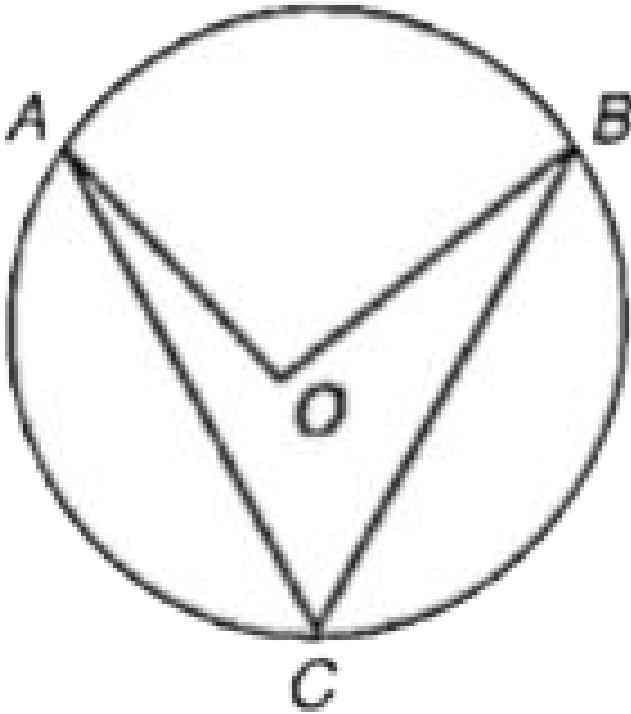
A. 2

B. 1

C. 4

D. 3

Answer: D

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20. In the adjoining figure 'O' is the centre of circle. $\angle CAO = 25°$ and $\angle CBO = 35°$. What

is the value of $\angle AOB$?

A. $55°$

B. $110°$

C. $120°$

D. Data insufficient

Answer: C

Everyday Mathematics

1. Eight people are planning to share equally the cost of a rental car. If one person withdraws from the arrangement and the others share equally the entire cost of the car, then the share of each of the remaining persons increases by:

A. $\dfrac{1}{9}$

B. $\dfrac{1}{8}$

C. $\dfrac{1}{7}$

D. $\dfrac{7}{8}$

Answer: C

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2. The cost price of an article 'A' is ₹ 160 and selling price of another article B is ₹ 240. If the selling price of A will be equal to the cost price

of B, then, the profit after selling A is $20\,\%$

What is the profit on 'B'?

A. $16.66\,\%$

B. $50\,\%$

C. $25\,\%$

D. None of these

Answer: C

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3. Twenty women can do a work in sixteen days. Sixteen men can complete the same work in fifth days. What is the ratio between the capacity of man and a woman ? $3:4$ b. $4:3$ c. $5:3$ d. Data inadequate

   A. $3:4$

   B. $3:5$

   C. $5:3$

   D. None of these

Answer: D

4. Average age of 6 sons of a family is 8 years. Average age of sons together with their parents is 22 years. If the father is older than the mother by 8 years, the age of mother (in years) is :

A. 44 years

B. 52 years

C. 60 years

D. 68 years

Answer: C

5. A train travelling at 48 kmph completely crosses another train having half its length and travelling in opposite direction at 42 kmph, in 12 seconds. It also passes a railway platform in 45 seconds. The length of the platform is $400\ m$ b. $450\ m$ c. $560\ m$ d. $600m$

A. 400 m

B. 450 m

C. 560 m

D. 600 m

Answer: A

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6. A well with 10 m inside diameter is dug 14 m deep. Earth taken out of it is spread all a round to a width of 5 m to form an embankment. Find the height of embankment.

A. 2.46 m

B. 3.56 m

C. 4.66 m

D. 5.76 m

Answer: C

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7. In a mixture of 60 litres, the ratio of milk and water is 2:1. If this ratio is to be 1: 2, then the quantity of water to be further added is:

A. 20 litres

B. 30 litres

C. 40 litres

D. 60 litres

Answer: D

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8. The fluid cortained in a bucket can fill four large bottles or seven small bottles. A full large bottle is ussed to fill an empty small bottle.

What fraction of the fluid is left over in the large battle when the small one is full ?

A. $\dfrac{2}{7}$

B. $\dfrac{3}{7}$

C. $\dfrac{4}{7}$

D. $\dfrac{5}{7}$

Answer: B

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9. A moneylender borrows money at 4% per annum and pays the interest at the end of the year. He lends it at 6% per annum compound interest compounded half yearly and receives the interest at the end of the year. In this way he gains Rs. 104.50 a year. The amount of money he borrows, is

   A. Rs. 4500

   B. Rs. 5000

   C. Rs. 5500

   D. Rs. 6000

Answer: B

10. After spending 40% in machinery, 25% in building, 15% in raw material and 5% on furniture, Harilal had a balance of Rs.52200. The money with him was _____.

    A. Rs. 260000

    B. Rs. 289000

    C. Rs.348000

D. Rs. 556000

Answer: C

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Achievers Section

1. Following are the steps of construction of a ΔPQR, given that OR = 3 cm, $\angle POR = 45°$ and QP - PR = 2 cm. Arrange them and select the correct option.

(i) Make an angle XQR = $45°$ at point of base QR.

(ii) Join SR and draw the perpendicular bisector of SR say AB.

(iii) Draw the base QR of length 3 cm.

(iv) Let bisector AB intersect QX at P. Join PR.

(v) Cut the line segment QS = QP - PR = 2 cm from the ray ox A.

A. $(iii) \rightarrow (ii) \rightarrow (i) \rightarrow (v) \rightarrow (iv)$

B. $(iii) \rightarrow (i) \rightarrow (ii) \rightarrow (v) \rightarrow (iv)$

C. $(iii) \rightarrow (i) \rightarrow (ii) \rightarrow (iv) \rightarrow (v)$

D. $(iii) \rightarrow (i) \rightarrow (v) \rightarrow (ii) \rightarrow (iv)$

Answer: D

2. Fill in the blanks.

(P) Any point lying on x-axis is of the form _____.

(Q) The abscissa of a point on y-axis is _____.

(R) The point at which the two coordinate axes meet is called the _____.

(S) The perpendicular distance of the point (4, 5) from x-axis is _____.

(T) The perpendicular distance of the point (3, 7) from y-axis is _____.

	(P)	(Q)	(R)	(S)	(T)
A.	$(0, y)$	1	origin	5	3
B.	$(x, 0)$	0	origin	5	3
C.	$(x, 0)$	0	origin	3	5
D.	$(0, y)$	1	origin	3	5

Answer: B

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3. State True (T) or False (F).

(P) In a $\triangle ABC$, if E is the midpoint of median AD, then ar($\triangle BED$) $= \dfrac{1}{8}$ ar($\triangle ABC$).

(Q) A parallelogram and a rectangle on the same base and between the same parallels are equal in area.

(R) If a triangle and a parallelogram are on the same base and between the same parallels, then the ratio of the area of the triangle to the area of the parallelogram is 1 : 2.

(S) In a trapezium ABCD, it is given that AB||DC

and the diagonals AC and BD intersect at O.

Then, ar(ΔAOB) = ar(ΔCOD).

A.
(P)	(Q)	(R)	(S)
F	T	F	T

B.
(P)	(Q)	(R)	(S)
T	F	F	T

C.
(P)	(Q)	(R)	(S)
T	F	T	F

D.
(P)	(Q)	(R)	(S)
F	T	T	F

Answer: D

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4. A die is rolled. If the number on the die is even, then a coin is tossed once and if the number on the die is odd, then a coin is tossed twice. Match the events in Column I with their probabilities in Column II.

	Column I		Column II
(P)	Probability that 2 heads appears	(1)	$\dfrac{2}{3}$
(Q)	Probability that at least 1 head appear	(2)	0
(R)	Probability that a die shows an even number and a coin shows exactly two heads	(3)	$\dfrac{1}{6}$
(S)	Probability that a die shows an odd number and a coin shows at least one tail	(4)	$\dfrac{1}{2}$

	(P)	(Q)	(R)	(S)
A.	1	2	3	4
B.	3	1	2	4
C.	3	2	1	4
D.	4	3	2	1

Answer: B

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5. The volume of the space inside a right circular conical tent is $138\frac{2}{7}m^3$ and its vertical height is 4 m. Find the canvas required to make

the tent and also find the cost of the canvas at the rate of Rs.120 per m^2.

A. $126.3m^2$, Rs. 15164.16

B. $126.3m^2$, Rs. 15156

C. $136.2m^2$, Rs. 16344

D. $142.3m^2$, Rs. 17076

Answer: B

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