



MATHS

BOOKS - HT Olympiad Previous Year Paper

IMO QUESTION PAPER 2016 SET B

Mathematical Reasoning

1. Directions (Questions 508 to 509): These questions are based on the following information: 85 children went to an amusement park where they could ride on merry-go-round, roller coaster and Ferris wheel. It was known that 20 of them took all the three rides and 55 of them have taken at least two of the three rides. Each ride costs Re 1, and the total receipt of

the amusement park was Rs 145. How many children took exactly one ride? (a) 5 (b) 10 (c) 15 (d) 20

A. 10

B. 20

C. 25

D. 15

Answer: A



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2. If x, y are rational numbers and $\frac{5 + \sqrt{11}}{3 - 2\sqrt{11}} = x + y\sqrt{11}$.

The values of x and y are

A. $\frac{37}{35}, \frac{-13}{35}$

B. $\frac{37}{35}, \frac{13}{35}$

C. $\frac{-37}{35}, \frac{-13}{35}$

D. $\frac{-37}{35}, \frac{13}{35}$

Answer: C



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3. For a group of 32 students food lasts for 45 days . For how many days will the same food last for 72 students ?

A. 13

B. 40

C. 20

D. 6

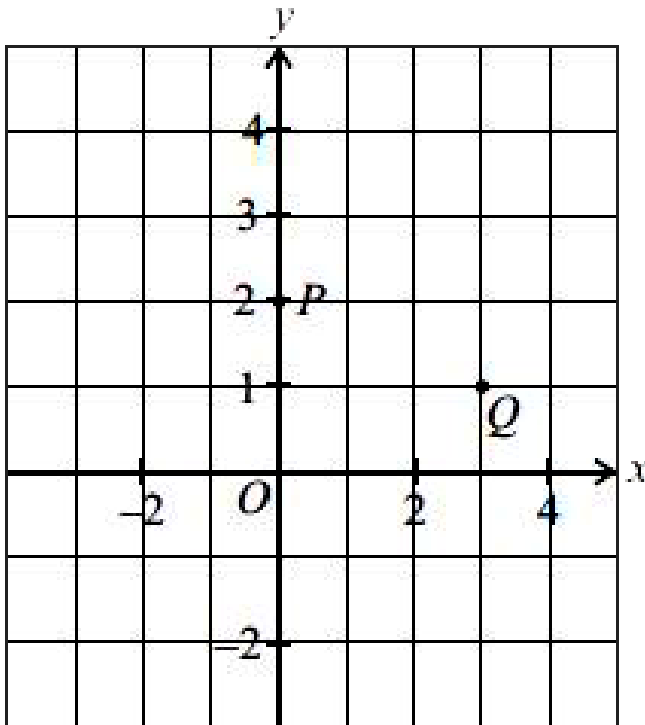
Answer: C



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4. Which of the following can be the coordinates of R, if $PR=QR$

?



A. $(1, -1)$

B. $(2, -2)$

C. $(2, 3)$

D. $(3, 3)$

Answer: C



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5. Which of the following steps is INCORRECT while constructing a quadrilateral ABCD, given that $AB = 5\text{cm}$, $BC = 7\text{cm}$, $AD = 4\text{cm}$, diagonal $AC = 9\text{ cm}$ and diagonal $BD = 6\text{cm}$.

1. Draw $AB=5\text{ cm}$

2. With A and B as centres and 4 cm and 6 cm as radii

respectively ,draw arcs to cut each other at D .

3. Join AD and BC. With A and B as centres and 9 cm and 7 cm as radii, respectively, draw arcs to cut each other at C .

4. Join AC and BC . Also join DC. ABCD is the required quadrilateral .

A. Only 1

B. Both 2 and 3

C. Only 3

D. Both 2 and 4

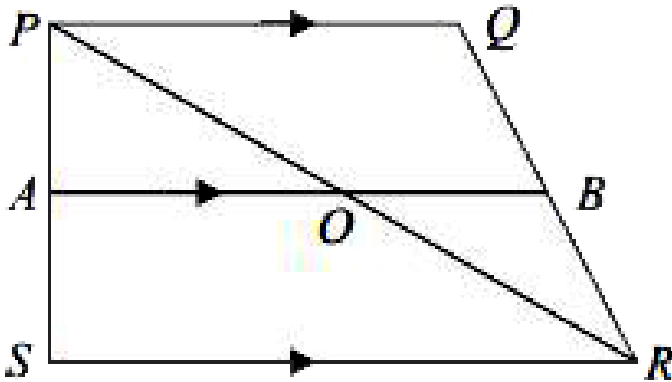
Answer: C



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6. In the figure given below PQRS is a trapezium . AB is parallel to PQ and cuts PR at O. If $\angle PSR = 90^\circ$, $\angle ABR = 110^\circ$ and $\angle QPR = 40^\circ$, find

- (i) $\angle PRQ$
- (ii) $\angle AOR$
- (iii) $\angle OPA$



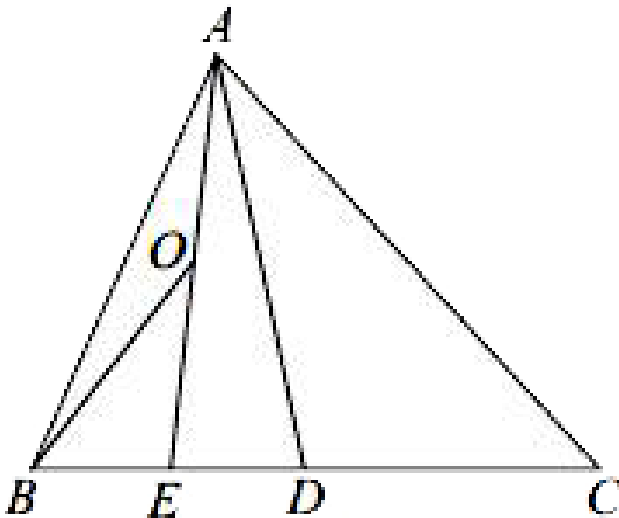
- A. i ii iii
 30° 110° 50°
- B. i ii iii
 15° 120° 45°
- C. i ii iii
 15° 140° 45°

- D. i ii iii
 30° 140° 50°

Answer: D

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7. In $\triangle ABC$ it is given that D is the midpoint of BC , E is the midpoint of BD and O is the midpoint of AE . Then, find $\angle BOE$.



A. $\frac{1}{3}ar(\Delta ABC)$

B. $\frac{1}{4}ar(\Delta ABC)$

C. $\frac{1}{6}ar(\Delta ABC)$

D. $\frac{1}{8}ar(\Delta ABC)$

Answer: D



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8. The factors $8(a - 2b)^2 - 2a + 4b - 1 =$ are

A. $(2a - 4b - 1)(4a - 8b + 1)$

B. $(2a + 4b + 1)(4a - 8b + 1)$

C. $(2a - 4b - 1)(4a - 8b - 1)$

D. $(2a + 4b - 1)(4a + 8b + 1)$

Answer: A



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9. If the point (3,4) lies on the graph of the equation $3y - ax - 7 = 0$ find the value of a

A. $\frac{2}{3}$

B. 1

C. $\frac{4}{3}$

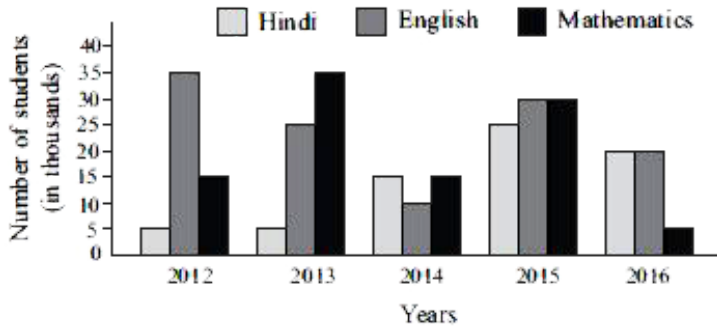
D. $\frac{5}{3}$

Answer: D



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10. (Number of students (in thousands) who opted for three different specializations during the five years in a University)



The total number of students who opted for English in the years 2012 and 2015 together are approximately what per cent of the total number of students who opted for all three subjects in the same years ?

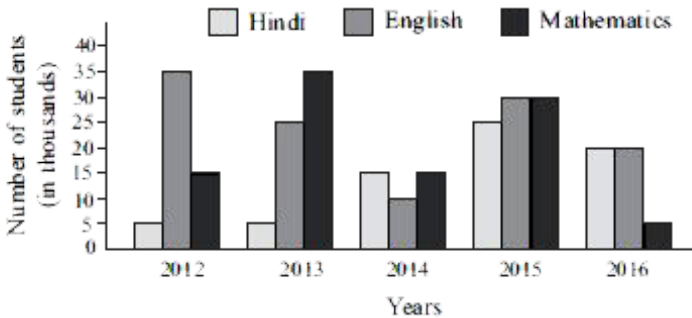
- A. 38
- B. 28
- C. 42
- D. 46

Answer: D



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11. (Number of students (in thousands) who opted for three different specializations during the five years in a University)



What is the respective ratio between the number of students who opted for Mathematics in the years 2012 and 2016 together and the number of students who opted for Hindi in the years 2013 and 2015 together ?

A. 2: 3

B. 12: 7

C. 11: 7

D. 12: 5

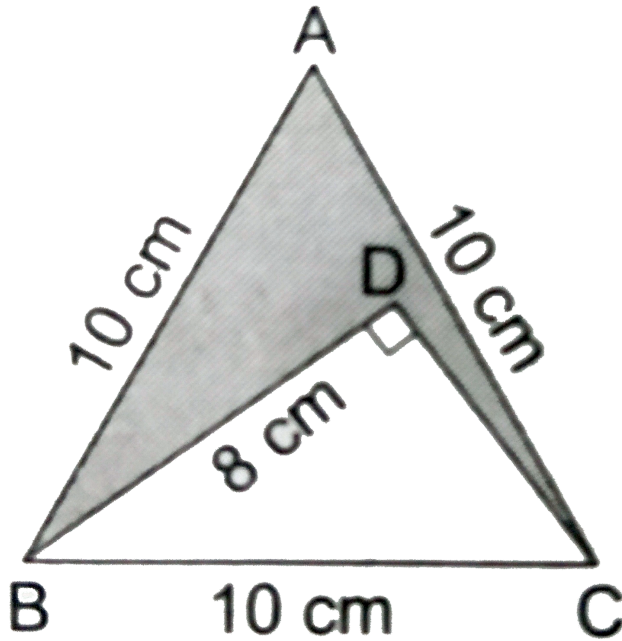
Answer: A



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12. In the given figures , $\triangle ABC$ is an equilateral triangle the length of whose side is equal to 10 cm , and $\triangle DBC$ right - angled at D and $BD=8$ cm . Find the area of the shaded region

[Take, $\sqrt{3} = 1.732$.]



- A. 19.3cm^2
- B. 43.3cm^2
- C. 17.3cm^2
- D. 21.3cm^2

Answer: A

13. Given below are the marks scored by a group of 90 students in a Mathematics test of 100 marks.

Marks	0-20	20-30	30-40	40-50	50-60	60-70	70-100
Number of students	7	10	10	20	20	15	8

Find the probability that a student obtained :

- (i) less than 20 % marks .
- (ii) 60 or more marks .

- A. $\begin{matrix} i & ii \\ 17/90 & 43/90 \end{matrix}$
- B. $\begin{matrix} i & ii \\ 7/90 & 43/90 \end{matrix}$
- C. $\begin{matrix} i & ii \\ 7/90 & 23/90 \end{matrix}$
- D. $\begin{matrix} i & ii \\ 17/90 & 23/90 \end{matrix}$

Answer: C



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14. ABCD is a cyclic quadrilateral such that AB is a diameter of the circle circumscribing it and $\angle ADC = 140^\circ$, then $\angle BAC$ is equal to

A. 80°

B. 50°

C. 40°

D. 30°

Answer: B



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15. A, B, C are three sets of values of x given below.

A : 2, 3, 7, 1, 3, 2, 3

B: 7, 5, 9, 12, 5, 3, 8

C : 4, 4, 11, 7, 2, 3, 4

Which one of the following options is correct ?

A. Mean of A = Mode of C

B. Mean of C = Median of B

C. Median of B = Mode of A

D. Mean, Median and Mode of A are equal .

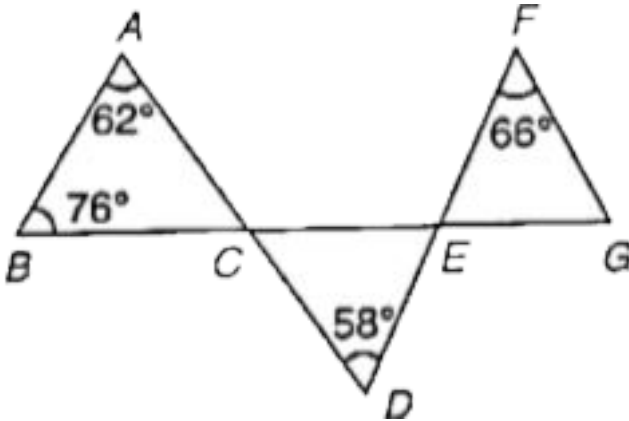
Answer: D



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16. In the adjoining figure

$\angle CAB = 62^\circ$, $\angle CBA = 76^\circ$, $\angle ADE = 58^\circ$ and $\angle DFG = 66^\circ$



Find $\angle FGE$:

A. 44°

B. 34°

C. 36°

D. None of these

Answer: B



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17. Using Euler's formula find the values of P,Q,R and S respectively .

Faces	6	5	20	14
Vertices	P	Q	36	R
Edges	12	9	S	36

A. 8, 6, 24, 54

B. 6, 8, 54, 24

C. 6, 8, 24, 54

D. 8, 6, 54, 24

Answer: A



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18. It is given that $\triangle ABC \cong \triangle FDE$ and $AB = 5 \text{ cm}$, $\angle B = 40^\circ$ and $\angle A = 80^\circ$ then which of the following is true ?

A. $DF = 5 \text{ cm}$, $\angle F = 60^\circ$

B. $DF = 5 \text{ cm}$, $\angle E = 60^\circ$

C. $DE = 5 \text{ cm}$, $\angle E = 60^\circ$

D. $DE = 5 \text{ cm}$, $\angle D = 60^\circ$

Answer: B



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19. The length and breadth of a hall are in the ratio 4:3 and its height is 5.5 metres. The cost of decorating its walls (including doors and windows) at Rs.6.60 per square metre is Rs.5082. Find the length and breadth of the room.

A. 13 m, 7 m

B. 45 m, 37 m

C. 40 m, 30 m

D. 50 m, 50 m

Answer: C



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20. Based on Playfair's axiom, for every line l and every point P not lying on l , there exists ___ line (s) passing through P and parallel to l .

A. Two distinct

B. A unique

C. Three distinct

D. None of these

Answer: B



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Everyday Mathematics

1. Saif purchased 20 dozens of toys at the rate of Rs. 375 per dozen. He sold each one at the rate of Rs. 33. What was his percentage profit??

A. 3.5 %

B. 4.5 %

C. 5.6 %

D. 6.5 %

Answer: C



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2. Water flows through a cylindrical pipe of diameter 5 mm at the rate of 10 m per minute and falls into a conical vessel having 40 cm as the diameter of its base and 24 cm as its height. How long will it take to fill the vessel ?

A. 48 mins 15 secs

B. 51 mins 2 secs

C. 52 mins 1 sec

D. 51 mins 12 secs

Answer: D



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3. A man take a 5 hours 45 mins in walking to a certain place and riding back. He would have gained 2 hours by riding both ways . The time he would take to walk both ways, is _____.

A. 3 hrs 45 mins

B. 7 hrs 30 mins

C. 7 hrs 45 mins

D. 11 hrs 45 mins

Answer: C



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4. From the salary of an officer, 10% is deducted as house rent, 15% of the rest he spends on children's education and 10% of the balance, he spends on clothes. After this expenditure he is left with Rs. 1,377. His salary is

A. Rs. 2000

B. Rs. 2040

C. Rs. 2100

D. Rs 2200

Answer: A



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5. A man borrows 12,500 at 20% compound interest. At the end of every year he pays 2000 as part repayment. How much does he still owe after three such instalments?

A. Rs. 12, 000

B. Rs. 12, 864

C. Rs. 15, 600

D. None of these

Answer: D



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6. 10 women can complete a work in 7 days and 10 children take 14 days to complete the same work. How many days will 5

women and 10 children take to complete the same work ?

A. 3

B. 5

C. 7

D. Cannot be determined

Answer: C



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7. Four different electronic devices make a beep after every 30 minutes, 1 hour, $1\frac{1}{2}$ hour and 1 hour 45 minutes respectively.

All the devices beeped together at 12 noon. They will again

beep together at:

A. 12 midnight

B. 3 a.m.

C. 6 a.m.

D. 9 a.m.

Answer: D



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8. If the price of eraser is reduced by 25% a person can buy 2 more erasers for a rupee. How many erasers are available for a rupee?

A. 8

B. 6

C. 4

D. 2

Answer: B



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9. The income of A B and C are in the ratio 7: 9: 12 and their spendings are in the ratio 8: 9: 15. If A saves $\frac{1}{4}$ th of his income, then the savings of A, B and C are in the ratio of:

A. 56: 99: 69

B. 99: 56: 69

C. 69: 56: 99

D. 99: 69: 56

Answer: A



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10. A tradesman gives 4% discount on the marked price and gives 1 article free for buying every 15 articles and thus gains 35%. The marked price is increased above the cost price by

A. 20 %

B. 39 %

C. 40 %

D. 50 %

Answer: D



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1. Length of a mathematics lab is $1\frac{1}{3}$ of its breadth and its height is $\frac{1}{2}$ of its length . The cost of whitewashing the walls at the rate of Rs. 2.60 per m^2 is Rs. 291.20 . Find the cost of tiling the floor at the rate of Rs. 6.75 per m^2 .

A. Rs. 324

B. Rs. 624

C. Rs. 570

D. Rs. 420

Answer: A



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Column I	Column II
(a) Angle bisectors of a parallelogram form a _____.	(p) Parallelogram
(b) The quadrilateral formed by joining the mid-points of the pairs of adjacent sides of a square is a _____.	(q) Rectangle
(c) The quadrilateral formed by joining the mid-points of the pairs of adjacent sides of a rectangle is a _____.	(r) Square
(d) The figure formed by joining the mid-points of the pairs of adjacent sides of a quadrilateral is a _____.	(s) Rhombus

2.

- A. $a \quad b \quad c \quad d$
 $r \quad q \quad s \quad p$
- B. $a \quad b \quad c \quad d$
 $q \quad r \quad p \quad s$
- C. $a \quad b \quad c \quad d$
 $q \quad r \quad s \quad p$
- D. $a \quad b \quad c \quad d$
 $s \quad r \quad q \quad p$

Answer: C



3. State True or False and select the correct option .

P. In a $\triangle ABC$ in which $AB=AC$, the altitude AD bisects BC .

Q. The sum of any two sides of a triangle is greater than twice the median drawn to the third side .

R . If D is the mid-point of the hypotenuse AC of a right $\triangle ABC$, then $BD=AC$.

S. Perimeter of a triangle is equal to the sum of its three medians .

T. If the altitudes AD , BE and CF of $\triangle ABC$ are equal, then $\triangle ABC$ is equilateral .

A.

P	Q	R	S	T
True	True	False	False	True

B.

P	Q	R	S	T
True	False	True	False	True

C.

P	Q	R	S	T
False	True	False	True	True

D.	<i>P</i>	<i>Q</i>	<i>R</i>	<i>S</i>	<i>T</i>
	True	True	False	True	True

Answer: A

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4. Fill in the blanks and select the correct option .

(I) There is (are) P circle (s) passing through three non-collinear points .

(II) A continuous piece of a circle is called the Q of the circle .

(III) If two arcs of a circle are congruent then their corresponding chords are R .

(IV) A line segment joining the centre to any point on the circle is called its S .

(V) The sum of either pair of opposite angles of a cyclic quadrilateral is T .

- A. P Q R S T
Infinite Chord Not equal Diameter 360°
- B. P Q R S T
Two Arc Equal Diameter 360°
- C. P Q R S T
One Chord Equal Radius 180°
- D. P Q R S T
One Arc Equal Radius 180°

Answer: D



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5. Given below is a question followed by three statements . You have to study the question and the statements and decide which of the statement is/are necessary to answer the question .

What is Arun's present age ?

I. Five years ago, Arun's age was double that of his son's age at that time .

II. Present ages of Arun and his son are in the ratio of 11:6 respectively .

III. Five years hence, the respective ratio of Arun's age and his son's age will become 12:7 .

A. Only I and II

B. Only II and III

C. Only I and III

D. Any two of the three

Answer: D



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