



MATHS

BOOKS - HT Olympiad Previous Year Paper

IMO QUESTION PAPER 2018 SET B

Mathematical Reasoning

1. Temperature of a body can be measured in Celsius unit as $X^{\circ}C$ or in Fahrenheit unit as $Y^{\circ}F$. The relation between the two scales of temperature is given by the linear equation $Y = \frac{9}{5}X + 32^{\circ}$.

(i) Find the temperature of a body in Fahrenheit, if the temperature of the body is $60^{\circ}C$

(ii) If the temperature of a body is $77^{\circ}F$ then find the temperature in Celsius.

- A. $\begin{matrix} (i) & (ii) \\ 140^{\circ}F & 35^{\circ}C \end{matrix}$

- B. (i) (ii)
 $80^{\circ} F$ $60^{\circ} C$
- C. (i) (ii)
 $140^{\circ} F$ $25^{\circ} C$
- D. (i) (ii)
 $70^{\circ} F$ $75^{\circ} C$

Answer: C



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2. A hemispherical bowl is filled to the brim with a beverage. The contents of the bowl are transferred into a cylindrical vessel whose radius is 50% more than its height. If the diameter is same for both the bowl and the cylinder, the volume of the beverage in the cylindrical vessel is $66\frac{2}{3}\%$ (b) $78\frac{1}{2}\%$ (c) 100% (d) More than 100% (i.e., some liquid will be left in the bowl)

A. $66\frac{2}{3}\%$

B. $78\frac{1}{2}\%$

C. 100%

D. None of these

Answer: C

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3. If $\frac{(8 + 3\sqrt{2}) + (7 - \sqrt{2}) - (3 - 4\sqrt{2})}{6 - 2\sqrt{2}} = a + b\sqrt{2}$, then find the value of a and b respectively.

A. $\frac{24}{7}, \frac{15\sqrt{2}}{7}$

B. $\frac{-24}{7}, \frac{-15}{7}$

C. $\frac{24}{7}, \frac{15}{6}$

D. $\frac{24}{7}, \frac{15}{7}$

Answer: D

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4. PQRS is a parallelogram. M and N are the mid-points of sides PQ and RS respectively. If XY is any line intersecting PS, MN and QR at X, O and Y respectively such that $XY \parallel PQ$, then find the ratio in which O divides the line XY.

A. 1:3

B. 1:1

C. 1:4

D. 2:1

Answer: B

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5. If $(x^{3/2} - xy^{1/2} + x^{1/2}y - y^{3/2})$ is divided by $(x^{1/2} - y^{1/2})$, the quotient is :

A. $x + y$

B. $x - y$

C. $x^{1/2} + y^{1/2}$

D. $x^2 - y^2$

Answer: A



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6. A money-lender 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.* 5500

B. *Rs.* 4500

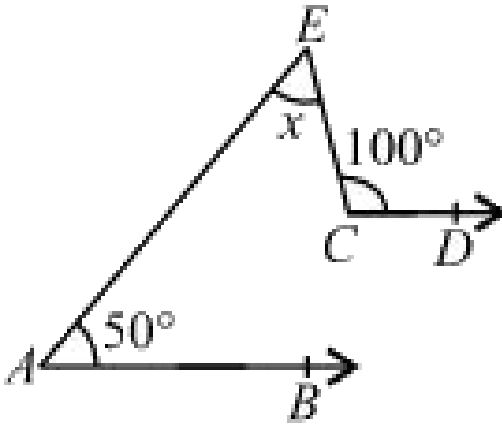
C. *Rs.* 5000

D. *Rs.* 6000

Answer: C

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7. In the given figure, if $AB \parallel CD$ then the value of x is _____.



A. 25°

B. 30°

C. 45°

D. 50°

Answer: D



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8. If the base radius and the height of a right circular cone are increased by 20%, then the percentage increase in volume is approximately. (a) 60 (b) 68 (c) 73 (d) 78

A. 60 %

B. 68 %

C. 73 %

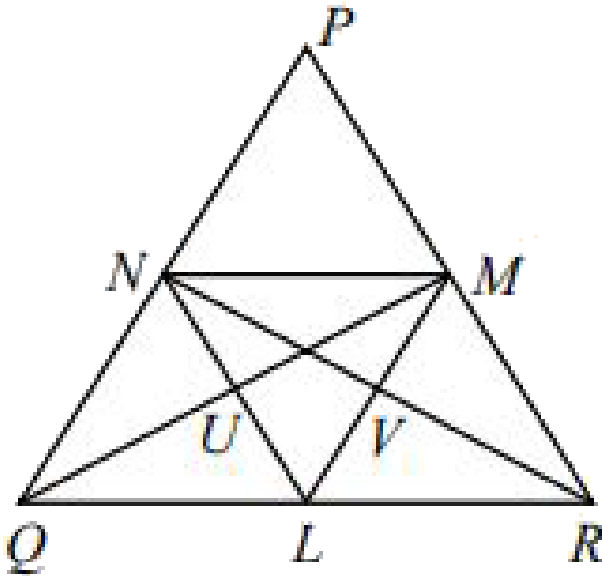
D. 78 %

Answer: C



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9. In the given figure (not drawn to scale), L, M and N are the mid-points of the sides QR, RP and PQ respectively of a ΔPQR . OM intersects the line LN at U and RN intersects the line LM at V, then $UV = kQR$. Find the value of k.



A. 4

B. $\frac{1}{4}$

C. 2

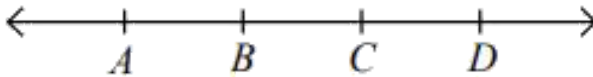
D. $\frac{1}{2}$

Answer: B



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10. In the given figure (not drawn to scale), $AC = BD$ and if BC is subtracted from AC and BD , then $AB = CD$.



Which of the following Euclid's axioms explains the above result?

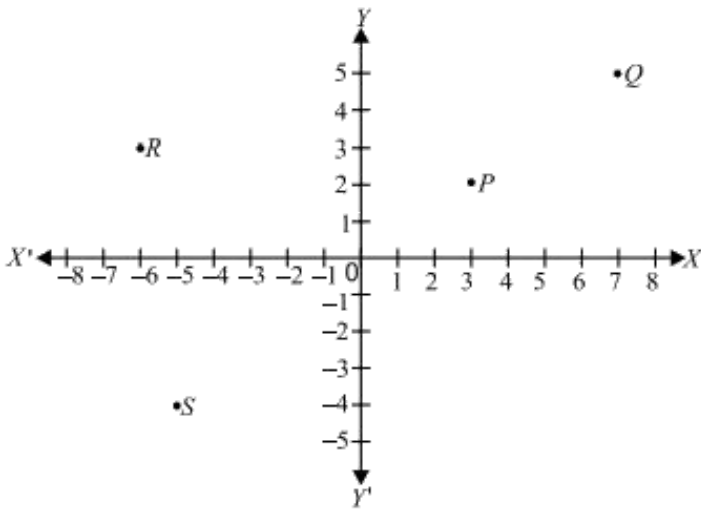
- A. If equals are added to equals, the wholes are equal.
- B. If equals are subtracted from equals, the remainders are equal.
- C. Things which coincide with one another are equal to one another.
- D. Things which are equal to the same thing are equal to one another.

Answer: B



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11. Study the given graph carefully.



Sum of abscissae of points P and R is _____

- A. 5
- B. 6
- C. 9
- D. -3

Answer: D



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12. Simplify :

(i) If $\frac{4^{n+3} \times 8^{3-n}}{\left(64^{\frac{-n}{2}}\right)^2} = 2^{9n} \times 4^{3n}$, then find the value of $2n$.

(ii) If $\sqrt{x} + \sqrt{x - \sqrt{1-x}} = 1$, then find the value of x .

A. $\begin{matrix} (i) & (ii) \\ 3/2 & 4/5 \end{matrix}$

B. $\begin{matrix} (i) & (ii) \\ 2 & 3/5 \end{matrix}$

C. $\begin{matrix} (i) & (ii) \\ 3 & 16/25 \end{matrix}$

D. $\begin{matrix} (i) & (ii) \\ 3 & 9/25 \end{matrix}$

Answer: C

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13. The mean of 150 observations was found to be 45. If at the time of calculation, two items were wrongly taken as 42 and 28 instead of 35 and 25, then find the correct mean.

A. 46

B. 44.9

C. 45.9

D. 43.5

Answer: B



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14. Which of the following is incorrect?

A. If three angles of a quadrilateral are equal, then it is always a parallelogram.

B. The line segments joining the mid points of the sides of an equilateral triangle divides it into four congruent triangles

C. PQRS is a parallelogram in which diagonal SQ bisects $\angle PQR$. If

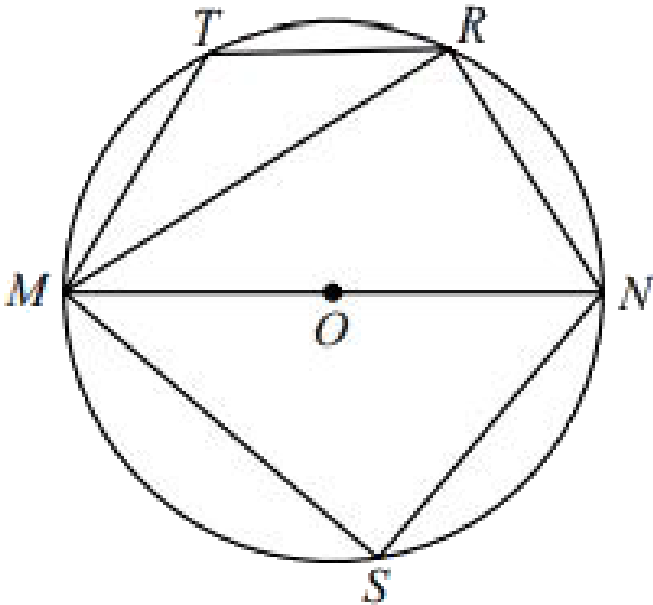
$$\angle PQS = 42^\circ, \text{ then } \angle SPQ = 96^\circ$$

D. None of these

Answer: A

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15. In the given figure (not drawn to scale), MN is the diameter of circle with centre O . If $\angle MNR = 55^\circ$, $\angle RMT = 30^\circ$ and $\angle MNS = 60^\circ$, then find the value of $\angle NMR$ and $\angle MRT$ respectively.



A. 35° , 25°

B. 25° , 15°

C. 45° , 65°

D. 30° , 20°

Answer: A



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16. The three vertices of a square ABCD are A(4, 3), B(-3, 3) and C(-3,-4).

Find :

(i) The coordinates of D.

(ii) The area of square ABCD.

A. (i) (ii)
 $(-4, -4)$ 49 sq. units

B. (i) (ii)
 $(3, -4)$ 25 sq. units

C. (i) (ii)
 $(2, -4)$ 36 sq. units

D. (i) (ii)
 $(4, -4)$ 49 sq. units

Answer: D



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17. In $\triangle ABC$ and $\triangle PQR$, if $AB=AC$, $\angle C = \angle P$ and $\angle B = \angle Q$, then the two triangles are

- A. Isosceles but not necessarily congruent
- B. Isosceles and congruent.
- C. Congruent but not isosceles
- D. Neither congruent nor isosceles.

Answer: A



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18. An open rectangular cistern when measured from outside is 1.15 m long, 0.94 m broad and 70 cm deep. It is made up of iron, which is 5 cm

thick. Find

(i) The capacity of cistern.

(ii) Volume of iron used.

- A. $\begin{matrix} (i) & (ii) \\ 756700 \text{ cm}^3 & 573300 \text{ cm}^3 \end{matrix}$
- B. $\begin{matrix} (i) & (ii) \\ 756700 \text{ cm}^3 & 529200 \text{ cm}^3 \end{matrix}$
- C. $\begin{matrix} (i) & (ii) \\ 529200 \text{ cm}^3 & 227500 \text{ cm}^3 \end{matrix}$
- D. $\begin{matrix} (i) & (ii) \\ 573300 \text{ cm}^3 & 183400 \text{ cm}^3 \end{matrix}$

Answer: D



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19. A tyre manufacturing company kept a record of the distance covered before a tyre needed to be replaced . The table shows the results of 1000 cases :

Distance (in km)	less than 4000	4000 to 9000	9001 to 14000	more than 14000
Frequency	20	210	325	445

If you buy a tyre of this company , what is the probability that :

it will last more than 9000 km ?

A. 0.02

B. 0.77

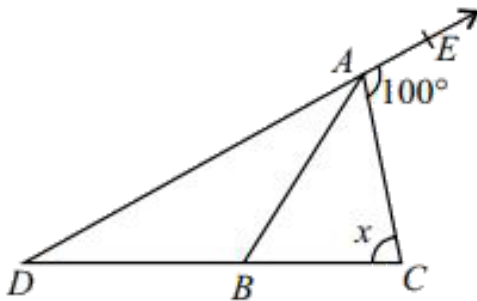
C. 0.445

D. 0.325

Answer: B

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20. In the given figure (not drawn to scale), $\angle DAB$ and $\angle BAC$ are in the ratio 2 : 3 respectively and $AB = DB$. Find the value of x .



A. 72°

B. 68°

C. 56°

D. None of these

Answer: B



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Everyday Mathematics

1. A piece of rectangular cardboard sheet measuring 40 inch \times 25 inch is made into an open chocolate box by cutting out squares of side 'p' from each corner. Which of the following expressions is equivalent to the volume of the box ?

A. $4p^3 - 120p^2 + 950p$

B. $4p^3 + 130p^2 + 1000p$

C. $4p^3 - 130p^2 + 1000p$

D. None of these

Answer: C



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2. There are some marbles of two colours black and golden in a jar. If the ratio of the number of black marbles to the golden marbles is 5:3 and the total number of marbles in the jar is 120, then how many black marbles are there in the jar?

A. 45

B. 75

C. 60

D. 80

Answer: B



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3. The king, queen and jack of heart cards are removed from the deck of 52 cards and then the remaining cards are well shuffled. One card is selected at random from the remaining cards. What is the probability of getting an ace card?

A. $\frac{3}{49}$

B. $\frac{4}{49}$

C. $\frac{12}{52}$

D. $\frac{3}{52}$

Answer: B



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4. Anya's piggy bank is full of Rs. 10 and Rs. 5 coins. It contains three times as many Rs. 5 coins as Rs. 10 coins. The total amount of money in piggy bank is Rs. 300 How many coins of Rs. 10 are there in the piggy bank?

A. 12

B. 36

C. 18

D. 16

Answer: A



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5. A tank can be filled by two taps P and Q in 15 hours and 20 hours respectively. The full tank can be emptied by a third tap R in 10 hours. If all the three taps are turned on at the same time, then in how much time will the empty tank be filled up completely?

A. 30 hours

B. 45 hours

C. 40 hours

D. 60 hours

Answer: A



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6. A school provides milk to the student daily in a cylinder glasses of diameter 7 cm. If the glass is filled with milk upto an height of 12 cm, find how many liters of milk is needed to server 1600 students.

A. 739.2 litres

B. 538 litres

C. 740 litres

D. 400 litres

Answer: A



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7. One year ago, Promila was four times as old as her daughter Sakshi. Six years hence, Promila's age will exceed her daughter's age by 9 years. The ratio of the present ages of Promila and her daughter is :

A. 9:2

B. 11:3

C. 12:5

D. 13:5

Answer: D



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8. A company bought 45 laptops and 15 printers to modernize billing operations. If the price of each laptop was $\frac{5}{3}$ times the price of each printer, then what percent of the total cost of the purchase was the total cost of laptops?

A. 72.5 %

B. 78 %

C. 90 %

D. None of these

Answer: D



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9. A cycle was sold at a loss of 8 % . If it was sold for Rs. 121 more, then there would have been a gain of 3 % . What was the cost price and selling price of the cycle respectively?

A. Rs. 1012, Rs. 1000

B. Rs. 1000, Rs. 1300

C. Rs. 1100, Rs. 1012

D. Rs. 1002, Rs. 1100

Answer: C



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10. A person has to completely put each of three types of juices, 210 litres of orange juice, 220 litres of guava juice and 260 litres of litchi juice in bottles of equal size without mixing any of the above three types of juices such that each bottle is completely filled. What is the least possible number of bottles required?

A. 45

B. 69

C. 72

D. 55

Answer: B



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1. Match the linear equations given in Column-I with their solutions given in Column-II and select the correct option.

Column-I

Column-II

$$(P) \quad 5x = -2y + 7 \quad (a) \quad (0, 0)$$

$$(Q) \quad 4x - 6y = 0 \quad (b) \quad (2, 0)$$

$$(R) \quad 3y = \frac{5}{3}x + 7 \quad (c) \quad (3, -4)$$

$$(S) \quad 2x - y = 4 \quad (d) \quad (3, 4)$$

A. $(P) \rightarrow (b), (Q) \rightarrow (c), (R) \rightarrow (a), (S) \rightarrow (d)$

B. $(P) \rightarrow (c), (Q) \rightarrow (b), (R) \rightarrow (d), (S) \rightarrow (a)$

C. $(P) \rightarrow (c), (Q) \rightarrow (a), (R) \rightarrow (d), (S) \rightarrow (b)$

D. $(P) \rightarrow (d), (Q) \rightarrow (b), (R) \rightarrow (a), (S) \rightarrow (c)$

Answer: C



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2. Read the statements carefully and select the correct option.

Statement-I : If two circles with centres A and B intersect each other at points M and N, then the line joining the centres AB bisects the common chord MN at right angle.

Statement-II : Two circles of radii 10 cm and 8 cm intersect each other and the length of common chord is 12 cm. Then the distance between their centres is 8 cm.

- A. Both Statement-I and Statement-II are true.
- B. Both Statement-I and Statement-II are false.
- C. Statement-I is false but Statement-II is true.
- D. Statement-I is true but Statement-II is false.

Answer: D



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3. Let ABC be a triangle in which $AB = 5.8$ cm, $BC + CA = 8.4$ cm and $\angle B = 60^\circ$. Given below are the steps of constructing the triangle ABC .

Which of the following options is correct while arranging the steps in correct order?

(P) Join AD .

(Q) From ray BX , cut off line segment $BD = BC + CA = 8.4$ cm.

(R) Draw a line segment AB of length 5.8 cm

(S) Draw a perpendicular bisector of AD meeting BD at point C . Join AC , ABC is the required triangle.

Draw $\angle ABX = 60^\circ$ at point B of line segment AB .

A. $(T) \rightarrow (R) \rightarrow (S) \rightarrow (P) \rightarrow (Q)$

B. $(R) \rightarrow (P) \rightarrow (T) \rightarrow (S) \rightarrow (Q)$

C. $(R) \rightarrow (T) \rightarrow (Q) \rightarrow (P) \rightarrow (S)$

D. $(P) \rightarrow (R) \rightarrow (S) \rightarrow (T) \rightarrow (Q)$

Answer: C



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

(i) The sum of any two sides of a triangle is greater than P the median drawn to the third side.

(ii) The perimeter of a triangle is Q than the sum of its three medians

(iii) If the altitude from the vertex of a triangle bisects the base, the triangle is R

- A. P Q R
Twice less isosceles
- B. P Q R
Twice greater isosceles
- C. P Q R
Half less equilateral
- D. P Q R
Half greater equilateral

Answer: B



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5. Read the statements carefully and state 'T' for true and 'F' for false.

(i) If the number of observations is odd, then the median is $\left(\frac{n}{2} + 1\right)^{th}$ observation.

(ii) The mean of 25 observations is 18. Out of these observations, the mean of first 13 observations is 16 and that of the last 13 observations is 20. Then, the 13th observation is 18.

(iii) Mode of the data 17, 21, 11, 48, 35, 11, 19, 17, 12, 13, 11, 15 is 11.

(iv) The mean of first 15 prime natural numbers is 27.5.

A. $\begin{matrix} (i) & (ii) & (iii) & (iv) \\ T & F & F & T \end{matrix}$

B. $\begin{matrix} (i) & (ii) & (iii) & (iv) \\ F & T & T & F \end{matrix}$

C. $\begin{matrix} (i) & (ii) & (iii) & (iv) \\ F & F & F & T \end{matrix}$

D. $\begin{matrix} (i) & (ii) & (iii) & (iv) \\ T & T & F & F \end{matrix}$

Answer: B



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