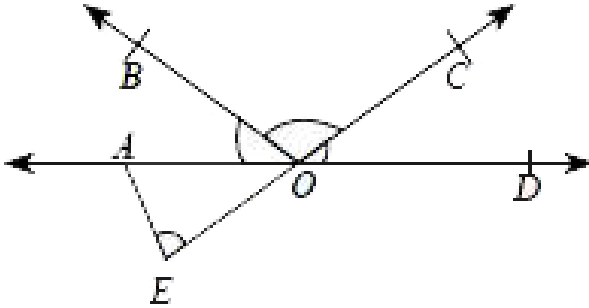# MATHS

BOOKS - HT Olympiad Previous Year Paper

IMO QUESTION PAPER 2017 SET B

Mathematical Reasoning

1. In the given figure, if $\angle AOB = \dfrac{a}{2}$, $\angle BOC = 5\left(\dfrac{a}{2} - 10°\right)$ and $\angle COD = a + 9°$

, then find $\angle AEO + \angle EAO.$

A. $127.75\degree$

B. $130.75\degree$

C. $129.50\degree$

D. $115.75\degree$

Answer: D

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2. If $\dfrac{4\sqrt{3}+5\sqrt{2}}{\sqrt{48}+\sqrt{18}} = \dfrac{a+b\sqrt{6}}{15}$ and $\left(\dfrac{a}{b}\right)^x \left(\dfrac{b}{a}\right)^{2x} = \dfrac{64}{729}$,

then find x .

A. 3

B. 2

C. 1

D. 4

Answer: A

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3. The three vertices of a rectangle ABCD are

$A(2,2), B(-3,2)$ and $C(-3,5)$. Plot these points on a

graph paper and find the coordinates of D. Also, find the area of rectangle ABCD.

A. 15 sq. units

B. 35 sq. units
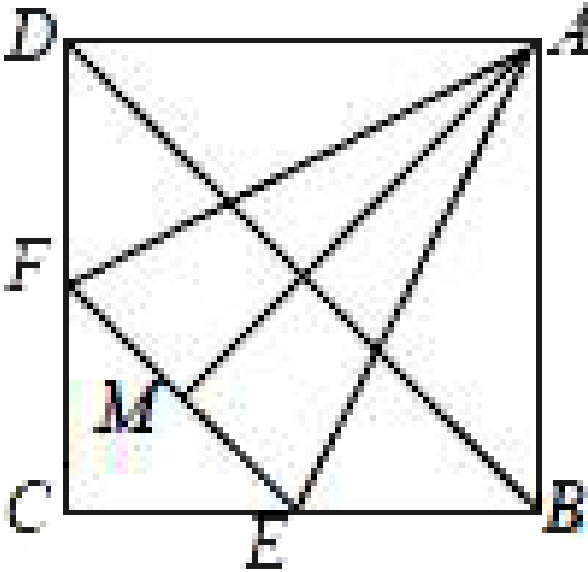
C. 20 sq. units

D. 25 sq. units

Answer: A

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4. In the given figure, if ABCD is a square and EF is parallel to diagonal BD and EM = FM, then which of the following is correct?

(i) DF = BE

(ii) AM bisects $\angle BAD$

A. Only (i)

B. Only (ii)

C. Both (i) and (ii)

D. Neither (i) nor (ii)

Answer: C

5. Sahil and Kush are equidistant from the Park. Upon considering the park as origin, the position of Sahil is (0, 5). If the ordinate of the position of Kush is zero, then out of the following options what will be the position of the Kush?

A. $(0, -5)$

B. $(5, 0)$

C. $(0, 0)$

D. $(5, 5)$

Answer: B

6. It is known that if $a + b = 10$, then $a + b - c = 10 - c$. State the Euclid's axiom that best illustrates this statement.

    A. If equals be subtracted from equals, the remainders are equal.

    B. Things which are halves of the same thing are equal to one other.

    C. The whole is greater than the part.
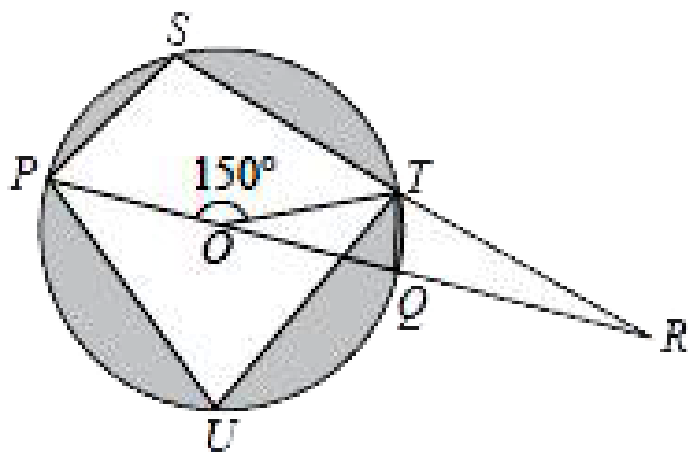
    D. None of these

Answer: A

7. In the given figure, $\angle POT = 150°$ and O is the centre

of circle. Find the measure of

(i) $\angle RQT$

(ii) $\angle PUT$

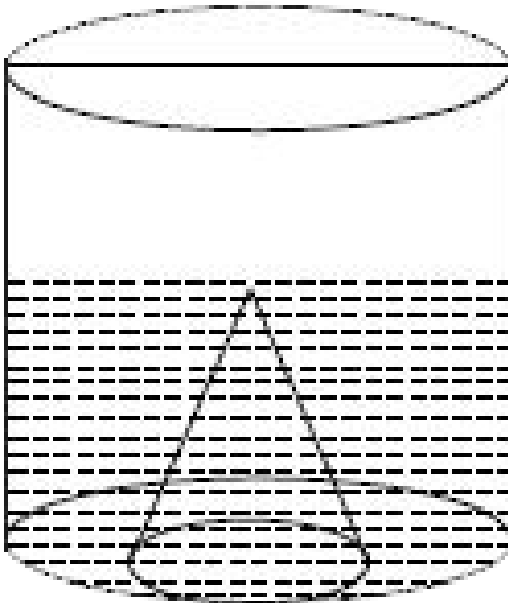|	(i)	(ii)
A.	75°	75°
B.	105°	75°
C.	105°	105°
D.	75°	105°

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8. In the given figure, a right circular cone of diameter r cm

and height 12 cm rests on the base of a right circular

cylinder of radius r cm. Their bases are in the same plane

and the cylinder is filled with water upto a height of 12 cm.

If the cone is removed, then find the height to which water

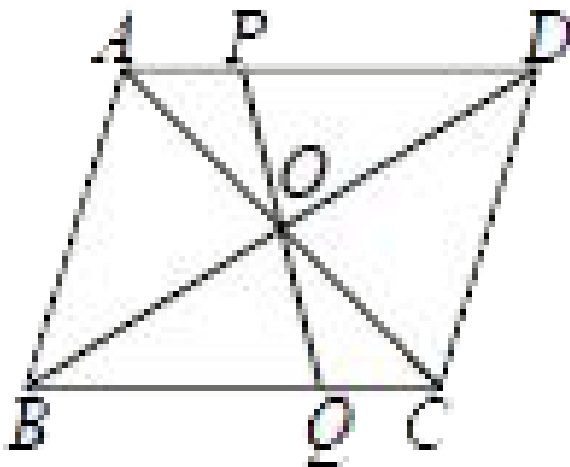level will fall.

A. 3 cm

B. 2 cm

C. 11 cm

D. 4 cm

Answer: C

9. The diagonals of a parallelogram ABCD intersect at a point O. Through O, if a line is drawn to intersect AD at P and BC at Q, then PQ divides the parallelogram into _____

.

A. Two parts of equal area

B. Two parts of area in 2 : 1

C. Two parts of area in 1 : 3

D. Two parts of area in 4 : 3

Answer: A

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10. The distance (in km) of 40 engineers from their residence to their place of work were found as follows

5	3	10	20	25	11	13	7	12	31
19	10	12	17	18	11	32	17	16	2
7	9	7	8	3	5	12	15	18	3
12	14	2	9	6	15	15	7	6	2

Find the probability that an engineer lives :

(i) less than 6 km from their place of work.

(ii) at least 6 km from their place of work.

(iii) within 1 km from their place of work.

(iv) at most 7 km from their place of work.

	(i)	(ii)	(iii)	(iv)
A.	2/5	4/5	3/5	3/20
B.	3/5	1/5	2/5	3/20
C.	4/5	1/5	0	7/20
D.	1/5	4/5	0	7/20

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11. Simplify $\sqrt[5]{x^4 \sqrt[4]{x^3 \sqrt[3]{x^2 \sqrt{x}}}}$.

A. $x^{119/121}$

B. $x^{119/120}$

C. $x^{117/120}$

D. $x^{113/120}$

Answer: B

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12. in the figure, X is a point in the interior of square $ABCD$. $AXYZ$ is also a square. If

$DY = 3cm$ and $AZ = 2cm$. Then $BY =$

A. 5 cm

B. 6 cm

C. 7 cm

D. 8 cm

Answer: C
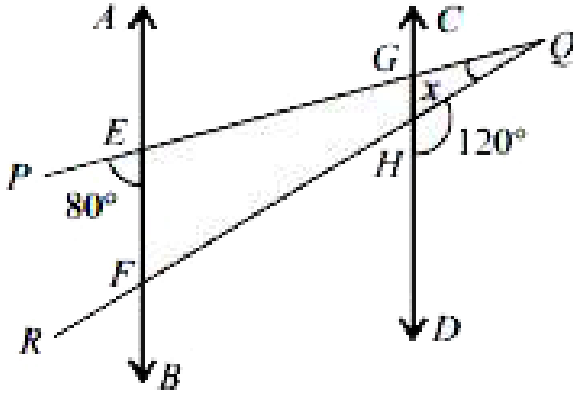
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13. In the given figure, $ABIICD$ and PQ, QR intersects

AB and CD both at E, F and G, H respectively. Find the value

of x.

A. $40°$

B. $20°$

C. $100°$

D. None of these

Answer: B

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14. Which of the following is INCORRECT.
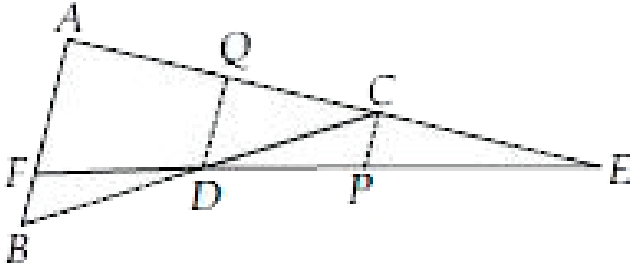
A. It is possible to construct an angle of $67.5°$ using ruler and compass only.

B. It is possible to construct a $\triangle PQR$ in which $QR = 6cm, \angle Q = 130°$ and $\angle R = 50°$.

C. It is possible to construct a $\triangle XYZ$ in which $\angle X = 60°, \angle Y = 100°$ and $\angle Z = 20°$.

D. In a $\triangle ABC, AB + BC > AC$.

Answer: B

15. The following steps are involved in finding the value of $a^4 + \dfrac{1}{a^4}$ when $a + \dfrac{1}{a} = 1$. Arrange them in sequential order from the first to the last .

(A) $a^2 + \dfrac{1}{a^2} + 2 = 1 \Rightarrow a^2 + \dfrac{1}{a^2} = -1$

(B) $\left(a^2\right)^2 + \left(\dfrac{1}{\left(a^2\right)^2}\right)^2 = 1^2$

(C) $\left(a + \dfrac{1}{a}\right)^2 = 1^2$

(D) $\left(a^2 + \dfrac{1}{a^2}\right)^2 = (-1)^2$

E $a^4 + \dfrac{1}{a^4} = -1$
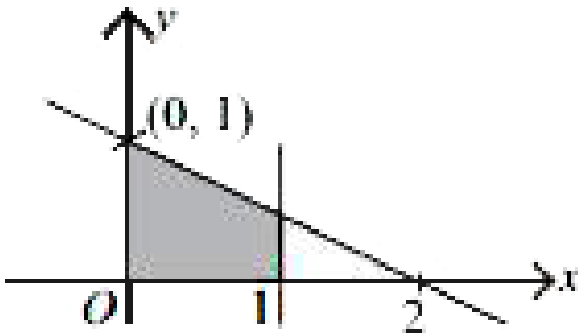
A. RPSQT

B. RSQPT

C. RQPST

D. RTSPQ

Answer: A

16. In the rectangular coordinate system given below, the shaded region is bounded by two straight lines. Which of the following is not an equation of one of the boundary lines ?

A. $x = 0$

B. $x = 1$

C. $x - y = 0$

D. None of these

Answer: C

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17. If $a = 5 + 2\sqrt{6}$ and $b = \dfrac{1}{a}$, then what will be the value of $a^2 + b^2$ and $a^3 + b^3$?

A. $98, 970$

B. $98, 1000$

C. 981, 985

D. 970, 560

Answer: A

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18. Which of the following experiments does not have equally likely outcomes?

A. Choosing a number at random from 1 to 7.

B. Tossing of a coin

C. Choose a letter at random from the word SCHOOL.

D. None of these.

Answer: C

19. The median of the following data : 0, 2, 2, 2, -3, 5, - 1, 5, 5, -3, 6, 6, 5, 6 is n x 0.7. Find the value of n.

A. 4

B. 5

C. 6

D. 7

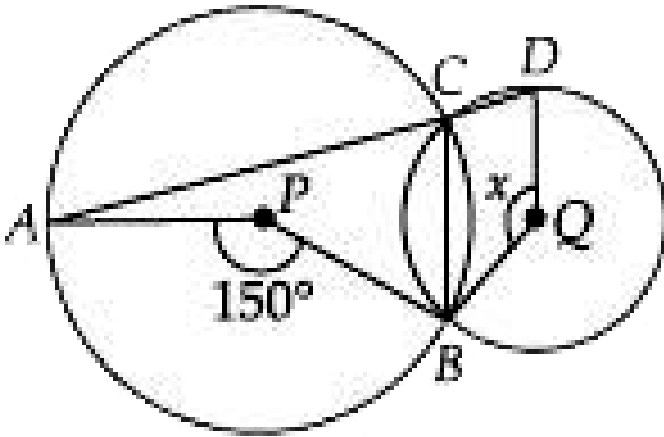**Answer: B**

20. In the given figure, P and Qare centres of two circles, intersecting at B and C and ACD is a straight line. If $\angle APB = 150°$ and $\angle BQD = x$ then find the value of x.

A. $210°$

B. $105°$

C. $75°$

D. $150°$

Answer: D

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Everyday Mathematics

1. A machine P can print one lakh books in 8 hours, machine Q can print the same number of books in 10 hours while machine R can print them in 12 hours. Al the machine are started at 9 a.m. while machine P is closed at 11 a.m. and the remaining two machines complete the work. Approximately at what time will the work be finished?

$11 : 30 \, am.$ b. $12 \, n\infty n$ c. $12 : 30 \, pm.$ d. $1 \, pm.$

    A. 12 : 30 p.m.

B. 1 : 00 p.m.

C. 2 : 00 p.m.

D. 2 : 30 p.m.

Answer: B

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2. In an examination in which maximum marks were 800, A gets 15% more than B, B gets 25% more than C and C gets 10% less than D. If A got 598 marks, then what percentage of full marks did D get (approximately)?

A. $45.8\,\%$

B. $62.3\,\%$

C. 57.8 %

D. None of these

Answer: C

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3. Priya has Rs. $(x^3 + x^2 - 17x + 20)$.She wants to buy ice-cream cones each of cost Rs. $(x - 3)$. After buying maximum number of ice-cream cones with her money, how much money is left with her?

A. Rs. 10

B. Rs. 50

C. Rs. 15

D. Rs. 5

Answer: D

4. A part of monthly expenses of a family on milk is fixed which is Rs. 700 and remaining varies with quantity of milk taken extra at the rate of Rs. 25 per litre. Taking quantity of milk required extra as x litres and total expenditure on milk as Rs. y, write a linear equation from the above information.

A. $-25x + y = 700$

B. $20x + y = 500$

C. $20x + 10y = 300$

D. $x + 25y = 900$

Answer: A

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5. In a class of 100 students, 23 students like dance and 39 students like computer. A student is selected at random. Find the probability that the selected student likes computer.

A. $\dfrac{39}{100}$

B. $\dfrac{29}{50}$

C. $\dfrac{19}{50}$

D. $\dfrac{39}{50}$

Answer: A

6. A closed rectangular box of length, breadth and height are 3 m, 2 m and 1 m respectively. Find the cost of cloth to cover box completely, if 1 m^2 cloth costs Rs. 10.

A. Rs. 22

B. Rs. 2200

C. Rs. 220

D. Rs. 200

Answer: C

7. The average marks of a student in 10 papers are 80. If the heighest and the lowest score are not considered the average is 81. If his heighest score is 92. Find the lowest score.

    A. 55

    B. 60

    C. 62

    D. Can't be determined

Answer: B

8. Nitesh borrows a sum a Rs. 1200 at the beginning of a year. After 4 months, Rs. 1800 more is borrowed at a rate of interest double the previous one. At the end of a year, the sum of interest on both the loans is Rs. 216. What is the first rate of interest per annum?

A. 9 %

B. 6 %

C. 8 %

D. 12 %

Answer: B

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9. Two trains A and B start running together from the same point in the same direction at 40 kmph and 64 kmph respectively. If the length of each train is 300 m, then how long will it take for the train B to cross train A?

A. 2 min 30 sec

B. 1 min 45 sec

C. 2 min 12 sec

D. 1 min 30 sec

Answer: D

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10. A,B and C start at the same time in the same direction to run around a circular stadium. A completes a round in 252 seconds, B in 308 seconds and C in 198 seconds, all starting at same point After what time will they again at the starting point ?
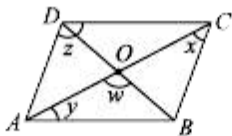
    A. 26 minutes 18 seconds

    B. 42 minutes 36 seconds

    C. 45 minutes

    D. 46 minutes 12 seconds

Answer: D

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1. By using a given figure of quadrilateral ABCD, match the columns.

Column-I		Column-II	
P.	If *ABCD* is a parallelogram, then sum of the angles x, y and z is	(1)	25°
Q.	If *ABCD* is a rhombus, where $\angle D = 130°$, then the value of x is	(2)	180°
R.	If *ABCD* is a rhombus, then the value of w is	(3)	50°
S.	If *ABCD* is a parallelogram, where $x + y = 130°$, then the value of $\angle B$ is	(4)	90°

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

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2. Simplify: (i) $\dfrac{4}{(2187)^{-3/7}} - \dfrac{5}{(256)^{-1/4}} + \dfrac{2}{(1331^2)^{-1/3}}$

(ii) $\left(\dfrac{x^a}{x^b}\right)^{\frac{1}{ab}} \left(\dfrac{x^b}{x^c}\right)^{\frac{1}{bc}} \left(\dfrac{x^c}{x^a}\right)^{\frac{1}{ca}}$

	(i)	**(ii)**
A.	270	x^{abc}
B.	330	0
C.	330	1
D.	270	$\dfrac{1}{x^{abc}}$

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

Statement-I : If $p(x)$ and $g(x)$ are two polynomials such that degree of $p(x) \geq$. degree of $g(x)$ and $g(x) \neq 0$, then we can find polynomials $q(x)$ and $r(x)$ such that

$p(x) = g(x) \cdot q(x) + r(x)$, where $r(x) = 0$ or degree of $r(x) = 0$ degree of $g(x)$.

Statement-II : $3x^2 + x - 1 = (x+1)(3x-2) + 1$.

    A. Both Statement-I and Statement-II are true.

    B. Both Statement-I and Statement-II are false.

    C. Statement-I is true but Statement-II is false.

    D. Statement-I is false but Statement-II is true.

Answer: A

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

P. The area of a quadrilateral ABCD in which AB = 3 cm, BC = 4 cm, CD = 4 cm, DA = 5 cm and AC = 5 cm is 18 cm^2.

Q. An advertisement board is in the form of an isosceles triangle with its sides equal to 12 m, 10 m and 10 m. The cost of painting it at Rs. 2.25 per m^2 is Rs. 112.

R. The area of an equilateral triangle is $81\sqrt{3}$ cm2, then its height is $9\sqrt{3}$ cm.

S. The lengths of the three sides of a triangular field are 40 m, 24 m and 32 m respectively. The area of the triangle is 384 m^2.

	P	Q	R	S
A.	F	T	T	F
B.	F	F	T	T
C.	T	T	F	F
D.	T	F	T	F

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5. Fill in the blanks.

(i) A sphere is placed inside the cylinder and touches all the faces of cylinder, then ratio of the volume of cylinder to the volume of sphere is __P__

(ii) __Q__ bricks will be required to construct a wall 10 m long, 6 m high and 22.5 cm thick, if each brick measures 25 cm by 12 cm by 9 cm.

(iii) The largest sphere is carved out of a cube of side 7 cm. Then the volume of the sphere is __R__ .

Curved surface area of the hollow cylinder of radii r_1 and r_2 and height h is __S__ .

	P	Q	R	S
A.	2:3	6000	189.67 cm^3	$2\pi h(r_1 - r_2)$
B.	3:2	6000	179.66 cm^3	$2\pi h(r_1 - r_2)$
C.	2:3	5000	189.67 cm^3	$2\pi h(r_1 + r_2)$
D.	3:2	5000	179.67 cm^3	$2\pi h(r_1 + r_2)$

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