MATHS

BOOKS - HT Olympiad Previous Year Paper

IMO QUESTION PAPER 2019 SET B

Mathematical Reasoning

1. If the polynomial $f(x) = ax^3 + bx - c$ is exactly divisible by the polynomial

$g(x) = x^2 + bx + c, c \neq 0$, then which of the following options is true?

A. $c = 2b^2$

B. $ab = 1$

C. $ac = 2b$

D. All of these

Answer: D

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2. Circle C_1 passes through the centre of circle C_2 and is tangential to it. If the area of C_1 is $4cm^2$, then the area of C_2 is _____

A. $8cm^2$

B. $8\sqrt{\pi}cm^2$

C. $16cm^2$

D. $16\sqrt{\pi}cm^2$

Answer: C

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3. Evaluate :

$\tan 12^\circ \tan 38^\circ \tan 52^\circ \tan 60^\circ \tan 78^\circ$

A. $\frac{1}{\sqrt{3}}$

B. $\sqrt{3}$

C. 2

D. 1

Answer: B

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4. If the sum of n terms of three A.P.'s are S_1, S_2 and S_3 The first term of each A.P. is unity and the common differences are 1, 2 and 3 respectively, then $\frac{S_1 + S_3}{S_2}$ is equal to

A. 0

B. 1

C. 2

D. 3

Answer: C

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5. Two parallel sides of a trapezium are 60 cm and 77 cm and other sides are 25 cm and 26 cm. Find the area of the trapezium.

A. $1644cm^2$

B. $1464cn^2$

C. $1504cm^2$

D. $1600cm^2$

Answer: A

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6. The sum of LCM and HCF of two numbers is 8340. If the LCM of these numbers is 8300 more than their HCF, then find the product of the two numbers.

A. 147200

B. 166400

C. 264000

D. 146480

Answer: B

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7. If the mean of the following distribution is 54, then find the value of m.

Class intervals	0-20	20-40	40-60	60-80	80-100
Frequency	7	m	10	9	13

A. 11

B. 66

C. 39

D. 21

Answer: A

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8. For which value of p, the given system of equations has a unique solution?

$x + 2y = 1, x + py = 5$

A. $p = 2$

B. $p = 0$

C. $p \neq 2$

D. $p \neq 0$

Answer: C

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9. Which of the following options is correct?

A. If n is any natural number, then $6^n - 5^n$ always ends with 1.

B. For any integer t, every even integer is of the form 2t + 1.

C. Both A and B

D. Neither A nor B

Answer: A

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10. If the mid-point of a segment joining $A\left(\frac{x}{2}, \frac{y+1}{2}\right)$ and B(x + 1,y- 3) is C (5, - 2), find x,y.

A. $6, -1$

B. $-4, 6$

C. $4, -6$

D. $3, 6$

Answer: A

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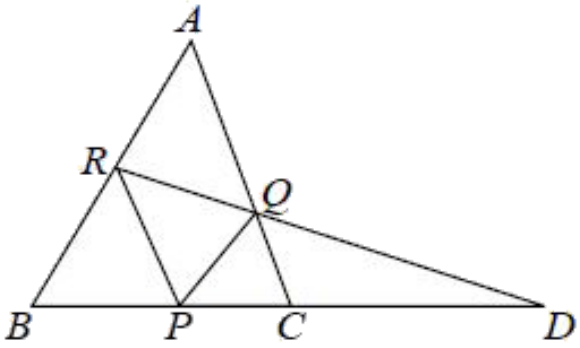
11. In the given figure, PQ || BA, PR || CA. If PD = x, then find $BD \times CD$.



A. 2x

B. x^2

C. $2x^2$

D. $\frac{x^2}{2}$

Answer: B

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12. A balloon is moving with the wind in a horizontal line at a height of $36\sqrt{3}$ m. The angle of elevation of the balloon from a point

A on the ground is 60°. After some time, the angle of elevation changes to 30°. Find the distance travelled by the balloon.

A. 72 m

B. 78 m

C. 86 m

D. 82 m

Answer: A

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13. The roots of the quadratic equation $\frac{1}{p+q+x} = \frac{1}{p} + \frac{1}{q} + \frac{1}{x}, (p+q \neq 0)$ are

_____

A. p, q

B. $-p, q$

C. $p, \ -q$

D. $-p, \ -q$

Answer: D

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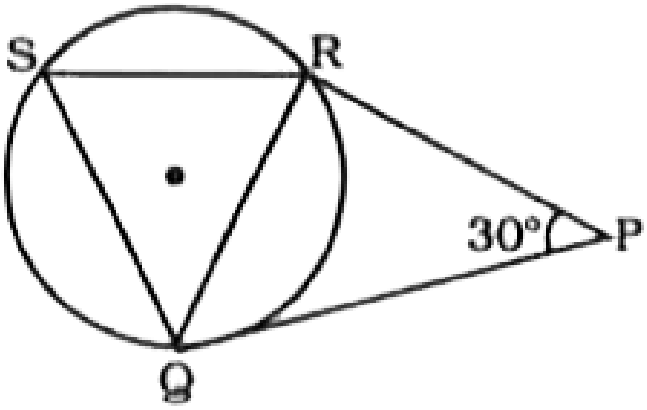
14. In the given figure tangents PQ and PR are drawn from an external point P to a circle with centre O, such that $\angle RPO = 30^\circ$. A chord RS is drawn parallel to the tangent PQ. Find $\angle RQS$.



A. 40°

B. 30°

C. 75°

D. 50°

Answer: B

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15. Which of the points A(0, 6), B(-2, 0), C(0, -5), D(3, 0) and E(1, 2) do(es) not lie on x-axis?

A. A and C only

B. B and D

C. A, C and E

D. E only

Answer: C

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16. If α and β are the zeroes of the quadratic equation $x^2 - 12x + 32 = 0$, then a quadratic equation whose zeroes are $\frac{1}{2\alpha + \beta}$ and $\frac{1}{2\beta + \alpha}$ is

A. $320x^2 + 36x + 1 = 0$

B. $320x^2 - 36x - 1 = 0$

C. $320x^2 - 36x + 1 = 0$

D. $320x^2 + 36x - 1 = 0$

Answer: C

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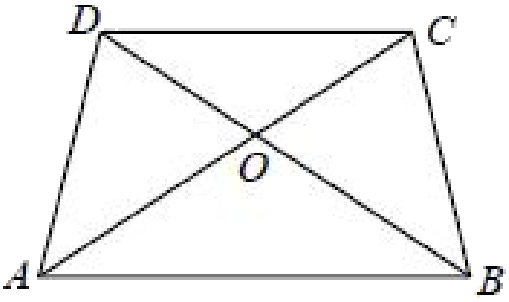
17. In the given trapezium ABCD, AB||CD and AB = 2CD. If area of $\Delta AOB = 84cm^2$ then the

area of ΔCOD is _____



A. $22cm^2$

B. $25cm^2$

C. $21cm^2$

D. $24cm^2$

Answer: C

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18. A reduction of 15% in the price of rice enables a purchaser to obtain 3 kg more for Rs 150. The reduced price per kg is _____

A. Rs 8.50

B. Rs 9

C. Rs 10

D. Rs 7.50

Answer: D

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19. In 50 tosses of a coin, tail appears 32 times. If a coin is tossed at random, then what is the probability of getting a head?

A. $\frac{1}{32}$

B. $\frac{1}{18}$

C. $\frac{16}{25}$

D. $\frac{9}{25}$

Answer: D

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20. If $\cot\theta = \frac{15}{8}$, then evaluate $\frac{(2+2\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(2-2\cos\theta)}$

A. $\frac{8}{15}$

B. $\frac{15}{8}$

C. $\frac{64}{225}$

D. $\frac{225}{64}$

Answer: D

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Everyday Mathematics

1. There is 60% increase in an amount in 6 years at simple interest. What will be the compound interest on ₹ 12,000 after 3 years at the same rate of interest?

A. Rs 2160

B. Rs 3972

C. Rs 3120

D. Rs 6240

Answer: B

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2. A and B together can do a piece of work in days. A having worked for 16 days, B finishes the remaining work alone in 44 days. In how many days shall B finish the whole work alone ? $30\ days$ b. $40\ days$ c. $60\ days$ d. $70\ days$

A. 30 days

B. 40 days

C. 60 days

D. 70 days

Answer: C

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3. To construct a wall 18 m long, 0.5 m thick and 9 m high, bricks of dimensions $20cm \times 15cm \times 10cm$ each are used. If the

mortar occupies $1/10^{th}$ of the volume of the wall, then find the number of bricks used.

A. 32960

B. 24420

C. 24300

D. 24296

Answer: C

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4. 5% of the voters in an election did not cast their votes. In the election, there were only two candidates. The winner by obtaining 52% of the total votes defeated his competitor by 2280 votes. The total number of voters was

A. 60000

B. 52000

C. 63500

D. None of these.

Answer: A

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5. The production of TV in a factory increases uniformly by a fixed number every year. It produced 8000 sets in 6^{th} year and 11300 in 9^{th} year. Find the total production in 6 years.

A. 40500

B. 20000

C. 20500

D. 31500

Answer: D

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6. Ram, Raghav, Tarun and Varun together had a total amount of Rs 240 with them. Ram had half of the total amount that others had. Raghav had one-third of the total amount that others had. Tarun had one-fourth of the total amount that others had. Find the amount that Varun had.

A. Rs 64

B. Rs 70

C. Rs 52

D. Rs 58

Answer: C

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7. In a party, the number of men, women and children guests are 72, 84 and 48 respectively. Find the minimum number of rooms required,

if in each room, the same number of guests are to be seated all of them being of the same category.

A. 20

B. 14

C. 17

D. 18

Answer: C

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8. Ankit purchased 1000 articles at the rate of Rs 5 each and sold 850 articles at the rate of Rs 7 each and rest of the articles at the rate of Rs 3.50 each. Find the average profit per article sold.

A. Rs 1.50

B. Rs 2.47

C. Rs1.75

D. None of these

Answer: D

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9. How many seconds will a 500 metre long train take to cross a man walking with a speed of 3km/hr. in the direction of the moving train if the speed of the train is 63km/hr ?

A. 25 seconds

B. 30 seconds

C. 40 seconds

D. 45 seconds

Answer: B

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10. Two customers Shyam and Ekta are visiting a particular shop in the same week (Tuesday to Saturday). Each is equally likely to visit the shop on any day as on another day. What is the probability that both will visit the shop on (i) the same day?

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

B. $\frac{4}{5}$

C. $\frac{12}{25}$

D. $\frac{1}{5}$

Answer: B

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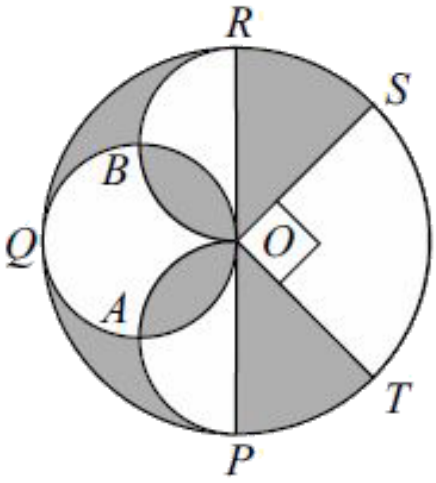
Achievers Section

1. The given figure is made up of a large circle PQRST with centre O and diameter 28 cm, a

small circle QAOB, two semi-circles and a sector OST. Find the total shaded area of the figure.



A. $(198\pi - 98)cm^2$

B. $(49\pi + 198)cm^2$

C. $(150\pi + 100)cm^2$

D. $(147\pi - 196)cm^2$

Answer: D

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2. The jack, queen, king and 8, all of diamonds are lost from a pack of 52 playing cards. If a card is drawn from the remaining well-shuffled pack, then find the probability of getting a

(a) Queen card

(b) Red card

(c) Red king card.

(a) (b) (c)

A. $\frac{1}{12}$ $\frac{1}{12}$ $\frac{1}{24}$

(a) (b) (c)

B. $\frac{1}{16}$ $\frac{3}{16}$ $\frac{1}{24}$

(a) (b) (c)

C. $\frac{1}{16}$ $\frac{1}{12}$ $\frac{1}{48}$

(a) (b) (c)

D. $\frac{1}{16}$ $\frac{11}{24}$ $\frac{1}{48}$

Answer: D

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3. Select the correct option.

A. The 15^{th} term from the end in the A.P. 13, 16, 19, ..., 160 is 108.

B. If the first, second and last terms of an A.P. are 6, 9 and 33 respectively, then the number of terms of the A.P. is 10.

C. The sum of an A.P. 2, 5, 8, ..., 152 is 3925.

D. All of these

Answer: B

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4. Study the statements carefully and select the correct option.

Statement-I : If the roots of the equation $x + k(4x + k - 1) + 2 = 0$ are real and equal, then $k = \frac{2}{3}$ or - 1.

Statement-II : The roots of the equation $ax^2 + bx + c = 0$ are real and equal, if and only if $b^2 - 4ac \geq 0$

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: C

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5. A Hollow cone is cut by a plane parallel to the base and upper portion is removed. If the curved surface of the remainder is 8/9 of the curved surface of the whole cone; find the ration of the line-segment into which the cone's altitude is divided by the plane.

A. $2:3$

B. $1:2$

C. $1:3$

D. $3:4$

Answer: B

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