NIOS-TMA-OCT25'

Name : Nishav Kumar

Enrollment No: 450032242512

Study Centre code : 450032

Subject : Mathematics (Subject code-211)

Course : Secondary (10th)

Medium : English

Phone Number: 9148119744

MATHEMATICS (211)

TUTOR MARKED ASSINGMENT

Q1 Answer any one of the following questions.

(A) Ankur, a secondary level mathematics student, initially struggled to defferentiate between rational and irrational numbers. Through an effective explanation utilizing fractions and decimal expansions, his sister Riya successfully clasified the distinction. Describe a possible method Riya might have used and then apply it to classify the following numbers as rational or irrational:

$1.125, \pi, 1.67676767\ldots, \frac{22}{7}$

Solution:- Riya explained that:

- Rational numbers can be written as p/q, where p and q are integers and $q \neq 0$. Their decimal form either terminates or repeats

- Irrational numbers cannot be written as p/q. their decimal form is non-terminating and non-repeating.

Classification:

1) 1.125 - Rational, because it is a terminating decimal.
2) π - Irrational, because it is non-terminating, non-repeating decimal
3) 1.67676767... - Rational, because it is a repeating decimal.
4) 22/7 → Rational, because it is in the form of p/q

Q2(A) A polygon which has equal sides and equal angle is called a regular polygon. It is found that the interior angle of regular polygon having n sides can be calculated as:

$$\text{Interior angle} = \left(\frac{n-2}{n}\right) \times 180^\circ$$

i) Name the simplest regular polygon and writes the value of its interior angle.

Solution: The simplest regular polygon is an equilateral triangle. It has 3 sides ($n = 3$), Using the formula for interior angle:

$$\text{Interior angle} = \left(\frac{n-2}{n}\right) \times 180^\circ = \left(\frac{3-2}{3}\right) \times 180^\circ$$

$\left(\frac{1}{3}\right) \times 180^{60}{}^\circ = 60^\circ$, So, the value of its interior angle is 60°.

ii) Prove that the sum of the (interior) angles of a hexagon is 720°.

Solution: Number of sides of a hexagon $(n) = 6$

Using the formula for sum of interior angles of a polygon:

$$\text{Sum of interior angles} = (n-2) \times 180^\circ$$
$$= (6-2) \times 180^\circ = 4 \times 180^\circ = 720^\circ$$

Hence, the sum of the interior angles of a Hexagon is 720°.

Q3(B) If ABC is an equilateral triangle and AD is the median. Prove that $3AB^2 = 4AD^2$.

Solution: Given: ABC is an equilateral triangle and AD is the median.

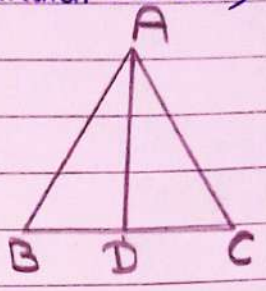
$AB = BC = AC$

Q3(B) Prove : $3AB^2 = 4AD^2$

In triangle ABD, Using Pythagoras Theorem

$AB^2 = AD^2 + BD^2$

$AB^2 = AD^2 + \left(\frac{BC}{2}\right)^2$ (Since AD is perpendicular to BC)



$AB^2 = AD^2 + \frac{AB^2}{4}$ $\left(AB = BC \because \text{Given}\right)$

$\frac{AB^2}{1} - \frac{AB^2}{4} = AD^2$

$\frac{4AB^2 - AB^2}{4} = AD^2$

$\frac{3AB^2}{4} = AD^2 \Rightarrow 3AB^2 = 4AD^2$

$\therefore 3AB^2 = 4AD^2$

Hence Proved

Q4(A)(i) If the sum of the exponents of the prime factors in the prime factorisation of 31752 is a and the product of the exponents of the prime factors in the prime factorisation of 21168 is b. Find a:b

Solution:- Step 1: Prime factorisation of 31752

We find the prime factors : $31752 = 2^3 * \times 3^4 \times 7^2$

Sum of exponents = $a = 3 + 4 + 2 = 9$

Step 2: Prime factorisation of 21168

$21168 = 2^4 \times 3^3 \times 7^2$

Q4(A)(i) $21168 = 2^4 \times 3^3 \times 7^2$

Product of exponents = $b = 4 \times 3 \times 2 = 24$

Step 3: Required ratio

$a : b = 9 : 24 = \boxed{3 : 8}$ Ans

Q4(A)(ii) Aman and Neha, donated Rs. x and Rs. y respectively from their pocket money, towards Prime Minister's National Relief Fund (PMNRF). The donation made by them are represented by the following equation:

$$\frac{3-2\sqrt{5}}{3+\sqrt{5}} = x - \sqrt{5}y$$

Find the total donation made by Aman and Neha towards PMNRF.

Solution: The given equation is: $\frac{3-2\sqrt{5}}{3+\sqrt{5}} = x - \sqrt{5}y$

To simplify, multiply both sides by the conjugate of the denominators $(3-\sqrt{5})$:

$$\frac{(3-2\sqrt{5})(3-\sqrt{5})}{(3+\sqrt{5})(3-\sqrt{5})} = x - \sqrt{5}y$$

The denominator simplifies as:

$$(3+\sqrt{5})(3-\sqrt{5}) = (3)^2 - (\sqrt{5})^2 \Rightarrow 9-5 = 4$$

Simplifying the numerator:

Q4(A)(ii) $(3-2\sqrt{5})(3-\sqrt{5}) = 9-3\sqrt{5}-6\sqrt{5}+10 = 19-9\sqrt{5}$

So, Now we have:

$$\frac{19-9\sqrt{5}}{4} = x-\sqrt{5}y$$

By Comparing both sides:

$$\frac{19-9\sqrt{5}}{4} = x-\sqrt{5}y \Rightarrow x = \frac{19}{4},\ y = \frac{9}{4}$$

Total donation = $\boxed{x+y = \frac{19}{4}+\frac{9}{4} = \frac{28}{4} = 7}$

The total donation made by Aman and neha is ₹7.

Q5(B) In a circle of radius 17cm and centre O, PQ and RS are two parallel chords such that PQ = 16cm and RS = 30cm. Find the distance between chord if

(a) The chord are on the same side of the centre of the circle

(b) The chord are on the opposite sides of the centre of the circle.

Solution: Given: radius = 17cm, PQ = 16cm and RS = 30cm.
O is the centre, PQ and RS are parallel

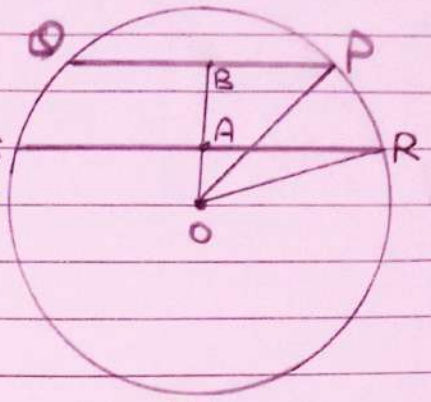
Construction: Draw perpendiculars from the centre O to the chords.

(a) If the chords are on the same side of centre:

Q5(B)(a) In ΔOAR,

$OR = 17cm$ (∵ radius)

$AR = \frac{RS}{2} = \frac{30}{2} = 15cm$ (⊥ from centre bisect the chord)



(a)

Using Pythagoras Theorem in ΔOAR

$OR^2 = AR^2 + OA^2$

$(17)^2 = (15)^2 + OA^2$

$289 = 225 + OA^2$

$289 - 225 = OA^2 \Rightarrow 64 = OA^2$

$\sqrt{64} = OA \Rightarrow OA = 8\ cm$

Similarly, In ΔOBP

$OP = 17cm$ (∵ radius)

$AR = \frac{PQ}{2} = \frac{16}{2} = 8cm$

Using pythagoras Theorem in ΔOBP

$OP^2 = BP^2 + OB^2$

$(17)^2 = (8)^2 + OB^2$

$289 = 64 + OB^2$

$289 - 64 = OB^2 \Rightarrow 225 = OB^2$

$\sqrt{225} = OB$

$OB = 15cm$

The distance between the chords when they are on the same side of Centre $= OB - OA$

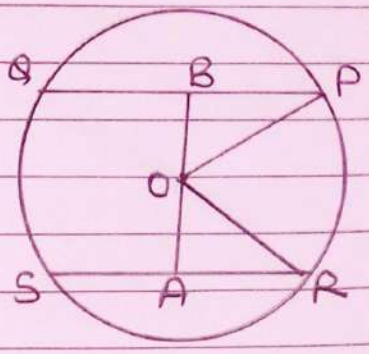
$AB = 15 - 8$

$AB = 7cm$

Q5(B)(b) If the chord are on opposite side of the centre:

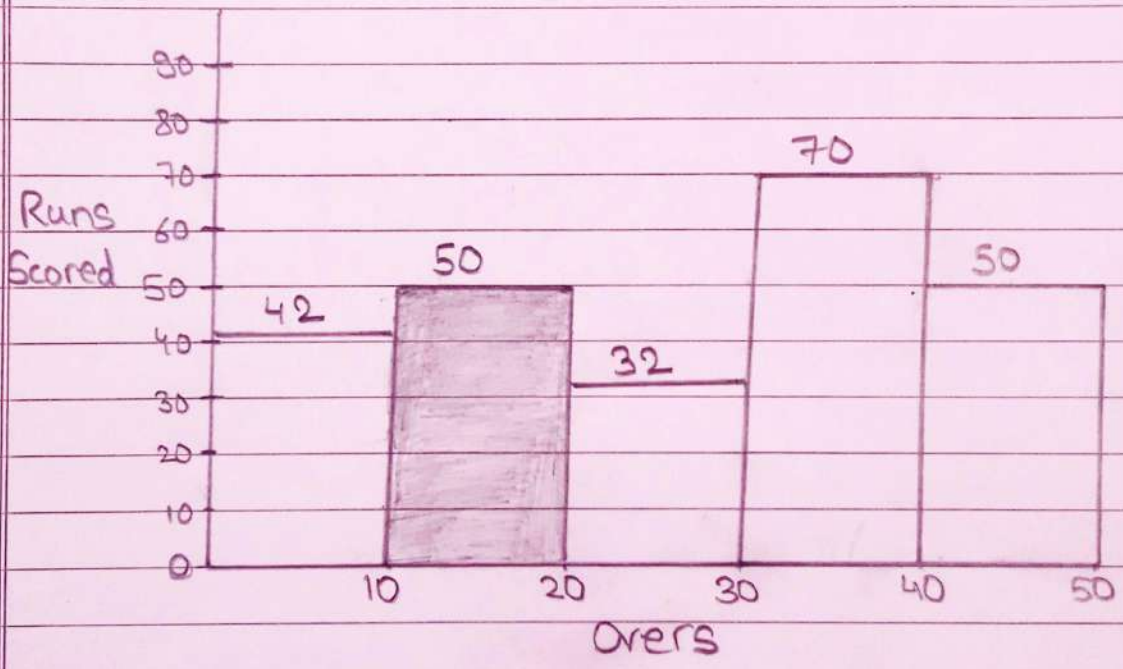
The distance between the chords is the sum of OB and OA

$$AB = 15 + 8$$
$$AB = 23cm$$



Q6 Prepare any one project as given below.

(B) Shown below is the histogram representing the runs scored by a cricket team in diffrent overs. Answer the following question based on the histogram.



(i) In which interval of overs the cricket team scored maximum runs?

Q6(B)(i) From the histogram, the maximum runs = 70, which lies in the interval: 30-40 overs.

(ii) In which interval of overs the cricket team scored equal number of runs?

Ans:- From the histogram, the team scored equal number of 50 runs in the interval: 10-20 and 40-50.

(iii) Construct a grouped frequency table for the data using equal class sizes from the above histogram.

Ans:-

Over	Runs Scored
0-10	42
10-20	50
20-30	32
30-40	70
40-50	50

(iv) Also construct a cumulative frequency table for the above grouped data.

Ans:-

Overs	Frequency	Cumulative Frequency
0-10	42	42
10-20	50	42+50 = 92
20-30	32	92+32 = 124
30-40	70	124+70 = 194
40-50	50	194+50 = 244

Q6(B)(v) Construct a frequency polygon for the data.