RIMC ENTRANCE EXAMINATION – DECEMBER 2017

MATHEMATICS · SOLVED PAPER

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PART – A

Q.1 **Find the difference of the place values of the two 6's (in the thousands and hundreds places) in 9670816640.**

Solution:

We have,

The number = 9670816640

So, place value of the 6 in the hundreds place = 6 × 100 = 600

Place value of the 6 in the thousands place = 6 × 1000 = 6000

Now, difference = 6000 − 600

= 5400

Hence the difference is 5400.

Q.3 **If $x^2 + \frac{1}{x^2} = 88$, find the value of $x - \frac{1}{x}$.**

Solution:

We have,

$\Rightarrow x^2 + \frac{1}{x^2} = 88$

To find = $x - \frac{1}{x}$

On adding and subtracting $2 \times x \times \frac{1}{x}$:

So, $\Rightarrow x^2 + \frac{1}{x^2} - 2 \times x \times \frac{1}{x} + 2 \times x \times \frac{1}{x} = 88$

$\Rightarrow (x^2 + \frac{1}{x^2} - 2) + 2 = 88$

$\because a^2 + b^2 - 2ab = (a - b)^2$

$\Rightarrow (x - \frac{1}{x})^2 = 88 - 2$

$\Rightarrow (x - \frac{1}{x})^2 = 86$

$\Rightarrow x - \frac{1}{x} = \pm\sqrt{86}$

$x - \frac{1}{x} = \pm\sqrt{86}$

Q.5 **(The question text is not available in the source copy; only the last step of the working is visible.)**

Solution:

$\Rightarrow x = \frac{20 + 168}{35}$

$\Rightarrow x = \frac{188}{35}$

Hence $\frac{188}{35}$ should be added.

Q.6 **The denominator of a rational number is greater than its numerator by 10. If the numerator is increased by 15 and the denominator is decreased by 5, the number obtained is $\frac{3}{2}$. Find the rational number.**

Solution:

Let the numerator of the rational number = x

So, denominator of the rational number = x + 10

Then, the rational number = $\frac{x}{x + 10}$

Now, A.T.Q., by adding 15 in numerator and subtracting 5 from denominator we get $\frac{3}{2}$.

So, $\Rightarrow \frac{x + 15}{x + 10 - 5} = \frac{3}{2}$

$\Rightarrow \frac{x + 15}{x + 5} = \frac{3}{2}$

$\Rightarrow 2x + 30 = 3x + 15$

$\Rightarrow 30 - 15 = 3x - 2x$

$\Rightarrow x = 15$

Hence the numerator = x = 15, the denominator = x + 10 = 25

Hence the rational number is $\frac{15}{25}$.

Q.7 **Express in power notation: $\frac{-625}{14641}$**

Solution:

A.T.Q. we have,

$\Rightarrow \frac{-625}{14641}$

So, $\Rightarrow -(\frac{625}{14641})$

$\Rightarrow -(\frac{25^2}{121^2})$

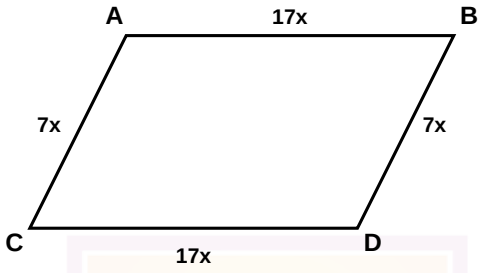
$\because \frac{a^m}{b^m} = (\frac{a}{b})^m$

$= -(\frac{25}{121})^2$

Also, $625 = 5^4$ and $14641 = 11^4$, so it can also be written as $-(\frac{5}{11})^4$

$$\frac{-625}{14641} = -(\frac{25}{121})^2 = -(\frac{5}{11})^4$$

Q.8 The measures of two adjacent sides of a parallelogram are in the ratio 17 : 7. If the second side measures 3.5 cm, find the perimeter of the parallelogram.



Solution:

Let the adjacent sides be 17x and 7x.

Second side = 7x = 3.5 cm

$\Rightarrow x = \frac{3.5}{7} = 0.5$

First side = 17x = 17 × 0.5 = 8.5 cm

Perimeter of the parallelogram = 2 × (sum of adjacent sides)

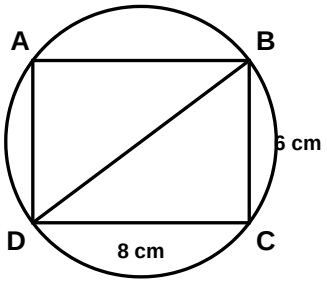
= 2 × (8.5 + 3.5)

= 2 × 12

= 24 cm

Hence the perimeter of the parallelogram is 24 cm.

Q.13 Find the area of the shaded portion in the figure if AB = 6 cm and BC = 8 cm, where ABCD is a rectangle. (Use π = 3.14)



Solution:

A.T.Q. we have,

In rectangle ABCD,

Length of the rectangle = 8 cm

Breadth of the rectangle = 6 cm

Now, we know that area of rectangle = l × b

So, area of rectangle = $8 \times 6 = 48\ cm^2$

Now, diagonal of rectangle = diameter of the circle.

So, diagonal = $\sqrt{l^2 + b^2}$

Diagonal = $\sqrt{8^2 + 6^2}$

Diagonal = $\sqrt{100}$

Diagonal = 10 cm

So, the diameter of the circle = 10 cm

Then, radius = $\frac{d}{2}$ = 5 cm

Now, area of circle = πr^2

$= 3.14 \times 5 \times 5$

$= 3.14 \times 25$

$= 78.5\ cm^2$

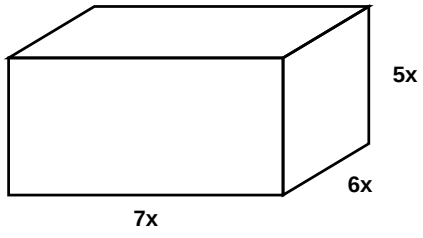
Now, area of shaded portion = area of circle − area of rectangle

So, area of shaded portion = 78.5 − 48.0

$= 30.5\ cm^2$

Hence the area of the shaded portion is 30.5 cm^2.

Q.14 Find the volume of a cuboid whose length, breadth and height are in the ratio 7 : 6 : 5 and its surface area is 1926 cm^2.



Solution:

Let the length = 7x, breadth = 6x and height = 5x.

Surface area of cuboid = 2(lb + bh + hl)

$\Rightarrow 2(7x \times 6x + 6x \times 5x + 5x \times 7x) = 1926$

$\Rightarrow 2(42x^2 + 30x^2 + 35x^2) = 1926$

$\Rightarrow 2 \times 107x^2 = 1926$

$\Rightarrow 214x^2 = 1926$

$\Rightarrow x^2 = 9$

$\Rightarrow x = 3$

So, length = 21 cm, breadth = 18 cm, height = 15 cm

Volume = $l \times b \times h = 21 \times 18 \times 15 = 5670\ cm^3$

Hence the volume of the cuboid is 5670 cm^3.

PART – B

Q.23 The ratio of Meena's age to the age of her mother is 3 : 8. The difference of their ages is 35 years. What will be the ratio of their ages after 4 years?

Solution:

A.T.Q. we have,

Ratio of age of Meena and mother = 3 : 8

Let the age of Meena = 3x and the age of mother = 8x

Now, difference of their age = 35

So, $8x - 3x = 35$

$\Rightarrow 5x = 35$

$\Rightarrow x = 7$

Hence the age of Meena = $3x = 3 \times 7 = 21$ years

The age of mother = $8x = 8 \times 7 = 56$ years

After 4 years: Meena = 21 + 4 = 25 years, mother = 56 + 4 = 60 years

Ratio = 25 : 60 = 5 : 12

Present ages are 21 years and 56 years; after 4 years the ratio of their ages will be 5 : 12.

Q.24 Factorise: (i) $9 - x^6 + 2x^3y^3 - y^6$ (ii) $75a^6b^2 - 108a^4b^4$

Solution:

(i) $\Rightarrow 9 - x^6 + 2x^3y^3 - y^6$

$\Rightarrow 9 - (x^6 - 2x^3y^3 + y^6)$

$\Rightarrow (3)^2 - [(x^3)^2 - 2x^3y^3 + (y^3)^2]$

$\because a^2 - 2ab + b^2 = (a - b)^2$

$\Rightarrow (3)^2 - (x^3 - y^3)^2$

$\because a^2 - b^2 = (a + b)(a - b)$

$\Rightarrow [3 + (x^3 - y^3)][3 - (x^3 - y^3)]$

(i) $(3 + x^3 - y^3)(3 - x^3 + y^3)$

(ii) $\Rightarrow 75a^6b^2 - 108a^4b^4$

$\Rightarrow 3a^4b^2(25a^2 - 36b^2)$

$\Rightarrow 3a^4b^2[(5a)^2 - (6b)^2]$

$\because a^2 - b^2 = (a + b)(a - b)$

$\Rightarrow 3a^4b^2(5a + 6b)(5a - 6b)$

(ii) $3a^4b^2(5a + 6b)(5a - 6b)$

Q.25 Rakesh invested Rs 2000 @ 5% per annum and Rs 3000 @ 4% per annum (simple interest). After a certain time he found that the difference between the interests on both investments was Rs 80. Find the time.

Solution:

Interest on Rs 2000 at 5% for 1 year = $\frac{2000 \times 5 \times 1}{100}$ = Rs 100

Interest on Rs 3000 at 4% for 1 year = $\frac{3000 \times 4 \times 1}{100}$ = Rs 120

Difference of interests in 1 year = 120 − 100 = Rs 20

Let the time = T years. Then the difference = 20T

$\Rightarrow 20T = 80$

$\Rightarrow T = 4$ years

Check: SI on 2000 = $\frac{2000 \times 5 \times 4}{100}$ = 400; SI on 3000 = $\frac{3000 \times 4 \times 4}{100}$ = 480; difference = 80 ✓

Hence the time is 4 years.