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RIMC Maths Previous Year Question Paper

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New Pattern-Based Mock Test

RASHTRIYA INDIA MILITARY COLLEGE (RIMC), DEHRADUN
ENTRANCE EXAMINATION- JUNE 2009
SUBJECT: MATHEMATICS

TIME:1Hr 30mint **Marks -200**

PART-A ($16 \times 5 = 80$ *MARKS*)

Q1. 1.Write the rational numbers given below in descending order.

$\frac{4}{5}, 81\%, 0.801, \frac{3}{5}$

Q2. The average of a list of 10 numbers is '0'. If 72 and 12 are added to the list, what will be its new average?

Q3. The areas of three circles are in the ratio 4:9:25. Find the ratio of their radii.

Q4. 11 men can dig 6¾ meter long trench in one day. How many men should be employed for digging a 27meter long trench of the same type in one day?

Q5. The population of country in the year 2004 was 50,000. If the population is reducing by 20 per thousand per year, what would be the population of the country in the year 2006?

Q6. The side of a square is increased in length by 10%. Find the increase in area.

Q7. Arrange the digits 1, 2, 3, 4 and 5 in such a way that with the help of simple mathematical symbols (like $-, +, =, \div, \times$), they will make 111, 222, 333. All five digits have to be used and only once.

Q8. After 12 years, I shall be 3 times as old as I was 4 years ago. Find my present age.

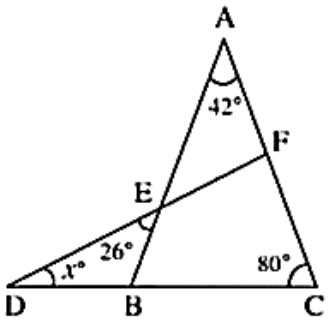
Q9. A car is travelling at the average speed of 50 km/hr. How much distance would it travel in 30 seconds?

Q10. The diagonal of a rectangle is thrice its smaller side. Find the ratio of its sides.

Q11. Find x. $\left(\frac{5}{3}\right)^{-5} \times \left(\frac{25}{9}\right)^{\frac{-11}{2}} = \left(\frac{5}{3}\right)^{8x}$

Q12. If selling price of an article is 4/3 of its cost price. Find its profit per cent.

Q13. In the figure BAC = 42°, ACB = 80°, FDC=x°, DEB = 26°.



Find the value of x.

Q14. Find five rational numbers between $-\frac{3}{2}$ *and* $\frac{5}{3}$.

Q15. How many 5 cm. cubes can be cut off from a cube whose side is 20 cm ?

Q16. A swimming pool is 20 meter in length, 15 meter in breadth and 4 meter in depth. Find the cost of cementing of its floor and walls at the rate of Rs. 12 per square meter.

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PART 'B' (12× 10 = 120)

Q17. By selling a house for Rs. 144000, a dealer loses 12 ½ %. At what price must he sell the house to make a profit of 5% ?

Q18. A rectangular tank 1·5 m long, 1·2 m broad and 1·8 m deep is half full of water. If a brick absorbs 1/5 of its own volume of water. How many bricks 15 cm long, 6 cm broad and 5 cm thick must be put into the tank; so that the water may just reach the top of the tank?

Q19. If $x^2 + \frac{1}{x^2} = 27$, find the value $x^3 - \frac{1}{x^3}$.

Q20. Three prizes are to be distributed in a quiz contest. The value of the second prize is five- sixths the value of the first prize and the value of the third prize is four-fifths that of the second prize. If the total value of the three. prizes is Rs. 450, find the value of each prize.

Q21. 1000 soldiers in a camp had enough food for 20 days. Some soldiers were transferred to another camp and the food lasted for 25 days. How many soldiers were transferred from the camp?

Q22. Factorize-

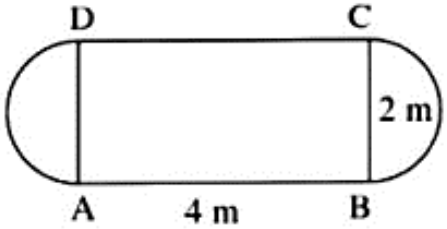
(i) $x^2 + 2x - 15$ (ii) $16x^2 - 9y^2$

(iii) $2 - 50x^2$

(iv) $x^6 - 2x^3y^3 + y^6 + x^3 - y^3$

Q23. A sum of money is lent at simple interest which amounts to Rs. 3192 in 3 years and to Rs. 3720 in 5 years. Find the sum of money and the rate of interest.

Q24. The shape of a garden is rectangular in the middle, and semi-circular at the ends as shown in the diagram. Find the area and perimeter of this garden.



Q25. Two buses do a journey between two cities 200 km apart. One bus A moves at 50 kph one way and 40 kph on the return. The other bus B does 45 kph on both journeys.

(i) Which bus takes lesser time to cover the to and fro distance?

(ii) Do they both take equal time?

Q26. Divide-

(A) x^7-y^7 by x-y

(B) $3y^4 - y^3 + 11y^2 + 2$ by $3y^2-1$

Q27. The external length, breadth and height of a closed wooden box are 30 cm, 18 cm and 20 cm respectively. If the walls of the box are 1·5 cm thick cm, find the capacity and weight of the box. (Given: $1cm^3 = 0.80gm$)

Q28. Solve

(A) $\frac{4}{x+1} + \frac{5}{x-1} = \frac{6}{x-1} + \frac{7}{x+1}$

(B) $\frac{5(1-p)}{3} + \frac{3p-1}{5} = 3p - \frac{1}{3}$

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Solution

Sol.1.

Method I

$\frac{4}{5}, 81\%, 0.801, \frac{3}{5}$

$= 0.8, \frac{81}{100}, .801, 0.6$

$= 0.8, 0.81, .801, 0.6$

Numbers in descending order are:

0.81, 0.801, 0.80, 0.60

Method II

$\frac{4}{5}, 81\%, 0.801, \frac{3}{5}$

$= \frac{4\times20}{5\times20}, \frac{81}{100}, \frac{801}{1000}, \frac{3\times20}{5\times20}$

= 80/100 , 81/100 , 801/1000 , 60/100

= 800/1000 , 810/1000 , 801/1000 , 600/1000

Numbers in descending order are-

810/1000, 801/1000, 800/1000, 600/1000

=0.81,0.801, 0.8 ,0.6

Sol.2.

Average of the 10 numbers is 0

.Sum of the 10 numbers = 10 × 0 = 0

Sum of the 12 numbers 0+72+12 = 84

Average of 12 numbers = 84/12 = 7

Sol.3.

Let r_1 r_2 and r_3 be the radii of the circles

$\pi r_1^2 : \pi r_2^2 : r_3^2 = 4 : 9 : 25$

$r_1^2 : r_2^2 : r_3^2 = 4 : 9 : 25$

$r_1 : r_2 : r_3 = 2:3:5$

Sol.4.

$6\frac{3}{4} = \frac{27}{4}$

$\frac{27}{4}$m long trench can be dug by = 11 men in one day

1 m long trench can be dug by=$\frac{11\times4}{27}$ men in 1 day

27 m long trench can be dug by $\frac{11\times4\times27}{27}$ men in one day=44men

persons required

Sol. 5.

Population of a country in 2004 was 50,000.

Reduction 2% in one year

(100-2) = 98

Population of the country in 2005 will be:

$\frac{98 \times 50{,}000}{100} = 49000$

Reduction in one year = 2% (100-2=98)

Population of the country in 2006 will be:

$\frac{98 \times 49{,}000}{100} = 48020$

Sol. 6.

Let each side be x cm.

Its area will be $x \times x = x^2$ cm^2

Increase in each side = 10%

New side = $\frac{110}{100}x = \frac{11}{10}x$

New area= $\frac{11}{10}x \times \frac{11}{10}x$

$\frac{121}{100}x^2$

Increase in area = $\frac{121}{100}x^2 - x^2$

$(\frac{121}{100} - 1)\, x^2$

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$\frac{21}{100}x^2$

Area Percentage Increase $\frac{\frac{21x^2}{100}}{x} \times 100$

$= 21\%$

Sol.7.

$23 \times 5 \times 1 - 4 = 111$

$213 + 4 + 5 = 222$

$345 - 12 = 333$

Step-by-step explanation:

$23 \times 5 \times 1 - 4$

$= 115 - 4$

$= 111$

$23 \times 5 \times 1 - 4 = 111$

$213 + 4 + 5$

$= 213 + 9$

$= 222$

$213 + 4 + 5 = 222$

$345 - 12$

$= 333$

$345 - 12 = 333$

Here are the Solutions :

$23 \times 5 \times 1 - 4 = 111$

$213 + 4 + 5 = 222$

$345 - 12 = 333$

Sol.8.

Let my present age be x years.

After 1 year I will be (x + 1) years old.

Four years ago I was (x - 4) years old.

According to the question

$x + 12 = 3(x - 4)$

$x + 12 = 3x - 12$

$x - 3x = -12 - 12$

$-2x = -24$

$x = 12$

Sol.9.

Speed of the car = 50 km/hr and

Time 30 seconds

$= \frac{30}{60 \times 60} = \frac{1}{120}$ hrs

Distance travelled by the car

$\frac{50 \times 1}{120} km$

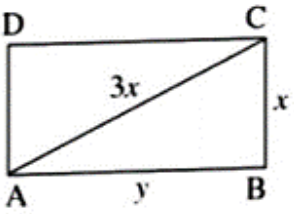
$\frac{5}{12} km$

$\frac{5 \times 1000}{12} m$

$\frac{1250}{3} m$

$416\frac{2}{3} m$

Sol.10.



Let

AB = y

$y^2 + x^2 = 9x^2$

$y^2 = 9x^2 - x^2$

$y^2 = 8x^2$

$y = 2\sqrt{2}x$

$y : x = 2\sqrt{2}x : x$

$= 2\sqrt{2} : 1$

Sol.11.

$\left(\frac{5}{3}\right)^{-5} \times \left(\frac{25}{9}\right)^{\frac{-11}{2}} = \left(\frac{5}{3}\right)^{8x}$

$\left(\frac{5}{3}\right)^{-5} \times \left(\frac{5}{3}\right)^{2\times\frac{-11}{2}} = \left(\frac{5}{3}\right)^{8x}$

$\left(\frac{5}{3}\right)^{-5} \times \left(\frac{5}{3}\right)^{-11} = \left(\frac{5}{3}\right)^{8x}$

$\left(\frac{5}{3}\right)^{-16} = \left(\frac{5}{3}\right)^{8x}$

$8x = -16$

$X = -2$

Sol.12.

Let C.P. be Rs. x

S.P. will be = Rs. $\frac{4}{3}x$

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Profit $=\frac{4}{3}x - x = \frac{1}{3}x$

$\frac{1}{3}x$

Profit %$= \frac{\frac{x}{3}}{x} \times 100\%$

$\frac{1}{3} \times 100\%$

$33\frac{1}{3}\%$

Sol.13.

In the given figure

In ΔABC. ∠ABC + 42° + 80°

= 180°

∠ABC = 180° - (42° + 80°)

In Δ EBD

= 180° - 122° = 58°

∠EBD = 180° - 58°

(Interior angle)

= 122°

In Δ EBD

x + 26° + 122° = 180°

x = 180° - 148°

= 32°

Sol.14.

$-\frac{3}{2} = -1.5$;

$\frac{5}{3} = 1.66$

Five rational numbers between - 1.5 and 1.66

can be- 1.4, 1.2, +1.2, +1.4 and + 1.5

i.e., $-\frac{14}{10}, \frac{-12}{10}, \frac{+12}{10}, \frac{+14}{10}$ and $\frac{+15}{10}$

i.e, $-\frac{7}{5}, \frac{-6}{5}, \frac{+6}{5}, \frac{+7}{5}$ and $\frac{+3}{5}$

Sol.15.

Volume of the bigger cube

= 20 × 20 × 20cm^3

Volume of the smaller cube

= 5 × 5 × 5 cm^3

Number of small cube to be cut out from the bigger cube = $\frac{20\times20\times20}{5\times5\times5}$

= 4 × 4 × 4

= 64

Sol.16.

Length = 20 m. Breadth = 15m and Depth = 4 m

Area of the floor and 4 walls

= Length × Breadth+ 2 (Length + Breadth) × Depth

= 20 × 15 + 2(20 + 15) × 4

= 300 + 2 × 35 × 4

= 300+280

= 580m^2

Cost of cementing the floor and its walls @ Rs. 12 per sq. m

= 580 × 12

= Rs 6960

Sol.17.

S.P. of the house = Rs. 144000

Loss = 12 ½ %

100-12.5 = 87.5

C.P. of the house = 100 × 144000 / 87.5

Profit = 5%

100+5 = 105

New S.P. of the house = 105 × 144000/87.5

= Rs. 172800

Sol.18.

Length = 1.5m

= 150cm

Breadth = 1.2m = 120cm

Depth = 1.8m

= 180cm

Volume of the tank = 150 × 120 × 180cm

Volume of the half full of water

$\frac{150\times120\times180}{2}$

150 × 120 × 90 cm^3

Volume of brick = 15 × 6 × 5 cm^3

= 450cm^3

A brick absorbs 1/5 of its own volume of water.

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Volume of the water absorbed = 450/5 c.c.

= 90c .c

Increase in volume if one brick is put in = 450-90 = 360cm^3

Number of bricks needed to full the tank = (150 × 120 × 90)/360 = 4500

Sol.19.

$x^2 + \frac{1}{x^2} = 27$

We know that $(x - \frac{1}{x})^2 = x^2 + \frac{1}{x^2} - 2$

= 27-2

= 25

$\left(x - \frac{1}{x}\right) = \pm 5$

$x^3 - \frac{1}{x^3} = (x - \frac{1}{x})(x^2 + \frac{1}{x^2} + 1)$

= ± 5(27+1)

= ±5 × 28

= ±140

Sol.20.

Let the value of the first prize be of Rs.x

Value of the second prize = Rs. 5/6 x

Value of the third prize =Rs. $\frac{4}{5} \times \frac{5}{6}x$

$= \frac{2}{3}x$

$Given\ x + \frac{5}{6}x + \frac{2}{3}x = 450$

$\frac{6x + 5x + 4x}{6} = 450$

$\frac{15x}{6} = 450$

x=$\frac{450 \times 6}{15}$

x = Rs.180

Value of the first prize = Rs. 180

.. Value of the second prize = $\frac{5}{6} \times 180$

= Rs. 150

Value of the third prize = 2/3 x

= 2/3 × 180

= Rs 120

Sol.21.

Numbers of soldiers	Days
1000 ↑	20↓
X	25

x : 1000 = 20:25

25x = 1000 × 20

x = (1000 × 20)/25

x = 40 × 20

x = 800

1000 - 800 = 200 soldiers were transferred from the camp.

Sol.22.

(i) $x^2 + 2x - 15$

= $x^2 + 5x - 3x - 15$

= x(x + 5) - 3(x + 5)

= (x + 5) (x - 3)

(ii) $16x^2 - 9y^2$

= $(4x)^2 - (3y)^2$

= (4x + 3y) (4x - 3y)

(iii) $2 - 50x^2$

= $2(1 - 25x^2)$

= $2[1 - (5x)^2]$

= 2[1 + 5x] [1 - 5x]

(iv) $x^6 - 2x^3y^3 + y^6 + x^3 - y^3$

= $(x^3 - y^3)^2 + (x^3 - y^3)$

= $(x^3 - y^3)\ [x^3 - y^3 + 1]$

= $(x - y)\ (x^2 + xy + y^2)(x^3 - y^3 + 1)$

Sol.23.

Let Rs. P be the principal amount and R% be the rate.

According to the question

3192-p=$\frac{P \times R \times 3}{100}$ ..... (I)

3192-p=$\frac{P \times R \times 5}{100}$ ..... (II)

(3192 - P)/(3720 - P) = 3/5

15960 - 5P = 11160 - 3P

- 5P + 3P = 11160 - 15960

- 2P = - 4800

P = Rs 2400

3192 - P = (P × R × 3)/100

3192 - 2400 = (2400 × R × 3)/100

792 = 24 × 3R

R = 792/72

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R = 11%
Hence, P = Rs 2400
R = 11% per annum

Sol.24.

Diameter of the semi-circle = 2m
Area of the whole rectangular field with two semi-circles
= Area of the rectangle + Area of two half circles
$= 4 \times 2 + 2 \times \frac{1}{2}\pi \times 1^2$
$= (8 + \pi)\ m^2$
$= (8 + 3.14)m^2$
$= 11.14m^2$
(Take π = 3.14)
Perimeter of the garden
= 4 + 4 + 2π ×1
= (8 + 2π)m
= 8 + 2 × 3.14
= 8+6.28
= 14.28m

Sol.25.

Time taken by the first bus = 200/50 + 200/40
= (4 + 5)hrs
= 9hrs
Time taken by the second bus
= (200/45 + 200/45) hrs
= 400/45 hrs
= 8 8/9 hrs
= 8 hours 53 minutes 20 seconds
(i) Bus No. 2 takes less time to cover to and for distance.
(ii) No, they do not take equal time

Sol.26.

(i)

$$x - y)\ \frac{x^6 + x^5y + x^4y^2 + x^3y^3 + x^2y^4 + xy^5 + y^6}{x^7 - y^7}$$

$$x^7 - x^6y$$
$$- \quad +$$
$$+x^6y - y^7$$
$$x^6y - x^5y^2$$
$$- \quad +$$
$$x^5y^2 - y^7$$
$$x^5y^2 - x^4y^3$$
$$- \quad +$$
$$+x^4y^3 - y^7$$
$$+x^4y^3 - x^3y^4$$
$$- \quad +$$
$$+x^3y^4 - y^7$$
$$x^3y^4 - x^2y^5$$
$$- \quad +$$
$$+x^2y^5 - y^7$$
$$x^2y^5 - xy^6$$
$$- \quad +$$
$$+xy^6 - y^7$$
$$+xy^6 - y^7$$
$$- \quad +$$
$$X$$

Remainder = 0
Quotient = $x^6 + x^5y + x^4y^2 + x^3y^3 + x^2y^4 + xy^5 + y^6$

$$\frac{x^7 - y^7}{x - y} = x^6 + x^5y + x^4y^2 + x^3y^3 + x^2y^4 + xy^5 + y^6$$

(ii)

$3y^4 - y^3 + 11y^2 + 2$ by $3y^2 - 1$

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$$3y^2-1)\overline{\frac{y^2-\frac{1}{3}y+4}{3y^4-y^3+11y^2+2}}$$

$3y^4 - y^2$

$+$

$-y^3+12y^2+2$

$-y^3+\frac{1}{3}y$

$+ \quad -$

$12y^2-\frac{1}{3}y+2$

$12y^2-4$

$- \quad - \quad +$

$-\frac{1}{3}y+6$

Remainder = $-\frac{1}{3}y+6$

Quotient= $y^2-\frac{1}{3}y+4$

Sol.27.

External length = 30 cm

Thickness 1.5

Internal length = 30-3=27 cm

External breadth = 18cm

Thickness 1.5 cm

Internal breadth = 18-3= 15 cm

External height = 20cm

Thickness = 1.5cm

Internal height = 20-3 = 17cm

Capacity (Internal volume) of the wooden box

= 27 × 15 × 17cm^3

= 68885 cm^3

External volume of the wooden box

= 30 × 18 × 20

= 10800cm^3

Volume of the wood used = External vol. - Internal vol.

= (10800 - 6885) cm^3

= 3915 cm^3

Given,

1 cm^3 = 0.80 gm

Weight of the box = 3915 × 0.8 = 3132gm

Sol.28.

(a) $\frac{4}{(x+1)}+\frac{5}{x-1}=\frac{6}{x-1}+\frac{7}{x+1}$

$\frac{4}{(x+1)}-\frac{7}{x+1}=\frac{6}{x-1}-\frac{5}{x-1}$

$\frac{-3}{(x+1)}=\frac{1}{(x-1)}$

x + 1 = - 3x + 3

x + 3x = 3 - 1

4x = 2

x = ½

(b). $\frac{5(1-p)}{3}+\frac{3p-1}{5}=-3p-\frac{1}{3}$

$\frac{25-25p+9p-3}{15}=\frac{-(9p+1)}{3}$

22 - 16p = - 45p - 5

(45 - 16) p = - 22 - 5

=-27

p = - 27/29

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