Grade 10 Andhra Pradesh Mathematics 2019

Q1. Write $A = \{2,4,8,16\}$ in set-builder form.

Solution:

$A = \left\{\frac{2^n}{n} \in N, \text{and } n < 5\right\}$

Q2. Find the value of $\log_5 \sqrt{625}$.

Solution:

$\log_5 \sqrt{625}$

$= \log_5 25$

$= \log_5 5^2$

$= 2\log_5 5$

$= 2 \times 1$

$= 2$

Q3. The larger of two supplementary angles exceeds the smaller by 58°, then find the angles.

Solution:

Let the required supplementary angles be x and y.

$x + y = 180° - - - - (1)$

The larger angle exceeds the smaller by 58°.

$x - y = 58° - - - -(2)$

Solve (1) and (2),

$2x = 238°$

$x = \frac{238°}{2}$

$x = 119°$

Then using the value of x

$y = 61°$

Q4. Find the curved surface area of the cylinder, whose radius is 7 cm and height is 10 cm.

Solution:

Radius if the cylinder $(r) =$ 7 cm

Height of the cylinder (h) $=$ 10 cm

The curved surface area of the cylinder $= 2\pi rh$

$= 2 \times \frac{22}{7} \times 7 \times 10 = 440 \text{ cm}^2$

SECTION - II

Q5. Rohan's mother is 26 years older than him. The product of their ages after 3 years will be 360. Then write the required quadratic equation to find Rohan's present age.

Solution:

Let Rohan's present age be x years.

His mother's age at present is $(x + 26)$ years.

After 3 years, Rohan's age $= (x + 3)$ years

After 3 years, his mother's age $= (x + 26) + 3 = (x + 29)$ years

The product of their ages $= (x + 3)(x + 29)$

$= x \times x + x \times 29 + 3 \times x + 3 \times 29$

$= x^2 + 29x + 3x + 87$

$= x^2 + 32x + 87$

By the sum, the product of their ages is 360

$x^2 + 32x + 87 = 360$

$x^2 + 32x + 87 - 360 = 0$

$x^2 + 32x - 273 = 0$ is the required quadratic equation.

Q6. Find the zeroes of the quadratic polynomial $x^2 - x - 30$ and verify the relation between the zeroes and its coefficients.

Solution:

Given the polynomial $x^2 - x - 30$,

To find the zeros, $x^2 - x - 30 = 0$ [say]

$= x^2 - 6x + 5x - 30$

$= x(x - 6) + 5(x - 6)$

$= (x + 5)(x - 6)$

$x = -5$ and $x = 6$

Sum of the zeroes $= 6 + (-5)$

$= 1$

$= \frac{-1}{1}$

$= -\frac{\text{coefficient of } x}{\text{coefficient of } x^2}$

Product of the zeroes $= 6(-5)$

$= -30$

$= \left(-\frac{30}{1}\right)$

$= \frac{\text{constant term}}{\text{coefficient of } x^2}$

Q7. A joker's cap is in the form of a right circular cone, whose base radius is 7 cm and height is 24 cm. Find the area of the sheet required to make 10 such caps.

Solution:

Base radius of the conical cap $(r) = 7$ cm

Height $(h) = 24$ cm

Slant height $(l) = \sqrt{r^2 + h^2}$

$= \sqrt{7^2 + 24^2}$

$= \sqrt{49 + 576}$

$= \sqrt{625}$

$= 25$ cm

Area of sheet required to make a cap = Lateral surface area of the cap

$= \pi rl$

$= \left(\frac{22}{7}\right) \times 7 \times 25$

$= 550$ sq. cm

Area of sheet required to 10 such caps

$= 10 \times 550$

$= 5500$ sq. cm

Q8. Find the HCF of 1260 and 1440 by using Euclid's division lemma.

Solution:

The given numbers are 1260 and 1440.

$1440 = 1260 \times 1 + 180$

$1260 = 180 \times 7 + 0$

HCF of 1440 and 1260 is 180.

Q9. If the sum of the first 15 terms of an AP is 675 and its first term is 10, then find 25^{th} term.

Solution:

First-term of an AP $= a = 10$

Let the common difference be d.

Sum of the first 15 terms is $S_{15} = 675$

$\left(\frac{15}{2}\right)[2a + 14d] = 675$

$[2 \times 10] + 14d = \frac{675 \times 2}{15}$

$14\,d = 90 - 20 = 70$

$d = \frac{70}{14}$

$d = 5$

25^{th} term of an AP is $a_{25} = a + 24\,d$

$= 10 + 24 \times 5$

$= 10 + 120$

$= 130$

Q10. [a] Show that $2 + 5\sqrt{3}$ is irrational.

Solution:

[a] Let us assume the contrary that $2 + 5\sqrt{3}$ is rational that is coprime can be found for ' a ' and ' b ' and $b \neq 0$ such that

$2 + 5\sqrt{3} = \left(\frac{a}{b}\right)$

$5\sqrt{3} = \left(\frac{a}{b}\right) - 2$

$\sqrt{3} = \left(\frac{a}{5b}\right) - \left(\frac{2}{5}\right)$

Since $\left(\frac{a}{5b}\right)$ and $\left(\frac{2}{5}\right) \in$ Q,

$\left(\frac{a}{5b}\right) - \left(\frac{2}{5}\right) \in$ Q.

So, $\sqrt{3}$ is rational.

But this contradicts the fact that $\sqrt{3}$ is irrational.

So, our assumption that $2 + 5\sqrt{3}$ is rational is wrong.

So, $2 + 5\sqrt{3}$ is irrational.

OR

[b] Check whether -221 is a term of the AP 22, 5, 8, 1....

Solution:

From the given AP, 22, 15, 8,1 ....

$a = 22, d = -7$

n^{th} term of an AP $= a_n = a + (n-1)d$

In this AP, let the n^{th} term be -321

$a + (n-1)d = -321$

$22 + (n-1)(-7) = -321$

$(\text{n} - 1)(-7) = -343$

$n - 1 = \frac{-343}{-7}$

$n = 49 + 1$

$n = 50$

Hence, -321 will be the 50^{th} term in the given AP.

Q11. [a] In a class test, the sum of Moulika's marks in mathematics and English is 30. If she got 2 marks more in mathematics and 3 marks less in English, the product of her marks would have been 210. Find her marks in the two subjects.

Solution:

[a] Given that the sum of Moulika's marks in Mathematics and English is 30.

Let the marks of Moulika in Mathematics be x and that of in English be $30 - x$.

If she got 2 marks more in mathematics then marks in maths $= x + 2$

And she got 3 marks less in English then the marks in English = *30-x-3=27-x*

Product of these two $= (x + 2)(27 - x) = 210$

$x^2 - 25x + 156 = 0$

$(x - 12)(x - 13) = 0$

$x = 12,13$

Case (i) If $x = 12$, the marks of Moulika in

Mathematics $= 12$

English = 30-12 = 18

Case (ii) If $x = 13$, the marks of Moulika in

Mathematics $= 13$

English = 30-13 = 17

OR

[b] An oil drum is in the shape of the cylinder, whose diameter is 2 m and height is 7 m. The painter charges Rs. 5 per m^2 to paint the drum. Find the total charges to be paid to the painter for 10 drums.

Solution:

The diameter of the oil drum which is in the shape of cylinder $= d = 2$ m

The radius of the drum $= r = \frac{d}{2} = \frac{2}{2} = 1$ m

Height $= h = 7$ cm

Total surface area of the drum which is in the shape of cylinder $= 2\pi r(r + h)$

$= 2 \times \left(\frac{22}{7}\right) \times (1) \times (1 + 7)$

$= 2 \times \left(\frac{22}{7}\right) \times 8$

$= 50.28$ sq. m

Charges to paint the drum per sq. m = Rs. 5

The total cost of painting 10 such type of drums $= 50.28 \times 5 \times 10 =$ Rs. 2514

Q12. (i) [a] If A $= \{x: x$ is a natural number less than is 6$\}$.

B $= \{x: x$ is a prime number which is a divisor of 60$\}$.

C $= \{x: x$ is an odd natural number less than 10$\}$.

D $= \{x: x$ is an even natural number which is a divisor of 48$\}$.

Then write the roster form for all the above sets and find

[a] A ∪ B

[b] B ∩ C

[c] A − D

[d] D − B

Solution:

(i) [a]A = {1, 2, 3, 4, 5}

B = {2, 3, 5}

C = {1, 3, 5, 7, 9}

D = {2, 4, 6, 8, 12, 14, 16, 24, 48}

[a] A ∪ B = {1, 2, 3, 4, 5} ∪ {2, 3, 5} = {1, 2, 3, 4, 5}

[b] B ∩ C = {2, 3, 5} ∩ {1, 3, 5, 7, 9} = {3, 5}

[c] A − D = {1, 2, 3, 4, 5} − {2, 4, 6, 8, 12, 14, 16, 24, 48} = {1, 3, 5}

[d] D − B = {2, 4, 6, 8, 12, 14, 16, 24, 48} − {2, 3, 5} = {4, 6, 8, 12, 16, 24, 48}

OR

(ii) 6 pencils and 4 notebooks together cost Rs. 90 whereas 8 pencils and 3 notebooks together cost Rs. 85. Find the cost of one pencil and that of one notebook.

Solution:

Let the cost of one pencil be Rs. x.

Cost of one notebook = Rs. y.

The total cost of 6 pencils and 4 notebooks = Rs. 90

$6x + 4y = 90 - - - (1)$

The total cost of 8 pencils and 3 notebooks = Rs. 85

$8x + 3y = 85 - - - (2)$

On solving the above two equations, $x = 5, y = 15$.

The cost of one pencil = Rs. 5

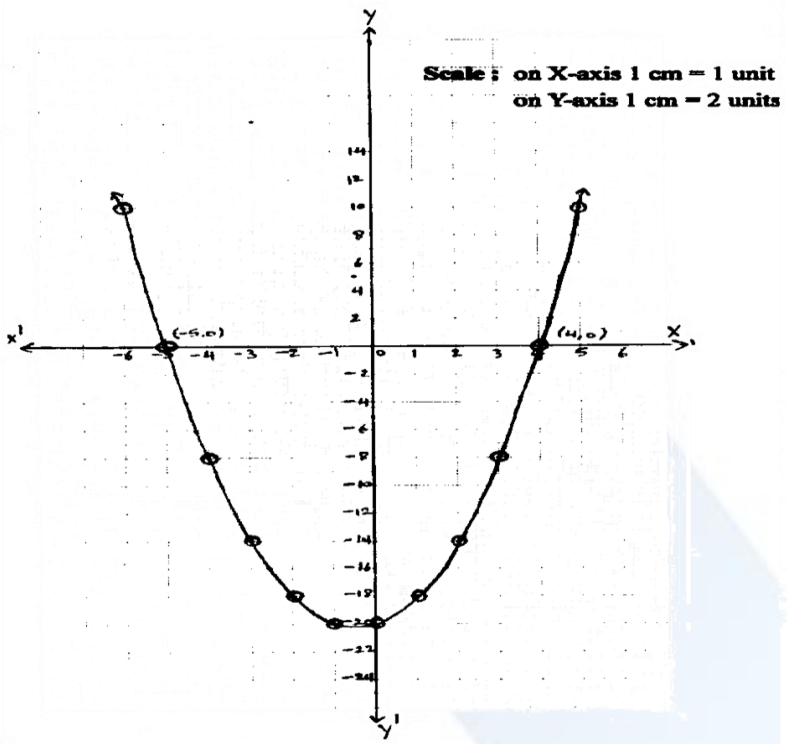
The cost of one notebook = Rs. 15

Q13. [a] Find the zeroes of the quadratic polynomial $p(x) = x^2 + x - 20$ using the graph.

Solution:

[a] Let $y = x^2 + x - 20$

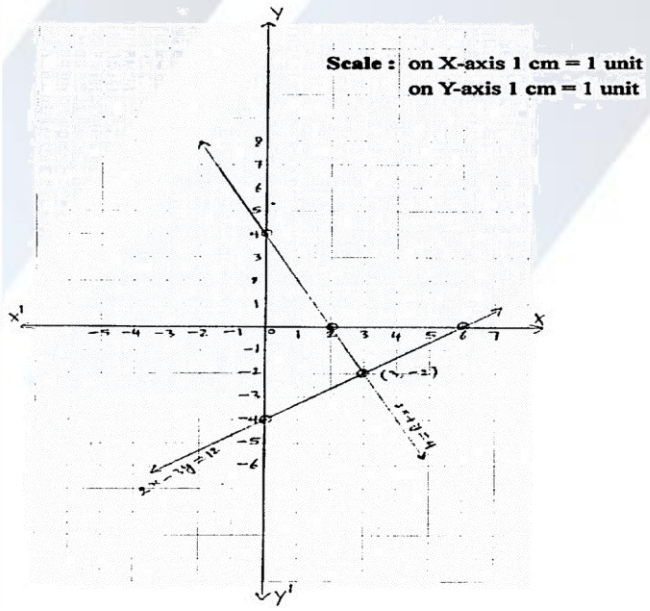
Zeroes are those values of x where graph touches the x-axis.



OR

[b] Solve the following pair of linear equations graphically. $2x + y + 4$ and $2x - 3y = 12$.

Solution:



$x = 3, y = -2$

Q14. If $n(A) = 8, n(B) = 3, n(A \cap B) = 2$, then $n(A \cup B) =$

(A) 5

(B) 7

(C) 9

(D) 13

Solution: C

$n(A \cup B) = n(A) + n(B) - n(A \cap B) = 8 + 3 - 2 = 9$

Q15. The discriminant of $6x^2 - 5x + 1 = 0$ is

(A) 1

(B) 2

(C) 6

(D) $-\frac{5}{6}$

Solution: A

Discriminant= $b^2 - 4ac = (-5)^2 - 4 \times 6 \times 1 = 1$

Q16. Sum of the zeroes of the polynomial $x^2 + 5x + 6 = 0$ is

(A) 5

(B) -5

(C) 6

(D) $\frac{5}{6}$

Solution: B

Sum of the zeroes= $-\frac{\text{coefficient of } x}{\text{coefficient of } x^2} = -\frac{5}{1} = -5$

Q17. Which of the following is not irrational?

(A) $\sqrt{2}$

(B) $\sqrt{3}$

(C) $\sqrt{4}$

(D) $\sqrt{5}$

Solution: C

$\sqrt{4} = 2$

Q18. One root of the equation $x - \frac{3}{x} = 2$ is

(A) 1

(B) 2

(C) 3

(D) 4

Solution: C

$3 - \frac{3}{3} = 3 - 1 = 2 = \text{RHS}$

Q19. If $4, a, 9$ are in GP, then $a =$

(A) 6

(B) ± 6

(C) 7

(D) ± 7

Solution: B

Common ratios will be equal.

$\frac{a}{4} = \frac{9}{a}$

$a^2 = 36$

$a = \pm 6$

Q20. If the total surface area of a cube is 96cm^2, then its volume is

(A) $32\ \text{cm}^3$

(B) $64\ \text{cm}^3$

(C) $128\ \text{cm}^3$

(D) $256\ \text{cm}^3$

Solution: B

The total surface area of a cube$= 6a^2 = 96\ \text{cm}^2$

$a = 4\ \text{cm}$

Volume $= a^3 = 4^3 = 64\ \text{cm}^3$.

Q21. $\log_{10}\ 0.001 =$

(A) 2

(B) 3

(C) -2

(D) -3

Solution: D

$\log_{10} 0.001 = \log_{10} 10^{-3} = -3$

Q22. Match the following.

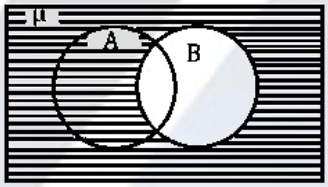
If a, b, c are the zeroes of a cubic polynomial $ax^3 + b^2 + cx + d = 0$, then

[i] $a + b + c$	[a] $-\frac{d}{a}$
[ii] $ab + bc + ca$	[b] $\frac{c}{a}$
[iii] abc	[c] $-\frac{b}{a}$

(A) [i] - c, [ii] - b, [iii] - a
(B) [i] - a, [ii] - b, [iii] - c
(C) [i] - b, [ii] - a, [iii] - c
(D) [i] - c, [ii] - a, [iii] - b
Solution: A

Q23. The next term in AP $\sqrt{3}, \sqrt{12}, \sqrt{27}, \cdots\cdots$
(A) $\sqrt{32}$
(B) $\sqrt{36}$
(C) $\sqrt{42}$
(D) $\sqrt{48}$
Solution: D
Common difference will be equal.
$d = \sqrt{12} - \sqrt{3} = \sqrt{27} - \sqrt{12} = \sqrt{3}$
So, next term$= 4\sqrt{3} = \sqrt{48}$

Q24. The shaded region in the figure shows



(A) A − B
(B) B − A
(C) μ − B
(D) A ∪ B
Solution: C

Q25. $5x - 3$ represents polynomial.
(A) Linear
(B) Quadratic
(C) Cubic
(D) Fourth degree
Solution: A
Since the degree of the polynomial is one.

Q26. The common difference in AP $\log_2 2, \log_2 4, \log_2 8 \ldots \ldots$ is

(A) 1

(B) 2

(C) 3

(D) 4

Solution: A

$d = \log_2 4 - \log_2 2 = 2 - 1 = 1$

Q27. The sum of the first ' n ' odd natural numbers is

(A) n

(B) n^2

(C) $n(n+1)$

(D) $n(n+2)$

Solution: B

The sum of the first ' n ' odd natural numbers is n^2.

Q28. The quadratic polynomial, whose zeroes are $\sqrt{2}$ and $-\sqrt{2}$ is

(A) $x^2 - 2$

(B) $x^2 + 2$

(C) $x^2 + \sqrt{2}$

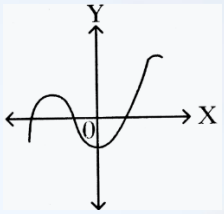
(D) $x - 2$

Solution: A

Quadratic polynomial$= x^2 - (sum\ of\ the\ zeroes)x +$ product of the zeroes

$= x^2 - 2$

Q29. The number of zeroes of the polynomial in the graph is



(A) 0

(B) 1

(C) 2

(D) 3

Solution: D

Since the graph touches the x-axis at three points.

Q30. The line $2x - 3y = 8$ intersects x -axis at

(A) $(2, -3)$

(B) $(0, -3)$
(C) $(2, 0)$
(D) $(4, 0)$
Solution: D
$2 \times 4 - 3 \times 0 = 8 = \text{RHS}$

Q31. The volume of the cone, whose radius is 3 cm and height is 8 cm, is ____ cm^3.
(A) 6π
(B) 12π
(C) 18π
(D) 24π
Solution: D
Volume of cone$= \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi \times 3^2 \times 8 = 24\pi \text{ cm}^3$

Q32. If $6x + 2y + 9 = 0$ and $kx + y - 7 = 0$ has no solution, then $k =$
(A) 3
(B) 2
(C) -3
(D) -2
Solution: A
Condition for no solution:
$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$
$\frac{6}{k} = \frac{2}{1}$
$k = 3$

Q33. If the equation $x^2 + 5x + k = 0$ has real and distinct roots, then
(A) $k = 6$
(B) $k < 6.25$
(C) $k > 6$
(D) $k > 25$
Solution: B
Discriminant will be greater than zero.
$b^2 - 4ac > 0$
$5^2 - 4 \times 1 \times k > 0$
$k < 6.25$