Telangana Board SSC Class 10 Maths 2018 Question Paper 1 with Solutions

PART A
SECTION - I

1. Find the distance between the points (1, 5) and (5, 8).

Solution:
Let the given points be:
$(x_1, y_1) = (1, 5)$
$(x_2, y_2) = (5, 8)$
Distance between two points

$= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(5-1)^2 + (8-5)^2}$

$= \sqrt{4^2 - 3^2}$

$= \sqrt{16 + 9}$

$= \sqrt{25}$
= 5 units

2. Expand $\log_{10} 385$.

Solution:
$\log_{10} 385$
$= \log_{10} (5 \times 7 \times 11)$
We know that log abc = log a + log b + log c
$= \log_{10} 5 + \log_{10} 7 + \log_{10} 11$

3. Give one example each for a finite set and an infinite set.

Solution:
Finite set: A = {3, 5, 7, 9, 11, 13, 15, 17}
n(A) = 8
Infinite set: Z = Set of all integers
= {.....,-4, -3, -2, -1, 0, 1, 2, 3, 4, ...}
$n(Z) = \infty$

4. Find the sum and product of roots of the quadratic equation.
$x^2 - 4\sqrt{3}x + 9 = 0$

Solution:
Given quadratic equation is:
$x^2 - 4\sqrt{3}x + 9 = 0$

Comparing with the standard form $ax^2 + bx + c = 0$,
$a = 1$, $b = -4\sqrt{3}$ and $c = 9$
Sum of the roots = $-b/a = -(-4\sqrt{3})/1 = 4\sqrt{3}$
Product of the roots = $c/a = 9/1 = 9$

5. Is the sequence $\sqrt{3}, \sqrt{6}, \sqrt{9}, \sqrt{12}, \ldots$ form an Arithmetic Progression? Give reason.

Solution:
Given,
$\sqrt{3}, \sqrt{6}, \sqrt{9}, \sqrt{12}, \ldots$
First term = $a = \sqrt{3}$
Second term - First term = $\sqrt{6} - \sqrt{3}$
Third term - Second term = $\sqrt{9} - \sqrt{6} = 3 - \sqrt{6}$
Since the common difference is not the same throughout the sequence, it is nor form an AP.

6. If $x = a$ and $y = b$ is the solution for the pair of equations $x - y = 2$ and $x + y = 4$, then find the values of a and b.

Solution:
Given pair of equations are:
$x - y = 2$....(i)
$x + y = 4$....(ii)
Adding (i) and (ii),
$x - y + x + y = 2 + 4$
$2y = 6$
$y = 6/2 = 3$
Substituting $y = 3$ in (i),
$x - 3 = 2$
$x = 2 + 3$
$x = 5$
Therefore, $a = 5$ and $b = 3$.

7. Verify the relation between zeroes and coefficients of the quadratic polynomial $x^2 - 4$.

Solution:
Let the given quadratic polynomial $p(x) = x^2 - 4$
Let $p(x) = 0$
$x^2 - 4 = 0$
$x^2 = 4$
$x = \sqrt{4}$
$x = \pm 2$
Therefore, zeroes of the given polynomial are -2 and 2.
Sum of the zeroes = $-2 + 2 = 0 = -0/1$ = -Coefficient of x/ Coefficient of x^2
Product of the zeroes = $(-2)(2) = -4 = -4/1$ = Constant term/Coefficient of x^2
Hence, verified the relationship between the zeroes and coefficients of the given quadratic polynomial.

SECTION - II

8. Complete the following table for the polynomial $y = p(x) = x^3 - 2x + 3$.

x	-1	0	1	2
x^3				
-2x				
3				
y				
(x, y)				

Solution:
Given,
$y = p(x) = x^3 - 2x + 3$

x	-1	0	1	2
x^3	-1	0	1	8
-2x	2	0	-2	-4
3	3	3	3	3
y	4	3	2	7
(x, y)	(-1, 4)	(0, 3)	(1, 2)	(2, 7)

9. Show that log (162/343) + 2 log(7/9) - log(1/7) = log 2

Solution:
LHS = log (162/343) + 2 log(7/9) - log(1/7)
= log (162/343) + log (7/9)2 - log (1/7)
= log (162/343) + log (49/81) - log (1/7)
= log [(162 × 49)/ (343 × 81)] - log (1/7)
= log (2/7) - log (1/7)
= log [(2/7)/ (1/7)]
= log 2
= RHS
Therefore, log (162/343) + 2 log(7/9) - log(1/7) = log 2

10. If the equation $kx^2 - 2kx + 6 = 0$ has equal roots, then find the value of k.

Solution:
Given,
$kx^2 - 2kx + 6 = 0$
Comparing with the standard form $ax^2 + bx + c = 0$,
a = k, b = -2k, c = 6
Given that, the equation has equal roots.

$\Rightarrow b^2 - 4ac = 0$
$\Rightarrow (-2k)^2 - 4(k)(6) = 0$
$\Rightarrow 4k^2 - 24k = 0$
$\Rightarrow 4k(k - 6) = 0$
$\Rightarrow k(k - 6) = 0$
$\Rightarrow k = 0, k = 6$
$k = 0$ is not possible.
Hence, the value of k is 6.

11. Find the 7th term from the end of the arithmetic progression 7, 10, 13,..., 184.

Solution:
Given AP is:
7, 10, 13, …., 184
First term = a = 7
Common difference = d = 3
nth term of AP
$a_n = a + (n - 1)d$
$a_7 = 7 + (7 - 1)3$
$= 7 + (6)(3)$
$= 7 + 18$
$= 25$
Therefore, the 7th term of the AP is 25.

12. In the diagram on a Lunar eclipse, if the positions of Sun, Earth and Moon are shown by (-4, 6), (k, -2) and (5, -6) respectively, then find the value of k.

Solution:
Given that the diagram on a Lunar eclipse, if the positions of Sun, Earth and Moon are shown by (-4, 6), (k, -2) and (5, -6) respectively.
That means the points lie on a straight line.
Hence, the area of the triangle formed by these points will be 0.
$\Rightarrow 1/2\,[-4(-2 + 6) + k(-6 - 6) + 5(6 + 2)] = 0$
$\Rightarrow -4(4) + k(-12) + 5(8) = 0$
$\Rightarrow -16 - 12k + 40 = 0$
$\Rightarrow 12k = 24$
$\Rightarrow k = 24/12$
$\Rightarrow k = 2$

13. Given the linear equation 3x + 4y = 11, write linear equations in two variables such that their geometrical representations form parallel lines and intersecting lines.

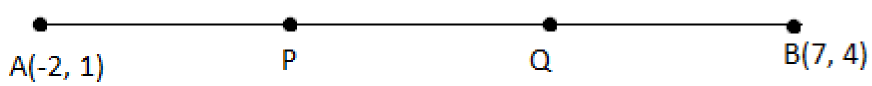
Solution:
Given,
Equation of first line is 3x + 4y = 11
Let ax + by + c be the equation of the second line.
Condition for parallel lines:
$a_1/a_2 = b_1/b_2 \neq c_1/c_2$
$3/a = 4/b \neq 11/c$
Let us consider some values of a, b, c which satisfies the above condition.

a = 6, b = 8, c = 14
Therefore, the equation of line which is parallel to the given line is 6x + 8y + 14 = 0
Condition for intersecting lines:
$a_1/a_2 \neq b_1/b_2$
$3/a \neq 4/b$
Let us consider some values of a, b, c which satisfies the above condition.
a = 8, b = 6, c = 11
8x + 6y + 11 = 0
Therefore, the equation of line which is perpendicular to the given line is 8x + 6y + 11 = 0

SECTION - III

14. Find the points of trisection of the line segment joining the points (-2, 1) and (7, 4).

Solution:
Let the given points be:
$A = (x_1, y_1) = (-2, 1)$
$B = (x_2, y_2) = (7, 4)$



P divides AB in the ratio 1 : 2.
Here, m : n = 1 : 2
Using the section formula,
$P(x, y) = [(mx_2 + nx_1)/ (m + n), (my_2 + ny_1)/ (m + n)]$
= [(7 - 4)/ (1 + 2), (4 + 2)/ (1 + 2)]
= (3/3, 6/3)
= (1, 2)
Q is the midpoint of PB.
Q = [(1 + 7)/2, (2 + 4)/3]
= (8/2, 6/2)
= (4, 3)
Hence, the required points are (1, 2) and (4, 3).

OR

Sum of squares of two consecutive even numbers is 580. Find the numbers by writing a suitable quadratic equation.

Solution:
Let x and (x + 2) be the two consecutive even numbers.
According to the given,
$x^2 + (x + 2)^2 = 580$
$x^2 + x^2 + 4x + 4 - 580 = 0$
$2x^2 + 4x - 576 = 0$
$2(x^2 + 2x - 288) = 0$
$x^2 + 2x - 288 = 0$
$x^2 + 18x - 16x - 288 = 0$
x(x + 18) - 16(x + 18) = 0

$(x - 16)(x + 18) = 0$
$x = 16, x = -18$
If $x = 16, x + 2 = 18$
If $x = -18, x + 2 = -18 + 2 = -16$
Hence, the two consecutive even numbers are 16, 18 or -18, 16.

15. Prove that $\sqrt{3} + \sqrt{5}$ is an irrational number.

Solution:
Let $\sqrt{3} + \sqrt{5}$ be a rational number.
$\sqrt{3} + \sqrt{5} = a$, where a is an integer.
Squaring on both sides,
$(\sqrt{3} + \sqrt{5})^2 = a^2$
$(\sqrt{3})^2 + (\sqrt{5})^2 + 2(\sqrt{3})(\sqrt{5}) = a^2$
$3 + 5 + 2\sqrt{15} = a^2$
$8 + 2\sqrt{15} = a^2$
$2\sqrt{15} = a^2 - 8$
$\sqrt{15} = (a^2 - 8)/2$
$(a^2 - 8)/2$ is a rational number since a is an integer.
Therefore, $\sqrt{15}$ is also an integer.
We know that integers are not rational numbers.
Thus, our assumption that $\sqrt{3} + \sqrt{5}$ is a rational number is wrong.
Hence, $\sqrt{3} + \sqrt{5}$ is an irrational number.

OR

Show that cube of any positive integer will be in the form of 8m or 8m + 1 or 8m + 3 or 8m + 5 or 8m + 7, where m is a whole number.

Solution:
Let a be the positive integer.
By Euclid's division lemma,
$a = bq + r$ where $0 \le r < b$
Let $b = 8$ then $a = 8q + r$
Where, $r = 0, 1, 2, 3, 4, 5, 6, 7$
When $r = 0$
$a = 8q$
$a^3 = (8q)^3$
$= 512q^3$
$= 8(64q^3)$
$= 8m$ where $m = 64q^3$
When $r = 1$,
$a = 8q + 1$
$a^3 = (8q + 1)^3$
$a^3 = 512q^3 + 1 + 3(8q)(8q + 1)$
$= 512q^3 + 1 + 24q(8q + 1)$
$= 512q^3 + 1 + 192q^2 + 24q$
$= 8(64q^3 + 24q^2 + 3q) + 1$
$= 8m + 1$ where $m = 64q^3 + 24q^2 + 3q$
When $r = 2$,

$a = 8q + 2$
$a^3 = (8q + 2)^3$
$= 512q^3 + 8 + 48q(8q + 2)$
$= 512q^3 + 8 + 384q^2 + 96q$
$= 512q^3 + 384q^2 + 96q + 8$
$= 8 (64q^3 + 48q^2 + 12q + 1)$
$= 8m$
where $m = 64q^3 + 48q^2 + 12q + 1$
When $r = 3$,
$a = 8q + 3$
$a^3 = (8q + 3)^3$
$= 512q^3 + 27 + 72q(8q + 3)$
$= 8(64q^3 + 3 + 72q^2 + 27q) + 3$
$= 8m + 3$
where $m = 64q^3 + 72q^2 + 27q+3)$
When $r = 4$,
$a = 8q + 4$
$a^3 = (8q + 4)^3$
$= 512q^3 + 64 + 768q^2 + 384q$
$a^3 = 8(64q^3 + 8 + 96q^2 + 48q)$
$a^3 = 8m$
where $m = 64q^3 + 8 + 96q^2 + 48q$
when $r = 5$,
$a = 8q + 5$
$a^3 = (8q + 5)^3$
$= 512q^3 + 960q^2 + 600q + 125$
$= 8 (64q^3 + 120q^2 + 75q + 15) + 5$
$= 8m + 5$
where $m = 64q^3 + 120q^2 + 75q + 15$
When $r = 6$,
$a = 8q + 6$
$a^3 = (8q + 6)^3$
$= 512q^3 + 1152q^2 + 864q + 216$
$= 8 (64q^3 + 144q^2 + 108q + 27)$
$= 8m$
where $m = 64q^3 + 144q^2 + 108q + 27$
When $r = 7$,
$a = 8q + 7$
$a^3 = (8q + 7)^3$
$= 512q^3 + 343 + 1344q^2 + 1176 q$
$= 8(64q^3 + 168q^2 + 147q + 42) + 7$
$= 8m + 7$
where $m = 64q^3 + 168q^2 + 147q + 42$

Therefore, the cube of any positive integer will be in the form of $8m$ or $8m + 1$ or $8m + 3$ or $8m + 5$ or $8m + 7$, where m is a whole number.

16. Find the solution of $x + 2y = 10$ and $2x + 4y = 8$ graphically.

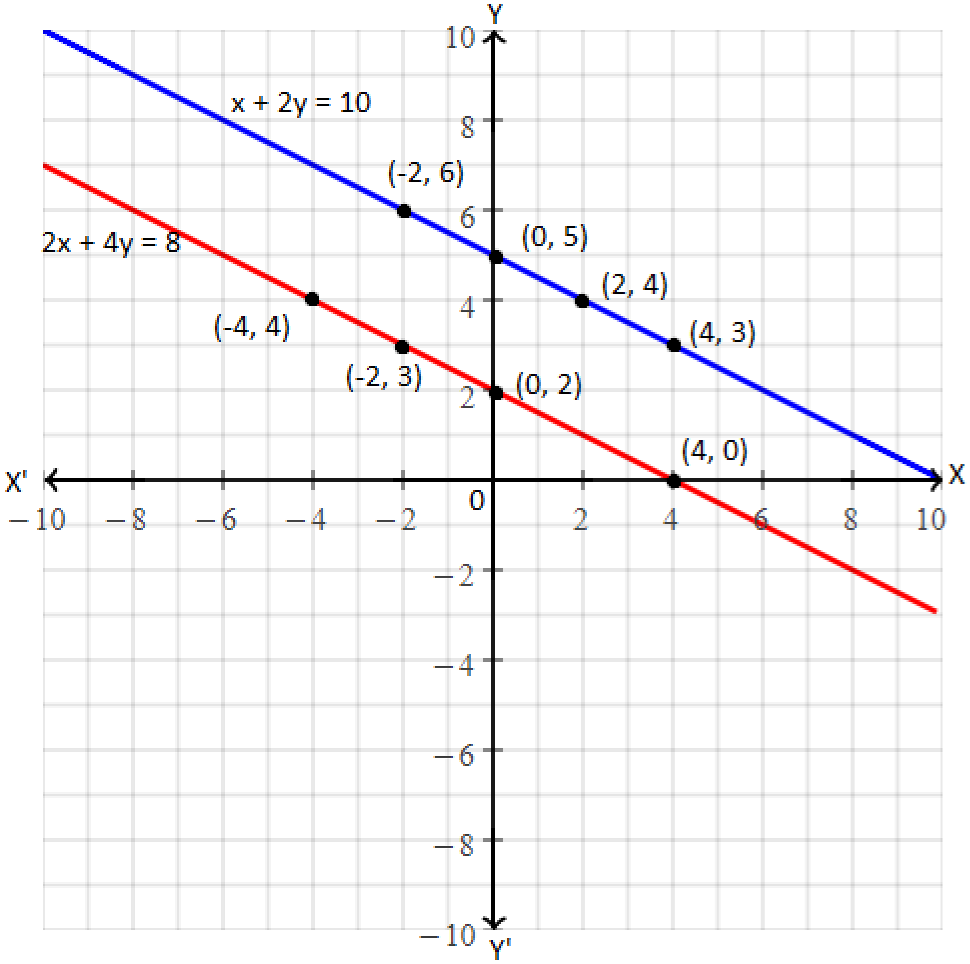
Solution:

Given,
x + 2y = 10
2x + 4y = 8
Consider the first equation,
x + 2y = 10
2y = -x + 10
y = -(1/2)x + 5

x	-2	0	2	4
y	6	5	4	3

Now, consider the another equation,
2x + 4y = 8
4y = -2x + 8
y = -(1/2)x + 2

x	-4	-2	0	4
y	4	3	2	0

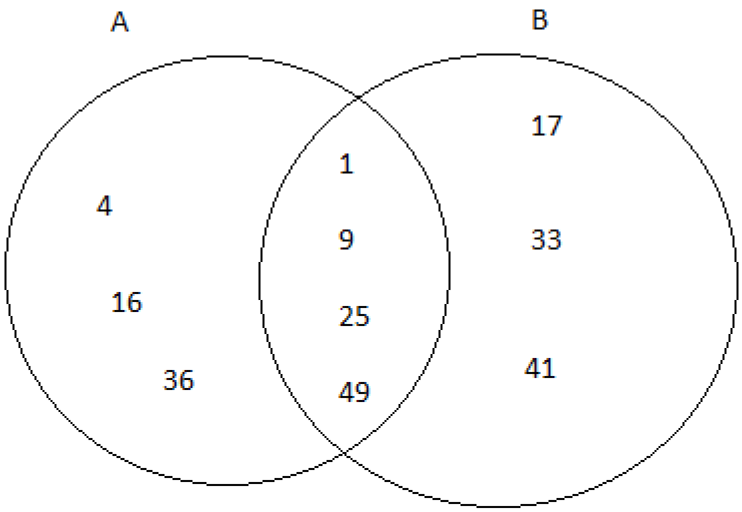


The lines representing the given pair of equations are parallel to each other.
Hence, there is no solution for the given pair of equations.

OR

A = {x : x is a perfect square, x < 50, x ∈ N}
B = {x : x = 8m + 1, where m ∈ W, x < 50, x ∈ N}
Find A ∩ B and display it with a Venn diagram.

Solution:
Given,
A = {x : x is a perfect square, x < 50, x ∈ N}
A = {1, 4, 9, 16, 25, 36, 49}
B = {x : x = 8m + 1, where m ∈ W, x < 50, x ∈ N}
B = {1, 9, 17, 25, 33, 41, 49}
A ∩ B = {1, 4, 9, 16, 25, 36, 49} ∩ {1, 9, 17, 25, 33, 41, 49}
= {1, 9, 25, 49}



17. Find the sum of all two digit positive integers which are divisible by 3 but not by 2.

Solution:
Two digit positive numbers which are divisible by 3 but not by 2 are
15, 21, 27, 33, ..., 99
This is an AP with a = 15 and d = 6.
Last term = l = 99
n = 15
$S_n = n/2\ (a + l)$
$= (15/2) \times (15 + 99)$
$= (15/2) \times 114$
$= 15 \times 57$
$= 855$
Hence, the required sum is 855.

OR

Total number of pencils required are given by $4x^4 + 2x^3 - 2x^2 + 62x - 66$. If each box contains $x^2 + 2x - 3$ pencils, then find the number of boxes to be purchased.

Solution:
Given,
Total number of pencils = $4x^4 + 2x^3 - 2x^2 + 62x - 66$
Number of pencils in each box = $x^2 + 2x - 3$

$$
\begin{array}{r|rrrrr}
 & 4x^2 & -\,6x & +\,22 & & \\
\hline
x^2 + 2x - 3 & 4x^4 & +\,2x^3 & -\,2x^2 & +\,62x & -\,66 \\
 & 4x^4 & +\,8x^3 & -\,12x^2 & & \\
\hline
 & & -\,6x^3 & +\,10x^2 & +\,62x & -\,66 \\
 & & -\,6x^3 & -\,12x^2 & +\,18x & \\
\hline
 & & & 22x^2 & +\,44x & -\,66 \\
 & & & 22x^2 & +\,44x & -\,66 \\
\hline
 & & & & 0 &
\end{array}
$$

Hence, the total number of boxes required to be purchased = $4x^2 - 6x + 22$