KENDRIYA VIDYALAYA GACHIBOWLI, GPRA CAMPUS HYD – 32
REVISION TEST - 04 FOR CLASS X BOARD EXAM 2021
SAMPLE ANSWERS

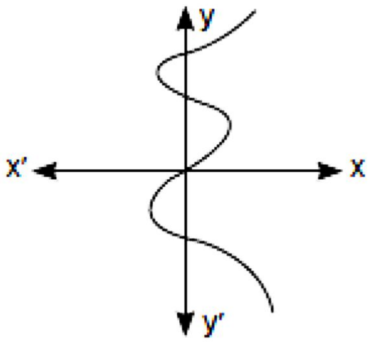
Max. marks: 50 **Time Allowed: 2 hrs**

SECTION – A (1 MARK EACH)

1. If $\frac{p}{q}$ is a rational number (q ≠ 0), what is condition of q so that the decimal representation of $\frac{p}{q}$ is terminating?

For any rational number $\frac{p}{q}$ with terminating decimal representation, the prime factorisation of *q* is of the form $2^n.5^m$, where *n* and *m* are non-negative integers.

2. The graph of x = p(y) is given below, for some polynomial p(y). Find the number of zeroes of p(y).



∵ Graph of *p*(*y*) intersects *y*-axis in four different points.
∴ Numbers of zeroes = 4

3. Find the discriminant of the quadratic equation: $3\sqrt{3}x^2 + 10x + \sqrt{3} = 0$.

$3\sqrt{3}x^2 + 10x + \sqrt{3} = 0$
Here $a = 3\sqrt{3}$, $b = 10$, $c = \sqrt{3}$
$D = b^2 - 4ac = (10)^2 - 4 \times 3\sqrt{3} \times \sqrt{3} = 100 - 36 = 64$

4. The nth term of an AP is 6n + 2. Find its common difference.

$a_n = 6n + 2$
$\Rightarrow a_1 = 6 \times 1 + 2 = 8$
$a_2 = 6 \times 2 + 2 = 14$
∴ Common difference $= a_2 - a_1 = 14 - 8 = 6$

5. If cot θ = $\frac{7}{8}$, evaluate $\frac{(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(1-\cos\theta)}$

$$\frac{(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(1-\cos\theta)} = \frac{1-\sin^2\theta}{1-\cos^2\theta} = \frac{\cos^2\theta}{\sin^2\theta} = \cot^2\theta = \left(\frac{7}{8}\right)^2 = \frac{49}{64}$$

6. Find the value of k so that the following system of equations has no solution:

3x – y – 5 = 0, 6x – 2y + k = 0

Here $a_1 = 3$, $b_1 = -1$, $c_1 = -5$,
and $a_2 = 6$, $b_2 = -2$, $c_2 = k$.

For no solution, $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \Rightarrow \frac{3}{6} = \frac{-1}{-2} \neq \frac{-5}{k} \Rightarrow \frac{1}{2} \neq \frac{-5}{k} \Rightarrow k \neq -10$

7. In ΔABC, D and E are points on sides AB and AC respectively such that DE || BC and AD : DB = 3 : 1. If EA = 6.6 cm then find AC.

AD : DB = 3 : 1

In ΔABC, DE || BC

$\Rightarrow \frac{AD}{DB} = \frac{AE}{EC}$ (By BPT)

$\Rightarrow \frac{3}{1} = \frac{AE}{EC} \Rightarrow \frac{3}{1} = \frac{6.6}{EC}$

$\Rightarrow$ EC = $\frac{6.6}{3}$ = 2.2 cm

AC = AE + EC = 6.6 + 2.2 = 8.8 cm

8. Find the distance between the points, $\left(-\frac{8}{5}, 2\right)$ and $\left(\frac{2}{5}, 2\right)$.

Distance between $\left(-\frac{8}{5}, 2\right)$ and $\left(\frac{2}{5}, 2\right) = \sqrt{\left(-\frac{8}{5} - \frac{2}{5}\right)^2 + (2-2)^2} = \sqrt{4} = 2$

SECTION – B (2 MARKS EACH)

9. Find HCF and LCM of 625, 1125 and 2125 using fundamental theorem of arithmetic.

$625 = 5^4$

$1125 = 3^2 \times 5^3$

$2125 = 5^3 \times 17$

$\therefore$ HCF = 5^3 = 125

LCM = $5^4 \times 3^2 \times 17$ = 95625

10. Find a quadratic polynomial whose zeroes are $5 + \sqrt{2}$ and $5 - \sqrt{2}$.

Let α, β are zeroes of quadratic polynomial $p(x)$.

$\therefore p(x) = x^2 - (\alpha + \beta)x + \alpha\beta$

Here, $\alpha = 5 + \sqrt{2}$, $\beta = 5 - \sqrt{2}$

$\therefore \alpha + \beta = 5 + \sqrt{2} + 5 - \sqrt{2} = 10$

and $\alpha\beta = (5 + \sqrt{2})(5 - \sqrt{2}) = 25 - 2 = 23$

$\therefore p(x) = x^2 - 10x + 23$

11. Solve for x and y by the method of elimination: $4x - 3y = 1$; $5x - 7y = -2$

Given equations are

$4x - 3y = 1$ ...(i)

$5x - 7y = -2$ ...(ii)

For making coefficient of y equal in both the equations multiplying equation (i) with 7, we get

$7 \times (4x - 3y) = 7 \times 1$

$\Rightarrow 28x - 21y = 7$ ...(iii)

Multiplying equation (ii) with 3, we get

$3 \times (5x - 7y) = 3 \times -2$

$\Rightarrow 15x - 21y = -6$ ...(iv)

Subtracting equation (iv) from (iii), we get

$$\begin{array}{r} 28x - 21y = 7 \\ 15x - 21y = -6 \\ - \quad + \qquad + \\ \hline 13x = 13 \\ \hline \end{array}$$

$\Rightarrow x = 1$

when $x = 1$, equation (i) becomes

$4 \times 1 - 3y = 1 \Rightarrow -3y = -3 \Rightarrow y = 1$

$\therefore x = 1, y = 1$

12. In an AP, the 24th term is twice the 10th term. Prove that the 36th term is twice the 16th term.

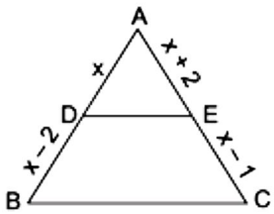
Let 1st term = a, common difference = d.
$a_{10} = a + 9d$, $a_{24} = a + 23d$
According to the question, $a_{24} = 2 \times a_{10}$
$\Rightarrow a + 23d = 2(a + 9d) \Rightarrow a + 23d = 2a + 18d \Rightarrow a = 5d$
Now, $a_{16} = a + 15d = 5d + 15d = 20d$ ...(i)
$a_{36} = a + 35d = 5d + 35d = 40d$ ...(ii)
From (i) and (ii), we get
$a_{36} = 2 \times a_{16}$ Hence proved.

13. Find the sum: –5 + (–8) + (–11) + ... + (–230).

Here $a = -5$, $d = (-8) - (-5) = -3$
$a_n = l = -230$
Now $a_n = a + (n-1)d$
$\therefore\ a + (n-1)d = -230$
$\Rightarrow -5 + (n-1)(-3) = -230$
$\Rightarrow (n-1)(-3) = -225$
$\Rightarrow (n-1) = \frac{-225}{-3} = 75$
$\therefore\ n = 76$
$S_n = \frac{n}{2}(a + l) = \frac{76}{2}(-5 - 230) = 38(-235) = -8930$

14. In ΔABC, D and E are points on the sides AB and AC respectively, such that DE || BC. If AD = x, DB = $x - 2$, AE = $x + 2$ and EC = $x - 1$, Find the value of x.

In ΔABC, DE || BC (Given)
$\frac{AD}{DB} = \frac{AE}{EC}$ (By BPT)
$\Rightarrow \frac{x}{x-2} = \frac{x+2}{x-1}$
$\Rightarrow x(x-1) = (x+2)(x-2)$
$\Rightarrow x^2 - x = x^2 - 2^2 \Rightarrow x^2 - x = x^2 - 4$
$\Rightarrow x = 4$



SECTION – C (3 MARKS EACH)

15. Prove that $\sqrt{5}$ is irrational.

Let √5 be a rational number
Therefore, √5= p/q where p, q are co-primes and q ≠ 0
On squaring both sides, we get $p^2 = 5q^2$ ...(1)
⇒5 is a factor of p^2 [since, $5q^2 = p^2$] ⇒5 is a factor of p
Let p = 5m for all m (where m is a positive integer)
Squaring both sides, we get $p^2 = 25m^2$ ...(2)
From (1) and (2), we get $5q^2 = 25m^2$ ⇒ $q^2 = 5m^2$
⇒ 5 is a factor of q^2 [since, $q^2 = 5m^2$] ⇒5 is a factor of q
Thus, we see that both p and q have common factor 5 which is a contradiction that p, qare co-primes.
Therefore, Our assumption is wrong
Hence √5 is not a rational number i.e., irrational number.

16. If α and β are zeroes of the quadratic polynomial $4x^2 + 4x + 1$, then form a quadratic polynomial whose zeroes are 2α and 2β.

$p(x) = 4x^2 + 4x + 1$
$\because$ α, β are zeroes of $p(x)$
$\therefore\ \alpha + \beta$ = sum of zeroes = $\frac{-b}{a}$

$\Rightarrow \alpha + \beta = \frac{-4}{4} = -1$ ...(i)

Also $\alpha.\beta$ = Product of zeroes = $\frac{c}{a}$

$\Rightarrow \alpha.\beta = \frac{1}{4}$ ...(ii)

Now a quadratic polynomial whose zeroes are 2α and 2β

x^2 – (sum of zoroes)x + Product of zeroes

$= x^2 - (2\alpha + 2\beta)x + 2\alpha \times 2\beta = x^2 - 2(\alpha + \beta)x + 4(\alpha\beta)$

$= x^2 - 2 \times (-1)x + 4 \times \frac{1}{4}$ [Using eq. (i) and (ii)]

$= x^2 + 2x + 1$

17. Solve for x and y : $\frac{1}{7x} + \frac{1}{6y} = 3,\ \frac{1}{2x} - \frac{1}{3y} = 5.$

$\frac{1}{7x} + \frac{1}{6y} = 3$ ...(i) and $\frac{1}{2x} - \frac{1}{3y} = 5$ ...(ii)

Multiplying equation (ii) by $\frac{1}{2}$, we get $\frac{1}{4x} - \frac{1}{6y} = \frac{5}{2}$ ...(iii)

Adding eq. (i) and (iii), we get

$\frac{1}{4x} + \frac{1}{7x} = \frac{5}{2} + 3 \Rightarrow \frac{7+4}{28x} = \frac{11}{2}$

$\Rightarrow \frac{11}{28x} = \frac{11}{2}$

$\Rightarrow 28x = 2 \Rightarrow x = \frac{1}{14}$

Putting the value of x in eq. (i), we get $y = \frac{1}{6}$

18. Prove the following identities: $\sin^8\theta - \cos^8\theta = (\sin^2\theta - \cos^2\theta)(1 - 2\sin^2\theta\cos^2\theta)$

LHS $= (\sin^4\theta)^2 - (\cos^4\theta)^2$

$= (\sin^4\theta + \cos^4\theta)(\sin^4\theta - \cos^4\theta)$

$= (\sin^4\theta + \cos^4\theta)(\sin^2\theta + \cos^2\theta)(\sin^2\theta - \cos^2\theta)$

$= (\sin^2\theta - \cos^2\theta)\{(\sin^2\theta)^2 + (\cos^2\theta)^2 + 2\sin^2\theta\cos^2\theta - 2\sin^2\theta\cos^2\theta\}$

$= (\sin^2\theta - \cos^2\theta)\{(\sin^2\theta + \cos^2\theta)^2 - 2\sin^2\theta\cos^2\theta\}$

$= (\sin^2\theta - \cos^2\theta)(1 - 2\sin^2\theta\cos^2\theta)$ = RHS.

SECTION – D (5 MARKS EACH)

19. Solve for x : $2\left(\frac{2x-1}{x+3}\right) - 3\left(\frac{x+3}{2x-1}\right) = 5$; given that $x \neq -3,\ x \neq \frac{1}{2}$.

$2\left(\frac{2x-1}{x+3}\right) - 3\left(\frac{x+3}{2x-1}\right) = 5$

Let $\frac{2x-1}{x+3} = y$

$\therefore$ Given equation becomes $2y - 3 \times \frac{1}{y} = 5 \Rightarrow 2y^2 - 3 = 5y \Rightarrow 2y^2 - 5y - 3 = 0$

$\Rightarrow 2y^2 - 6y + y - 3 = 0 \Rightarrow 2y(y - 3) + 1(y - 3) = 0$

$\Rightarrow (y - 3)(2y + 1) = 0 \Rightarrow y = 3,\ y = -\frac{1}{2}$

$\Rightarrow \frac{2x-1}{x+3} = 3$ or $\frac{2x-1}{x+3} = -\frac{1}{2} \Rightarrow 2x - 1 = 3x + 9$ or $4x - 2 = -x - 3$

$\Rightarrow -x = 10$ or $5x = -1 \Rightarrow x = -10$ or $x = \frac{-1}{5}$

$\therefore x = -10, \frac{-1}{5}$

20. Find the centre of a circle passing through (5, – 8), (2, – 9) and (2, 1).

Let H(x, y) is centre of circle passing through A, B and C. Since AH, BH and CH are radius of circle.

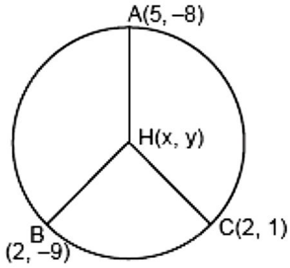
$\therefore$ AH = BH and BH = CH

Also $AH^2 = BH^2$ and $BH^2 = CH^2$

$AH^2 = (x-5)^2 + (y+8)^2 = x^2 + 25 - 10x + y^2 + 64 + 16y$

$BH^2 = (x-2)^2 + (y+9)^2 = x^2 + 4 - 4x + y^2 + 81 + 18y$

$CH^2 = (x-2)^2 + (y-1)^2 = x^2 + 4 - 4x + y^2 + 1 - 2y$



$\because$ $AH^2 = BH^2$ [Radii of a circle]

$\therefore$ $x^2 + 25 - 10x + y^2 + 64 + 16y = x^2 + 4 - 4x + y^2 + 81 + 18y$

$\Rightarrow -10x + 4x + 16y - 18y = -4$

$\Rightarrow -6x - 2y = -4$

$\Rightarrow 3x + y = 2$ ...(i)

Also $BH^2 = CH^2$

$\therefore$ $x^2 + 4 - 4x + y^2 + 81 + 18y = x^2 + 4 - 4x + y^2 + 1 - 2y$

$\Rightarrow 18y + 2y = 1 - 81$

$\Rightarrow 20y = -80 \Rightarrow y = -4$

Putting value of y in (i), we get

$3x + (-4) = 2 \Rightarrow 3x = 2 + 4$

$\Rightarrow 3x = 6 \Rightarrow x = 2$

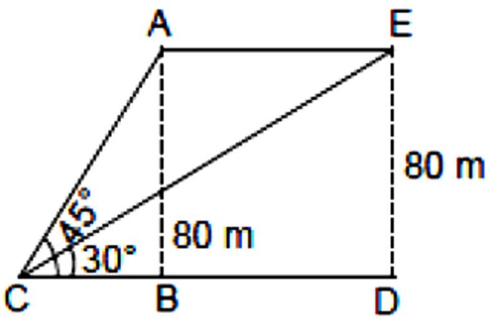
$\therefore$ Coordinates of centre are (2, –4).

CASE STUDY-BASED QUESTIONS (Each sub-question carries 1 mark)

21. In a village, a bird is sitting on the top of a tree, which is 80 m high. The angle of elevation of the bird, from a point on the ground is 45°. The bird flies away from the point of observation horizontally and remains at a constant height. After 2 seconds, the angle of elevation of the bird from the point of observation becomes the complementary angle of 60°.

Based on the above information, answer the following questions: (Attempt any four)

(i) Draw the correct figure based on the above information.



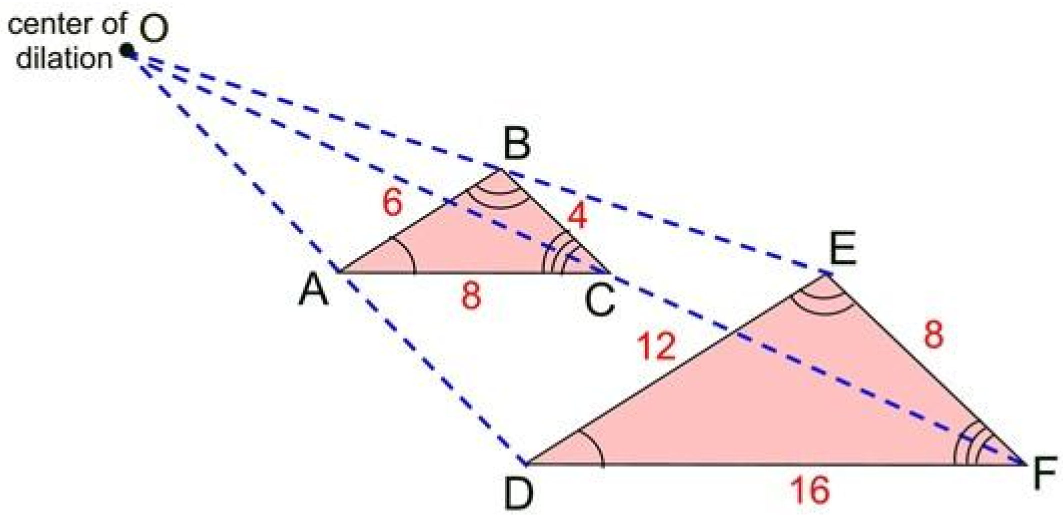
(ii) Find the angle of elevation of the bird after 2 second.
Angle of elevation of the bird after 2 second = $90^0 - 60^0 = 30^0$.

(iii)Find the distance covered by bird after 2 seconds.
Let bird is at A and after 2 seconds it reaches at E.
$\therefore$ Distance covered = AE.
In right ΔABC, $\frac{BC}{AB} = \cot 45°$
$\frac{BC}{80} = 1 \Rightarrow BC = 80$ m
In right ΔEDC, $\frac{DC}{DE} = \cot 30°$
$\Rightarrow DC = 80 \times \sqrt{3}$ [$\because$ DE = AB]
Now, BD = CD – BC = $80\sqrt{3} - 80 = 80(\sqrt{3} - 1) = 80 \times 0.732 = 58.56$ m
Now, BD = AE = 58.56 m
$\therefore$ Speed of bird = $\frac{58.56}{2}$ = 29.28 m/sec.

(iv)Find the speed of flying of the bird.
29.28 m/s

(v) If the height is doubled, then what will be the new distance covered by the bird.
Distance will be doubled = 160 x 0.732 = 117.12 m

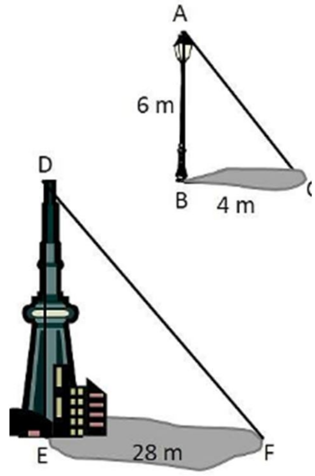
22. Similar figures are figures with the same shape, but not necessarily the same size. The term similar (or similarity) can be defined using the language of transformations.
Two figures are similar if one is the image of the other under a transformation that multiplies all distances (lengths) by the same positive scale factor. That is to say, one figure is a dilation of the other. In the below figure, ΔDEF is a dilation of ΔABC by a scale factor of 2.
Therefore, OD = 2•OA
OE = 2•OB
OF = 2•OC



Based on the above information, answer the following questions: (Attempt any four)

(i) Find by which criteria ΔOAB ~ ΔODE.
ΔOAB ~ ΔODE by SSS Similarity criteria

(ii) A vertical pole of length 6 m casts a shadow 4 m long on the ground and at the same time a tower casts a shadow 28 m long. Find the height of the tower.



Height of pole=AB=6 m
Length of shadow of pole =BC=4 m
Length of shadow of tower=EF=28 m
In $\triangle ABC$ and $\triangle DEF$
$\angle B=\angle E=90^0$ both 90^0 as both are vertical to ground
$\angle C=\angle F$ (same elevation in both the cases as both shadows are cast at the same time)
$\therefore \triangle ABC \sim \triangle DEF$ by AA similarity criterion
We know that if two triangles are similar, ratio of their sides are in proportion
So, AB/DE = BC/EF
$\Rightarrow$ 6/ DE = 4/28
$\Rightarrow$ DE = 6×7 = 42 m
Hence the height of the tower is 42 m

NOTE: Students can do directly also by taking the ratio AB/DE = BC/EF.

(iii) Find by which criteria $\Delta OAC \sim \Delta ODF$.

$\Delta OAC \sim \Delta ODF$ by SSS Similarity criteria

(iv) Find the ratio of the perimeter of ΔABC and ΔDEF.
Ratio of the perimeter of ΔABC and ΔDEF = 1 : 2

(v) Find the ratio of the areas of ΔOAB and ΔODE.
Ratio of areas of ΔOAB and ΔODE = 1 : 4