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# Mathematics–X
# SAMPLE QUESTION PAPER
## (With Hints & Answers)

**1**

**As per 2020 CBSE Sample Question Paper**

*Time Allowed : 3 hours* *Maximum Marks : 80*

**General Instructions:**

(*i*) ***All the questions are compulsory.***

(*ii*) *The question paper consists of* ***40*** *questions divided into four Sections* ***A, B, C*** *and* ***D.***

(*iii*) ***Section A*** *comprises of* ***20*** *Questions of* ***1 mark*** *each.* ***Section B*** *comprises of* ***6*** *Questions of* ***2 marks*** *each.* ***Section C*** *comprises of* ***8*** *Questions of* ***3 marks*** *each.* ***Section D*** *comprises of* ***6*** *Questions of* ***4 marks*** *each.*

(*iv*) *There is no overall choice. However, an internal choice has been provided in two questions of* ***1 mark*** *each, two questions of* ***2 marks*** *each, three questions of* ***3 marks*** *each and three questions of* ***4 marks*** *each. You have to attempt only one of the alternatives in all such questions.*

(*v*) *Use of* ***calculators*** *is not permitted.*

## SECTION-A

***Q. 1 to Q. 10 are multiple choice questions. Select the most appropriate answer from the given options.***

**Q.1.** Cards marked with the numbers 2 to 101 are placed in a box and mixed thoroughly. One card is drawn from this box. Find the probability that the number on the card is a number which is perfect square.

**(*a*)** $\frac{9}{101}$ **(*b*)** $\frac{9}{100}$ **(*c*)** $\frac{1}{11}$ **(*d*)** $\frac{1}{10}$ ***[Ans. (b);*** $\frac{9}{100}$

**Q.2.** The co-ordinates of one end point of a diameter of a circle are (3, 5). If the co-ordinates of the centre be (6, 6), find the co-ordinates of the other end point of the diameter.

**(*a*)** (9, 7) **(*b*)** (7, 9) **(*c*)** (9, 0) **(*d*)** (7, 7) ***[Ans. (a); (9, 7)***

**Q.3.** If area of sector of a circle is 105 $cm^2$ and length of its arc is 30 cm, calculate the radius of the circle.

**(*a*)** 5 cm **(*b*)** 6 cm **(*c*)** 7 cm **(*d*)** 8 cm ***[Ans. (c); 7 cm***

**Q.4.** Which of the following rational numbers have terminating decimal expansion?

**(*a*)** $\frac{11}{3000}$ **(*b*)** $\frac{91}{270}$ **(*c*)** $\frac{343}{2^3 \times 5^2 \times 7^3}$ **(*d*)** $\frac{31}{2^4 \times 3^5}$

***[Ans. (c);*** $\frac{343}{2^3 \times 5^2 \times 7^3}$

**Q.5.** If α and β are zeroes of the polynomial $p(x) = x^2 - 5x + 6$, then the value of $\alpha + \beta - 3\alpha\beta$ is:

**(*a*)** –5 **(*b*)** –13 **(*c*)** 13 **(*d*)** 6 ***[Ans. (b); –13***

**Q.6.** In Figure 1, XY || QR, $\frac{PQ}{XQ} = \frac{7}{3}$ and PR = 6.3 cm, then YR equals:

**(*a*)** 2.7 cm **(*b*)** 18.9 cm

**(*c*)** 2.1 cm **(*d*)** 0.9 cm ***[Ans. (a); 2.7 cm***

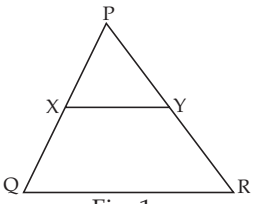


Fig. 1

**Q.7.** If $\sec\theta + \tan\theta = 7$, then $\sec\theta - \tan\theta$ is:

**(a)** $\frac{1}{7}$ **(b)** 7 **(c)** 6 **(d)** 49 *[Ans.* **(a);** $\frac{1}{7}$

**Q.8.** For what value of $k$, the pair of equations $4x - 3y = 9$, $2x + ky = 11$ has no solution:

**(a)** $\frac{9}{11}$ **(b)** $\frac{1}{2}$ **(c)** $-\frac{3}{2}$ **(d)** $-\frac{2}{3}$ *[Ans.* **(c);** $-\frac{3}{2}$

**Q.9.** Consider the following frequency distribution of the heights of 60 students of a class:

| *Height (in cm)* | 150-155 | 155-160 | 160-165 | 165-170 | 170-175 | 175-180 |
|---|---|---|---|---|---|---|
| *No. of Students* | 15 | 13 | 10 | 8 | 9 | 5 |

The sum of the lower limit of the modal class and the upper limit of the median class is:

**(a)** 310 **(b)** 315 **(c)** 320 **(d)** 330 *[Ans.* **(b); 315**

**Q.10.** In an A.P. if $S_{21} = 1250$, $S_{20} = 1200$, find $a_{21}$.

**(a)** 2450 **(b)** 150 **(c)** 100 **(d)** 50 *[Ans.* **(d); 50**

***(Q. 11 to Q. 15) Fill in the blanks*:**

**Q.11.** The distance of the point (6, –6) from origin is _____ . *[Ans.* $\mathbf{6\sqrt{2}}$

***Or***

**Q.11.** ABCD is a $\|^{gm}$ with vertices (1, 4), (7, 11), ($p$, 4) and (1, –3), then value of $p$ is _____ . *[Ans. 7*

**Q.12.** If $p$ is a prime number, then LCM of $p$, $p^2$ and $p^3$ is _____ . *[Ans.* $p^3$

**Q.13.** If $5\tan\theta = 12$, then $\frac{13\sin\theta}{3}$ is _____ . *[Ans. 4*

**Q.14.** If '$a$' and '$b$' are prime numbers, then their LCM is _____ . *[Ans.* $a \times b$

**Q.15.** The decimal expansion of $\frac{141}{120}$ will terminate after how many _____ places of decimals? *[Ans. 3*

***(Q. 16 to Q. 20) Answer the following questions:***

**Q.16.** What is the probability that answer selected from the numbers 1, 2, 3, ... 15 is a multiple of 4? *[Ans.* $\frac{1}{5}$

**Q.17.** Find the sum of 17 terms of the A.P. 5, 9, 13, 17 ... *[Ans. 629*

**Q.18.** An urn contains 9 red, 7 white and 4 black balls. A ball is drawn at random. What is the probability that the ball drawn is not red? *[Ans.* $\frac{11}{20}$

**Q.19.** Solve: $x^2 - 8x + 16 = 0$. *[Ans.* $x = 4$

**Q.20.** Find the sum of 20 terms of the A.P. 1, 6, 11, 16,.... *[Ans. 970*

***Or***

**Q.20.** Find the $5^{th}$ term from the end of the A.P. 10, 7, 4, ...., – 65. *[Ans. –53*

## SECTION-B

***Questions number 21 to 26 carry 2 marks each.***

**Q.21.** Find the least positive integer which if diminished by 5 is exactly divisible by 36 and 54. *[Ans. 113*

**Q.22.** How many irrational numbers lie between $\sqrt{2}$ and $\sqrt{3}$? Write any *two* of them.

*[Ans.* $\sqrt{2}$ *= 1.414 and* $\sqrt{3}$ *= 1.732*

*Thus, there are infinite irrational numbers between* $\sqrt{2}$ *and* $\sqrt{3}$

*Two of them are 1.415659756 and 1.416893]*

**Q.23.** Find the mode of the data, using an empirical formula when it is given that median = 41.25 and mean = 33.75. *[Ans. Mode = 56.25*

**Q.24.** In Fig. 2, PA and PB are tangents to a circle with centre C. If $\angle CPB = 35^\circ$, then find $\angle PCA$.

*[Ans. 55°*

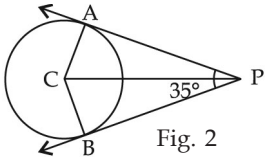


Fig. 2

**Q.25.** Find the sum of all natural numbers that are less than 100 and divisible by 4.

*[Ans. $n = 24$; $S_{24} = 1200$*

***Or***

**Q.25.** How many two-digit numbers are divisible by 3? *[Ans. $n = 30$*

**Q.26.** Find the value of $p$ for which the points $(-1, 3)$, $(2, p)$ and $(5, -1)$ are collinear. *[Ans. $p = 1$*

***Or***

**Q.26.** P and Q are the points with co-ordinates $(2, -1)$ and $(-3, 4)$, find the co-ordinates of the point R such that PR is $\frac{2}{5}$ of PQ. *[Hint: Required point, R is (0, 1); Use Section formula*

## SECTION-C

***Questions number 27 to 34 carry 3 marks each.***

**Q.27.** Show that a number of the form $14^n$, where $n$ is a natural number can never end with digit zero.

**Q.28.** If $\alpha$ and $\beta$ are zeroes of a quadratic polynomial $4x^2 + 4x + 1$, then form a quadratic polynomial whose zeroes are $2\alpha$ and $2\beta$. *[Ans. $x^2 + 2x + 1$*

**Q.29.** If in $\Delta ABC$, AD is median and $AM \perp BC$, then prove that $AC^2 = AD^2 + BC \times DM + \frac{1}{4}BC^2$.

**Q.30.** If $\frac{\cos\alpha}{\cos\beta} = m$ and $\frac{\cos\alpha}{\sin\beta} = n$, then show that $(m^2 + n^2)\cos^2\beta = n^2$.

**Q.31.** The sum of first six terms of an A.P. is 42. The ratio of its $10^{th}$ term and of its $30^{th}$ term is 1 : 3. Find the first term of the A.P. *[Ans. $a = 2$*

**Q.32.** The vertices of a triangle are A(–1, 3), B(1, –1) and C(5, 1). Find the length of the median through the vertex C. *[Length of median = 5 units*

***Or***

**Q.32.** A cylindrical pipe has inner diameter of 4 cm and water flows through it at the rate of 20 meter per minute. How long would it take to fill a conical tank of radius 40 cm and depth 72 cm?

*[Ans. 4.8 minutes; Hint: Time required to fill the conical tank* $= \frac{\text{Volume of cone}}{\text{Volume of water coming out of cylindrical pipe per unit time}}$

**Q.33.** In Fig. 3, PS is the diameter of a circle of radius 6 cm. The points Q and R trisect the diameter PS. Semi-circles are drawn on PQ and QS as diameters. Find the area of the shaded region.

*[Ans. Area of shaded region = 37.71 cm²*

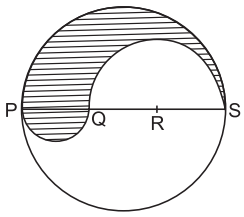


Fig. 3

***Or***

**Q.33.** Find the area of the minor segment of a circle of radius 42 cm, if the length of the corresponding arc is 44 cm. *[Ans. $(924 - 441\sqrt{3})$ cm²*

**Q.34.** Find the number of spherical lead shots, each of diameter 6 cm that can be made from a solid cuboid of lead having dimensions 24 cm × 22 cm × 12 cm. *[Ans. 56 shots*

*Or*

**Q.34.** A wooden souvenir is made by scooping out a hemisphere from each end of a solid cylinder. If the height of the cylinder is 10 cm and its base is of radius 3.5 cm then find the total cost of polishing the souvenir at the rate of ₹10 per $cm^2$. ***[Ans. ₹3,740***

## SECTION-D

***Questions number 35 to 40 carry 4 marks each.***

**Q.35.** A lending library has a fixed charge for the first two days and an additional charge for each day thereafter. Reema paid ₹30 for a book kept for 6 days, while Smita paid ₹40 for the book she kept for 8 days. Find the fixed charge and the charge for each extra day. If Sonu kept a book for 4 days, how much he will have to pay?

***[Ans. Fixed charge = ₹10; Charge for each extra day = ₹5; then, Sonu will pay ₹20 for 4 days***

**Q.36.** In an equilateral ΔABC, E is any point on BC such that BE = $\frac{1}{4}$ BC. Prove that $16\ AE^2 = 13\ AB^2$.

*Or*

**Q.36.** ABC is an isosceles triangle in which ∠B = 90° and AC = $3\sqrt{2}$ m. Two equilateral triangles ACP and ABQ are drawn on the sides AC and AB respectively. Find the ratio of area (ΔABQ) and area (ΔACP). ***[Ans. 1 : 2; Using:*** $\frac{ar\,(\Delta ABQ)}{ar\,(\Delta ACP)} = \left(\frac{AB}{AC}\right)^2$

**Q.37.** The points A(1, –2), B(2, 3), C($k$, 2) and D(–4, –3) are the vertices of a parallelogram. Find the value of $k$ and the altitude of the parallelogram corresponding to the base AB.

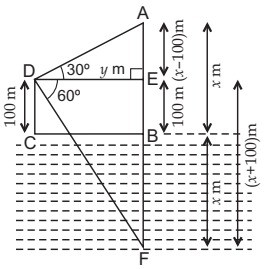
***[Ans. k = –3; Altitude of parallelogram =*** $\frac{24}{\sqrt{26}}$ ***units***

*Or*

**Q.37.** Find the coordinates of a point P, which lies on the line segment joining the points A(–2, –2) and B(2, –4) such that AP = 3/7 AB. ***[Ans. –2/7, –20/7***

**Q.38.** From a point 100 m above a lake the angle of elevation of a stationary helicopter is 30° and the angle of depression of reflection of the helicopter in the the lake is 60°. Find the height of the helicopter above the lake.

***Ans.***
***Height of the helicopter above the lake = 200 m***




**Q.39.** A donor agency ensures that milk is supplied in containers, which are in the form of a frustum of a cone to be distributed to flood victims in a camp. The height of each frustum is 30 cm and the radii of whose lower and upper circular ends are 20 cm and 40 cm respectively. If this milk is available at the rate of ₹35 per litre and 880 litres of milk is needed daily for a camp—

(*a*) Find how many milk containers are needed daily for the camp.

(*b*) What daily cost will it put on the donor agency?

***[Ans. (a) 10 containers; (b) ₹30,800; Hint: Volume of one container = 88,000 $cm^3$ or 88 liters***

*Or*

**Q.39.** 50 circular discs, each of radius 7 cm and thickness 0.5 cm are placed one above the other. Find the total surface area of the solid so formed. Find how much space will be left in a cubical box of side 25 cm if the solid formed is placed inside it. ***[Ans. Space left = 11,775 $cm^3$***

**Q.40.** State and Prove Pythagoras theorem.

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# Mathematics–X
# SAMPLE QUESTION PAPER
## (With Hints & Answers)

# 2

**As per 2020 CBSE Sample Question Paper**

*Time Allowed : 3 hours* *Maximum Marks : 80*

**General Instructions:**

(*i*) ***All** questions are **compulsory**.*
(*ii*) *This Question Paper consists of **40** questions divided into four sections – **A, B, C** and **D**.*
(*iii*) *Section **A** contains **20** questions of **1** mark each. Section **B** contains **6** questions of **2** marks each. Section **C** contains **8** questions of **3** marks each. Section **D** contains **6** questions of **4** marks each.*
(*iv*) *There is no overall choice. However, an internal choice has been provided in two questions of **1 mark** each, two questions of **2 marks** each, three questions of **3 marks** each and three questions of **4 marks** each. You have to attempt only one of the alternatives in all such questions.*
(*v*) *Use of calculator is not permitted.*

## SECTION-A

***Q. 1 to Q. 10 are multiple choice questions. Select the most appropriate answer from the given options.***

**Q.1.** Determine $k$ so that $k + 2$, $4k - 6$ and $3k - 2$ are three consecutive terms of an A.P.

**(*a*)** 2 **(*b*)** 3 **(*c*)** 4 **(*d*)** 5

***[Ans.* (*b*); $k = 3$**

**Q.2.** A spherical ball of diameter 21 cm is melted and recasted into cubes, each of side 1 cm. Find the number of cubes thus formed. **(use $\pi = \frac{22}{7}$)**

**(*a*)** 21 **(*b*)** 121 **(*c*)** 4851 **(*d*)** 441 ***[Ans.* (*c*); 4851**

**Q.3.** From a well shuffled pack of 52 cards, black aces and black queens are removed. From the remaining cards, a card is drawn at random. Find the probability of drawing a king or a queen.

**(*a*)** $\frac{1}{48}$ **(*b*)** $\frac{1}{12}$ **(*c*)** $\frac{1}{24}$ **(*d*)** $\frac{1}{8}$ ***[Ans.* (*d*); $\frac{1}{8}$**

**Q.4.** Find the sum of first 25 terms of an A.P. whose $n^{th}$ term is $1 - 4n$.

**(*a*)** 1275 **(*b*)** –1275 **(*c*)** 25 **(*d*)** 625

***[Ans.* (*b*); –1275**

**Q.5.** For any positive integer $a$ and 3, there exist unique integers $q$ and $r$ such that $a = 3q + r$, where $r$ must satisfy.

**(*a*)** $0 \le r < 3$ **(*b*)** $1 < r < 3$ **(*c*)** $0 < r < 3$ **(*d*)** $0 < r \le 3$

***[Ans.* (*a*); $0 \le r < 3$**

**Q.6.** If $\tan\theta + \cot\theta = 5$, then the value of $\tan^2\theta + \cot^2\theta$ is:

(*a*) 23 **(*b*)** 25 **(*c*)** 27 **(*d*)** 15

***[Ans.* (*a*); 23**

**Q.7.** $\pi - \frac{22}{7}$ is:

**(*a*)** a rational number **(*b*)** an irrational number
**(*c*)** a prime number **(*d*)** an even number

***[Ans.* (*b*); an irrational number**

**Q.8.** Two lines are given to be parallel. The equation of one of the lines is $4x + 3y = 14$. The equation of the second line can be:

**(a)** $3x + 4y = 14$ **(b)** $8x + 6y = 28$

**(c)** $12x + 9y = 42$ **(d)** $-12x = 9y$ *[Ans. (d); Using* $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

**Q.9.** Mode is the value of the variable which has:

**(a)** maximum frequency **(b)** minimum frequency

**(c)** mean frequency **(d)** middle-most frequency

*[Ans.* **(a); maximum frequency**

**Q.10.** If $ax + by = a^2 - b^2$ and $bx + ay = 0$, then the value of $(x + y)$ is:

**(a)** $a^2 - b^2$ **(b)** $b - a$ **(c)** $a - b$ **(d)** $a^2 + b^2$

*[Ans.* **(c); $a - b$**

***(Q. 11 to Q. 15) Fill in the blanks:***

**Q.11.** In Fig. 1, if CD = 2 (BC), then value of ∠BAD is _____. *[Ans.* **60°**

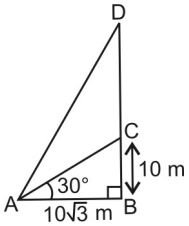


Fig. 1

**Q.12.** If the sum of the zeroes of the quadratic polynomial $3x^2 - kx + 6$ is 3, then the value of $k$ is _____ . *[Ans.* **$k = 9$**

***Or***

**Q.12.** What _____ (number) should be added to the polynomial $x^2 - 5x + 4$, so that 3 is the zero of the polynomial? *[Ans.* **2**

**Q.13.** If $\Delta ABC \sim \Delta PQR$, perimeter of $\Delta ABC$ = 32 cm, perimeter of $\Delta PQR$ = 48 cm and PR = 6 cm, then the length of AC is equal to _____ . *[Ans.* **AC = 4 *cm***

**Q.14.** If sec 2A = cosec (A – 27°), where 2A is an acute angle, then the measure of ∠A is _____ .

*[Ans.* **∠A = 39°**

**Q.15.** The pair of equations $y = 0$ and $y = -5$ has _____ solutions.

*[Ans.* ***∴ No solution, Parallel lines***

***(Q. 16 to Q. 20) Answer the following questions*:**

**Q.16.** A card is drawn from a well-shuffled pack of 52 cards. What is the probability that it is an ace of hearts? *[Ans.* $\frac{1}{52}$

***Or***

**Q.16.** A dice is thrown once. Find the probability of getting a number less than 5. *[Ans.* $\frac{2}{3}$

**Q.17.** If the numbers $n - 2$, $4n - 1$ and $5n + 2$ are in A.P., find the value of $n$. *[Ans.* **$n = 1$**

**Q.18.** A sector is cut off from a circle of radius 21 cm. The angle of the sector is 120°. Find the length of its arc. (Take $\pi = \frac{22}{7}$) *[Ans.* ***44 cm***

**Q.19.** If the second term of an A.P. is 4 and seventh term is –11, find its common difference.

*[Ans.* **$d = -3$**

**Q.20.** Represent in the form of a quadratic equation:

The sum of the squares of two positive integers is 117. If the square of the smaller number equals four times the larger number, we need to find the integers. *[Ans.* **$y^2 + 4y - 117 = 0$**

## SECTION-B

***Questions number 21 to 26 carry 2 marks each.***

**Q.21.** In Figure 2, $l \parallel m$ and $\Delta OAC \sim \Delta OBD$. If AC = 5 cm, OA = 3 cm and BD = 2 cm, find OB.

***[Ans. OB = 1.2 cm***

***[Hint: When the two triangles are congruent, corresponding sides are proportional***

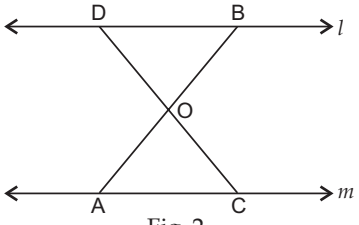


Fig. 2

***Or***

**Q.21.** Diagonals AC and BD of a trapezium ABCD with AB || DC intersect each other at the point O. Prove that OA.OD = OB.OC

**Q.22.** How many decimal places are there in decimal equivalent of $\frac{7}{125}$ ? ***[Ans. 3 decimal places***

**Q.23.** A survey was conducted by a group of students to collect the data regarding the number of plants in 10 houses of a locality which is as follows:

10, 5, 2, 0, 4, 7, 1, 3, 12, 3

Find the median of the data. ***[Ans. Median = 3.5***

**Q.24.** Find the values of $k$ for which a root of the quadratic equation $x^2 - 2(1 + 3k)x + 7(3 + 2k) = 0$ is 7. ***[Ans. k = 2***

***Or***

**Q.24.** How many terms of the A.P. 20, $19\frac{1}{3}$, $18\frac{2}{3}$, ..... be taken so that their sum is 300?

***[Ans. n = 36 or 25***

**Q.25.** An integer is chosen between 0 and 100. What is the probability that it is

**(*i*)** divisible by 7 **(*ii*)** not divisible by 9?

$\left[\text{Ans. } (i)\frac{7}{50}; (ii)\frac{89}{100}\right.$

**Q.26.** Two cubes each of volume 27 $cm^3$ are joined end to end. Find the surface area of the resulting cuboid. ***[Ans. 90 $cm^2$***

## SECTION-C

***Questions number 27 to 34 carry 3 marks each.***

**Q.27.** In a right angled $\Delta ABC$, AC is the hypotenuse and the other two sides are of length 12 m and 9 m. X is a point outside the triangle such that XA = 36 m and $\angle XAC = 90^\circ$. Find XC.

***[Ans. XC = 39 m***

***[Hint: Using Pythagoras' Theorem***

**Q.28.** In Fig. 3, if $\Delta BEA \cong \Delta CDA$, then prove that $\Delta DEA \sim \Delta BCA$.

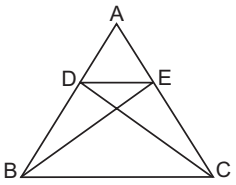


Fig. 3

**Q.29.** Given. $\sqrt{3}\tan 5\theta = 1$, find the value of $\theta$. ***[Ans. $\theta = 6^\circ$***

***Or***

**Q.29.** If $7 \sin^2 \theta + 3 \cos^2 \theta = 4$, find the value of $\sec \theta + \text{cosec } \theta$. [*Ans.* $\frac{2\sqrt{3}(1+\sqrt{3})}{3}$]

**Q.30.** Solve the following equation for $x$:

$$\frac{1}{x+1} + \frac{2}{x+2} = \frac{4}{x+4}, \; x \neq -2, -4$$ [*Ans.* $x = 2(1+\sqrt{3}), 2(1-\sqrt{3})$]

**Q.31.** Draw a circle of radius 3 cm. From a point 7 cm away from its centre, construct a pair of tangents to the circle.

**Q.32.** Two circles touch each other internally. The sum of their areas is $130\ \pi\ \text{cm}^2$ and the distance between their centres is 8 cm. Find the radii of the two circles.

[*Ans. Radii of the two circles are 11 cm and 8 cm*

*Or*

**Q.32.** Find the area of a quadrilateral whose vertices, taken in order are (1, 2), (4, 3), (6, 6) and (3, 4).

[*Ans.* $\frac{9}{2}$ *sq. units*

**Q.33.** In what ratio does the point P on the $x$-axis divide the line segment joining the points A(–4, 5) and B (3, –7)? Also find the coordinates of the point P.

[*Ans. Required Ratio = 5 : 7; Required Point, P = (–13/12, 0)*

**Q.34.** A 20 m deep well with diameter 7 m is dug and the earth taken out from digging is evenly spread out to form a platform of dimensions 22 m × 14 m. Find the height of the platform. $\left(\text{Use } \pi = \frac{22}{7}\right)$ [*Ans. Height of the platform = 2.5 m*

*Or*

**Q.34.** The radii of the circular ends of a bucket in the form of frustum of a cone of height 15 cm are 14 cm and $r$ cm ($r < 14$). If the capacity of the bucket is 5390 $\text{cm}^3$, then find $r$.

[*Ans. Radius of the frustum = 7 cm*
[*Hint:* $r^2 + 14r - 142 = 0$



## SECTION-D

***Questions number 35 to 40 carry 4 marks each.***

**Q.35.** A 35 m long ladder just reaches a window of a building. If the ladder makes an angle $\theta$ with the level ground, such that $\tan \theta = \frac{1}{2\sqrt{6}}$.

Find the:

(*i*) height of the window above the ground level and

(*ii*) horizontal distance of the foot of the ladder from the building.

[*Ans.* (*i*) *Height of window = 7 m*

(*ii*) *Horizontal distance of the foot of the ladder from the building* $= 14\sqrt{6}$ *m or 34.3 m*

**Q.36.** A class test in mathematics was conducted for class X of a school. Following distribution gives marks (out of 60) of students:

| *Marks* | 0-10 | 10-20 | 20-30 | 30–40 | 40–50 | 50–60 |
|---|---|---|---|---|---|---|
| *Number of students* | 8 | 22 | 12 | 10 | 5 | 3 |

Find the mean of the marks obtained. [*Ans. Mean = 23.5*

**Q.37.** If $\cos (A + B) = 0$ and $\cot (A - B) = \sqrt{3}$, find the value of:

(*i*) sec A. tan B – cot A . sin B (*ii*) cosec A . cot B + sin A . tan B

[*Hint A = 60°, B = 30° therefore, (i)* $\frac{\sqrt{3}}{2}$, *(ii)* $\frac{5}{2}$

*Or*

**Q.37.** If $m = \cos A - \sin A$ and $n = \cos A + \sin A$; show that:

$$\frac{m^2 + n^2}{m^2 - n^2} = -\frac{1}{2}\sec A \cdot \text{cosec } A = \frac{(\cot A + \tan A)}{2}.$$

**Q.38.** O is the centre of a circle of radius 5 cm. T is a point such that OT = 13 cm, TP and TQ are tangents to the circle and OT intersects the circle at E. AB is tangent to the circle at E intersecting TP and TQ at A and B respectively. Find the length of AB.

*Sol.* $\angle OPT = 90°$ *...[Tangent is ⊥ to the radius through the point of contact*

*We have,* $OP = 5$ *cm,* $OT = 13$ *cm*

*In rt.* $\Delta OPT$,

$OP^2 + PT^2 = OT^2$ *...[Pythagoras' theorem*

$\Rightarrow PT = 12$ *cm*

$QP = OQ = OE = 5$ *cm* *...[Radius of the circle*

$ET = OT - OE = 13 - 5 = 8$ *cm*

*Let* $PA = x$ *cm, then* $AT = (12 - x)$ *cm*

$PA = AE = x$ *cm* *...[Tangents from an external point are equal*

*It rt.* $\Delta AET$,

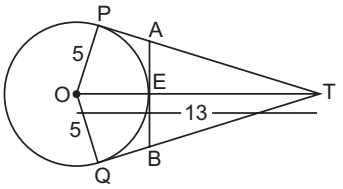
$AE^2 + ET^2 = AT^2$ *...[Pythagoras' theorem*

$\therefore\ x = \frac{10}{3}$ *cm*

$AB = AE + EB = 2x$

$\therefore\ AB = 2\left(\frac{10}{3}\right) = \frac{20}{3}$ *cm* $= 6\frac{2}{3}$ *cm*

*Hence,* $AB = 6.67$ *cm or* $6.7$ *cm.*





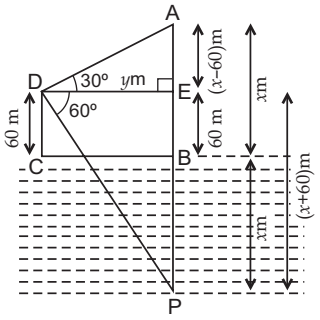

*Or*

**Q.38.** State and prove Thales theorem.

**Q.39.** The angle of elevation of a cloud from a point P, 60 m above the surface of a lake is 30° and the angle of depression of the reflection of the cloud in the lake at P is 60°. Find the height of the cloud from the surface of the lake.

*Ans. Height of the cloud from the surface of the lake = 120 m*

*Hint:*




**Q.40.** A manufacturer of sports goods produced 10,000 hockey kits in the 5th year and 18,000 in the 9th year. Assuming that the production increases uniformly by a fixed number every year, find (*i*) the production in the 12th year, (*ii*) in which year the production will be 28,000 kits? *[Ans. (i)* $a_{12} = 24{,}000$*; (ii)* $n = 14$

*Or*

**Q.40.** If $p^{th}$ term of an A.P. is $q$ and $q^{th}$ term is $p$, then show that its $n^{th}$ term is $(p + q - n)$.

* • •• • *