CBSE Sample Paper-02 (solved)
SUMMATIVE ASSESSMENT –I
MATHEMATICS
Class – IX

Time allowed: 3 hours Maximum Marks: 90

General Instructions:

a) All questions are compulsory.
b) The question paper comprises of 31 questions divided into four sections A, B, C and D. You are to attempt all the four sections.
c) Questions 1 to 4 in section A are one mark questions.
d) Questions 5 to 10 in section B are two marks questions.
e) Questions 11 to 20 in section C are three marks questions.
f) Questions 21 to 31 in section D are four marks questions.
g) There is no overall choice in the question paper. Use of calculators is not permitted.

Section A

Q1. The value of $\left(2+\sqrt{3}\right)\left(2-\sqrt{3}\right)$ in

Q2. If (x+1) and (x-1) are factors of px^3+x^2-2x+9 then value of p and q are

Q3. An angle is 14° more than its complement. Find its measure.

Q4. The point (-2, 5) lies in

Section B

Q5. Given $\sqrt{2}=1.44, \sqrt{3}=1.732, \sqrt{5}=2.236$ (upto three places of decimal). Evaluate

1. $\frac{\sqrt{3}}{2}$

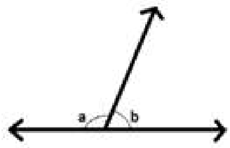
2. $\frac{2}{3}\sqrt{5}$

Q6. Find the value of the polynomial $5x-4x^2+3$ at

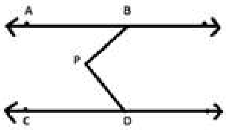
1. $x=0$
2. $x=-1$

Q7. If m, n are lines in the same plane such that p intersects m and $n \parallel m$, show that p intersects n also.

Q8. In the given figure, a is greater than b by one-third of a right angle. Find the value of a and b.



Q9. If lines AB and CD are parallel and P is any point between AB and CD. Show that $\angle ABP + \angle CDP = \angle BPD$.



Q10. Show that all the line segments drawn from a given point not on it, the perpendicular line segment is the shortest.

Section C

Q11. Find two irrational numbers between 5 and 5.2.

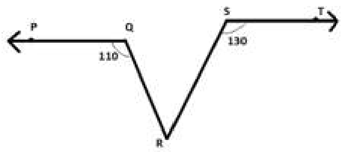
Q12. Express $0.\overline{285}$ as a fraction in simplest form.

Q13. Find the integral zeroes of the polynomial $x^3 + x^2 + x - 3$.

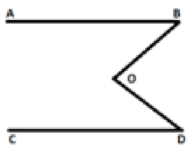
Q14. Check whether $7 + 3x$ is a factor of $3x^3 + 7x$. (use remainder theorem)

Q15. State any 2 axioms given by Euclid. Give an example for each.

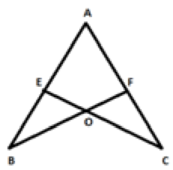
Q16. In the given figure, if $PQ \parallel ST$, $\angle PQR = 110°$ and $\angle RST = 130°$, find $\angle QRS$.



Q17. In the given figure, $AB \parallel CD$. Find the measure of reflex $\angle BOD$.



Q18. In the following figure, it is given that $\angle B = \angle C$ and $BA = BC$. Prove that $\Delta BAF \cong \Delta CAE$.



Q19. Plot the points $P(5,5), Q(-3,-3), R(5,-3)$. Name the figure obtained on joining the points P, Q, R. If possible, find the area of the figure obtained.

Q20. Manish has a vegetable garden in the shape of a rhombus. The length of each side of the garden is 35m and its diagonal is 42m long. After growing the vegetables in it, he wants to divide it in four equal parts. Find the area of each part.

Section D

Q21. If $x = \dfrac{5-\sqrt{3}}{5+\sqrt{3}}$ and $y = \dfrac{5+\sqrt{3}}{5-\sqrt{3}}$, then show that $x^2 - y^2 = -\dfrac{10\sqrt{3}}{11}$

Q22. Represent $\sqrt{17}$ on the number line.

Q23. Without actual division prove that $x^4 - 5x^3 + 8x^2 - 10x + 12$ is divisible by $x^2 - 5x + 6$.

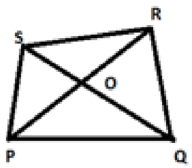
Q24. Factorise: $2y^3 + y^2 - 2y - 1$

Q25. Using factor theorem, check if $\left(x-\sqrt{2}\right)$ and $\left(x+\sqrt{2}\right)$ is a factor of $7x^2 - 4\sqrt{2}x - 6$.

Q26. Which of the number $1, -1, -3$ are zeroes of the polynomial $2x^4 + 9x^3 + 11x^2 + 4x - 6$?

Q27. State and prove RHS congruence criterion.

Q28. In the given figure, $PQRS$ is a quadrilateral in which diagonals PR and QS intersect in O.



Show that:

1. $PQ + QR + RS + SP > PR + QS$
2. $PQ + QR + RS + SP < 2(PR + QS)$

Q29. If two parallel lines are intersected by a transversal, prove that the bisectors of the two pairs of interior angles enclose a rectangle.

Q30. Prove that sum of all the angles around a point is $360°$.

Q31. A field is in the shape of a trapezium whose parallel sides are 50m and 15m. the non- parallel sides are 20m and 25m. find the area of the trapezium.

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ANSWER KEY

1. 1
2. p = 2, q = -1
3. An angle is $14°$ more than its complement. Find its measure.
4. 2nd quadrant
5.
   1. $\frac{\sqrt{3}}{2}=\frac{1.732}{2}=0.866$
   2. $\frac{2}{3}\sqrt{5}=\frac{2}{3}(2.236)=1.4906$

6. Value of the polynomial at $x=0$ is 3.

   Value of the polynomial at $x=-1$ is -6.

7. Let if possible p and n be non-intersecting lines

   $\Rightarrow p \parallel n$

   But $n \parallel m$

   Therefore, $p \parallel m$

   $\Rightarrow p$ and m are non intersecting lines

   But it is given that p and m are intersecting lines.

   So, our supposition is wrong.

   Hence, p intersects n.

8. $a+b=180°$ (linear pair)

   $a-b=30°$ (given)

   $\therefore a=105°, b=75°$

9. Construction: draw a line EF passing through $P \parallel AB$.The line EF is obviously $\parallel AB$ and CD.

   Since $EF \parallel AB$, $\therefore \angle 1=\angle 2$ (alternate angles) ....(1)

   Similarly, $EF \parallel CD, \therefore \angle 3=\angle 4$ (alternate angles) ....(2)

   On adding (1) and (2), we get

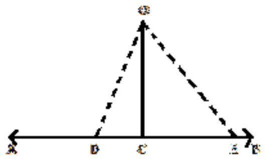
$\angle 1 + \angle 4 = \angle 2 + \angle 3 = \angle BPD$

$\Rightarrow \angle ABP + \angle CDP = \angle BPD$

10. **Given**: let AB is a line and O is a point outside it. OC is drawn perpendicular to AB.

To prove: OC is the shortest side for all the segments drawn from point O to line AB.

Construction: take point D and E on the line segment AB and join to O.



Proof: In $\Delta ODC, \angle OCD = 90°$

$\therefore \angle ODC$ is acute angle.

$\Rightarrow \angle OCD > \angle ODC$

$OD > OC$ (greater angle has greater side opposite to it)

Hence proved.

11. If x and y are two distinct positive rational numbers such that xy is not a perfect square of a rational number, then $\sqrt{xy}$ is an irrational number lying between x and y.

$\therefore$ 1st irrational number between 5 and 5.2 is $\sqrt{5 \times 5.2} = \sqrt{26}$

2nd irrational number between them is $\sqrt{5 \times \sqrt{26}}$

$5 < 5.0824789637875236...... < 5.2$

Also, $5 < 5.1023428624....... < 5.2$

$5 < 5.112379643265478....... < 5.2$

$\therefore 5.1023428624........, 5.11237964325489........, 5.0834789637875236.......$ are irrational numbers between 5 and 5.2.

12. Let $x = 0.\overline{285}$ (1)

$\Rightarrow x = 285285........$

$1000x = 285.\overline{285}$ (2)

Subtracting (1) from (2), we have

$1000x - x = 285.\overline{285} - 0.\overline{285}$

$999x = 285$

$x = \dfrac{285}{999}$

13. Let $p(x)=x^3+x^2+x-3$

The possible integral zeroes of $p(x)$ are the factors of 3,i.e ±1 and ±3

$\therefore\ p(1)=0,\ p(-1)\neq 0,\ p(3)\neq 0,\ p(-3)\neq 0$

Hence, 1 is the only integral zero of the polynomial $p(x)$.

14. $p(x)=3x^3+7x, divisor=3x+7=3\left(x+\frac{7}{3}\right)$

Comparing $x+\frac{7}{3}$ by $x-a$,we get $a=-\frac{7}{3}$

Remainder = $p\left(-\frac{7}{3}\right)=3\left(-\frac{7}{3}\right)^3+7\left(-\frac{7}{3}\right)$

$=-\frac{343}{9}-\frac{49}{3}$

$=-\frac{490}{9}\neq 0$

Hence, $7+3x$ is not a factor of $3x^3+7x$.

15. AXIOMS

1. Things which are equal to the same thing are equal to one another.
2. If equals are added to equals , the wholes are equal.

Give examples yourself.

16. Through point R, draw a line ARB parallel to PQ and parallel to ST.

Let $\angle ARQ=x$ and $\angle BRS=y$

Since, $PQ \parallel AR$ and QR is transversal

$110^\circ+x=180^\circ$ (co-interior angles are supplementary)

$x=70^\circ$

Similarly, $y=50^\circ$

Since, ARB is straight line, $\therefore \angle ARB=180^\circ$

$\Rightarrow x+\angle QRS+y=180^\circ$

$\Rightarrow \angle QRS=60^\circ$

17. Draw $EO \parallel AB$

Then, $\angle 1+\angle 2=x$

Now, $EO \parallel AB$ and BO is the transversal,

$\therefore \angle 1+\angle ABO=180^\circ$ (co-int. angles)

$\angle 1=140^\circ$

Similarly, $\angle 2=145^\circ$

$\therefore \angle 1+\angle 2=285^\circ$

Hence, reflex $\angle BOD=285^\circ$

18. In ΔBOE and ΔCOF we have

$\angle B=\angle C$

And $\angle BOE=\angle COF$ (vertically opposite angles)

$\therefore \angle B+\angle BOE=\angle C+\angle COF$

$\Rightarrow 180^\circ-\angle BEO=180^\circ-\angle CFO$ (by angle sum property)

$\Rightarrow \angle BEO=\angle CFO$ (1)

Now, $\angle BEO+\angle OEA=180^\circ, \angle CFO+\angle OFA=180^\circ$ (angles of a linear pair)

$\therefore \angle BEO+\angle OEA=\angle CFO+\angle OFA$

$\angle OEA=\angle OFA, \angle CEA=\angle BFA$ (using (1), $\angle OEA=\angle CEA$ and $\angle OFA=\angle BFA$ …………(2))

Now, in ΔBAF and ΔCAE, we have

$\angle B=\angle C$ (given)

$\angle CEA=\angle BFA$ (from (2))

$BA=AC$ (given)

$\therefore \Delta BAF\cong\Delta CAE$ (by AAS)

19. Plot the points of the figure

Name of the figure – right triangle

Area – 32 square units

20. Let $ABCD$ be the garden

$DC=35m, DB=42m$

Draw $CE\perp DB$

$DE=\frac{1}{2}DB=\frac{1}{2}\times 42=21m$

$CE=28m$ (by pythagoras theorem)

Area of $\Delta DBC=\frac{1}{2}\times DB\times CE=588sq.m$

$\therefore$ area of garden $ABCD=2\times 588=1176sq.m$

Area of each part $=\frac{1176}{4}=294sq.m$

21. Prove it yourself.

22. Do it yourself

23. Do it yourself

24. $y^2(2y+1)-1(2y+1)$

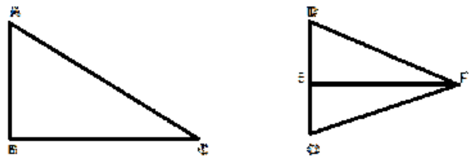
$(2y-1)(y^2-1)$

$(2y+1)(y-1)(y+1)$

25. Yes, $\left(x-\sqrt{2}\right)$ is a factor but $\left(x+\sqrt{2}\right)$ is not

26. 1 and -1 are not zeroes but -3 is a zero

27. RHS congruence criterion: two right triangles are congruent if the hypotenuse and one side of one triangle are respectively equal to the hypotenuse and one side of the other triangle.



Given: Two right triangles ABC and DEF in which $\angle B = \angle E = 90°, AC = DF, BC = EF$

To Prove: $\Delta ABC \cong \Delta DEF$

Construction: Produce DE to O so that $EO = AB$. Join OF

Proof: In ΔABC and ΔOEF , we have

$AB = OE$ (By construction)

$\angle B = \angle FEO = 90°$

$BC = EF$

$\Delta ABC \cong \Delta OEF$ (By SAS)

$\Rightarrow \angle A = \angle O$ …………(1)

$AC = OF$ (By CPCT)…………(2)

Also, $AC = DF$ (Given)

$\therefore DF = OF$

$\Rightarrow \angle D = \angle O$ (Angles opposite to equal sides in ΔDOF are equal)

From (1) and (3), we get

$\angle A = \angle D$ ………….(4)

Thus, in ΔABC and ΔDEF , we have

$\angle A = \angle D$ (from (4))

$\angle B = \angle E$ (given)

$\Rightarrow \angle A + \angle B = \angle D + \angle E$

$\Rightarrow 180° - \angle C = 180° - \angle F$ $(\because \angle A + \angle B + \angle C = 180°$ and $\angle D + \angle E + \angle F = 180°)$

$\Rightarrow \angle C = \angle F$

Now, in ΔABC and ΔDEF , we have

$BC = EF$ (given)

$\angle C = \angle F$ (proved above)

$AC = DF$

$\therefore \Delta ABC \cong \Delta DEF$ (By SAS)

28.

1. Using the theorem: the sum of any two sides of a triangle is greater than the third side in triangles PQR, RSP, PQS, QRS and adding all the results we will get what we need to prove.
2. Using the same theorem in triangles OPQ, OQR, ORS, OSP and adding them we get

$2(OP + OQ + OR + OS) > PQ + QR + RS + SP$

$\Rightarrow 2\left[(OP + OR) + (OQ + OS)\right] > PQ + QR + RS + SP$

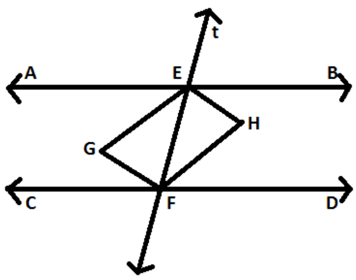
$\Rightarrow 2(PR + QS) > PQ + QR + RS + SP$ $(\because OP + OR = PR$ and $OQ + OS = QS)$

$\Rightarrow PQ + QR + RS + SP < 2(PR + QS)$

29. **Given**: $AB \parallel CD$ and a transversal t cuts them at E and F respectively. EF, FG, EH, FH are the bisectors of the interior angles $\angle AEF, \angle CFE, \angle BEF, \angle EFD$ respectively.

To prove: $EGFH$ is a rectangle.

Proof: $AB \parallel CD$ and the transversal t cuts them at E and F respectively.



Proof: $AB \parallel CD$ and the transversal t cuts them at E and F respectively.

$\therefore \angle AEF = \angle EFD$ (alternate interior angles)

$\Rightarrow \frac{1}{2}\angle AEF = \frac{1}{2}\angle EFD \Rightarrow \angle GEF = \angle EFH$

$\therefore EG \parallel FH$ ($\because$ alternate interior angles formed above when transversal EF cuts EG and FH)

Similarly, $EH \parallel FG$

$\therefore EGFH$ is a parallelogram.

$\therefore \angle AEF + \angle BEF = 180°$ (linear pair)

$\Rightarrow \frac{1}{2}\angle AEF + \frac{1}{2}\angle BEF = 90° \Rightarrow \angle GEF + \angle HEF = 90°$

$\Rightarrow \angle GEH = 90° (\because \angle GEF + \angle HEF = \angle GEH)$

Thus, $EGFH$ is a parallelogram one of whose angles is $90°$.

$\therefore EGFH$ is arectangle.

30. Do it yourself.

31. BC and AD are non-parallel sides of the trapezium. Through the vertex C, we draw $CE \parallel DA$ and CE meets AB and E. Here, $AECD$ becomes a parallelogram. Then

$AE = 15m, BE = 35m, CE = 20m.$

Semiperimeter of $\Delta CEB = 40m$

Area of $\Delta CEB = 100\sqrt{6} sq.m$

Also, we have $CE \perp BE$ and let $CL = h$. So, area of $\Delta CEB = \frac{1}{2} \times BE \times h = 100\sqrt{6}$

$\Rightarrow h = \frac{40\sqrt{6}}{7} m$

Area of trapezium $ABCD = \frac{1}{2}(AB + CD) \times h = \frac{1300\sqrt{6}}{7} sq.m$