CBSE

Model Answer Sheet 2014

केन्द्रीय माध्यमिक शिक्षा बोर्ड

Central Board of Secondary Ed

(परीक्षार्थी भरें To be filled in by the candidate)

परीक्षार्थी प्रश्न–पत्र के ऊपर लिखें कोड को दर्शाये गये बॉक्स में लिखें
Candidate should write code no. as written on the top of the question paper in this box → 30/2

अतिरिक्त उत्तर–पुस्तिका (ओं) की संख्या
No. of supplementary answer-book (s) used → NIL

परीक्षा का नाम Name of the examination AISSE

कक्षा Class 10

विषय Subject MATHEMATICS

परीक्षा का दिन एवं तिथि
Day & Date of the Examination MONDAY - 03/03/2014

उत्तर देने का माध्यम Medium of answering the paper ENGLISH

किसी शारीरिक अक्षमता से प्रभावित हो तो सम्बन्धित वर्ग में ✓ का निशान लगायें

B	D	H	S	C

B = दृष्टिहीन, D = मूक व बधिर, H = शारीरिक रूप से विकलांग, S = स्पास्टिक C = डिस्लेक्सिक
If Physically challenged, tick the category
B = Blind, D = Deaf & Dumb, H = Physically Handicapped, S = Spastic, C = Dyslexic

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प्रमाणित किया जाता है कि मैंने / हमने इस उत्तर पुस्तिका का मूल्यांकन प्रश्न पत्र के समुचित सेट के अनुसार और पूर्णरुप से मूल्यांकन पद्धति के अनुसार किया है।
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SECTION A

1. (C) $1/5$

2. (B) $150\sqrt{3}$

3. (D) $90°$

4. (B) 3

5 (B) $10\sqrt{2}$

6. (A) 5

7 (C) 2cm

8 (A) $7/8$

SECTION B

9. EA and EC are tangents from point E to the circle with centre O_1

$EA = EC$ ... (1) | Length of tangents from an external point to the circle are equal |

EB and ED are tangents from point E to circle with centre O_2

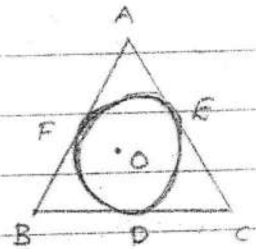
$EB = ED$ ... (2) | Length of tangents from an external point to the circle are equal |

(1) + (2)

$\Rightarrow EA + EB = EC + ED$

$\Rightarrow AB = CD$ | Proved |

10. Given : A circle with centre O inscribed in an iscoceles triangle with ~~centre~~ $AB = AC$



To prove : $BD = DC$

Proof :

AF = AE (1) | Length of tangents from an external point to the circle are equal |

~~AB~~ BF = BD (2) | Length of tangents from an external point to circle are equal |

CD = EC (3) | Length of tangents from an external point to circle are equal |

AB = AC | given |

AF + BF = AE + EC i.e,

BF = EC | since AF = AE |

BD = CD | from (2) and (3) |

11 (i) Even numbers occur in (2,2) (2,4) (2,6) (4,2) (4,4) (4,6) (6,2) (6,4) (6,6)

P (number of each die is even) = $9/36 = 1/4$

(ii) Sum of numbers are 5 in (1,4) (2,3) (3,2) (4,1)

P (sum of numbers appearing on two dice is 5) = $\frac{4}{36} = \frac{1}{9}$

12. TSA of hemisphere = 462 cm^2

$3\pi r^2 = 462$

$3 \times \frac{22}{7} \times r^2 = 462$

$r^2 = 49$

$r = 7\ cm$

Volume of hemisphere = $\frac{2}{3}\pi r^3$

$= \frac{2}{3} \times \frac{22}{7} \times 7 \times 7 \times 7$

$= \frac{2156}{3}\ cm^3$

13. The sequence goes like this,

110, 120, 130 990

Since they have a common difference of 10, they form an A.P, $a = 110$, $a_n = 990$, $d = 10$

$a_n = a + (n-1) \times d$

$990 = 110 + (n-1) \times 10$

$990 - 110 = (n-1) \times 10$

$880 = (n-1) \times 10$

$n - 1 = 88$

$n = 89$

There are 89 terms between 101 and 999 divisible by 2 and 5.

14. $a = 9,\ b = -3k,\ c = k$

Since roots of the equation are equal

$b^2 - 4ac = 0$

$(-3k)^2 - (4 \times 9 \times k) = 0$

$9k^2 - 36k = 0$

$k^2 - 4k = 0$

$k(k-4) = 0$

$k = 0$ or $k = 4$

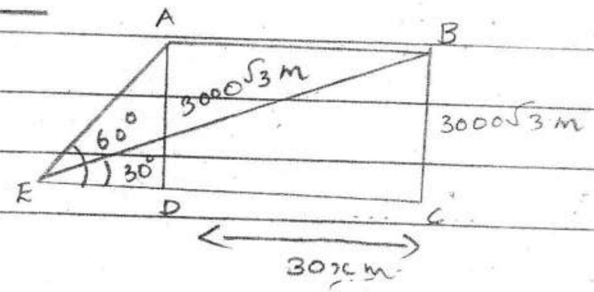
Since $k = 0$ is not possible for the equation, $k = 4$

SECTION C

15. $\angle AED = 60°,\ \angle BEC = 30°$

$AD = BC = 3000\sqrt{3}$ m

Let the speed of the



aeroplane = x m/s

then $AB = DC = 30 \times x$

$= 30x$ m . . . (1)

ΔAED is right angled

$\tan 60^\circ = AD/DE$

$\sqrt{3} = \frac{3000\sqrt{3}}{DE}$

$DE = 3000$ m . . . (2)

ΔBEC is right angled

$\tan 30^\circ = BC/EC$

$1/\sqrt{3} = \frac{3000\sqrt{3}}{DE + CD}$

$DE + CD = 3000 \times 3$

$3000 + 30x = 9000$ | from (1) and (2) |

$3\cancel{0}x = \cancel{6000}$ 200

$x = 200$ m/s

Speed of plane is 200 m/s

16. side of cube, $a = 7cm$

The diameter of the largest possible sphere is 7cm | same as side of cube |

Radius, $r = 7/2$ cm

Volume of the wood left = Volume of cube - Volume of sphere

$= a^3 - \frac{4}{3}\pi r^3$

$= 7 \times 7 \times 7 - \frac{4}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times \frac{7}{2}$

$= 7 \times 7 \left(7 - \frac{11}{3}\right)$

$= 7 \times 7 \left(\frac{21-11}{3}\right)$

$= 7 \times 7 \times \frac{10}{3}$

$= \frac{490}{3} cm^3$

17. width of water in canal = 6m

Height of water in canal = 1.5m

Length of water in canal in 1h = 4 km = 4000m

Let the Base area of field be x

The height of standing water in the field $= \frac{8}{100}$ m

Volume of water in canal in 10 minutes i.e $\frac{1}{6}$ hours

= Volume of water in field

$\frac{1}{\cancel{6}} \times \cancel{6} \times 1.5 \times 4000 = \text{Base area} \times \frac{8}{100}$

$15 \times \cancel{400}^{\cancel{100}\,50} = x \times \frac{\cancel{8}^{2}}{100}$

$x = 15 \times 50 \times 100\ m^2$

$= 75000\ m^2$

18. Area of trapezium = $24.5\ cm^2$

$\frac{h(a+b)}{2} = 24.5$, where $a = AD$, $b = BC$

$\frac{h(10+4)}{2} = 24.5$

$h \times 7 = 24.5$

$h = \frac{24.5}{7} = 3.5\ cm$

$AB \perp AD$ | Given |

$\therefore$ AB is the height of the trapezium

$h = AB = 3.5cm$

But AB is the radius of the quadrant

Area of the shaded region = Area of trapezium - Area of quadrant

$\Rightarrow 24.5 - \frac{1}{4} \times \frac{22}{7} \times 3.5 \times 3.5$

$\Rightarrow 24.5 - \frac{19.25}{2}$

$\Rightarrow \frac{49 - 19.25}{2}$

$\Rightarrow \frac{29.75}{2} \text{ cm}^2$

19. A (3, -3) and B (-2, 7)

on the x axis, the y coordinate is zero

So, let the point be (x, 0)

Let the ratio be k : 1

$(x, 0) = \left(\frac{-2k+3}{k+1}, \frac{7k-3}{k+1} \right)$

$\frac{7k-3}{k+1} = 0$

$7k - 3 = 0 \Rightarrow k = 3/7$

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

$$\frac{-2 \times 3/7 + 3}{3/7 + 1} = x$$

$$\frac{-6/7 + 3}{10/7} = x$$

$$\frac{\frac{-6+21}{7}}{10/7} = x$$

$$\frac{\frac{15}{7}}{\frac{10}{7}} = x$$

$$x = 3/2$$

The coordinates of the point is $(3/2, 0)$

20. Area of the shaded region = Area of major sector AOB - Area of major sector COD

$$\Rightarrow \frac{360-60}{360} \times \frac{22}{7} \times 42 \times 42 - \frac{360-60}{360} \times \frac{22}{7} \times 21 \times 21$$

$$\Rightarrow \frac{\cancel{300}^{5}}{\cancel{360}_{6}} \times 22 \times 6 \times 42 - \frac{\cancel{300}^{5}}{\cancel{360}_{6}} \times 22 \times 3 \times 21$$

$\Rightarrow 3465\ cm^2$

21. $\frac{16}{x} - 1 = \frac{15}{x+1}$

$\frac{16}{x} - \frac{15}{x+1} = 1$

$16(x+1) - 15x = x^2 + x$

$16x + 16 - 15x = x^2 + x$

$x + 16 = x^2 + x$

$x^2 - 16 = 0$

$(x+4)(x-4) = 0$

$x+4 = 0, \quad x-4 = 0$

$x = -4, \quad x = +4$

22 $a_2 + a_1 = 30$

$$a+d+a+6d=30$$

$$2a+7d=30 \quad \cdots (1)$$

$$(2\times a_8)-1 = a_{15}$$

$$(2(a+7d))-1 = a+14d$$

$$(2a+14d)-1 = a+14d$$

$$2a\cancel{+14d}-1 = a\cancel{+14d}$$

$$2a-a=1$$

$$a=1$$

~~Substitute a in (1)~~

$$2a+7d=30$$

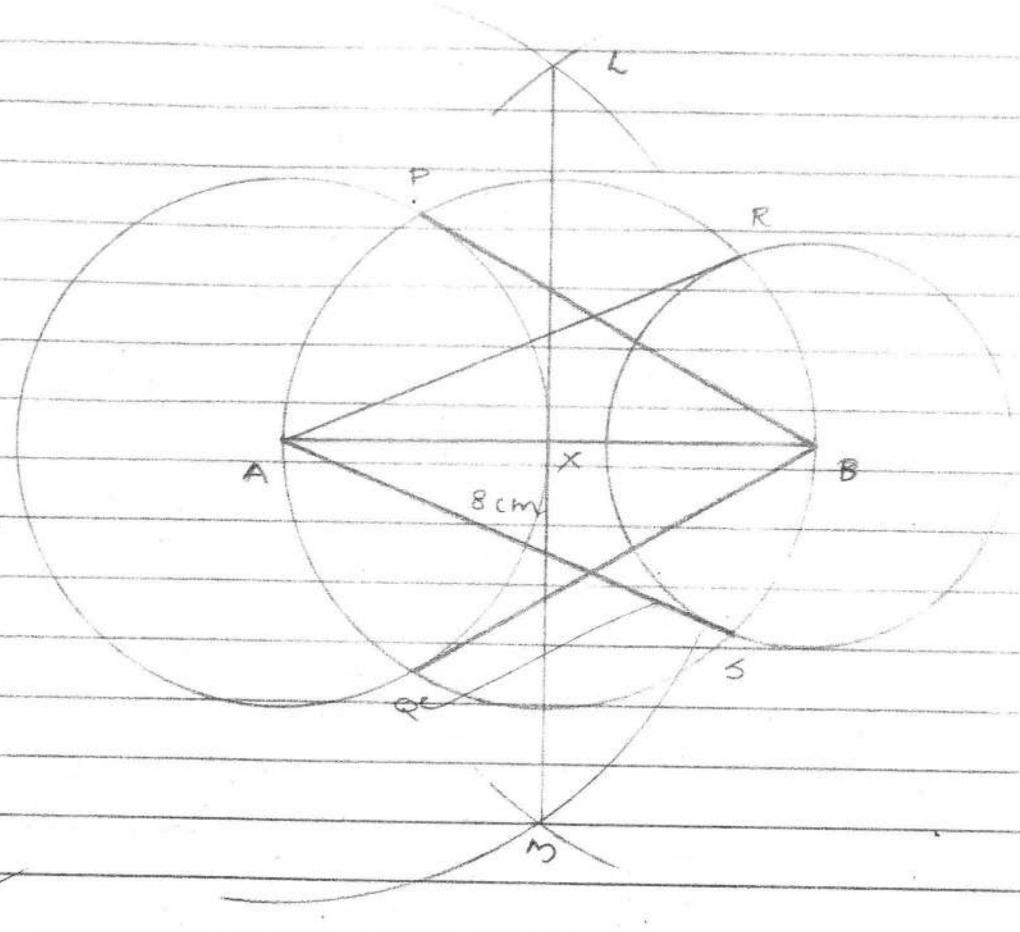
$$2\times 1+7\times d=30$$

$$7d=28$$

$$d=4$$

The A.P is 1, 5, 9, 13, 17 . . .

23



Step 1: Construct a line segment AB of 8cm length

Step 2: With A as centre, draw a circle of radius

4 cm

Step 3 : with B as centre draw a circle of radius 3cm

Step 4 : Draw a perpendicular bisector of AB and let it intersect AB at X

Step 5 : with X as centre and XA as radius, draw a circle

Step 6 : Let this circle intersect, the circle with centre A at P and Q and the circle with B as centre at R and S respectively

Step 7 : Join AR, AS, BP and BQ

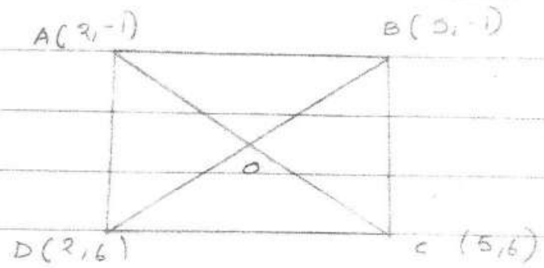
∴ AR, AS, BP and BQ are the required tangents.

24. $AC = \sqrt{(5-2)^2 + (6+1)^2}$

$= \sqrt{3^2 + 7^2}$

$= \sqrt{9+49}$

$= \sqrt{58}$



$BD = \sqrt{(5-2)^2 + (-1-6)^2}$

$= \sqrt{3^2 + 7^2}$

$= \sqrt{9+49}$

$= \sqrt{58}$

Since $AC = BD = \sqrt{58}$ cm, the diagonals of rectangle ABCD are equal

Midpoint of $AC = \left(\frac{2+5}{2}, \frac{-1+6}{2}\right)$.

$= \left(7/2, 5/2\right)$

Mid point of $BD = \left(\frac{2+5}{2}, \frac{6+-1}{2}\right)$

$= \left(7/2, 5/2\right)$

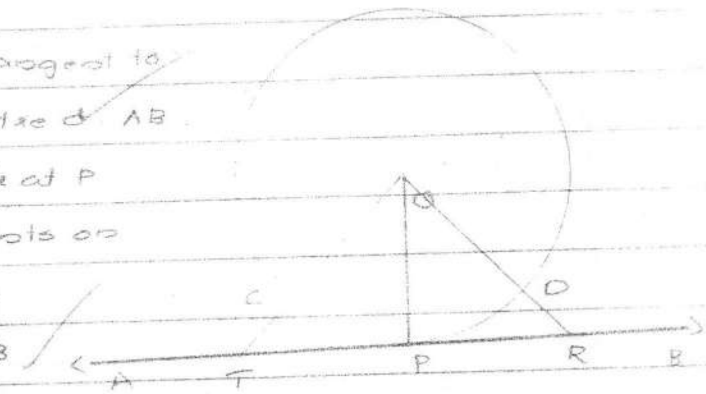
Since the midpoint of diagonal AC = Midpoint of diagonal $BD = \left(\frac{7}{2}, \frac{5}{2}\right)$,

they bisect each other

SECTION D

25. Given : AB is a tangent to circle with centre O. AB touches the circle at P

T and R are points on the tangent AB



To prove : $OP \perp AB$

Proof

$OC = OP = OD$ (radii of circle)

$OC = OP$

$OC + CT > OP$ .... (1)

$OD = OP$

$OD + DR > OP$ .... (2)

From (1) and (2), we can understand

that OP is shorter than any distance drawn towards the tangent from the centre $\therefore$ OP is the shortest distance. The shortest distance is the perpendicular

$\therefore OP \perp AB$

It is proved that the tangent at any point of circle is perpendicular to the radius through the point of contact.

26. diameter of sphereical marble = 1.4cm

Radius, $r = 1.4/2 = 0.7 = 7/10$ cm

Diameter of cylindrical vessel = 7cm

Radius, $R = 7/2$ cm

~~Let h be the rise in water level, then~~

Volume of 150 spherical marbles = Volume of water risen.

$\Rightarrow \cancel{150}^{\cancel{50}\ 2} \times \frac{4}{\cancel{3}} \times \pi \times \frac{\cancel{7}}{\cancel{10}_{5}} \times \frac{\cancel{7}}{\cancel{10}_{5}} \times \frac{7}{\cancel{10}_{5}} = \pi \times \frac{\cancel{7}}{\cancel{2}} \times \frac{\cancel{7}}{\cancel{2}} \times h$

$\Rightarrow h = \frac{4 \times 7}{5}$

$\Rightarrow 28/5 = h$

$\Rightarrow h = 5.6$ cm

The rise in the level of water, $h = 5.6$cm.

27. Height of frustum, $h = 24cm$

$r_1 = 20cm$

$r_2 = 8cm$

Volume of container $= \frac{1}{3} \times \frac{22}{7} \times (20^2 + 20\times8 + 8^2) \times 24$

$\Rightarrow \frac{1}{3} \times \frac{22}{7} \times (400 + 160 + 64) \times 24$

$\Rightarrow \frac{1}{\cancel{3}} \times \frac{22}{7} \times 624 \times \cancel{24}\ 8$

$\Rightarrow \frac{22}{7} \times 624 \times 8 \ cm^3$

$\Rightarrow \frac{22}{7} \times 624 \times 8 \times \frac{1}{1000}$ litres

Total cost $=$ Rs $\cancel{21}^{3} \times \frac{22}{\cancel{7}} \times 624 \times 8 \times \frac{1}{1000}$

$= \frac{66 \times 624 \times 8}{1000}$

$\Rightarrow$ Rs 329.472

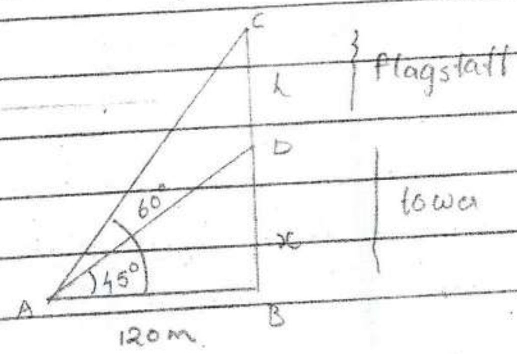
$\Rightarrow$ Rs 329.5 (approximately)

28. Height of flagstaff $= CD = h\,m$

Height of tower $= BD = x\,m$

$\angle DAB = 45°$, $\angle CAB = 60°$

$AB = 120m$



ΔABD is right angled

$\tan 45° = 1$

$\cancel{AB}$ $\frac{x}{AB} = 1$

$x = AB = 120\,m$

ΔACB is right angled

$\tan 60° = \sqrt{3}$

$\frac{h+x}{120} = \sqrt{3}$

$h + 120 = 120\sqrt{3}$

$h = 120\sqrt{3} - 120$

$h = 120(\sqrt{3} - 1)$

$h = 120(1.73 - 1)$

$h = 120 \times 0.73$

$h = 87.6\,m$

29. Let the speed of stream $= x$ km/h

Then the speed of boat in upstream $= (18 - x)$ km/h

Speed of boat in downstream $= (18 + x)$ km/h

According to the question,

$$\frac{24}{18-x} - \frac{24}{18+x} = 1$$

$$\frac{24(18+x) - 24(18-x)}{18^2 - x^2} = 1$$

$$432 + 24x - 432 + 24x = 324 - x^2$$

$$48x = 324 - x^2$$

$$x^2 + 48x - 324 = 0$$

$$x^2 + 54x - 6x - 324 = 0$$

$$x(x+54) - 6(x+54) = 0$$

$$(x+54)(x-6) = 0$$

$$x+54 = 0, \quad x-6 = 0$$

$$x = -54, \quad x = 6$$

Since speed cannot be negative,

the speed of stream $x = 6$ km/h

30. ~~The sequence of number of trees is~~

$$\cancel{2\times1, 2\times2, 2\times3 \ldots\ldots 2\times12}$$

$$\cancel{2, 4, 6 \ldots\ldots 24}$$

~~The sequence forms an A.P as the common difference is 2~~

~~The total number of trees planted by students~~

~~$S_n = \frac{n}{2} \times (a + a_n)$~~

~~where $n = 12$, $a = 2$, $a_n = 24$~~

~~$S_{12} = \frac{12}{2} \times (2 + 24)$~~

~~$= 6 \times 26$~~

~~$= 156$~~

~~The~~

30 The sequence of trees goes like this.

$4, 8, 12, \ldots 48$

They form an A.P with common difference 4

The total number of trees planted by students 1 to 12 is given by

$S_n = \frac{n}{2} \times (a + a_n)$

where $n = 12$, $a = 4$, $a_n = 48$

$S_{12} = \frac{12}{2} \times (4 + 48)$

$= 6 \times 52 = 312$

The value of environmental observation is shown by the students

31 $\frac{x-3}{x-4} + \frac{x-5}{x-6} = 10/3$

$\frac{(x-3)(x-6) + (x-4)(x-5)}{(x-4)(x-6)} = 10/3$

$\Rightarrow \frac{x^2-9x+18 + x^2-9x+20}{x^2-10x+24} = 10/3$

$\Rightarrow 3(2x^2-18x+38) = 10x^2-100x+240$

$\Rightarrow 6x^2 - 54x + 114 = 10x^2-100x+240$

$\Rightarrow 4x^2 - 46x + 126 = 0$

$\Rightarrow 2x^2 - 23x + 63 = 0$

$\Rightarrow 2x^2 - 14x - 9x + 63 = 0$

$\Rightarrow 2x(x-7) - 9(x-7) = 0$

$\Rightarrow (2x-9)(x-7) = 0$

$\Rightarrow 2x-9 = 0,\ x-7 = 0$

29

$\Rightarrow x = 9/2, x = 1$

32. i) No. of cards remaining $= 52 - 3 \times 2$

$= 52 - 6 = 46$

No. of red cards $= 26 - 6 = 20$

$P(\text{a red colour}) = 20/46 = \underline{10/23}$

ii) No. of queen $= 4 - 2 = 2$

$P(\text{a queen}) = 2/46 = \underline{1/23}$

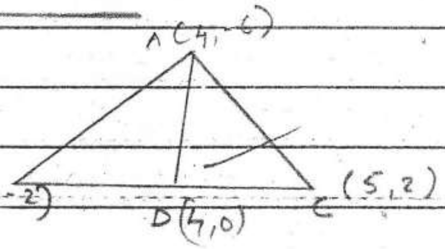
iii) No. of ace $= 4$

$P(\text{an ace}) = 4/46 = \underline{2/23}$

iv) No. of face cards $= 12 - 6 = 6$

$P(\text{a face card}) = 6/46 = \underline{3/23}$

33. AD is the median of $\triangle ABC$ from vertex A



$D(x, y) = \left(\frac{3+5}{2}, \frac{-2+2}{2}\right) = (4, 0)$

Area of $\Delta ADB = \frac{1}{2} \times (4(0+2) + 4(-2+6) + 3(-6-0))$

$= \frac{1}{2} \times (8 + 16 + -18)$

$= \frac{1}{2} \times 6 = 3$ square units ... (1)

Area of $\Delta ACB = \frac{1}{2} \times (4(0-2) + 4(2+6) + 5(-6-0))$

$= \frac{1}{2} \times (-8 + 32 - 30)$

$= \frac{1}{2} \times -6 = -3$

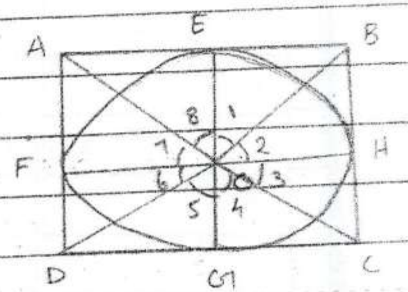
Since area is positive,

Area of $\Delta ACB = 3$ square units ... (2)

From (1) and (2) Area of ΔADB = Area of ΔACB

It is verified that median of ΔABC divides it into two triangles of equal areas.

34. Given : A circle with centre O is inscribed in a quadrilateral ABCD



In ΔAEO and ΔAFO,

$OE = OF$ (radii of circle)

$\angle OEA = \angle OFA = 90°$ (radius is perpendicular to the tan through the point of contact is perpendicular to the tangent)

OA = OA (common side)

$\Delta AEO \cong \Delta AFO$ (RHS rule)

$\angle 7 = \angle 8$ ...(1) (CPCT)

Similarly,

$\angle 1 = \angle 2$ ... (2)

$\angle 3 = \angle 4$ ... (3)

$\angle 5 = \angle 6$ ... (4)

$\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5 + \angle 6 + \angle 7 + \angle 8 = 360°$ (angle around a point is 360°)

$2\angle 1 + 2\angle 8 + 2\angle 4 + 2\angle 5 = 360°$

$\angle 1 + \angle 8 + \angle 4 + \angle 5 = 180°$

$(\angle 1 + \angle 8) + (\angle 4 + \angle 5) = 180°$

$\angle AOB + \angle DOC = 180°$

It is proved that opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre.

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