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

क्या लेखन-लिपिक उपलब्ध करवाया गया : हां / नहीं
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प्रमाणित किया जाता है कि मैंने / हमने इस उत्तर पुस्तिका का मूल्यांकन प्रश्न पत्र के समुचित सेट के अनुसार और पूर्णरूप से मूल्यांकन पद्धति के अनुसार किया है।
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जहाँ पर सामूहिक अंकन की व्यवस्था हो वहाँ सभी परीक्षकों के लिए हस्ताक्षर करना अनिवार्य 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

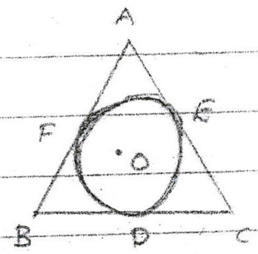
$EB = ED$ ... (2) | Length of tangents from an external point to the circle are equal |

(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) = $\frac{9}{36} = \frac{1}{4}$

(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) = $4/36 = 1/9$

12. TSA of hemisphere = $462\ cm^2$

$3\pi r^2 = 462$

$3 \times 22/7 \times r^2 = 462$

$r^2 = 49$

$r = 7\ cm$

Volume of hemisphere = $2/3 \pi r^3$

$= 2/3 \times 22/7 \times 7 \times 7 \times 7$

$= 2156/3\ cm^3$

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 $k = 4$

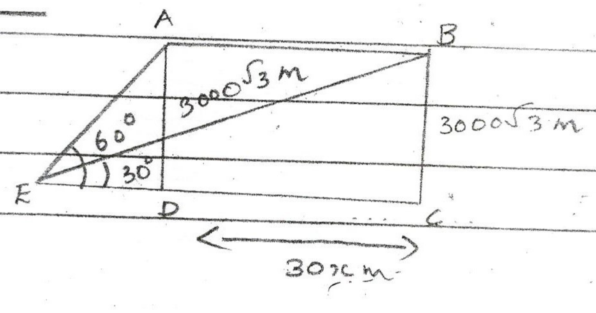
Since $k = 0$ is not possible for the equation, $k = 4$

<u>SECTION C</u>

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.

$\tan 60° = AD/DE$

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

DE = 3000 m . . . (2)

ΔBEC is right angled

$\tan 30° = BC/EC$

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

DE + CD = 3000×3

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

$30x = 6000$

$x = 200$ m/s

Speed of plane is 200 m/s

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

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

Radius, $r = 7/2$ cm

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

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

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

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

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

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

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

17. width of water in canal = 6 m

Height of water in canal = 1.5 m

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

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

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

$15 \times 400 = x \times \frac{8}{100}$

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

$= 75000 \ m^2$

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

$h = AB = 3.5 \ cm$

But AB is the radius of the quadrant

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

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

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

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

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

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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

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

$$\Rightarrow \frac{300}{360} \times 22 \times 6 \times 42 - \frac{300}{360} \times 22 \times 3 \times 21$$

$$\Rightarrow 3465 \text{ cm}^2$$

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. $a_2 + a_1 = 30$

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

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

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

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

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

$2a ~~+14d~~ - 1 = a ~~+14d~~$

$2a - a = 1$

$a = 1$

Substitute a ~~in (1)~~

$2a + 7d = 30$

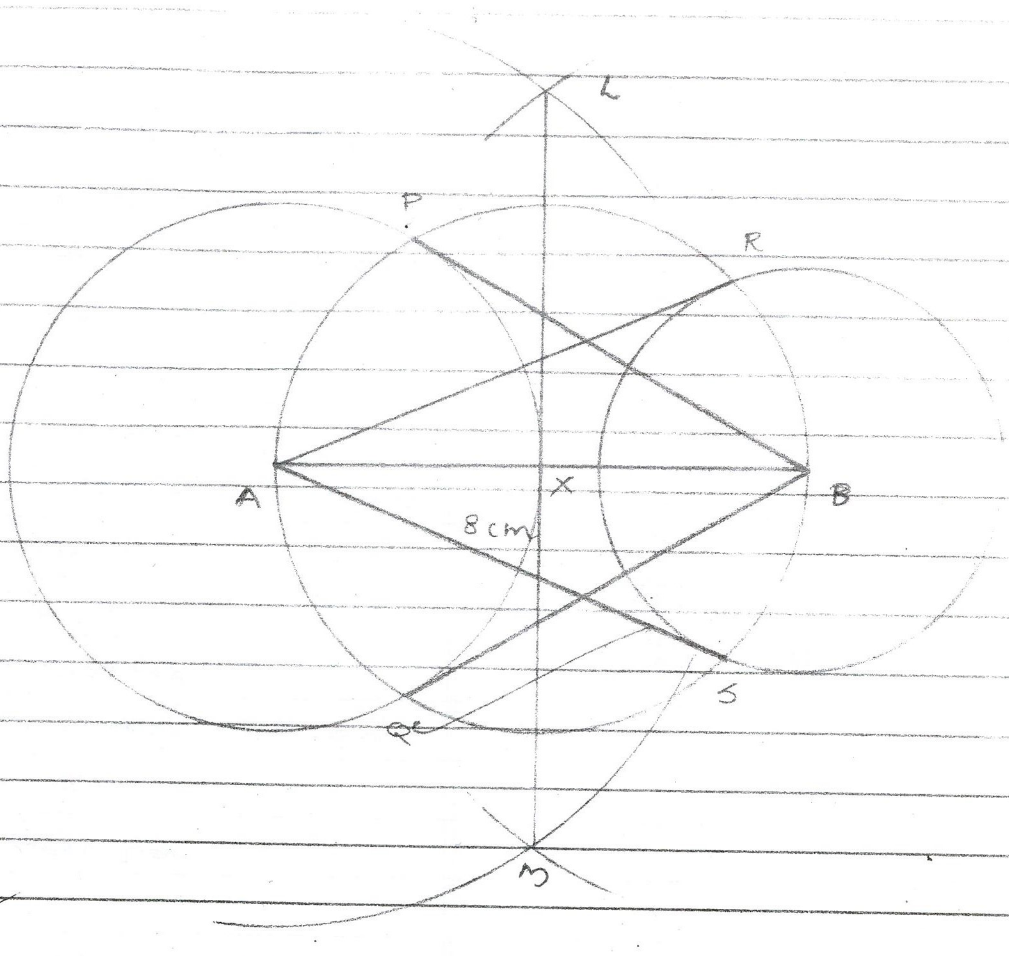
$2 \times 1 + 7 \times d = 30$

$7d = 28$

$d = 4$

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

16

4 cm

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

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

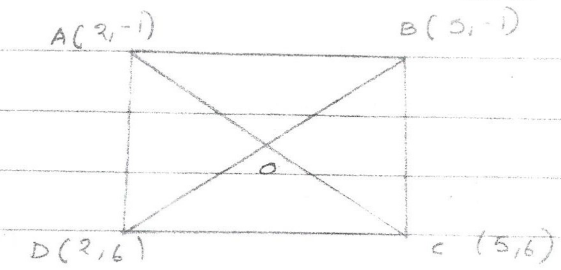
∴ AR, AS, BP and BQ are the required tangents.

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

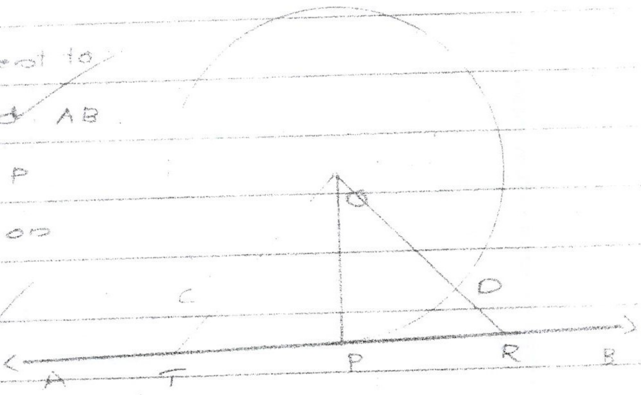
$= \left(7/2, 5/2\right)$

Since the midpoint of diagonal AC = Midpoint of diagonal BD $= (7/2, 5/2)$,

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 ∴ OP is the shortest distance. The shortest distance is the perpendicular

∴ $OP \perp AB$

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

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26. diameter of sphereical marble = 1.4 cm

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

Diameter of cylindrical vessel = 7 cm

Radius, $R = 7/2$ cm

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

Volume of 150 spherical marbles = Volume of water risen.

$$\Rightarrow 150 \times \frac{4}{3} \times \pi \times \frac{7}{10} \times \frac{7}{10} \times \frac{7}{10} = \pi \times \frac{7}{2} \times \frac{7}{2} \times h$$

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

$$\Rightarrow 28/5 = h$$

$$\Rightarrow h = 5.6 \text{ cm}$$

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

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

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

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

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

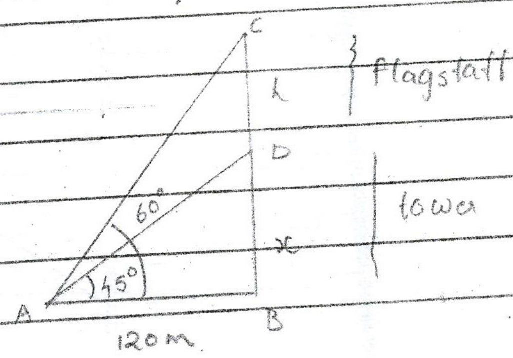
$\Rightarrow$ Rs 329.5 (approximately)

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

$\tan 45° = 1$

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

$x = AB = 120 m$

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~~

~~$2\times1, 2\times2, 2\times3 \ldots 2\times12$~~

~~$2, 4, 6 \ldots 24$~~

~~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. $\frac{x-3}{x-4} + \frac{x-5}{x-6} = \frac{10}{3}$

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

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

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

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

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

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

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

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

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

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

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

32. i) No. of cards remaining = 52 − 3 × 2

= 52 − 6 = 46

No. of red cards = 26 − 6 = 20

P (a red colour) = 20/46 = 10/23

ii) No. of queen = 4 − 2 = 2

P (a queen) = 2/46 = 1/23

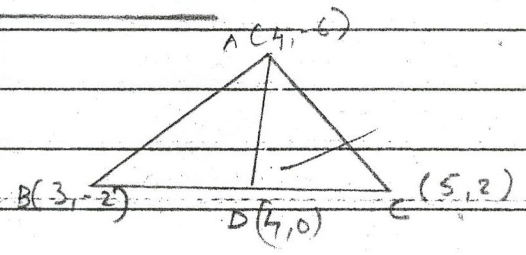
iii) No. of ace = 4

P (an ace) = 4/46 = 2/23

iv) No. of face cards = 12 − 6 = 6

P (a face card) = 6/46 = 3/23

33. AD is the median of Δ 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 $\Delta ACB = \frac{1}{2} \times (4(0-2) + 4(2+6) + 5(-6-0))$

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

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

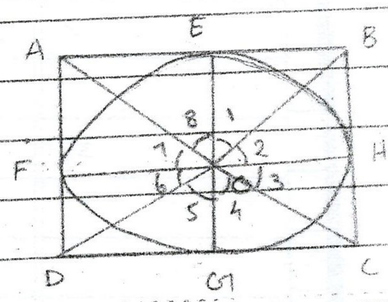
Since area is positive,

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 perpendi

cular 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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