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केन्द्रीय माध्यमिक शिक्षा बोर्ड
Central Board of Secondary Education

(परीक्षार्थी भरे To be filled in by the candidate)

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अतिरिक्त उत्तर-पुस्तिका (ओं) की संख्या
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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

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H 004110

SECTION A

1. (C) $\frac{1}{6}$ ✓

2. (B) $150\sqrt{3}$ ✓

3. (D) 90° ✓

4. (B) 3 ✓

5. (B) $10\sqrt{2}$ ✓

6. (A) 5 ✓

7. (C) 2cm ✓

8. (A) $\frac{1}{8}$ ✓

SECTION B

9. EA and EC are tangents from point E to the circle with centre O_1 .
 $EA = EC$ (1) | Lengths of tangents from an external point to the circle are equal |

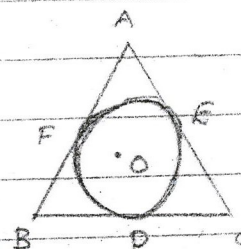
EB and ED are tangents from point E to circle with centre O_2 .
 $EB = ED$ (2) | Lengths of tangents from an external point to the circle are equal |

(1) + (2)

$$\Rightarrow EA + EB = EC + ED$$

$$\Rightarrow AB = CD \quad | \text{Proved} |$$

10. Given : A circle with centre O inscribed in an isosceles triangle with ~~base~~ $AB = AC$.
 To prove : $BD = DC$



Proof:

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

~~$AB = AC$~~ $BF = BD$ (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 $(2,2) (2,4) (2,6) (4,2) (4,4) (4,6) (6,2) (6,4) (6,6)$

$P(\text{number of each die is even}) = \frac{9}{36} = \frac{1}{4}$

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

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

12. TSA of hemisphere = 462 cm^2

$$3\pi r^2 = 462$$

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

$$r^2 = 49$$

$$r = 7 \text{ cm}$$

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

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

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

13. The sequence goes like this,

$$110, 120, 130, \dots, 990$$

Since they have a common difference of

10, they form an A.P., $a = 110$, $a_n = 990$, $d = 10$

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

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

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

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

$$n-1 = 88$$

$$n = 89$$

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

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

Since roots of the equation are equal

$$b^2 - 4ac = 0$$

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

$$9k^2 - 36k = 0$$

$$k^2 - 4k = 0$$

$$k(k-4) = 0$$

$$k = 0 \text{ or } k = 4$$

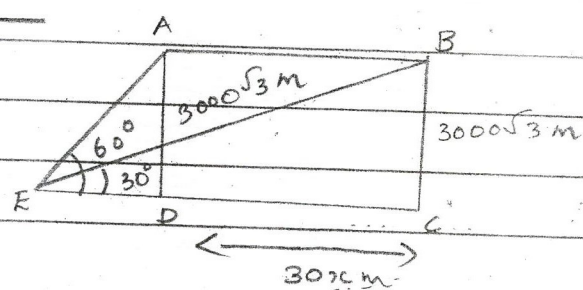
Since $k = 0$ is not possible for the equations, $k = 4$

SECTION C

$$15. \quad \angle AED = 60^\circ, \angle BEC = 30^\circ$$

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

Let the speed of the



$$\text{aeroplane} = x \text{ m/s}$$

$$\text{then } DC = 30 \times x$$

$$= 30x \text{ m} \quad \dots (1)$$

$\triangle AED$ is right angled,

$$\tan 60^\circ = \frac{AD}{DE}$$

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

$$DE = 3000 \text{ m} \quad \dots (2)$$

$\triangle BEC$ is right angled

$$\tan 30^\circ = \frac{BC}{EC}$$

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

$$DE + CD = 3000 \times \sqrt{3} \times \sqrt{3}$$

$$3000 + 30x = 9000 \quad \text{from (1) and (2)}$$

$$30x = 6000$$

$$x = 200 \text{ m/s}$$

speed of plane is 200 m/s

16. side of cube, $a = 7\text{ cm}$

The diameter of the largest possible

sphere is 7 cm | same as side of cube |

Radius, $r = 7/2\text{ cm}$

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

$$\begin{aligned} &= a^3 - \frac{4}{3} \pi r^3 \\ &= 7 \times 7 \times 7 - \frac{4}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times \frac{7}{2} \\ &= 7 \times 7 \left(7 - \frac{11}{3} \right) \\ &= 7 \times 7 \left(\frac{21-11}{3} \right) \\ &= 7 \times 7 \times \frac{10}{3} \\ &= \frac{490}{3} \text{ cm}^3 \end{aligned}$$

17. width of ^{water in} canal = 6 m

Height of ^{water in} canal = 1.5 m

Length of water in canal is $1\text{ km} = 4\text{ km} = 4000\text{ m}$

Let the Base area of field be x

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

Volume of water in canal is 10 m³ water i.e. $\frac{1}{6}$ hours

= Volume of water in field

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

$$15 \times 4000 = x \times \frac{8}{100}$$

$$x = 15 \times 500 \times 100 \text{ m}^2$$

$$= 750000 \text{ m}^2$$

18.

Area of trapezium = 24.5 cm^2

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

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

$$h \times 7 = 24.5$$

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

$AB \perp AD$ | Given |

$\therefore AB$ is the height of the trapezium

$$h = AB = 3.5 \text{ cm}$$

But AB is the radius of the quadrant

Area of the shaded region = Area of trapezoid -

Area of quadrant

$$\Rightarrow 24.5 - \frac{1}{2} \times \frac{11}{7} \times 3.5 \times 3.5$$

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

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

$$\Rightarrow \frac{29.75}{2}$$

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

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

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

$$7k-3=0 \Rightarrow k = \frac{3}{7}$$

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

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

$$\frac{-6/1 + 3}{10/1} = x$$

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

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

$$x = \frac{3}{2}$$

The coordinates of the point is $(\frac{3}{2}, 10)$

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

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

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

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

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

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

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

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

$$x + 16 = x^2 + x$$

$$x^2 - 16 = 0$$

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

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

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

$$22. \quad a_2 + a_1 = 30$$

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

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

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

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

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

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

$$2a-a=1$$

Substitute $a = 1$ in (1)

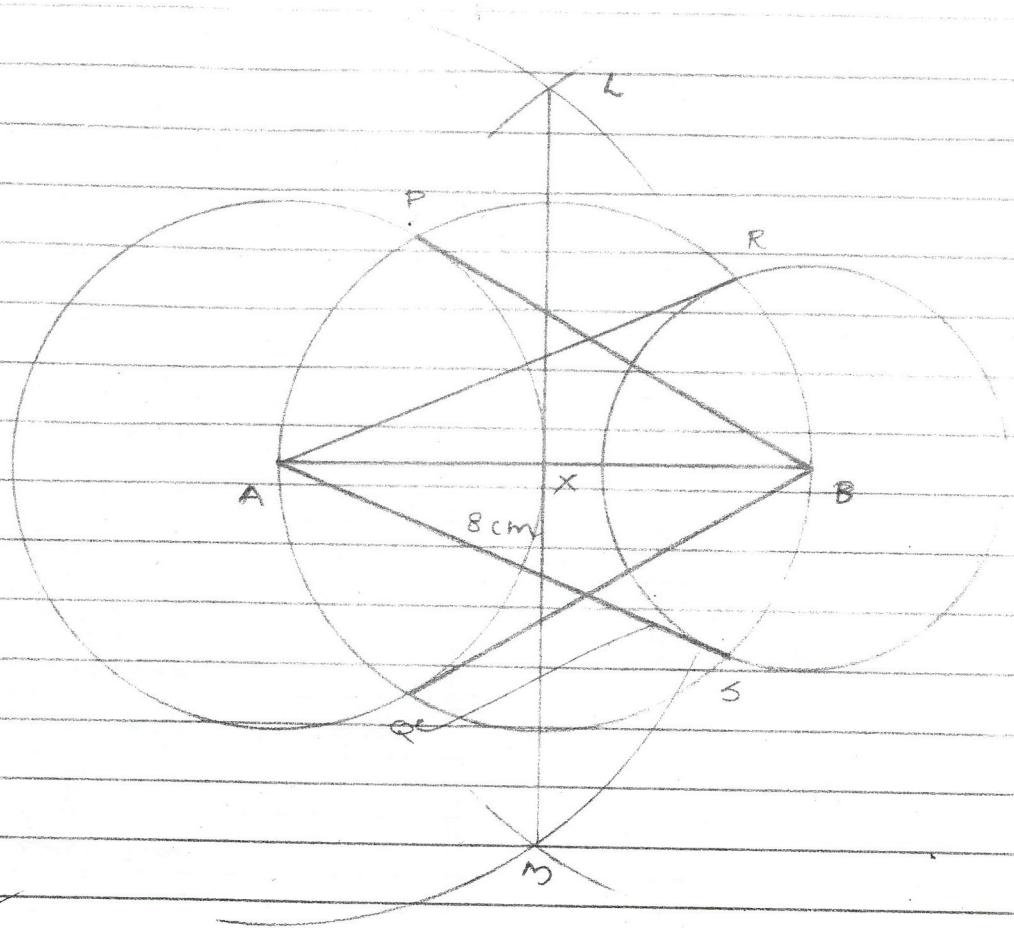
$$2a+7d = 30$$

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

$$7d = 28$$

$$d = 4$$

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



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

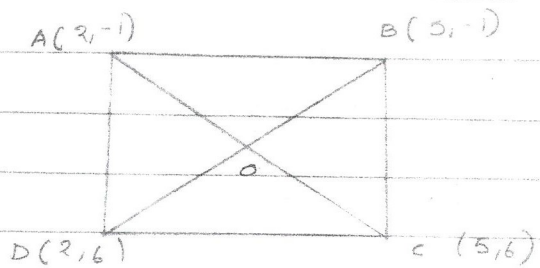
Step 6: Let this circle intersect the circle with centre A at P and Q and the circle with B as centre at R and S respectively

Step 7: Join AR, AS, BP and BQ

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

24.

$$\begin{aligned}
 AC &= \sqrt{(5-2)^2 + (6+1)^2} \\
 &= \sqrt{3^2 + 7^2} \\
 &= \sqrt{9+49} \\
 &= \sqrt{58}
 \end{aligned}$$



$$\begin{aligned}
 BD &= \sqrt{(5-2)^2 + (-1-6)^2} \\
 &= \sqrt{3^2 + 7^2} \\
 &= \sqrt{9+49} \\
 &= \sqrt{58}
 \end{aligned}$$

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

$$\begin{aligned}
 \text{Midpoint of AC} &= \left(\frac{2+5}{2}, \frac{-1+6}{2} \right) \\
 &= \left(\frac{7}{2}, \frac{5}{2} \right)
 \end{aligned}$$

$$\begin{aligned}
 \text{Midpoint of BD} &= \left(\frac{2+5}{2}, \frac{6+(-1)}{2} \right) \\
 &= \left(\frac{7}{2}, \frac{5}{2} \right)
 \end{aligned}$$

Since the midpoint of diagonal AC = Midpoint of

diagonal $BD = (\frac{7}{2}, \frac{5}{2})$,
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

$$OC = OP = OD \quad \text{radii of circle}$$

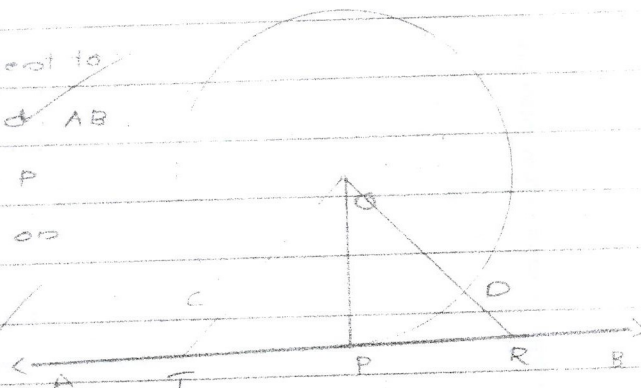
$$OC = OP$$

$$OC + CT > OP \quad \dots (1)$$

$$OD = OP$$

$$OD + DR > OP \quad \dots (2)$$

From (1) and (2), we can understand
that OP is shorter than any distance drawn



from the
towards the tangent ^{centre} 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 spherical 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.

$$\Rightarrow 150 \times \frac{4}{3} \times \pi \times \left(\frac{7}{10}\right)^3 = \pi \times \frac{1}{2} \times 7^2 \times h$$

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

$$\Rightarrow 28/5 = h$$

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

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

27. Height of frustum, $h = 24\text{cm}$

$$r_1 = 20\text{cm}$$

$$r_2 = 8\text{cm}$$

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

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

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

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

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

$$\text{Total cost} = \frac{22}{7} \times \frac{22}{7} \times \frac{1}{1000} \times 624 \times 8 \times \frac{1}{1000}$$

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

$$= 329.472$$

$$\Rightarrow \text{Rs } 329.472$$

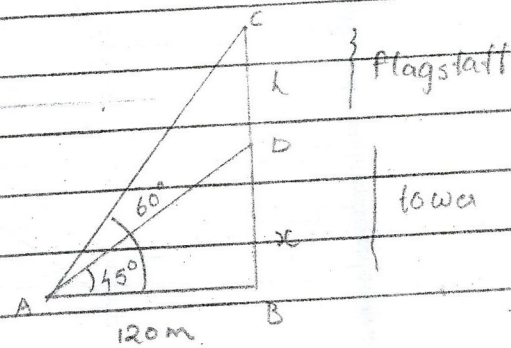
$$\Rightarrow \text{Rs } 329.5 \text{ [approximately]}$$

28. Height of flagstaff = $CD = h\text{m}$

Height of tower = $BD = x\text{m}$

$$\angle DAB = 45^\circ, \angle CAB = 60^\circ$$

$$AB = 120\text{m}$$



$\triangle ABD$ is right angled

$$\tan 45^\circ = 1$$

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

$$x = AB = 120 \text{ m}$$

$\triangle ACB$ is right angled

$$\tan 60^\circ = \sqrt{3}$$

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

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

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

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

$$h = 120(1.73 - 1)$$

$$h = 120 \times 0.73$$

$$h = 87.6 \text{ m}$$

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,

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

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

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

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

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

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

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

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

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

$$x = -54, x = 6$$

Since speed cannot be negative,

the speed of stream $x = 6 \text{ km/h}$

Q. The sequence of number of days is

$$2 \times 1, 2 \times 2, 2 \times 3, \dots, 2 \times 12$$

$$2, 4, 6, \dots, 24$$

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

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

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

$$\text{ ~~where } n=12, a=2, a_n=24~~$$

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

$$\text{ ~~} = 6 \times 26~~$$

$$\text{ ~~} = 156~~$$

~~Ans~~

30 The sequence of trees goes like this.

$$4, 8, 12, \dots, 48$$

They form an A.P. with common difference 4.

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

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

$$\text{ where } n=12, a=4, a_n=48$$

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

$$= 6 \times 52 = 312$$

The value of environmental observation is shown by the students

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

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

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

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

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

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

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

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

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

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

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

$$\Rightarrow x = \frac{9}{2}, x = 1$$

32. i) No. of cards remaining = $52 - 3 \times 2$
 $= 52 - 6 = 46$

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

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

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

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

iii) No. of ace = 4

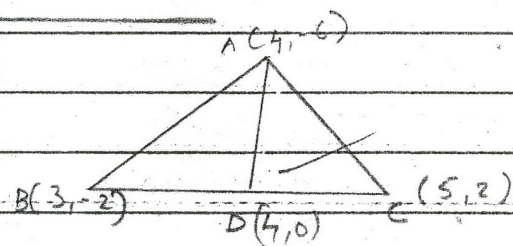
$P(\text{an ace}) = \frac{4}{46} = \frac{2}{23}$

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

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

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

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



$$\begin{aligned}
 \text{Area of } \triangle ADB &= \frac{1}{2} \times (4(0+2) + 4(-2+6) + 3(-6-0)) \\
 &= \frac{1}{2} \times (8 + 16 - 18) \\
 &= \frac{1}{2} \times 6 = 3 \text{ square units} \quad (1)
 \end{aligned}$$

$$\begin{aligned}
 \text{Area of } \triangle ACB &= \frac{1}{2} \times (4(0-2) + 4(2+6) + 5(-6-0)) \\
 &= \frac{1}{2} \times (-8 + 32 - 30) \\
 &= \frac{1}{2} \times -6 = -3
 \end{aligned}$$

Since area is positive,

$$\text{Area of } \triangle ACB = 3 \text{ square units} \quad (2)$$

From (1) and (2) Area of $\triangle ADB$ = Area of $\triangle ACB$

It is verified that median of $\triangle ABC$ divides it into two triangles of equal areas.

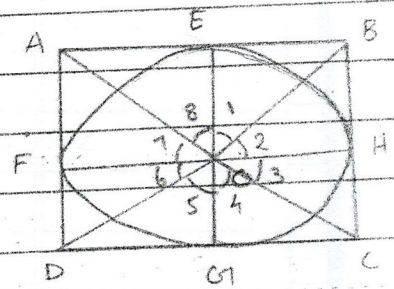
34. Given: A circle with centre O

is inscribed in a quadrilateral ABCD

In $\triangle AEO$ and $\triangle AFO$,

$OE = OF$ (radii of circle)

$\angle OEA = \angle OFA = 90^\circ$ (radii to tangents)



perpendicular to the line through the
point of contact is perpendicular
to the tangent

$$OA = OA \quad (\text{common side})$$

$$\triangle AEO \cong \triangle AFO \quad (\text{RHS rule})$$

$$\angle 7 = \angle 8 \quad \dots (1) \quad (\text{C.P.C.T.})$$

Similarly,

$$\angle 1 = \angle 2 \quad \dots (2)$$

$$\angle 3 = \angle 4 \quad \dots (3)$$

$$\angle 5 = \angle 6 \quad \dots (4)$$

$$\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5 + \angle 6 + \angle 7 + \angle 8 = 360^\circ \quad (\text{angle around a point is } 360^\circ)$$

$$2\angle 1 + 2\angle 3 + 2\angle 4 + 2\angle 5 = 360^\circ$$

$$\angle 1 + \angle 3 + \angle 4 + \angle 5 = 180^\circ$$

$$(\angle 1 + \angle 3) + (\angle 4 + \angle 5) = 180^\circ$$

$$\angle AOB + \angle DOC = 180^\circ$$

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

✓ E0663936
✓ E0653408