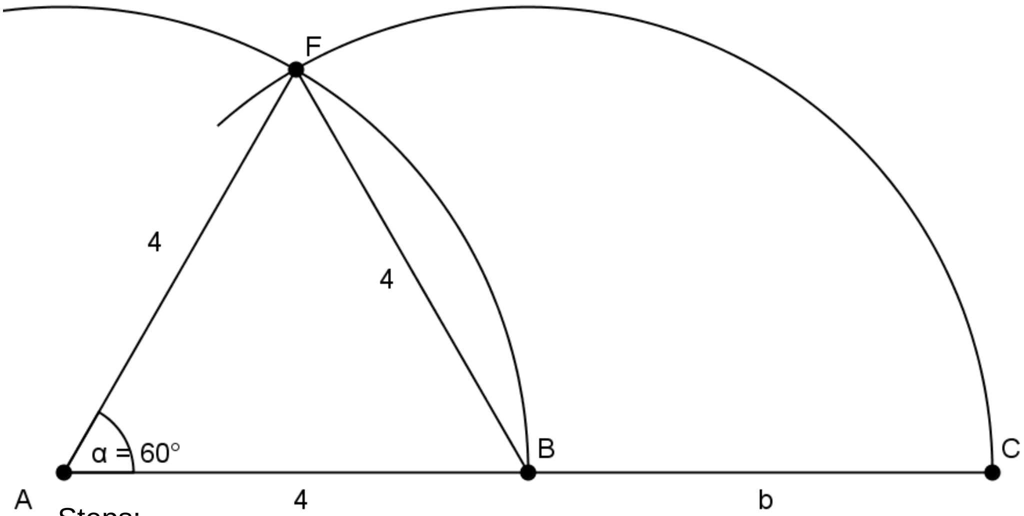
Worksheet 27 Memorandum: Revision Term 2

Grade 9 Mathematics

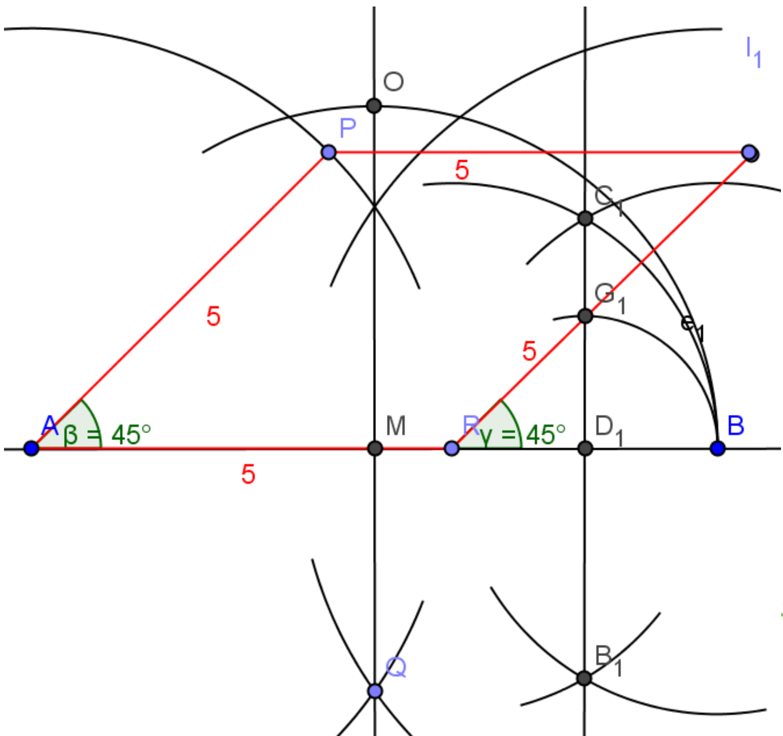
1. a)



Steps:

i) Measure AB 4cm, and extend BC another 4 cm.
ii) Place the protractor points at 4cm apart. Draw an arc from B around towards A.
iii) Place the protractor on B and draw an arc from C around towards A.
iv) Label the point where the arcs from B and C intersect (on the diagram as point F).
v) Connect point A with point F (it should be 4cm) and point B and point F (which should also be 4cm).
vi) If the angles are measured, they will all give 60°.

b)

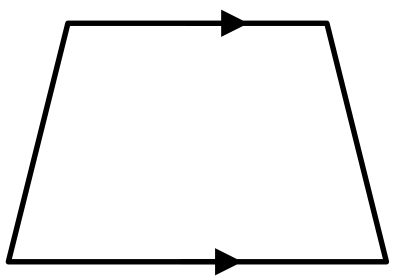


Steps:

i) Construct a line AB.
ii) Measure 5cm on the protractor, place the tip on A, and draw an arc. Do the same thing from point B – the second arc should intersect with the first one.
iii) Do the same step in ii) but below the line.
iv) Draw a line from the one set of intersecting arcs to the other.
v) From the perpendicular (point M on our diagram), measure the distance from M to B and the protractor a draw an arc until it intersects with the perpendicular line.
vi) Connect A with this point (O on our diagram). This creates an angle of 45°.
vii) On the line AO, measure 5cm and label the end P (as on our diagram).
viii) Measure 5cm from A on the line AB for the second side of the rhombus.
ix) From point R repeat steps ii) until vii).
x) This will create the other 135° angle (angles on a straight line add up to 180°).
xi) Finally connect P with the other point for the second 45° angle.

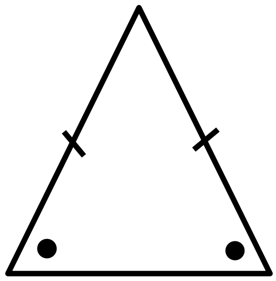
Please note: There are other ways to complete this question after constructing the 45° angle, such as using a parallel-sides construction. What is important is that there is a rhombus and that the properties of the rhombus (i.e. opposite angles equal, all 4 sides equal, opposite pairs of sides parallel) are observed.

2. a)



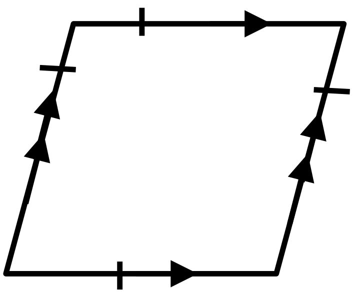
This is a trapezium because there are no equal sides and one pair of opposite sides are parallel.

b)



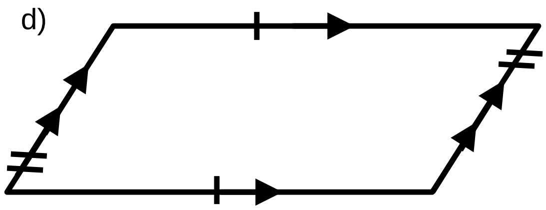
This is an isosceles triangle. Two sides and two angles are equal.

c)



This is a rhombus. Two pairs opposite sides parallel and all four sides are equal.

d)



This is a parallelogram because two pairs of opposite sides are equal and parallel.

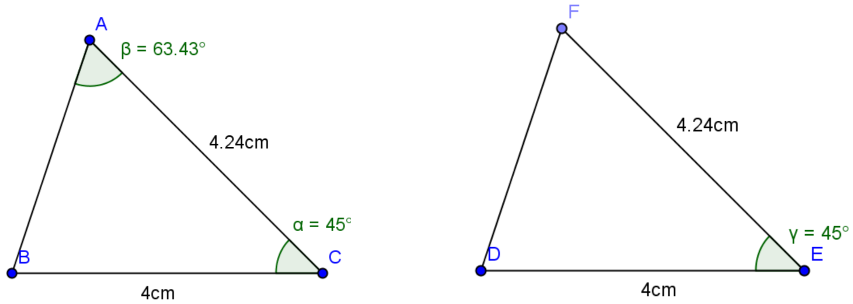
3. a) In a rectangle, the diagonals are equal to each other and bisect each other.

b) In a rhombus, the diagonals bisect each other at 90° angles and they bisect both pairs of opposite angles.

c) In a parallelogram, the diagonals bisect each other.

d) In a kite, the diagonal between the equal sides bisects the other diagonal and the interior angles. The diagonals also intersect at 90°

4. a)

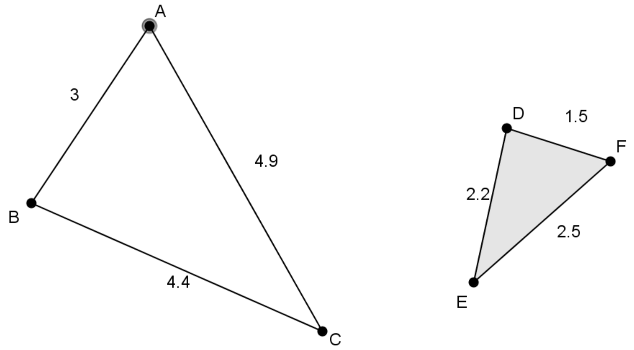


In ΔABC and ΔDEF

1. AC = FC	Given, both equal to 4.24cm
2. $\hat{C} = \hat{E}$	Given, both equal to 45º
3. $BC = DE$	Given, both equal to 4cm.

∴ ΔACB ≡ ΔFED (SAS)

b)

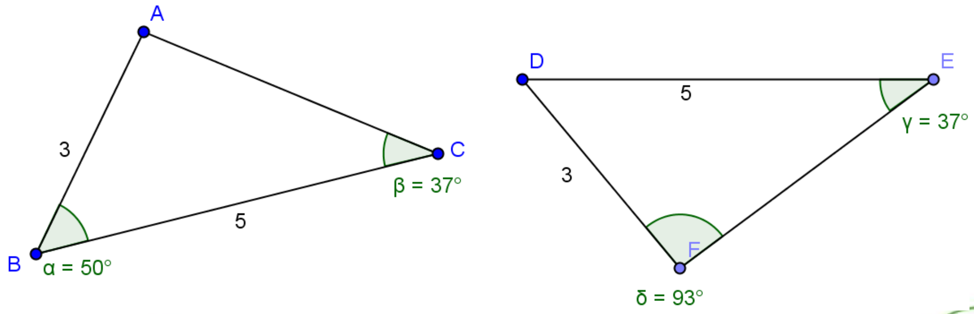


In ΔABC and ΔDEF:

$$\frac{AB}{DF} = \frac{BC}{DE} = \frac{AC}{EF} = \frac{2}{1}$$

∴ ΔABC lll ΔFDE sides are in proportion.

c)



In ΔABC and ΔDEF

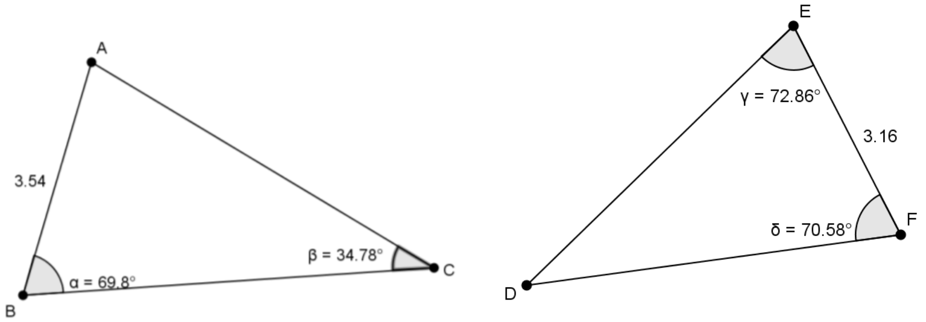
1. $\hat{C} = \hat{E}$ — Given
2. BC = DE — Given, both sides equal to 5
3. $\hat{D} = 180° - 93° - 37°$ — Sum of angles in Δ

   $\therefore \hat{D} = 50°$

   $\therefore \hat{B} = \hat{D}$ — Both equal to 50º

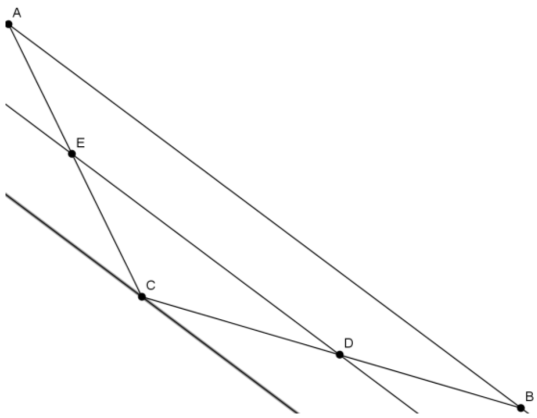
$\therefore \Delta ABC \equiv \Delta FDE$ — (ASA)

d)



Neither, no angles are equal and no sides are equal.

e)



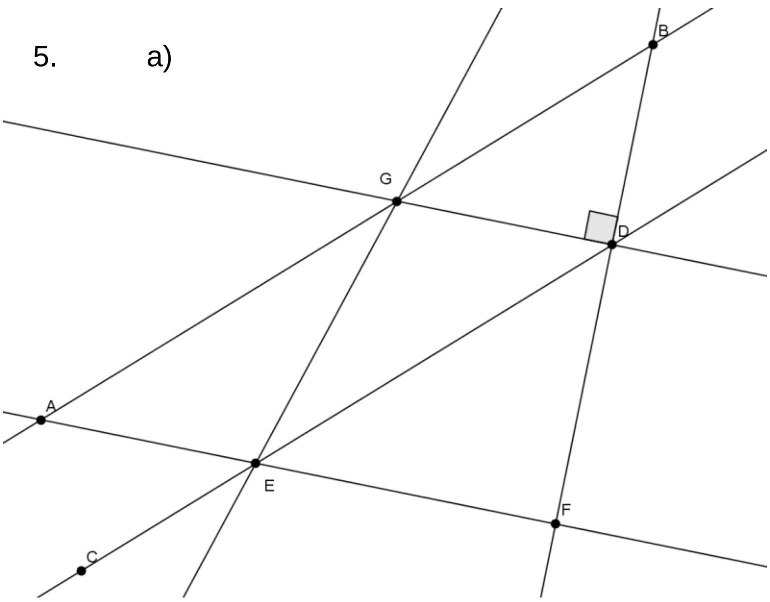
In ΔABC and ΔCDE

1. $\hat{C}$ is common
2. $C\hat{A}B = C\hat{E}D$ — Corros. Angles
3. $C\hat{B}A = C\hat{D}E$ — Corros. Angles

$\therefore$ ΔCAB ||| ΔCED

All three angles equal.

5. a)



i) In ΔBDG and ΔDFE

1. $\hat{D} = \hat{F}$ — Corros. $\angle s$
2. $B\hat{G}D = G\hat{D}E$ — Alt. $\angle s$

   $G\hat{D}E = D\hat{E}F$ — Alt . $\angle s$

   $\therefore B\hat{G}D = D\hat{E}F$
3. $G\hat{B}D = E\hat{D}F$ — 3rd . ∠ in Δ

$\therefore$ ΔDGB ||| ΔFED — All 3 . $\angle s$ =

ii) In ΔBDG and ΔBFA

1. $\hat{B}$ is common.

2. $\hat{D} = \hat{F}$ proved above/ corros. $\angle s$

3. $B\hat{A}F = B\hat{G}D$ 3rd ∠ in Δ

∴ ΔBDA ||| ΔBFG All 3 angles equal.

iii) In ΔAGE and ΔGED

1. EG is common

2. $A\hat{G}E = G\hat{E}D$ Alt angles, AB ll CD

3. $A\hat{E}G = E\hat{G}D$ Alt angles, GD ll AF

∴ $\Delta AGE \equiv \Delta DEG$ ASA

iv) Parallelogram, opposite sides parallel and equal (proved with congruency in question iii) above).

v) 4:5 for BD: DF

∴ $\frac{4}{9} \times 18 = 8cm$ ∴ BD = 8cm.

Similarly: 4: 5 for GD: EF

∴ $\frac{4}{9} \times 12cm = 5\frac{1}{3}cm$

∴ $Area\ of\ \Delta BDG = \frac{1}{2} \times b \times \perp h$

$= \frac{1}{2} \times 5\frac{1}{3} \times 8$

$= 21\frac{1}{3}cm^2\ \ or\ 21.3333cm^2$

vi) $BA^2 = AF^2 + BF^2$

$BA^2 = (12cm)^2 + (18cm)^2$

$BA^2 = 144 + 324$

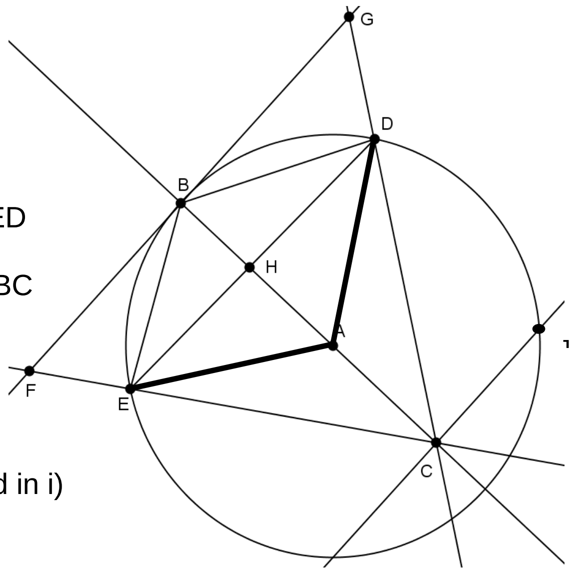
$BA = \sqrt{468}$

$BA = 21.6333cm$

∴ 4:5 is GB: AG

$\therefore \frac{5}{9} \times 21.6333cm = 12.02cm = AG$

b) i) In ΔEHC and ΔDHC



1. HC is common
2. EH = HD given
3. BC ⊥ FGIn

∴ ED ⊥ BC FG ll ED

$\therefore E\hat{H}C = D\hat{H}C = 90°$ ED ⊥ BC

∴ ΔCEH ≡ ΔCDH SAS

ii) BC ⊥ ED Proved in i)

And bisects ED

∴ BECD is a kite.

iii) $E\hat{B}H = D\hat{B}H$ BECD is a kite, diagonals bisect angles.

And $F\hat{B}H = G\hat{B}H = 90°$ BC ⊥ FG

$\therefore F\hat{B}H - E\hat{B}H = G\hat{B}H - D\hat{B}H$

$\therefore F\hat{B}E = G\hat{B}D$

iv) No, only angles $\hat{F}$ and $\hat{E}$ are equal.

The other two cannot be proved equal to each other.

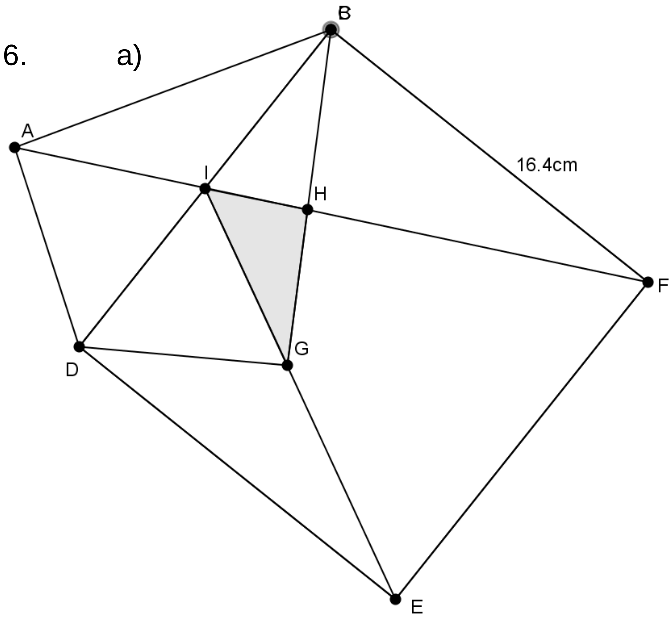
v) In ΔAEHBand ΔADB

1. AE = AD Radii of the circle
2. EB = BD BECD is a kite, proved above
3. AB is common.

∴ ΔAEB ≡ ΔADB (SSS)

vi) Isosceles triangles, AE = BA = DA, radii.

6. a)



i) In ΔDEI and ΔBFI

1.	DI = BI	given
2.	DE = BF	BDEF is a Square
3.	$\hat{D} = \hat{B} = 90°$	BDEF is a Square.

$\therefore \Delta IED \equiv \Delta IFB$ (SAS)

ii) For ΔIED:

ID = 16.4cm ÷ 2 = 8.2cm

∴ Area = $\frac{1}{2} \times b \times h$

$= \frac{1}{2} \times 8.2cm \times 16.4cm$

$= 67.24cm^2$

Similarly for ΔBFI area = 67.24cm^2.

For ΔEFI: Area $= \frac{1}{2} \times 16.4 \times 16.4$

$= 134.48$

Which is equal to Area of ΔIED + area of ΔBFI.

iii) In ΔADI and ΔDGI

1. DI is common.

2. AI = IG given.

3. $D\hat{I}G = F\hat{I}B$ $\Delta IED \equiv \Delta IFB$

$F\hat{I}B = A\hat{I}D$ Vertically opposite angles.

$\therefore A\hat{I}D = D\hat{I}G$ Both equal to $F\hat{I}B$

$\therefore \Delta DAI \equiv \Delta DGI$ SAS.

iv) $IE^2 = ID^2 + DE^2$ Pythag

$IE^2 = (8.2cm)^2 + (16.4cm)^2$

$IE = \sqrt{336.2}$

$IE = 18.34cm$

∴ IG = IE – GE

∴ IG = 18.34 – 10.4

∴ IG = 7.94cm

And IG = AI given

∴ AI = 7.94cm

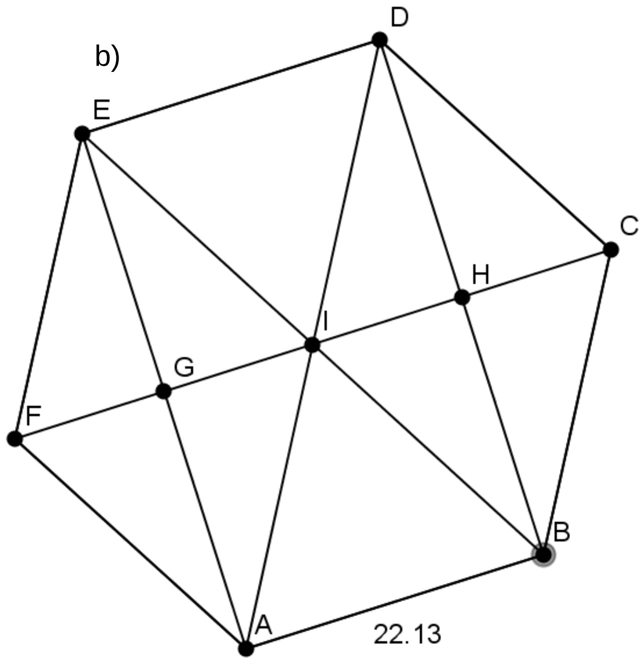
v) ADGI is a kite (2 pairs adjacent sides equal).

Area of a kite $= \frac{1}{2} \times diagnal\ 1\ \times diagonal\ 2$

$= \frac{1}{2} \times 14.1\ cm\ \times 8.2cm$

$= 57.81\ cm^2$

b)



i) A regular hexagon is made up of 6 equilateral triangles.

$\therefore D\hat{C}I = C\hat{I}B = 60°$

∴ DC ll EB Alt angles equal.

ii) DC = CB Regular hexagon

IB = BC Equilateral triangle

DI = DC Equilateral triangle

∴ All four sides are equal.

And DC ll EB Proved above.

∴ BCDI is a rhombus.

iii) ΔEDI is an equilateral Δ.

Line ⊥ ED bisects ED

$\therefore height^2 = EI^2 - \left(\frac{1}{2}ED\right)^2$

$\therefore h^2 = (22.13cm)^2 - \left(\frac{1}{2} \times 22.13cm\right)^2$

$\therefore h = \sqrt{367.302675}$

$\therefore h = 19.17\ cm$

$\therefore$ Area of ΔEDI = $\frac{1}{2} \times b \times h$

$= \frac{1}{2} \times 22.13 \times 19.17$

$= 212.12cm^2$

iv) Area of hexagon = 6 x area of equilateral triangle

= 6 x 212.12cm^2

= 1 272.72 cm^2

v) DB = 2 x 19.17m = 38.34cm

Perimeter = 2(38.34cm + 22.13cm)

= 120.94 cm

Area = 38.34cm x 22.13cm

= 848.46 cm^2

vi) Circumference $= 2\pi r$

$= 2\pi\ (22.13cm)$

$= 139.05cm$

Area of Circle $= \pi r^2$

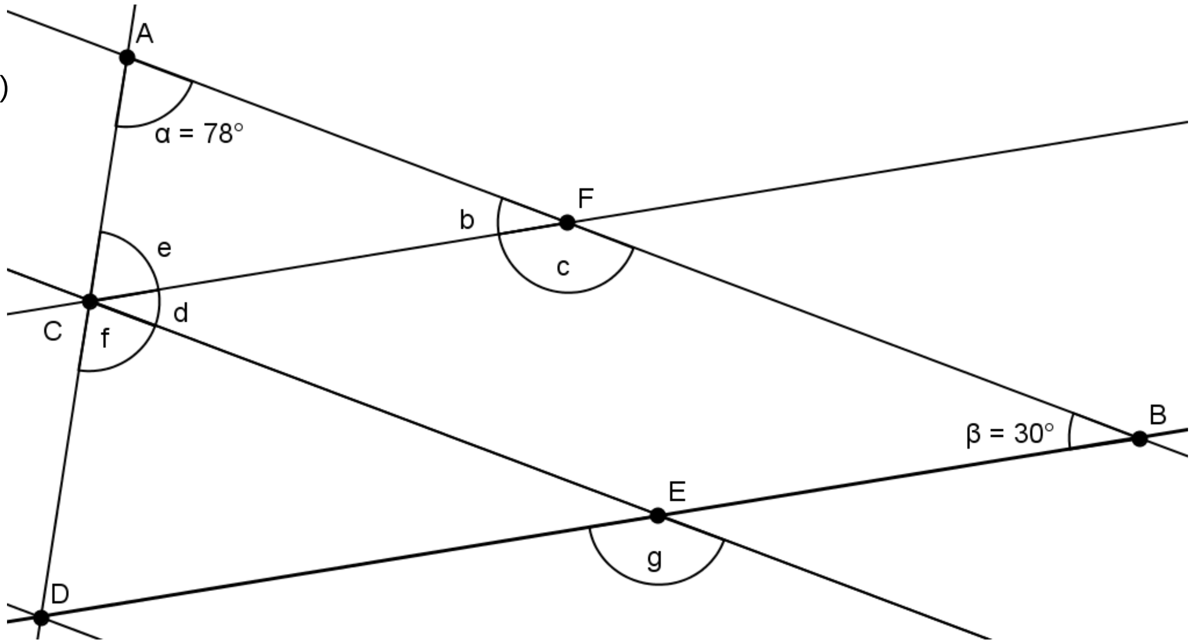
$= \pi\ (22.13cm)^2$

$= 1\ 538.55\ cm^2$

∴ Area of circle not covered by hexagon = 1 538.55 – 1 272.72

= 265.83 cm^2.

7. a)



$b = \beta = 30°$ Corrosp. Angles.CF ll DB

$c = 180° - 30°$ Angles on a str. Line.

$\therefore c = 150°$

$d = b = 30°$ Alt angles, AB ll CE

$e = 180° - 78° - 30°$ Sum of angles in Δ = 180°

$e = 72°$

$f = \alpha = 78°$ Corros. Angles, AB ll CE

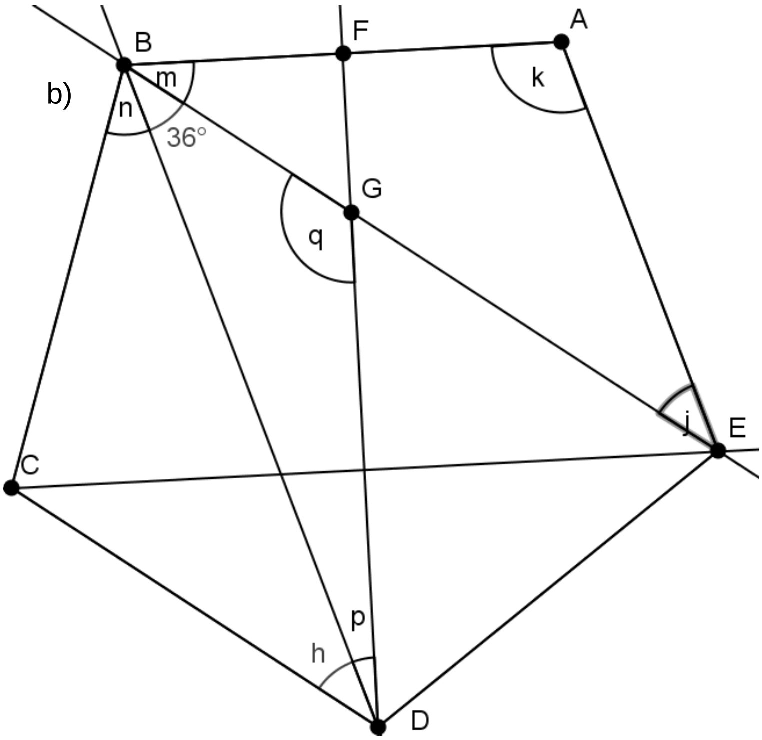
There are many different ways to get to the answer for g = 150°.

For example, calculating $C\hat{E}D = 30°$ (alternating angle with d), and then saying angles on a straight line to find g.

Alternatively $d + C\hat{E}D = 180°$ (co-interior angles) and then vertically opposite angles.

**A suggestion might be to ask your students to prove it in as many different ways as possible. This is a great way to encourage your students to try different methods and also to show them that "many roads lead to Rome".*

b)



$h = 36°$ Alt angles, BE ll CD

$j = 36°$ Alt angles, BD ll AE

$k = j = 36°$ Isos Δ; AB = AE

$m = 180° - 36 - 36°$

Sum of angles in Δ

$m = 108°$

$n = h = 36°$ Isos Δ, CD = BC

$p = 180° - 90° - 36° - 36°$

Sum of angles in Δ

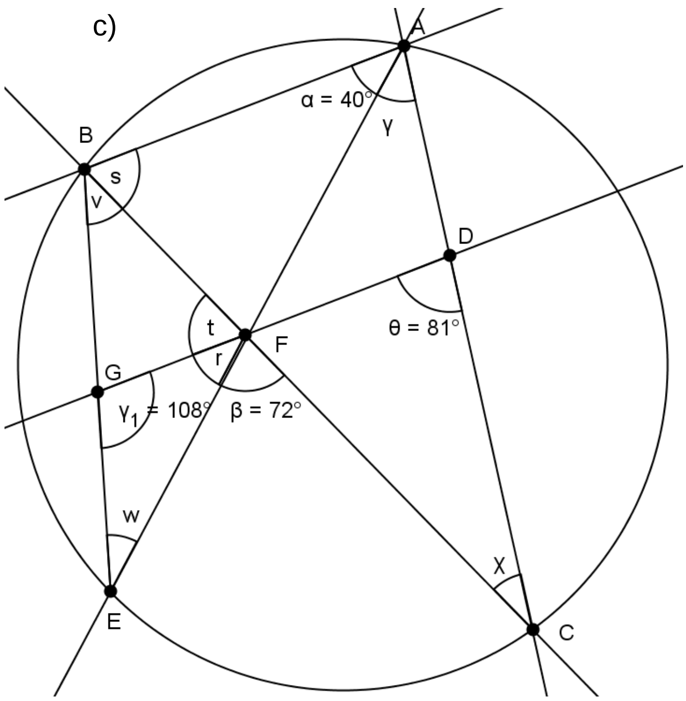
$p = 18°$

$q = 180° - 18° - 36°$

Sum of angles in Δ

$q = 126°$

c)



$A\hat{F}D = \alpha = 40°$ Alt angles

$\therefore r = 40$ Vert opp.

$w = 180° - 40° - 108°$

Sum of angles in Δ

$\therefore w = 32°$

$t = 180° - 40° - 72°$ Angles on str. Line

$\therefore t = 68°$

$s = t = 68°$ Alt angles

$v = 108° - 68°$ Ext angle of Δ

$\therefore v = 40°$

$D\hat{F}C = t = 68°$ Vert opp

$x = 180° - 68° - 81°$ Sum of angles in Δ

$\therefore x = 31°$

$y + \alpha = 81°$ Corros. Angles

$\therefore y = 41°$