AMDG

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Adv Geo -
M 11 January 2016

Q & A on 7.3

1. $\Sigma \angle s$

a $n = 4$
$(4-2)180 = 360$

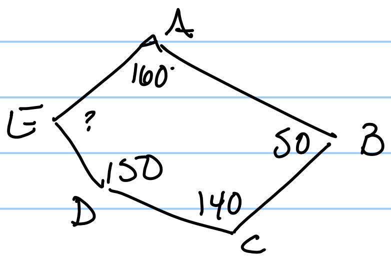
b. $n = 7$
$(7-2)180 = 900$

c $n = 8$
$(8-2)180 = 1080$

d. $n = 12$
$(12-2)180 = 1800$

e $n = 93$
$(93-2)180 = 16{,}380$

2.



$n = 5$, $S_i = (5-2)180 = 540$

$540 - \text{known} \angle s = \angle E$
$540 - 500 = \underline{40°}$

3 $d = \dfrac{n(n-3)}{2}$

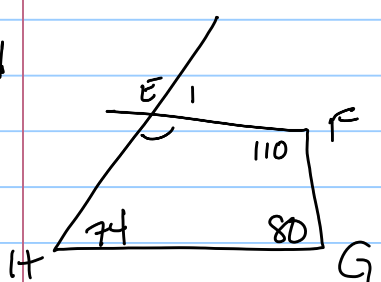
$\boxed{a}$ $n = 5, d = \dfrac{5(2)}{2} = 5$

$\boxed{b}$ $n = 6, d = \dfrac{6(3)}{2} = 9$

$\boxed{c}$ $n = 4, d = \dfrac{4(1)}{2} = 2$

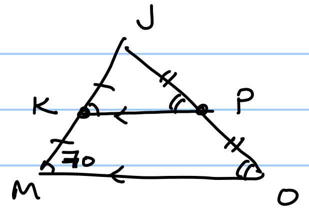
$\boxed{d}$ $n = 3, d = \dfrac{3(0)}{2} = 0$

4



$360 - (\angle F + \angle G + \angle H) = \angle FEH$
$360 - 264 =$
$96 = \angle FEH$
$m\angle 1 + 96 = 180$
$m\angle 1 = 84°$

5



$\angle JKP \cong \angle M$

$y+15 = 70$

$y = 55$

Midline $\Rightarrow \parallel$

$\parallel \Rightarrow$ corr $\angle$s $\cong$

a) $m\angle JKP = 70°$

b) $m\angle JPK$

$y-10$

45

c $m\angle J = 180 - \angle M - \angle O$

$= 180 - 70 - 45$

$= 65$

6. $S_e = 360$

7. fewest sides of a poly : 3

8. $n = 12$

a $S_i = 10(180) = 1800$

b. $S_e = 360$

10. a $S_i = 900$

$900 = (n-2)180$

$5 = n-2$

$7 = n$

b. $S_i = 1440$

$1440 = (n-2)180$

$8 = n-2$

$10 = n$

c $S_i = 2880$

$2880 = (n-2)180$

$16 = n-2$

$18 = n$

d $S_i = 180x - 720$

$180x - 720 = (n-2)180$

$180(x-4) = (n-2)180$

$x-4 = n-2$

$x-2 = n$

e. $436 = S_i$

$436 = (n-2)180$

$\underbrace{2.4\bar{2}}_{\text{not integer} \therefore} = n-2$

not possible

f. $S_i = 6(90) \rightarrow 540$

$540 = (n-2)180$

$3 = n-2$

$5 = n$

11. $S_e = S_i$, $n = ?$

$360 = (n-2)180$

$2 = n-2$

$n = 4$

Quadrilateral

b. $S_i = 2 \cdot S_e$

$(n-2)180 = 2 \cdot 360$

$n-2 = 4$

$n = 6$

Hexagon

12. $S_i = 900$

$(n-2)180 = 900$

$n-2 = 5$

13a $d = 14$; $\frac{n(n-3)}{2} = 14$, $n(n-3) = 28$, $n^2 - 3n - 28 = 0$, $(n-7)(n+4) = 0$

$\boxed{n = 7}$ or -4

heptagon

13b $d = 35$; $\frac{n(n-3)}{2} = 35$, $n(n-3) = 70$, $n^2 - 3n - 70 = 0$, $(n-10)(n+7) = 0$

$\boxed{n = 10}$ or -7

DECAGON

13c $209 = d$; $\frac{n(n-3)}{2} = 209$, $n^2 - 3n - 418 = 0$, $(n-22)(n+19) = 0$

$\boxed{n = 22}$ or -19

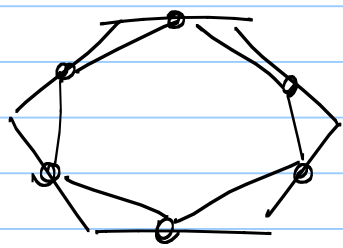
22-gon

14. a $n \uparrow \Rightarrow$ count ext$\angle$s $\uparrow$: A

b $n \uparrow \Rightarrow \Sigma$ m ext$\angle$s $\uparrow$: N

c Σ length diag > peri poly : S

d. Σ m$\angle$s midpt poly = ΣS_i orig : A

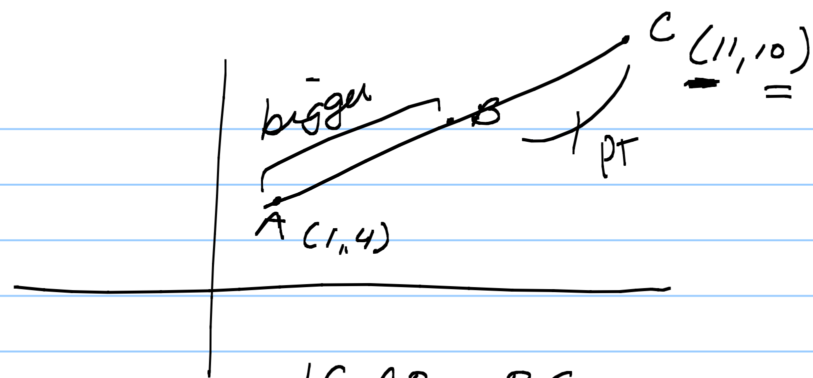


16. $AB > BC$

find restrictions:

a) $6 < x < 11$

b) $7 < y < 10$

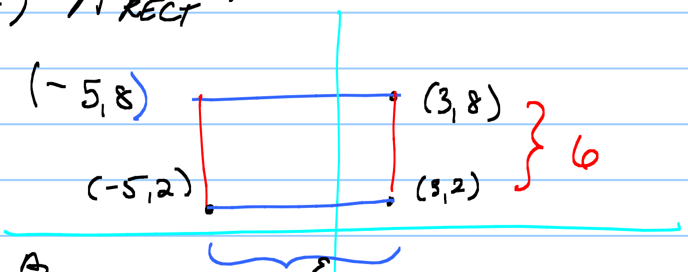


If $AB = BC$

$B = \left(\frac{1+11}{2}, \frac{4+10}{2}\right)$

$(6, 7)$

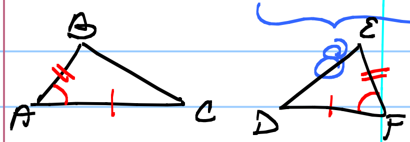
17) A_{RECT} :



$8(6) = 48$

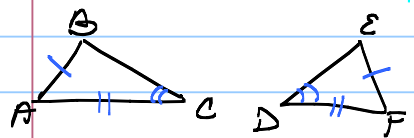
19

Pa)



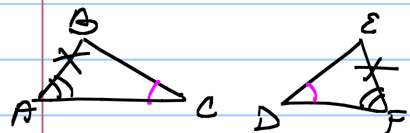
y, SAS

Pc)



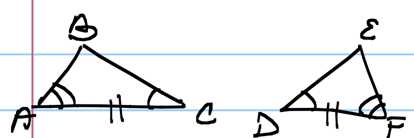
No

Pb)



Yes, AAS

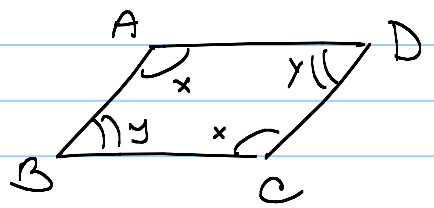
Pd)



Yes, ASA

$\boxed{\frac{3}{4}}$

$\boxed{20}$



Since sum ∠s $= 360°$

$2x + 2y = 360°$

$x + y = 180$

int ∠s sst supp ⇒ ∥

both pr opp sds ∥ ⇒ ▱

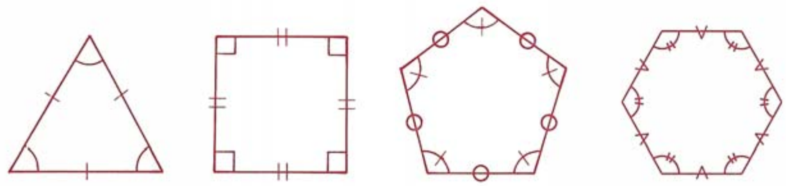
7.4: Regular Polygons

After studying this section, you will be able to

- Recognize regular polygons
- Use a formula to find the measure of an exterior angle of an equiangular polygon

Regular Polygons

The figures below are examples of ***regular polygons***.

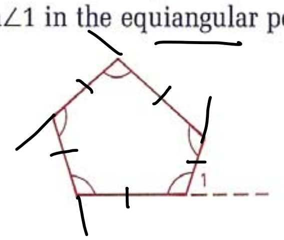


Equilateral Triangle | Square | Regular Pentagon | Regular Hexagon

Definition A ***regular polygon*** is a polygon that is both equilateral and equiangular.

A Special Formula for Equiangular Polygons

Can you find m∠1 in the equiangular pentagon below?



$n = 5$

$\frac{360}{5} = 72°$

m 1 int∠ of reg pentagon

$(n-2)(180)$

$3(180) = 540$ all ∠s

$\frac{1}{5}$ ∠s $= \frac{1}{5} 540 = 108°$

$180 - \frac{360}{n} =$

$180 - 72 = 108°$

Theorem 58 ***The measure E of each exterior angle of an equiangular polygon of n sides is given by the formula***

$$E = \frac{360}{n}$$

Problem Set A

1 Find the measure of an exterior angle of each of the following equiangular polygons.

$1 \text{ext} \angle = \frac{360}{n}$

a A triangle , $n=3$

$\frac{360}{3} = \boxed{120^\circ}$

b A quadrilateral 90°

c An octagon 45°

d A pentadecagon 24°

e A 23-gon $n=23$

$\therefore \frac{360}{23} = 15\frac{15}{23}{}^\circ$

supp of ext ∠

$$\frac{S_i}{\text{count}} = \frac{(n-2)180}{n} \quad \text{or} \quad 180 - \frac{360}{n}$$

2 Find the measure of an angle of each of the following equiangular polygons.

a A pentagon $n=5$

$180 - \frac{360}{5} = 108°$

c A nonagon $n=9$

$180 - \frac{360}{9} = 140°$

e A 21-gon $21=n$

$180 - \frac{\cancel{360}^{120}}{\cancel{21}_{7}} = 162\frac{6}{7}$

b A hexagon $n=6$

$180 - \frac{360}{6} = 120°$

d A dodecagon $n=12$

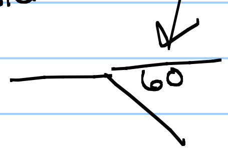
$150°$

3 Find the number of sides an equiangular polygon has if each of its exterior angles is

$\frac{360}{\text{side}} = \text{ext}\angle$

$\frac{360}{\text{ext}\angle} = \text{sides}$

a 60° **b** 40° **c** 36° **d** 2° **e** $7\frac{1}{2}°$



a: $\frac{360}{60} = 6\text{sides}$

b: $\frac{360}{40} = 9\text{sides}$

c: $\frac{360}{36} = 10\text{sides}$

d: $\frac{360}{2} = 180$ sides

e: $\frac{360}{7.5} = 48$ sides

Given int ∠, find supp (aka ext ∠).

$\frac{360}{ext\angle}$ = sides

x = ext ∠
n = number of sides
$\frac{360}{180-x} = n$

4 Find the number of sides an equiangular polygon has if each of its angles is

a 144° **b** 120° **c** 156° **d** 162° **e** $172\frac{4}{5}$° ← ok

a.
144
Ext
180
−144
36
& $\frac{360}{36}$ = 10 sides

b.
180
−120
60
then
$\frac{360}{60}$ = 6 sides

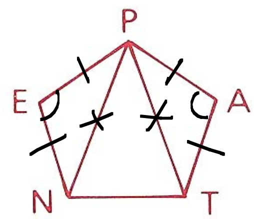
c.
180
−156
24
then
$\frac{360}{24}$ = 15 sides

d.
180 − 162 =
18
then $\frac{360}{18}$ = 20 sides

e.
180
−172.8
7.2

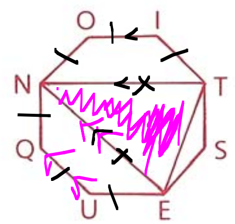
$\frac{360}{7.2}$ = 50 sides

5 Given: PENTA is a regular pentagon.
Prove: △PNT is isosceles.



Statements	Reasons
1 PENTA is reg pentagon.	1. GIVEN
2 $\overline{PE} \cong \overline{PA}$; $\overline{EN} \cong \overline{AT}$	2. REG ⇒ ≅ SDS
3 ∠E ≅ ∠A	3. REG ⇒ ≅ ∠S
4 △PEN ≅ △PAT	4. SAS (2 3 2)
5 $\overline{PN} \cong \overline{PT}$	5. CPCTC
6 △PNT is isos.	6. 2 ≅ SDS ⇒ ISOS △

6 In the stop sign shown, is △NTE scalene, isosceles, equilateral, or undetermined?



7 In an equiangular polygon, the measure of each exterior angle is 25% of the measure of each interior angle. What is the name of the polygon?

1x 3x
25% 75%

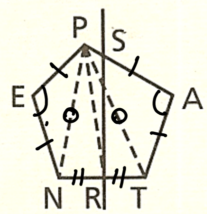
$4x = 180$
$x = 45$

Ext ∠ = 45° → $\frac{360}{45}$ = 8 sides ⇒ reg. octagon

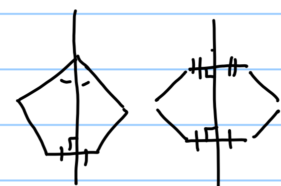
8 **a** Prove that the perpendicular bisector of a side of a regular pentagon passes through the opposite vertex.

Given: PENTA reg pentagon
$\overline{RS} \perp$ bis of $\overline{NT}$.

Prove: $\overline{RS}$ passes through P.



1 PENTA reg pentagon	1 Given
2 $\overline{RS} \perp$ bis of $\overline{NT}$.	2 Given
3 Draw $\overline{PN}$, $\overline{PR}$, $\overline{PT}$	3. Aux
4 $\overline{PE} \cong \overline{PA}$, $\overline{EN} \cong \overline{AT}$	4. REG POLY ⇒ ≅ SDS
5 $\angle E \cong \angle A$	5. REG POLY ⇒ ≅ ∡s
6 $\triangle PEN \cong \triangle PAT$	6. SAS
7 $\overline{PN} \cong \overline{PT}$	7. CPCTC
8 $\overline{NR} \cong \overline{TR}$	8. bis ⇒ ≅ seg (2)
9 $\overline{PR} \perp$ bis $\overline{NT}$	9. = dist ⇒ ⊥ bis (7 & 8)
10 $\overline{RS}$ passes through P.	10. Seg only has 1 ⊥ bis



b Can you generalize about the perpendicular bisectors of the sides of regular polygons?

The ⊥ bis of a side of a reg. polygon either bisects the ∠ at the vertex opp that side, or it is the ⊥ bis of the opposite side

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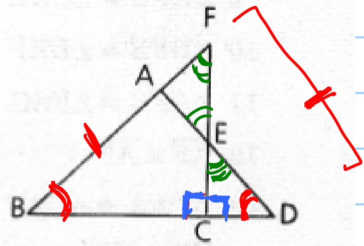
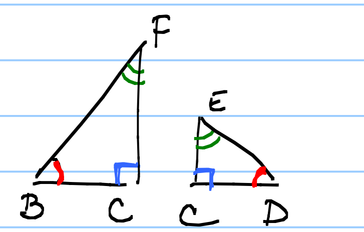
7.4: Regular Polygons.

9 Given: $\overline{AB} \cong \overline{AD}$,
$\overline{FC} \perp \overline{BD}$

Conclusion: $\triangle AEF$ is isosceles.





1 $\overline{AB} \cong \overline{AD}$	1 Given
2 $\angle B \cong \angle D$	2 If △ then △
3 $\overline{FC} \perp \overline{BD}$	3 Given
4 $\angle ECD, \angle FCB$ rt $\angle$s	4 $\perp$ lines form rt $\angle$s.
5 $\angle ECD \cong \angle FCB$	5 Rt $\angle$s are $\cong$.
~~6 $\angle AEF, \angle CED$ vert $\angle$s~~	~~6 Assumed from diagram~~
7 $\angle AEF \cong \angle CED$	7 Vert $\angle$s are $\cong$.
8 $\angle F \cong \angle CED$	8 No Choice Theorem
9 $\angle AEF \cong \angle F$	9 Transitive prop
10 $\triangle AEF$ is isos.	10 If a $\triangle$ has 2 $\cong \angle$s, it is isos.

10 The sum of the measures of the angles of a regular polygon is 5040. Find the measure of each angle. $168°$

$$\frac{(n-2)180}{180} = \frac{5040}{180}$$

$$n-2 = 28$$
$$n = 30$$
30 sides

ext∠: $12° = x$ | $180-12 = 168°$ int∠

$$\frac{360}{30} = 12°$$ ext∠

S_i

interior

11 The sum of a polygon's angle measures = is nine times the measure of an exterior angle of a regular hexagon. What is the polygon's name?

$$(n-2)180 = 9\left(\frac{360}{6}\right)$$

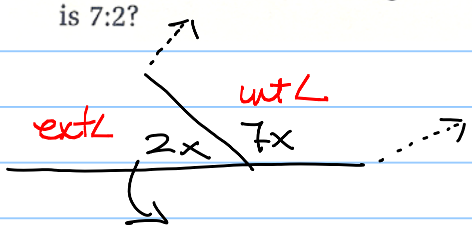
$$(n-2)180 = 9 \cdot 60$$

$$\frac{(n-2)180}{180} = \frac{9 \cdot 20 \cdot 3}{180}$$

$$n-2 = 3$$

$$n = 5 \rightarrow \text{PENTAGON}$$

12 What is the name of an equiangular polygon if the ratio of the measure of an interior angle to the measure of an exterior angle is 7:2?



$$9x = 180$$

$$x = 20$$

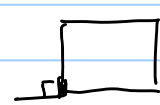
$$n = \frac{360}{40} \leftarrow \text{ext}\angle$$

$$n = 9$$

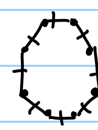
EQUIANGULAR NONAGON

13 Tell whether each statement is true Always, Sometimes, or Never (A, S, or N).

$\frac{360}{4}$



$45 = \frac{360}{8}$



a If the number of sides of an equiangular polygon is doubled, the measure of each exterior angle is halved. ← key

13a A

b The measure of an exterior angle of a decagon is greater than the measure of an exterior angle of a quadrilateral. ← not reg →

b S

c A regular polygon is equilateral.

c A

d An equilateral polygon is regular. = lat not = ∠ ⇒ Rhombus

d S

e If the midpoints of the sides of a scalene quadrilateral are joined in order, the figure formed is equilateral.

S

f If the midpoints of the sides of a rhombus are joined in order, the figure formed is equilateral but not equiangular.

f N