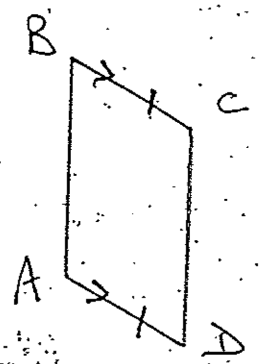
Sydney Grammar
SYDNEY GRAMMAR YR9

1. The angles of a pentagon are $2x°$, $3x°$, $3x°$ $3x°$ and $4x°$. Find the value of x.

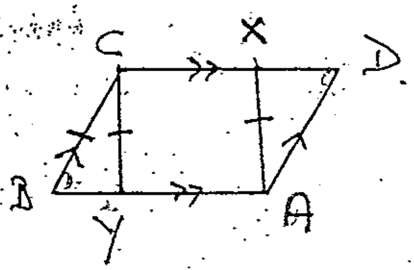
2. The sum of the interior angles of an n-sided convex polygon is double the sum of the exterior angles. Find the value of n.

3.



In the diagram above $ABCD$ is a quadrilateral with one pair of opposite sides equal and parallel. Copy the diagram onto your answer sheet and complete the following proof to show that the quadrilateral is a parallelogram. (You need only write out the proof.)
GIVEN: To prove $ABCD$ is a quadrilateral with $AD \parallel BC$ and $AD = BC$.
AIM: To prove that $AB \parallel DC$.
CONSTRUCTION: Join AC.
PROOF:

4.



In the figure above $ABCD$ is a parallelogram. The point X lies on CD, the point Y on AB and $AX = CY = BC$.

(a) Show that $AD = AX$.

(b) Give a reason why $\angle ADX = \angle CBY$.

(c) Use the base angles of the isosceles triangles ADX and CBY to prove that $\angle AXD = \angle \cancel{CBY}\, CYB$

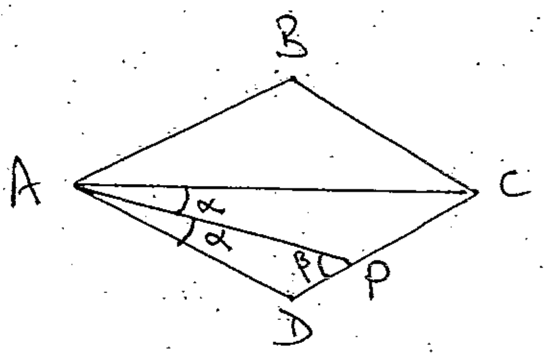
(d) Hence prove that $AX \parallel YC$.

(e) Why is $AYCX$ a parallelogram?

5. On the sheet provided construct the line parallel to AB that passes through the point K. Leave in all construction marks.

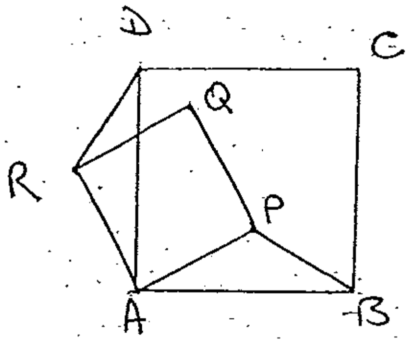
6. $ABCD$ is a square; E is a point on AC such that $AE = AB$; the line through E perpendicular to AC cuts BC, DC at F, G. Prove that $\angle FAG = 45°$.

7.



In the figure above $ABCD$ is a rhombus. AP bisects $\angle DAC$.
Prove that $\angle DPA = 3\angle DAP$.
Hint: Let $\angle DAP = \alpha$ and $\angle DPA = \beta$ and prove $\beta = 3\alpha$.

8.



In the figure above $ABCD$ and $APQR$ are squares. Prove that $BP = DR$.

V. Good effort! Tania Ahmed Thurs 9:00am.

See corrections!

Sydney Grammar - Geometry

1) $2x + 3x + 3x + 3x + 4x$ = angle sum of pentagon

angle sum $= 180(n-2)$

$= 180(5-2)$ ✓

$= 540^\circ$

$540 = 2x + 3x + 3x + 3x + 4x$

$= 15x$ ✓

$\therefore x = 36^\circ$

2) Sum of interior ∠s $= 180(n-2)$ ext ∠ sum $=$ ~~180n − (180n − 360)~~ 360°

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

~~360n = 360n − 720~~

$360 = 360n - 360$

$720 = 360n$ X

$\therefore n = 2$

Sum of interior ∠s = 2 × Sum of ext. ∠s

$\cancel{180}(n-2) = 2 \times \cancel{360}^{2}\,^\circ$

$\therefore n-2 = 4$

$n = 6$

3) In Δs ABC & ADC

1. AC is common ✓

2. BC = DA (given)

3. $B\hat{C}A = C\hat{A}D$ (alt ∠'s eq, BC∥AD)

$\therefore \Delta ABC \equiv \Delta ADC$ (SAS)

$\therefore$ ~~AB =~~ $B\hat{A}C = A\hat{C}D$ (equ ∠'s, cong Δs)

~~∴ AB∥CD (alt ∠'s are~~

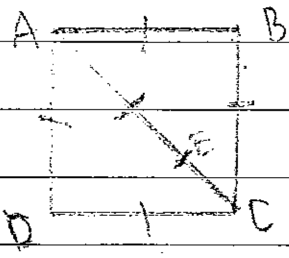
lines AB & CD are cut by transversal AC

∴ AB∥CD (alt ∠'s are equal) ✓

4) ?

5) X

6)



f) a) AD = AX (opp sides of a ||gm are equal)

b) ~~$A\hat{D}X = C\hat{B}Y$ as they are equ base ∠'s in congruent ∆s~~

~~c)~~ ~~in ∆s CBY & AXD~~

~~1. BC = AD (given as above)~~

~~2. CY = AX (given)~~

~~3. $A\hat{B}Y = A\hat{D}X$~~

$A\hat{D}X = C\hat{B}Y$ as they are ~~equal base ∠s in isosceles, cong ∆s~~ opp angles in a parallelogram

c) $A\hat{X}D = C\hat{Y}B$ (~~eq~~ eq ∠s opp eq sides, isos ∆)

d) ~~$B\hat{Y}C = Y\hat{A}X$ (corres ∠'s~~

~~$D\hat{X}A = Y\hat{A}X$ (alt ∠'s eq, CD // BA)~~

~~$Y\hat{A}X = B\hat{Y}C$ (~~

~~$B\hat{Y}C = Y\hat{C}X$ (alt ∠'s eq, BA // CD)~~

~~$Y\hat{C}X$ =~~

$360 - [(180 - x + 180 - x)]$

$360 - [(360 - 2x)]$

$2x$

Let $A\hat{X}D$ be x

∴ $C\hat{Y}B$ is x

∴ $C\hat{X}A = 180 - x$

∴ $C\hat{Y}A = 180 - x$

~~As 360 is angle sum of a quadrilateral~~

~~∴ CYAX has angle sum of 360°~~

~~360 =~~

$Y\hat{A}X = x$ (alt ∠'s/eq, CD // AB)

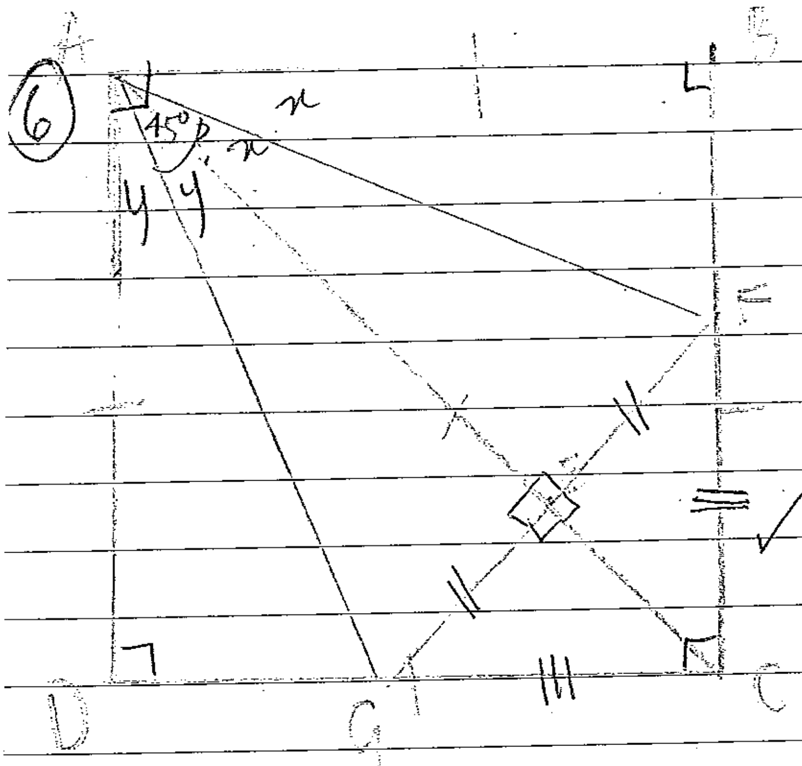
∴ $CYA + X\hat{A}Y = 180 - x + x$

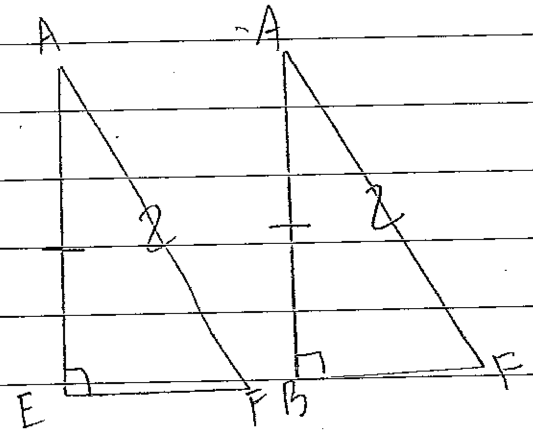
$= 180°$

∴ CY // XA (coint ∠s add up to 180°)

e) ∴ AYCY is a parallelogram as it has one pair of opp sides parallel and equal.

(6)





In Δs AEF & ABF

1. $AE = AB$ (given)
2. $A\hat{E}F = A\hat{B}F = 90°$ (given)
3. AF is common ✓

$\therefore \Delta AEF \equiv \Delta ABF$ (RHS)

$\therefore$ ~~$E\hat{A}F = B\hat{A}F$~~

Similarly, ΔADG & AEG (RHS)

$\therefore E\hat{A}F = B\hat{A}F$ (corres $\angle$'s, cong Δs)

$\therefore D\hat{A}G = E\hat{A}G$ (corres $\angle$'s, cong Δs)

Let $E\hat{A}F$ be x, $\therefore B\hat{A}F = x$

Let $D\hat{A}G$ be y, $\therefore E\hat{A}G$ ~~G~~ y

$\therefore x + x + y + y = 90°$ ✓ (int $\angle$ of a squ)

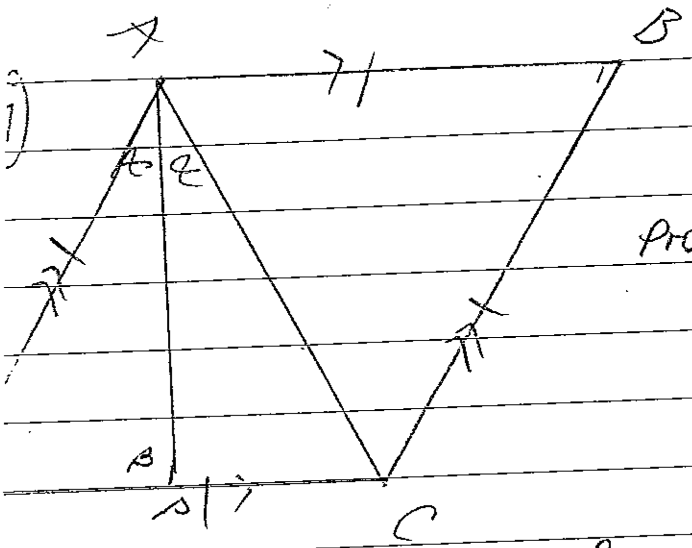
$2x + 2y = 90°$

$\therefore x + y = 45°$ ✓

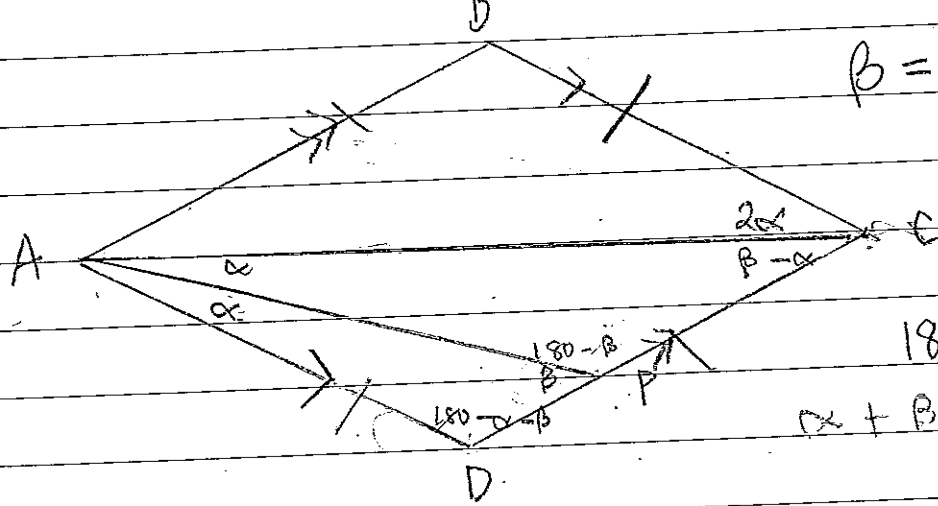
$\therefore F\hat{A}B + G\hat{A}E = 45°$ ✓

$\therefore F\hat{A}G = 45°$ ✓

1)



Prove $\beta = 3\alpha$



$\beta = 3\alpha$

$180 - 180 + \alpha + \beta$

$\alpha + \beta \neq 2\alpha + \beta - \alpha$

$\hat{ADP} = 180 - (\alpha + \beta)$

$= 180 - \alpha - \beta$

$\hat{ACP} = 180 - (180 - \beta + \alpha)$

$= \cancel{180} - \cancel{180} + \beta - \alpha$

$\hat{ACP} = \beta - \alpha$

$\therefore \beta = \hat{ACP} + \alpha$

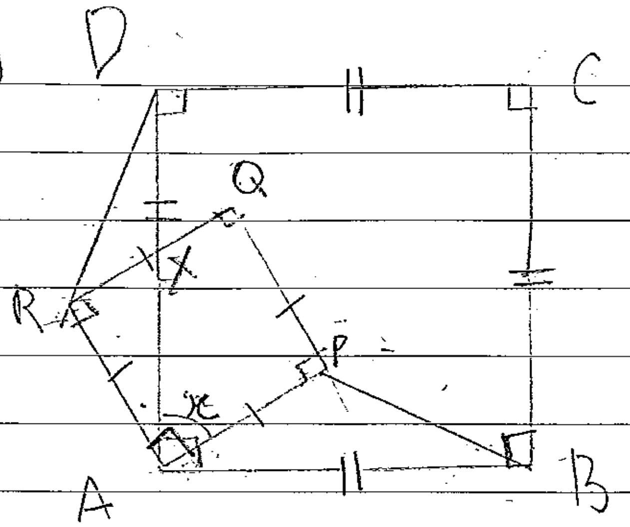
~~$\therefore \hat{BCA} = 2\alpha$ ($BC \parallel AD$)~~

$\therefore \hat{ACD} = 2\alpha$ (diagonals of rhom bisect ∠ they pass)

$2\alpha = \beta - \alpha$

$3\alpha = \beta$

8



$R\hat{A}P = B\hat{A}X = 90°$ (int ∠s of a squ)

$X\hat{A}P$ is a common angle of both

~~RAP~~ Let $X\hat{A}P$ be x

∴ $R\hat{A}P - x = 90 - x$ ∴ $R\hat{A}X = 90 - x$

~~In Δs APB & DXR~~ Similarly $B\hat{A}P = 90 - x$

~~1. DX =~~

In Δs ADR & APB

1. AR = AP (eq sides of squ)
2. DA = AB (eq. sides of squ)
3. $R\hat{A}Q = B\hat{A}P$ (as stated above)

∴ ΔADR ≡ ΔAPB

∴ DR = PB (corres sides, cong Δs)