SYDNEY GIRLS H.S.

| YEAR 11 TEST MARCH 2009 | Geometry |
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| Name | Result |

| *DIRECTIONS* | Use blue or black pen only. Full working should be shown to ensure maximum marks. |
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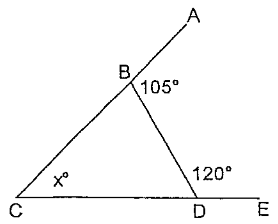
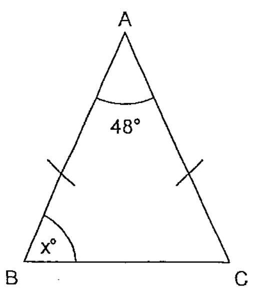
1. Find the values of the pronumerals, giving reasons :

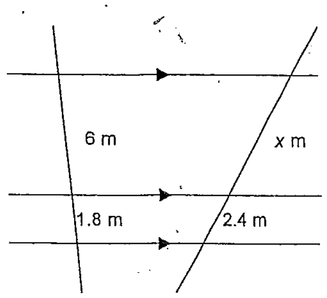
(a).

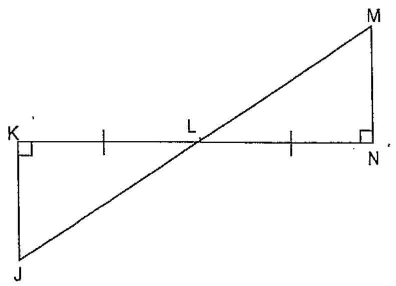



(b).

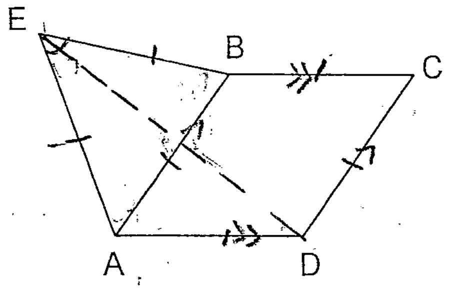



(c).



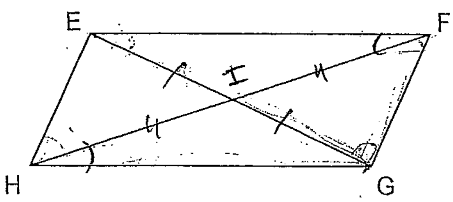
| | |
|---|---|
| 2. | (a). Find the size of each interior angle of a regular 15-sided polygon. |
| | (b). Find the number of sides in a regular polygon whose interior angles are 150°. |
| 3. | The diagonals of a rhombus are 8 cm and 6 cm long.<br>(a). Find the perimeter of the rhombus. |
| | (b). Find the area of the rhombus. |
| 4. |   (a). Prove that $\Delta JKL$ and $\Delta MNL$ are congruent. |
| | (b). Hence, prove that L is the midpoint of JM. |

5.




ABCD is rhombus with $\angle BCD = 48°$. $\Delta EAB$ is equilateral. Find the size of $\angle EDA$, giving reasons for your answer.

6.

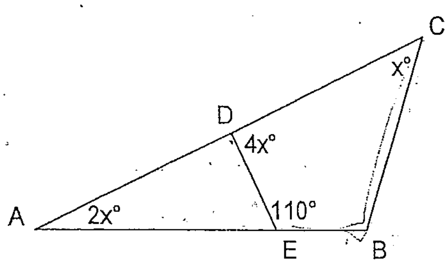



I is the intersection point of the diagonals EG and FH such that I is the mid-point of EG and $\angle EFH = \angle FHG$.

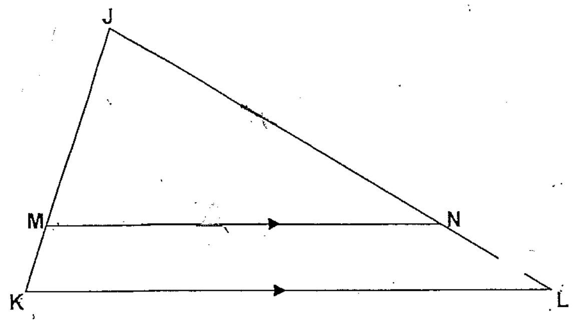
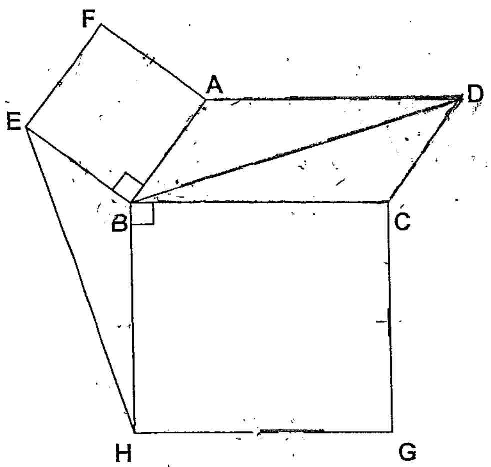
(a). Prove that $\Delta FIE$ and $\Delta HIG$ are congruent.

(b). Prove that EFGH is a parallelogram.

7.



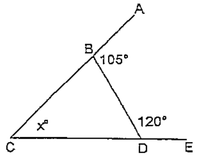

Find the size of $\angle EBC$.

| | | |
|---|---|---|
| 8. |  | In the given diagram, JK = 8 cm, JN = 9 cm, NL = 3 cm and MN = 6 cm.<br>(a). Prove that the two triangles are similar. |
| | (b). Find the length of MK and KL, giving reasons. | |
| 9. |  | *ABCD* is a parallelogram and *ABEF* and *BCGH* are both squares.<br>(a). Prove that $CD = BE$.<br>(b). Prove that $BD = EH$. |

| YEAR 11 TEST | Geometry |
|---|---|
| Name | Result $\frac{51}{53} = 96\%$ |
| ***DIRECTIONS*** | Use blue or black pen only. Full working should be shown to ensure maximum marks. |

1. Find the values of the pronumerals, giving reasons :

(a).




$\angle BDC = 180 - \angle BDE$ (~~CE straight line~~ supp. $\angle$s)

$= 60°$

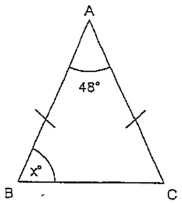
$\angle CBD = 180 - ABD$ (AC ~~straight line~~ supp. $\angle$s)

$= 75°$

$\therefore x = 180 - 60 - 75$ ($\angle$ sum $\triangle$)

$= 45°$

(b).




$\angle ABC = \angle ACB$ (base $\angle$s isosc. $\triangle$)

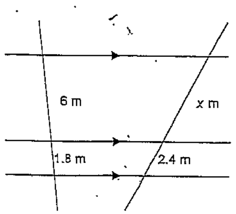
$= x$

$\therefore 2x + 48 = 180$ ($\angle$ sum $\triangle$)

$2x = 132$

$x = 66°$

(c).




$\frac{6}{1.8} = \frac{x}{2.4}$ (ratio of intercepts on parallel lines)

$\times \frac{1}{2}$

~~1.8x~~

$x = 8$

$10\frac{1}{2}$

2. (a). Find the size of each interior angle of a regular 15-sided polygon.

int. $\angle = \frac{(n-2) \times 180}{n}$

$= 156°$

(b). Find the number of sides in a regular polygon whose interior angles are 150°.

$150 = \frac{(n-2) \times 180}{n}$

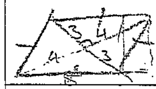
$150n = 180n - 360$

$360 = 30n$

$\therefore n = 12$ sides.

3. The diagonals of a rhombus are 8 cm and 6 cm long.

(a). Find the perimeter of the rhombus.




side = 5 cm (pythagorean triad 3, 4, 5) (diagonals bisect at 90°)

$\therefore p = 5 \times 4$

$= 20$ cm

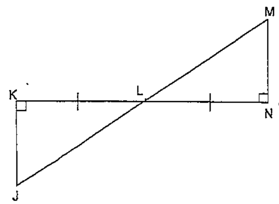
(b). Find the area of the rhombus.

$A = \frac{1}{2}xy$

$= \frac{8 \times 6}{2}$

$= 24 \text{ cm}^2$

4.




(a). Prove that $\triangle JKL$ and $\triangle MNL$ are congruent.

$\triangle JKL$, $MNL$:

- $\angle LKJ = \angle MNL = 90°$ (given)
- $\angle KLJ = \angle NLM$ (vert. opp)
- $KL = LN$ (given)

$\therefore \triangle JKL \equiv \triangle MNL$ (AAS)

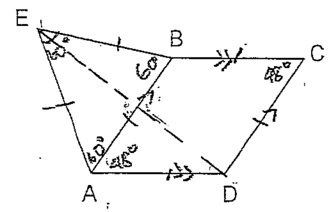
(b). Hence, prove that L is the midpoint of JM.

$JL = ML$ (corr. sides congr. $\triangle$s)

$\therefore L$ midpoint of JM.

16

5.



ABCD is rhombus with $\angle BCD = 48°$. $\Delta EAB$ is equilateral. Find the size of $\angle EDA$, giving reasons for your answer.

~~construct line ED.~~

$\angle BCD = \angle BAD = 48°$ (opp. ∠s rhombus ABCD)

$\angle BAE = 60°$ (~~int. ∠~~ equilateral Δ)

~~ΔAEA~~

AD = AB (ABCD rhombus) (sides of)

AB = EA (~~Δ sides~~ sides of equilateral Δ AEB)

∴ AD = AE

∴ ΔEAD isosc. Δ (2 sides equal)

Let ∠EDA = θ ; ∠EDA = ∠AED

∴ ∠AED = θ (base ∠s isosc. Δ)

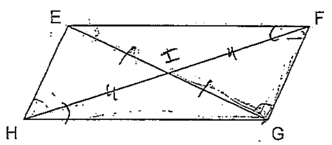
∴ ~~180~~ 2θ + 60 + 48° = 180° (∠ sum Δ)

2θ = 72°

∴ θ = 36

∴ ∠EDA = 36°

6.



I is the intersection point of the diagonals EG and FH such that I is the mid-point of EG and $\angle EFH = \angle FHG$.

(a). Prove that $\Delta FIE$ and $\Delta HIG$ are congruent.

ΔFIE, HIG:

- ∠EIF = ∠HIG (vert. opp)
- ∠EFH = ∠FHG (given)
- EI = IG (~~given~~ I midpoint EG)

∴ ΔFIE ≡ ΔHIG (AAS)

(b). Prove that EFGH is a parallelogram.

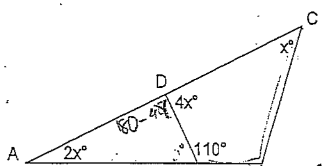
~~Given~~ ∠EFH = ∠FHG (given)

∴ EF // HG (why?) ✗ (alt. ∠s equal)

~~Similarly~~ EF = HG (corr. sides congr. Δs)

∴ EFHG parallelogram (1 pair of opp. sides parallel & equal)

7.



Find the size of $\angle EBC$.

~~EBC + 110~~

∠ADE = 180 − 4x (AC straight line)

∠AED = 70° (AB straight line)

2x + 70° + 180 − 4x = 180 (∠ sum Δ)

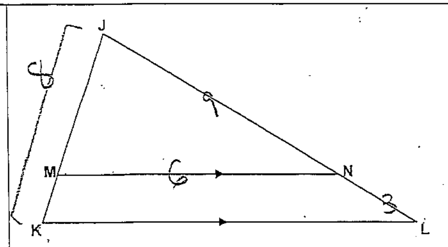
70 = 2x

x = 35°

∴ ∠EBC = ~~360~~ 360 − 110 − 4(35) − 35 (∠ sum quad)

(12)

8.



In the given diagram, JK = 8 cm, JN = 9 cm, NL = 3 cm and MN = 6 cm.

(a). Prove that the two triangles are similar.

ΔJMN, JKL: ∠MJN = ∠KJL (∠J common)

- ∠JNM = ∠JLK (corr. ∠s, MN // KL)

∴ ΔJMN /// ΔJKL (equiangular)

(b). Find the length of MK and KL, giving reasons.

$\frac{JM}{JK} = \frac{JN}{JL} = \frac{MN}{KL}$ (corr. side ratios equal ΔJMN /// ΔJKL)

$\frac{JM}{8} = \frac{9}{12} = \frac{6}{KL}$

$JM = \frac{72}{12} = 6$

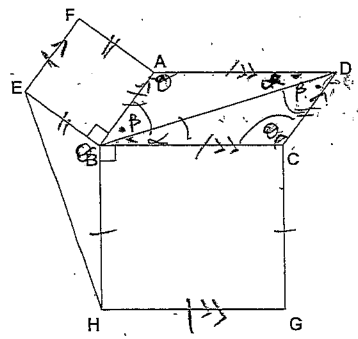
$KL = \frac{72}{9}$

∴ KL = 8 cm

∴ MK = JK − JM = 8 − 6

∴ MK = 2 cm

9.



*ABCD* is a parallelogram and *ABEF* and *BCGH* are both squares.

(a). Prove that *CD* = BE.

CD = AB (opp sides parallelogram)

AB = EB (ABEF is square) (sides of square) × ½

∴ CD = BE

(b). Prove that *BD* = *EH*.

Let ∠DCB = θ ; ∠DBC = α and ∠DBA = β

∠BDC = β = ∠DBA = β (alt. ∠s, AB // DC)

and ∴ 180° − α − β = θ (∠ sum Δ)

360° − β − α − 90° − 90° = ∠HBE

180 − β − α = ∠HBE (∠ sum at point B)

∴ ∠HBE = θ

In ΔDBC, EBH:

- EB = CD (given, above)
- BH = BC (BCHG square) (sides of)
- ∠EBH = ∠DCB = θ (above)

∴ ΔDBC ≡ ΔEBH (SAS)

∴ EH = DB (corr. sides congr. Δs)

Good!

($12\frac{1}{2}$)