S·H·S

VERITATE ET VIRTUTE

YEAR 9
ADVANCED MATHEMATICS

Geometry

Time Allowed: 45 minutes

Examiner: Ms Opferkuch

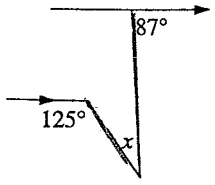
Instructions: All questions may be attempted.

All necessary working should be shown in every question.
Marks may be deducted for careless or badly arranged work.

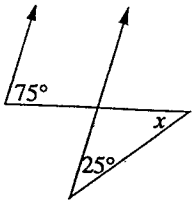
Name:

1. Find the value of x.

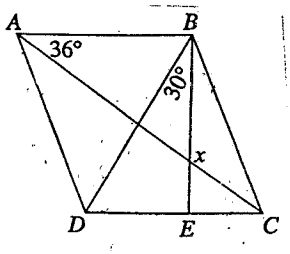
(a)



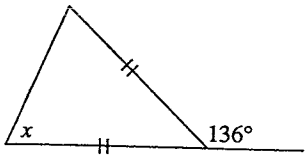
(b)



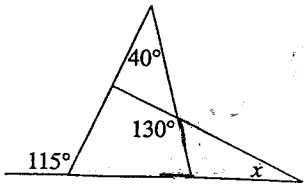
2. ABCD is a rhombus.
Find the value of x.



3. Find the value of x, giving reasons.



4. Find the value of x.

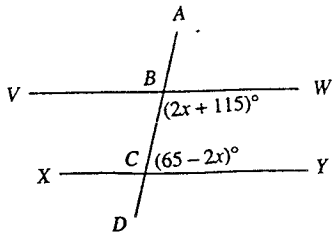


5. ABCD is a quadrilateral with AD extended to E.

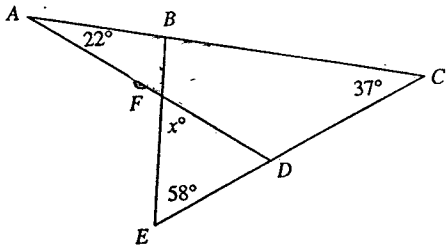
If $\angle ABC = \angle CDE$.

Prove that $\angle BAD + \angle BCD = 180^\circ$

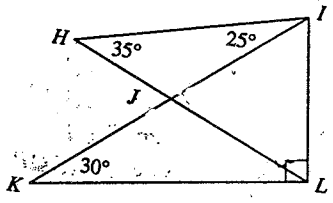
6. Prove $VW \parallel XY$.



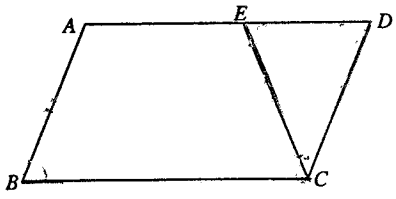
7. Evaluate x, giving reasons.



8. Prove that ΔJKL is equilateral and ΔJKL isosceles.



9. $ABCD$ is a parallelogram with $DE = DC$.
Prove that CE bisects $\angle BCD$.

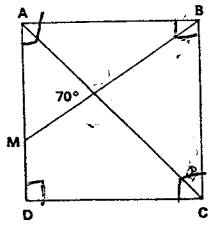


10. Find the sum of the interior angles of a regular polygon whose exterior angles are 18^0.

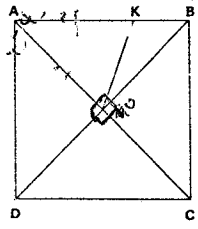
11. Bisect an interval AB. Refer to figure 1.
    (a) What type of quadrilateral is AYBX?
    (b) What property justifies the accuracy of this construction method?

12. What geometric property is required for regular polygons to tesselate?

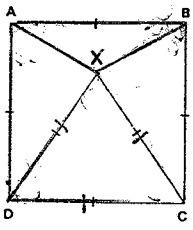
13(a) In the square ABCD as shown <ALM is 70°.
Find <LBC and give reasons.



13(b) ABCD is a square with the diagonals meeting at N.
On the line AB, a point K is taken so that AK=AN.
Find with reasons the size of <AKN and <KNB.

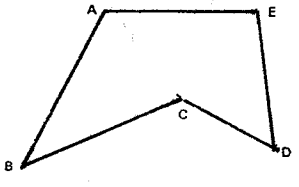


14. ABCD is a square and <CDX is an equilateral triangle as shown.
Find <AXB and <AXC in degrees.

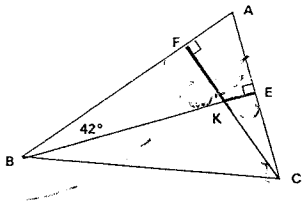


15 The figure ABCDE, as shown, is what is sometimes called a ..... pentagon.

By forming triangles show that the sum of the interior angles is still the same as calculated for the conventional pentagon.



16. Suppose <ABE = x.
    (a) Find <BAC and <BKF in terms of x.
    (b) Find <BKF in terms of x.
    (c) What is <BAC + < BKC?



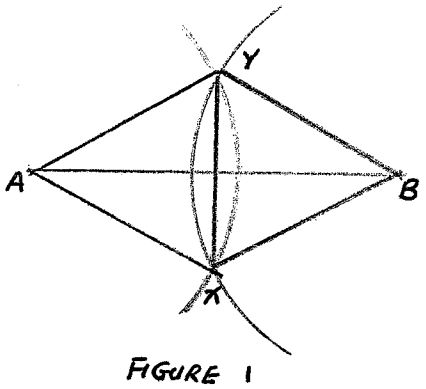


FIGURE 1

(1) a) $\angle BGF = 87°$ (alternate $\angle$)

$\angle EGF = 180 - 125$

$= 55°$ (cointerior

$\therefore x° = 87° - 55°$ ✓

$x° = 32°$ ✓

b) $\angle CBD = 180° - 75°$

$= 105°$ (cointerior $\angle$'s)

$\angle FDE = 105°$ (vertically opp)

$\therefore x° = (105 + 25) - 180$

$x° = 50°$

(2) $\angle BFA = 90° + 30° - 180°$

$= 60°$ ✓

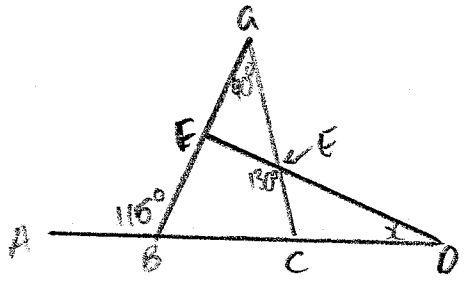
$\therefore x° = 180° - 60°$ ($\angle$ sum straight $\angle$)

$x° = 120°$ ✓

(3) $\frac{136°}{2} = \frac{2x}{2}$ (exterior $\angle$ is sum of 2 interior $\angle$'s)

$x° = 68°$ ✓

(4)



$\angle GBC = 180° - 115°$ ($\angle$ sum straight line)

$= 65°$

$\angle FEG = 180 - 130$ ($\angle$ sum straight line)

$= 50°$

$\angle GFE = 180 - 50 - 40$

$= 90°$

$\angle EFB = 90°$ ($\angle$ sum straight line)

$\therefore x° = 180° - 90° - 65°$ ($\angle$ sum straight line)

$x° = 25°$

(6) $2x° + 115° + 65° - 2x°$

$= 115 + 65$ ✓

$= 180°$

$\therefore VW // XY$ (cointerior $\angle$'s are supplementary) ✓

(7) $\angle CBE = (37° + 58°) - 180°$

$= 85°$ ($\angle$ sum of $\triangle$)

$\angle ABF = 180 - 85$ ($\angle$ sum straight line)

$= 95°$

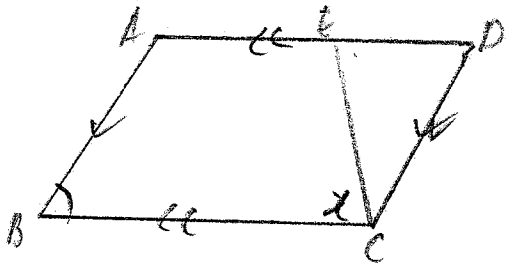
$\angle BFA = 180 - 95 - 22$

$= 63°$ ✓

$\therefore x = 63°$ (vertically opposite)

9) $\angle HJL = 180° - 35 - 25$
$= 120°$
$\angle KJL = 120°$ (vertically opposite)
$\angle JLK = 180 - 30 - 120$ ($\angle$ sum $\triangle$)
$= 30°$
$\therefore \triangle JKL$ is an isosceles $\triangle$ (base $\angle$'s of isos $\triangle$ are equal)
$\angle ILJ = 90 - 30$
$= 60°$
$\angle IJL = 180 - 120$
$= 60°$
$\angle JIL = 180 - 60 - 60$
$= 60°$
$\therefore \triangle IJL$ is equilateral $\triangle$ (all $\angle$'s are equal.

8) $AD // BC$ & $AB // DC$
$\angle DCE = x°$ (alternate $\angle$s)
$\angle DCE = x°$ (base of isos $\triangle$)
$\therefore CE$ bisects $\angle BCD$



10) $360 \div 18$
$= 20$
$(n-2) \times 180°$
$(20-2) \times 180°$
$18 \times 180°$
$= 3240° \div 20$
$= 162°$ for one interior $\angle$ in 20 sided polygon.

11) a) Rhombus ✓

b) All sides are equal ✓

12) Sides must all be equal ✓

13) a) $\angle LBC = 65°$ (∠ sum of △) ~~(∠ sum of bisected square)~~

b) $\angle ANK = 67.5$ (∠ base of isos)

$\angle AKN = 67.5$ (∠ base of isos)

$\therefore \angle BKN = 180 - 67.5$

$\angle BKN = 112.5$

$\therefore \angle KNB = 180° - 112.5° - 45°$

$\angle KNB = 22.5°$

15) a) "irregular" ✓

$180 + 180 + 180 = 540°$

$(5-2) \times 180$ ✓

$= 540°$ (∠ sum does not change)

b) $\angle BAC = 180 - x - 90$

$= 90 - x°$ ✓

$\angle BKF = 180 - 90 - x$

$= 90 - x°$ ✓

c) $\angle BKF = 180 - (90 - x)$

$= 90 + x$

$90 - x + 90 + x$ (∠BAC + ∠BKC)

$= 180$ ✓