## Poly-gon where?



Carole Greenes
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Practice, Research \& Innovation in Mathematics Education (PRIME) Group

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#### Abstract

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## Poly-Gon Where?

Poly-Gon Where is designed to develop skills in identifying and naming polygons that are of various sizes, shapes and positions and are "hidden" in larger polygons.

Large polygons are triangles, quadrilaterals, pentagons, hexagons, heptagons, or octagons. Some are convex. Some are concave.

Each large polygon contains two or three blue lines that connect vertices or sides to produce varying types of smaller polygons. In some shapes, lines intersect.

Smaller polygons are each labeled with a letter to enable identification of shapes.

When smaller polygons together form a larger polygon, the larger polygon may contain two or more letters.

Goal: Identify, name, and score polygons. Note that smaller polygons listed below are not in every shape.

Scoring corresponds to the number of sides of each smaller polygon:

- 3 points for each triangle
- 4 points for each quadrilateral
- 5 points for each pentagon
- 6 points for each hexagon
- 7 points for each heptagon
- 8 points for each octagon
- 9 points for each nonagon
- 10 points for each decagon

The Total for each shape is the sum of the numbers of points.
Solutions in this book show letters in alphabetical order. However, the order of the letters is not important.

NOTE: The shape itself cannot be counted.
See sample on next page.

Sample Polygon Identification and Scoring


## Convex Quadrilateral

| Polygon Name |  | Regions | $\underline{\text { Points }}$ |
| :--- | :--- | :--- | :--- |
| Triangles: | A, AC | 6 points |  |
| Quadrilaterals: | B, C, D, AB, BD, CD | 24 points |  |
| Pentagons: | ACD | 5 points |  |
| Hexagons: | ABC. ABD, BCD | 18 points |  |

Total: 53 points

## Section 1: Two Blue Lines

6 triangles
6 quadrilaterals
6 pentagons
6 hexagons
6 heptagons
6 octagons


## Isosceles Triangle

## Polygon Name Regions

$\qquad$ points


## Isosceles Triangle

Polygon Name Regions
Points

Total: $\qquad$ points


## Equilateral Triangle

Polygon Name
Regions
Points

Total: $\qquad$ points


## Scalene Triangle

Polygon Name
Regions
Points

Total: $\qquad$ points


## Scalene Triangle

## Polygon Name Regions <br> Points

Total: $\qquad$ points


## Equilateral Triangle

Polygon Name Regions Points

Total: $\qquad$ points


## Convex Quadrilateral

Polygon Name
Regions
Points

Total: $\qquad$ points


## Convex Quadrilateral

Polygon Name
Regions
Points

Total: $\qquad$ points


## Convex Quadrilateral

Polygon Name Regions Points

Total: $\qquad$ points


## Convex Quadrilateral

Polygon Name
Regions
Points

Total: $\qquad$ points


Concave Quadrilateral
Polygon Name
Regions
Points

Total: $\qquad$ points


Convex Quadrilateral
Polygon Name Regions
Points

Total: $\qquad$ points


## Convex Pentagon

Polygon Name Regions


## Convex Pentagon

Polygon Name Regions
Points

Total: $\qquad$ points


## Concave Pentagon

Polygon Name
Regions
Points

Total: $\qquad$ points


## Convex Pentagon

Polygon Name Regions

Points

Total: $\qquad$ points


## Convex Pentagon

Polygon Name
Regions
Points

Total: $\qquad$ points


## Concave Pentagon

Polygon Name Regions

## Points

Total: points


## Convex Hexagon

Polygon Name Regions Points

Total: $\qquad$ points


## Convex Hexagon

Polygon Name $\underline{\text { Regions }}$

Total: $\qquad$ points


## Concave Hexagon

Polygon Name
Regions
Points

Total: $\qquad$ points


Convex Hexagon
Polygon Name
Regions
Points

Total: $\qquad$ points


## Convex Hexagon

## $\underline{\text { Polygon Name Regions } \quad \underline{\text { Points }}}$

Total: $\qquad$ points


Concave Hexagon
Polygon Name
Regions
Points

Total: $\qquad$ points


Convex Heptagon
Polygon Name Regions
Points

Total: $\qquad$ points


## Concave Heptagon

Polygon Name
Regions
Points

Total: $\qquad$ points


## Convex Heptagon

Polygon Name Regions

## Points

Total: $\qquad$ points


## Concave Heptagon

Polygon Name
Regions
Points

Total: $\qquad$ points


## Concave Heptagon

Polygon Name
Regions

## Points

Total: $\qquad$ points


## Concave Heptagon

Polygon Name Regions Points

Total: $\qquad$ points


Convex Octagon
Polygon Name Regions

Total: $\qquad$ points


## Concave Octagon

Polygon Name
Regions

## Points

Total: $\qquad$ points


## Concave Octagon

Polygon Name Regions $\underline{\text { Points }}$

Total: $\qquad$ points


## Concave Octagon

Polygon Name Regions
Points

Total: points


## Convex Octagon

Polygon Name Regions $\underline{\text { Points }}$

Total: $\qquad$ points


## Concave Octagon

Polygon Name
Regions
Points

Total: points

## Section 2: Three Blue Lines

1 triangle<br>1 quadrilateral<br>1pentagon<br>1 hexagon<br>1 heptagon<br>1 octagon



Equilateral Triangle
Polygon Name Regions Points

Total: $\qquad$ points


Concave Quadrilateral
Polygon Name Regions

Points

Total: $\qquad$ points


## Concave Pentagon

Polygon Name Regions
Points

Total: $\qquad$ points


## Concave Hexagon

Polygon Name
Regions
Points

Total: $\qquad$ points


## Concave Heptagon

## Polygon Name <br> Regions

Points

Total: $\qquad$ points


## Concave Octagon

Polygon Name
Regions

## Points

Total: $\qquad$ points

## S

0

## L

## U

## T

I

$$
0
$$

N
S

## Section 1 Solutions: Two Blue Lines

6 triangles
6 quadrilaterals
6 pentagons
6 hexagons
6 heptagons
6 octagons


## Isosceles Triangle

| Polygon Name | $\underline{\text { Regions }}$ | Points |
| :--- | :--- | :---: |
| Triangles: | A, AB | 6 points |
| Quadrilaterals: | B, C, BC | 12 points |

Total:
18 points


## Isosceles Triangle

| Polygon Name |  | $\underline{\text { Regions }}$ |  |
| :--- | :--- | :--- | :--- |
|  |  | $\underline{\text { Points }}$ |  |
| Triangles: |  | A, C |  |
| Quadrilaterals: |  | AB, BC |  |
| Points |  |  |  |
| Pentagons: |  |  | 8 |
| 8 |  |  | 5 points |
|  |  |  |  |

Total: 19 points


## Equilateral Triangle

| Polygon Name |  | Regions | $\underline{l}$ Points |
| :--- | :--- | :--- | :--- |
| Triangles: | A, B, C. AB, AC, BD, CD | 21 points |  |
| Quadrilaterals: | D, BCD | 8 points |  |
| Pentagons: | ABC, ACD | 10 points |  |

Total 39 points


## Scalene Triangle

| Polygon Name |  | Regions | $\underline{\text { Points }}$ |
| :--- | :--- | :--- | :--- |
| Triangles: |  | A, B, AB, AC, BD |  |
| Quadrilaterals: | C, D, CD | 12 points |  |
| Pentagons: | ABD, ACD, BCD | 15 points |  |

Total
42 points


## Scalene Triangle

Triangles: $\mathbf{B}, \mathrm{C}, \mathrm{D}, \mathrm{AB}, \mathbf{A C}, \mathrm{BD}, \mathbf{C D} 21$ points
Quadrilaterals: A, ABC
8 points
Pentagons: ABD, ACD, BCD
15 points

Total: 44 points


Equilateral Triangle
Triangles: $\mathrm{B}, \mathrm{AB}, \mathrm{BC} \quad 9$ points
Quadrilaterals: A, C, D, AD, CD 20 points
Pentagons: $\mathrm{ABC}, \mathrm{ABD}, \mathrm{BCD} \quad 15$ points
Hexagons: ADC
6 points

Total: 50 points


## Convex Quadrilateral

Polygon Name
Triangles:
Regions
A, B,
Quadrilaterals:
C, AB, BC

## Points

6 points
12 points

Total: 18 points


## Convex Quadrilateral

| Polygon Name | Regions | $\underline{\text { Points }}$ |
| :--- | :--- | :--- |
| Quadrilaterals: | $\mathrm{A}, \mathrm{B}, \mathrm{C}, \mathrm{D}, \mathrm{AB}, \mathrm{AC}, \mathrm{BD}, \mathrm{CD}$ | $\mathbf{3 2}$ points |
| Hexagons: | $\mathrm{ABC}, \mathrm{ABD}, \mathrm{BCD}$ | $\mathbf{1 8}$ points |

Total 50 points


## Convex Quadrilateral

Polygon Name
Triangles:
Quadrilaterals:
Pentagons:
Hexagons:
Heptagons:

Regions
B, C, CD
$\mathrm{D}, \mathrm{AB}, \mathrm{AC}, \mathrm{BD}$
$\mathrm{A}, \mathrm{ABC}, \mathrm{BCD}$
ACD
ABD

Points
9 points
16 points
15 points
6 points
7 points

Total: 53 points


## Convex Quadrilateral

Polygon Name
Triangles:
Quadrilaterals:
Hexagons:

Regions
$\mathrm{A}, \mathrm{D}, \mathrm{AC}, \mathrm{CD}$
$\mathrm{B}, \mathrm{C}, \mathrm{AB}, \mathrm{BD}, \mathrm{ACD}$
ABC, ABD, BCD

Points
12 points
20 points
18 points

Total: 50 points


## Concave Quadrilateral

Polygon Name
Triangles:
Quadrilaterals:
Pentagons:
Hexagons:

Regions
$\mathrm{A}, \mathrm{B}, \mathrm{AB}, \mathbf{B D}$
$\mathbf{C}, \mathrm{D}, \mathrm{AC}, \mathbf{C D}$
ABD, BCD
ABC, ACD

Points
12 points
16 points
10 points
12 points

Total: 50 points


## Convex Quadrilateral

| Polygon Name | Regions | Points |
| :--- | :--- | :--- |
| Triangles: | B, AB, BC | 9 points |
| Quadrilaterals: | C | 4 points |
| Pentagons: | D, AD, CD, ABC | 20 points |
| Hexagons: | BAD, BCD | 12 points |
| Heptagons: | ACD | 7 points |

Total: 52 points


## Convex Pentagon

| Polygon Name |  | Regions | Points |
| :--- | :--- | ---: | ---: |
| Triangles: | B, C, AB | 9 points |  |
| Quadrilaterals: | A, AC, CD | 12 points |  |
| Pentagons: | D, BD, ABC | 15 points |  |
| Hexagons: | BCD | 6 points |  |
| Heptagons: | ACD, ABD | 14 points |  |

Total: 56 points


## Convex Pentagon

| Polygon Name | $\underline{\text { Regions }}$ | $\underline{\text { Points }}$ |
| :--- | :--- | :--- |
| Triangles: | A, B, C $, \mathbf{A B}, \mathbf{A C}$ | 15 points |
| Quadrilaterals: | D, BD, CD | 12 points |
| Pentagons: | ABC | 5 points |
| Hexagons: | ABD, BCD | 12 points |

Total: 44 points


## Concave Pentagon

| Polygon Name |  | Regions |
| :--- | :--- | :---: |
| Triangles: | C, D, AD, BC, CD | $\underline{15}$ points |
| Quadrilaterals: | A, B | 6 points |
| Pentagons: | ACD, BCD | 10 points |
| Hexagons: | AB | 6 points |
| Heptagons: | ABC, ABD | 14 points |

Total: 51 points


## Convex Pentagon

Polygon Name
Triangles: $\quad \mathrm{A}, \mathrm{C}, \mathrm{D}, \mathrm{AC}, \mathrm{CD}$
Quadrilaterals:
Pentagon:
Hexagons:

Regions

B, AB, BD
ACD
$\mathrm{ABC}, \mathrm{ABD}, \mathrm{BCD}$

## Points

15 points
12 points
5 points
18 points

Total: 50 points


## Convex Pentagon

| Polygon Name | $\underline{\text { Regions }}$ | $\underline{\text { Points }}$ |
| :--- | :--- | :--- |
| Triangles: | B, C, D, BD, CD | 15 points |
| Quadrilaterals: | A, AB, AC | 12 points |
| Pentagons: | BCD | 5 points |
| Hexagons: | ABC, ABD, ACD | 18 points |

Total: 50 points


## Concave Pentagon

Polygon Name
Triangles:
Quadrilaterals: C
Pentagons:
Heptagons:

Regions
$\mathrm{A}, \mathrm{B}, \mathrm{AB}, \mathrm{AC}$
$\mathrm{D}, \mathrm{BD}, \mathrm{CD}, \mathrm{ABC}, \mathrm{ACD}$
ABD, BCD

Points
12points
4 points
25 points
14 points

Total: 55 points


## Convex Hexagon

| Polygon Name | Regions | Points |
| :--- | :--- | ---: |
| Triangles: | B, C | 6 points |
| Quadrilaterals: | A, D, AB, AC, BD, CD | 24 points |
| Hexagons: | ABC, BCD | 12 points |
| Heptagon: | ABD, ACD | 14 points |

## Total: 56 points



## Convex Hexagon

| Polygon Name | $\underline{\text { Regions }}$ | $\underline{\text { Points }}$ |
| :--- | :--- | ---: |
| Triangles: | A, C, AC | $\mathbf{9}$ points |
| Quadrilaterals: | B, D, AB, CD | $\mathbf{1 6}$ points |
| Pentagon: | BD | $\mathbf{5}$ points |
| Hexagons: | ABC, ACD | $\mathbf{1 2}$ points |
| Heptagons: | ABD, BCD | 14 points |

Total: 56 points


## Concave Hexagon

| Polygon Name |  | Regions |
| :--- | :--- | :--- |
| Triangles: | B, C, D, BD, CD | $\underline{\text { Points }}$ |
| Pentagons: | A, AB, AC, BCD | 15 points |
| Heptagons: | ABC, ABD, ACD | 20 points |
|  |  | 21 points |

Total: 56 points


## Convex Hexagon

| Polygon Name | Regions | Points |
| :--- | :--- | :---: |
| Quadrilaterals: | A, B, C, AB | 16 points |
| Pentagons: | D, AC, BD, CD | 20 points |
| Heptagons: | ABC, ABD, BCD, | 21 points |
| Octagons: | ACD | 8 points |

Total: 65 points


## Convex Hexagon

Polygon Name
Triangles:
Quadrilaterals:
Pentagons:
Hexagons:
Heptagons:
Octagons:

CD
C, AC, ABD
Regions
D
$\mathrm{A}, \mathrm{B}, \mathrm{AB}, \mathbf{B D}$

ACD
ABC, BCD

Points
3 points
16 points
5 points
18 points
7 points
16 points

## Total: 65 points



## Concave Hexagon

| Polygon Name |  | Regions |
| :--- | :--- | :---: |
| Triangles: | D | $\underline{\text { Points }}$ |
| Quadrilaterals: | A, BD | 3 points |
| Pentagons: | B, AB, CD | 8 points |
| Hexagons: | C, AC, ABD | 15 points |
| Heptagons: | ACD | 18 points |
| Octagons: | BCD | 7 points |
| Nonagons: | $A B C$ | 8 points |
|  |  | 9 points |

Total: 68 points


## Convex Heptagon

| Polygon Name |  | Regions |  |
| :--- | :--- | :--- | ---: |
| Triangles: | A, D |  | 6 points |
| Quadrilaterals: | CD | 4 points |  |
| Pentagons: | B, C, AB, AC, BD | 25 points |  |
| Hexagons: | ACD | 6 points |  |
| Heptagons: | ABD | 7 points |  |
| Octagons: | BCD | 8 points |  |
| Nonagons: | ABC | 9 points |  |

Total: 65 points


## Concave Heptagon

| Polygon Name | Regions | Points |
| :--- | :--- | ---: |
| Triangles: | D | 3 points |
| Quadrilaterals: | C, CD | 8 points |
| Pentagons: | A, AC, BD | 15 points |
| Hexagons: | B | 6 points |
| Heptagons: | AB, ACD | 14 points |
| Octagons: | ABD, BCD | 16 points |

Total: 62 points


## Convex Heptagon

| Polygon Name | Regions | Points |
| :--- | :--- | ---: |
| Quadrilaterals: | B, C | 8 points |
| Pentagons: | D, BD, DC | 15 points |
| Hexagons: | A, AB, AC | 18 points |
| Heptagons: | BCD | 7 points |
| Octagons: | $A B C$ | 8 points |
| Nonagons: | $A C D, A B D$ | 18 points |

Total: 74 points


## Concave Heptagon

Polygon Name
Triangles:
Pentagons:
Hexagons:
Heptagons:
Octagons:
Nonagons:

Regions
A, C, AC
AB, CD
B, D
ACB, ACD
BD
BCD, ABD

Points
9 points
10 points
12 points
14 points
8 points
18 points

Total: 71 points


## Concave Heptagon

Polygon Name
Triangles:
Quadrilaterals:
Pentagons:
Heptagons:
Octagons:

Regions
C
A, B, D, AC, CD
AB, BD
ACD, ABC, BCD
ABD

Points
3 points
20 points
10 points
21 points
8 points

Total: 62 points


## Concave Heptagon

## Polygon Name

Triangles:
Quadrilaterals:
Pentagons:
Hexagons:
Heptagons:
Octagons:
Nonagons:

Regions
D
A, B, AB, BD
CD
C, ABD
AC
BCD, ACD
ABC

Points
3 points
16 points
5 points
12 points
7 points
16 points
9 points

Total: 68 points


## Convex Octagon

| Polygon Name | $\underline{\text { Regions }}$ | $\underline{\text { Points }}$ |
| :--- | :--- | :---: |
| ${ } }$ | C, D | 8 points |
| Pentagons: | A, B, AC, BD, CD | 25 points |
| Heptagons: | $A B$ | 7 points |
| Nonagons: | $A B C, A B D$ | 18 points |

Total: 58 points


## Concave Octagon

| Polygon Name |  | Regions |  |
| :--- | :--- | :--- | :---: |
| Quadrilaterals: | B, C | 8 points |  |
| Pentagons: |  | A, D, AB, CD | 20 points |
| Hexagons: |  | AC, BD | 12 points |
| Octagons: | $A B D, ~ B C D$ | 16 points |  |
| Nonagons: | $A B D$ | 9 points |  |

Total 65 points


## Concave Octagon

Polygon Name
Quadrilaterals: A
Pentagons:
B, D. AB
Hexagons:
C, AC, BD
Heptagons:
CD
Nonagons:
Decagons:
ABC, ACD
BCD

Points
4 points
15 points
18 points
7 points
18 points
10 points

Total: 72 points


## Concave Octagon

| Polygon Name | $\underline{\text { Regions }}$ | $\underline{\text { Points }}$ |
| :--- | :--- | ---: |
| Quadrilaterals: | A, D | 8 points |
| Hexagons: | B, C, AB, AC, BD, CD | 48 points |
| Octagons: | ACD, ABD | 16 points |
| Decagons: | ABC, BCD | 20 points |

Total: 92 points


## Concave octagon

| Polygon Name | Regions | Points |
| :--- | :--- | ---: | ---: |
| Quadrilaterals: | A, D | 8 points |
| Hexagons: | B, X, AB, AC, BD, CD, | 36 points |
| Octagons: | ABD | 8 points |
| Decagon: | ABC, BCD | 20 points |

Total
72 points


## Concave Octagon

| Polygon Name |  | Regions |  |
| :--- | :--- | ---: | :--- |
| Quadrilaterals: | B, C, D, BD | 16 points |  |
| Pentagons: | CD | 5 points |  |
| Hexagons: | A, AC | 12 points |  |
| Heptagons: | AB, BCD | 14 points |  |
| Nonagons: | ABD, ACD | 18 points |  |

Total: 65 points

## Section 2 Solutions: Three Blue Lines

1 triangle<br>1 quadrilateral<br>1pentagon<br>1 hexagon<br>1 heptagon<br>1 octagon



Equilateral Triangle

| Polygon Name |  | Regions | Points |
| :--- | :--- | :--- | :---: |
| Triangles: | B, E, F, AB, CE, DF, EF, ADF, BCE, CDEF | $\mathbf{3 0}$ points |  |
| Quadrilaterals: | A, C, D, AD, BC, CD, ABCD, ABDF | $\mathbf{3 2}$ points |  |
| Pentagons: | ABD, CEF, DEF, ABCE, ACDEF, BCDEF | $\mathbf{3 0}$ points |  |
| Hexagons: | ABDEF | $\mathbf{6}$ points |  |
| Heptagons: | ABCEF | 7 points |  |

Total: 105 points


## Concave Quadrilateral

## Polygon Name

Triangles:
Quadrilaterals:
Pentagons:

Regions
A, B, C, E, AB, AC, DE, BDE
D, BD, ABC, ABDE
ABD, ABCD

## Points

24 points
16 points
10 points

Total: 50 points


## Concave Pentagon

Polygon Name
Triangles:
Quadrilaterals:
EF, ACD, ACE, BDF, CDEF

| Pentagons: | CDE, ABCD, ACDEF, BCDEF | 20 points |
| :--- | :--- | ---: |
| Hexagons: | CDF, CEF, DEF, ACDE, ACEF, BDEF | 36 points |
| Heptagons: | BCDE | 7 points |

Total: 123 points


## Concave Hexagon

## Polygon Name

Triangles:
Quadrilaterals: $\quad \mathbf{B}, \mathbf{C}, \mathbf{E}, \mathbf{F}, \mathrm{AB}, \mathrm{BC}, \mathrm{BE}$, DE, EF, ABC, DEF

Pentagons: BCEF ${ }^{`}$
Hexagons: BDE, ABCD, ADEF
Heptagons: ABCF, DECF, ABCEF, BCDEF

## Points

9 points

44 points
5 points
18 points
28 points

Total: 104 points


## Concave Heptagon

Polygon Name

Triangles:
Quadrilaterals:
Pentagons:
Hexagons:
Heptagons:
Nonagons:
Decagons:

Regions
A, E, CE
C, D, DE
B, AB, ABD
BD, CDE
BC, ABC, ABDE
ABCD
BCD

Points
9 points
12 points
15 points
12 points
21 points
9 points
10 points

Total: 88 points


## Concave Octagon

Polygon Name
Triangles:
Quadrilaterals:
Pentagons:

Hexagons:
Heptagons:
Octagons:
Nonagons:

D, BDE
Regions
B, E
A, C. AB, AC, BD

DE, ABC
CD, ABD, ABCD
BCD, CDE, ABDE
BCDE

## Points

6 points 20 points 10 points

12 points
21 points
24 points
9 points

Total: 102 points
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