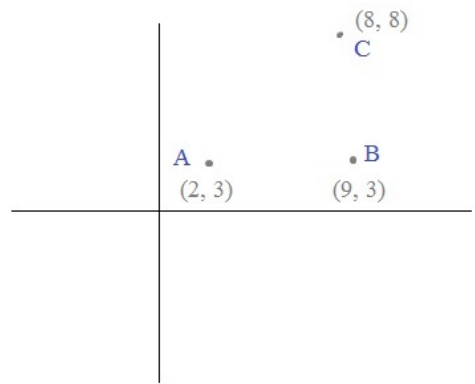# Middle School Geometry

Worksheets with detailed solutions

Topics include area, circles, coordinate plane, volume, angles, polygons, and more.
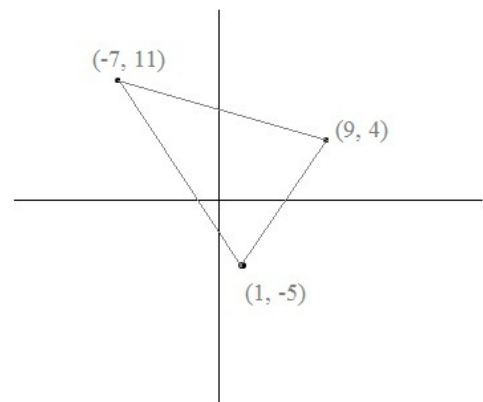
A parallelogram has the following vertices: A (2, 3)   B (9, 3)   C (8, 8)

   a) What is the 4th vertex of ▱ ABCD ?

   b) What is the 4th vertex of ▱ ADBC ?

   c) Assuming ▱ ABCD, What is the area?

(8, 8)
C

A .
(2, 3)

. B
(9, 3)

A triangle has the following vertices: (-7, 11)   (9, 4)   (1, -5)

Using "Encasement", find the area of the triangle
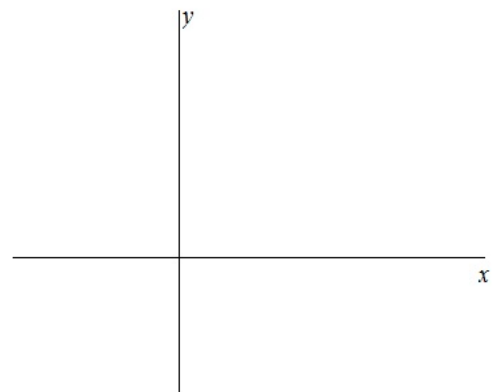

(-7, 11)

(9, 4)

(1, -5)

Identify the Quadrant or Axis of each point.
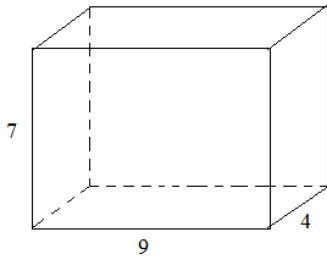
a) (2, -3)   b) (-2, 3)   c) (1, 210)   d) (-21, -3.44)   e) (0, 9)   f) (9, 0)

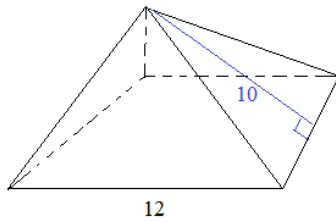A rectangle has the following vertices: (1, 1) (7, 1) (1, 4)

    a) Where is the 4th vertex?

    b) What is the perimeter of the rectangle?

    c) What is the area of the rectangle?

y

x

What is the surface area of a box with dimensions 4" x 7" x 9" ?

7

9

4

Find the surface area of the figure:

10

12

Square Pyramid

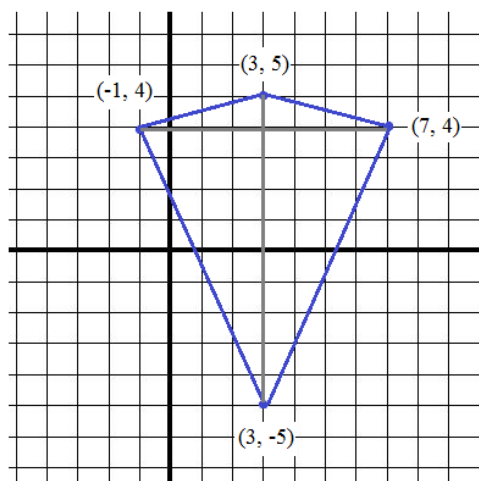
What is the volume of a 3' x 6' x 9' rectangular prism?

---

the figure with vertices (-1, 4) (7, 4) (3, 5) (3, -5) is a "kite"
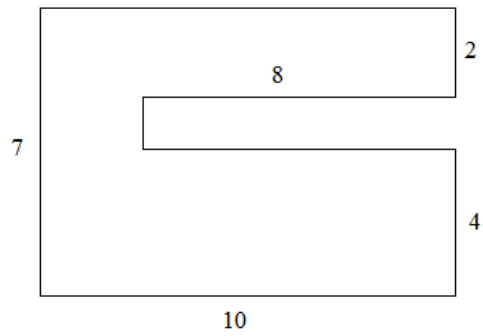
Diagonals are perpendicular

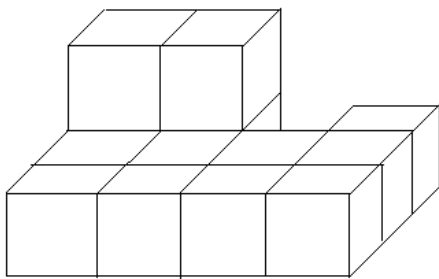Two pairs of disjointed sides are congruent

What is the area inside the kite?

(Hint: Cut into triangles)

(3, 5)

(-1, 4)

(7, 4)

(3, -5)

What is the area of the shape?

8
2
7
4
10

What is the volume and surface area is each block is a 3 x 3 inch cube?

A cake is baked in a 8" x 12" x 3" pan.

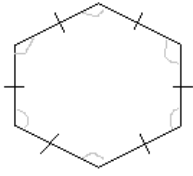If you frost the sides and top, how much frosting is needed?

A fish tank is 28" tall and 14" wide and 32" long.

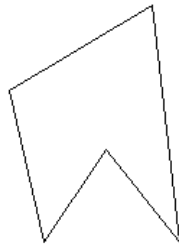How much water is needed to fill the tank to a level 25" high?

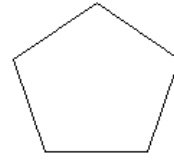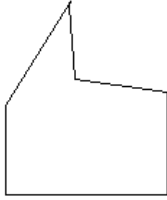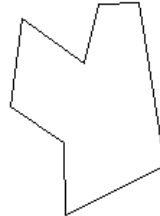I. Classifying Polygons
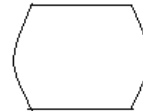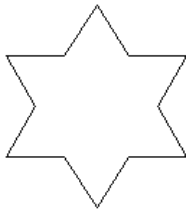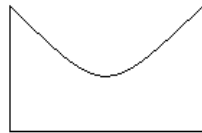
Match the figure with its description:

1)
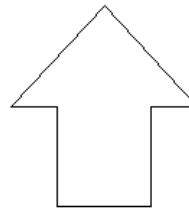
2)

3)
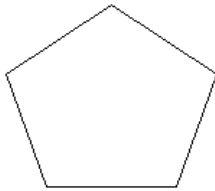
a) regular pentagon

b) concave pentagon

c) regular hexagon

d) convex pentagon

e) non-polygon

4)

5)

6)

f) concave octagon

g) convex octagon

h) hexagon

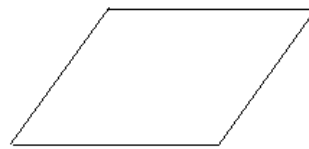i) quadrilateral

7)

8)

9)

j) dodecagon

k) heptagon

II. Polygon Parts

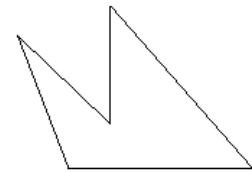1) Draw the diagonals in the polygons

a)

b)

c)

2) How many vertices are in a nonagon?

3) How many diagonals are in a triangle?

Find the area and circumference of each circle.

1)

(4, 4)

Circumference _____

Area _____

2)

(-3, 3) (7, 3)

Circumference _____

Area _____

3)

(-7, 7)

Circumference _____

Area _____

4)

(9, 6)

Circumference _____

Area _____

5)

Circumference _____

Area _____

(11, -2)

(17, -8)

6)

(-20, 35)

(-20, -3)

Circumference _____

Area _____

7)

(-20, 7)

(-8, 2)

Circumference _____

Area _____

8)

(50, 32)

(26, 14) (50, 14)

Circumference _____

Area _____

mathplane.com

Plot (and connect) the points in the following sequences....

Sequence A: (6, 4) (6, 13) (13, 6) (6, 6)

Sequence B: (2, 5) (1, 6) (1, 0)

Sequence C: (-6, -1) (-3, 2) (-2, 0) (0, -1) (-2, -2) (-6, -3)

Sequence D: (2, 4) (13, 4) (11, 0) (4, 0) (2, 4)

Sequence E: (4, 4) (4, 6) (3, 7) (4, 8) (5, 7) (4, 6)

Sequence F: (-2.5, 0) (-2, -0.5) (-2.5, -1) (-3, -0.5) (-2.5, 0)

Sequence G: (2, 5) (4, 5) (6, 4)
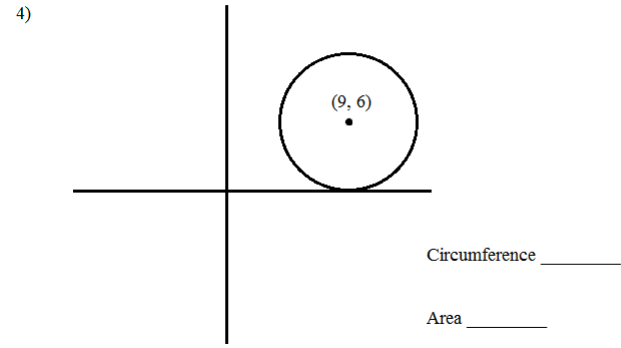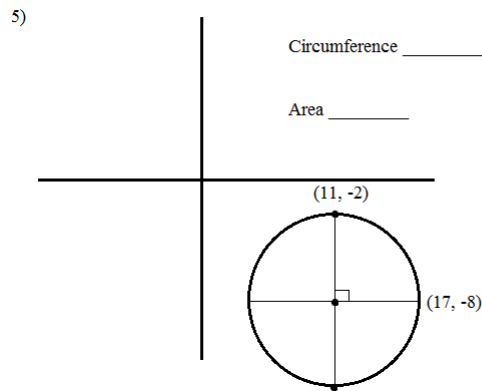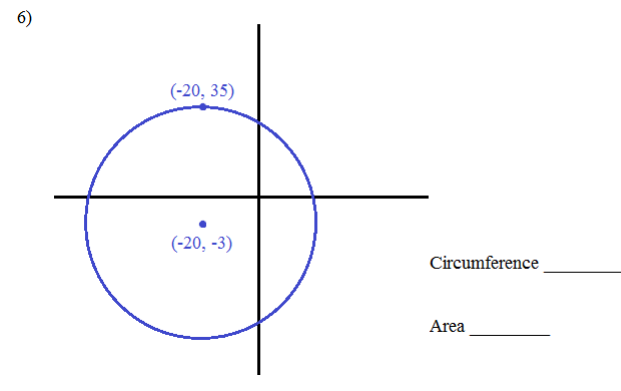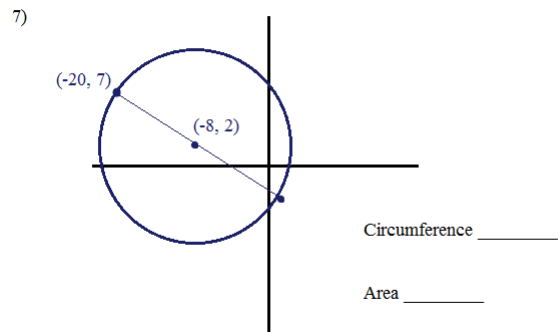
Sequence H: (-4, -2) (-2, -2)

Title:

Title Pieces: Arrange letter pairs in numerical order to reveal title of sketch!

BL
1

D_
5

KH
3

OC
2

EA
4

GO
6

IS
9

ES
7

_F
8

NG
11

HI
10

For Snoopy, the mental challenge from some geometry problems is just peanuts!

A parallelogram has the following vertices: A (2, 3)   B (9, 3)   C (8, 8)

a) What is the 4th vertex of ▱ ABCD ?

Since base $\overline{AB}$ is horizontal and 7 units long, the top of the parallelogram must be horizontal and 7 units long. Therefore, the 4th vertex is (1, 8)
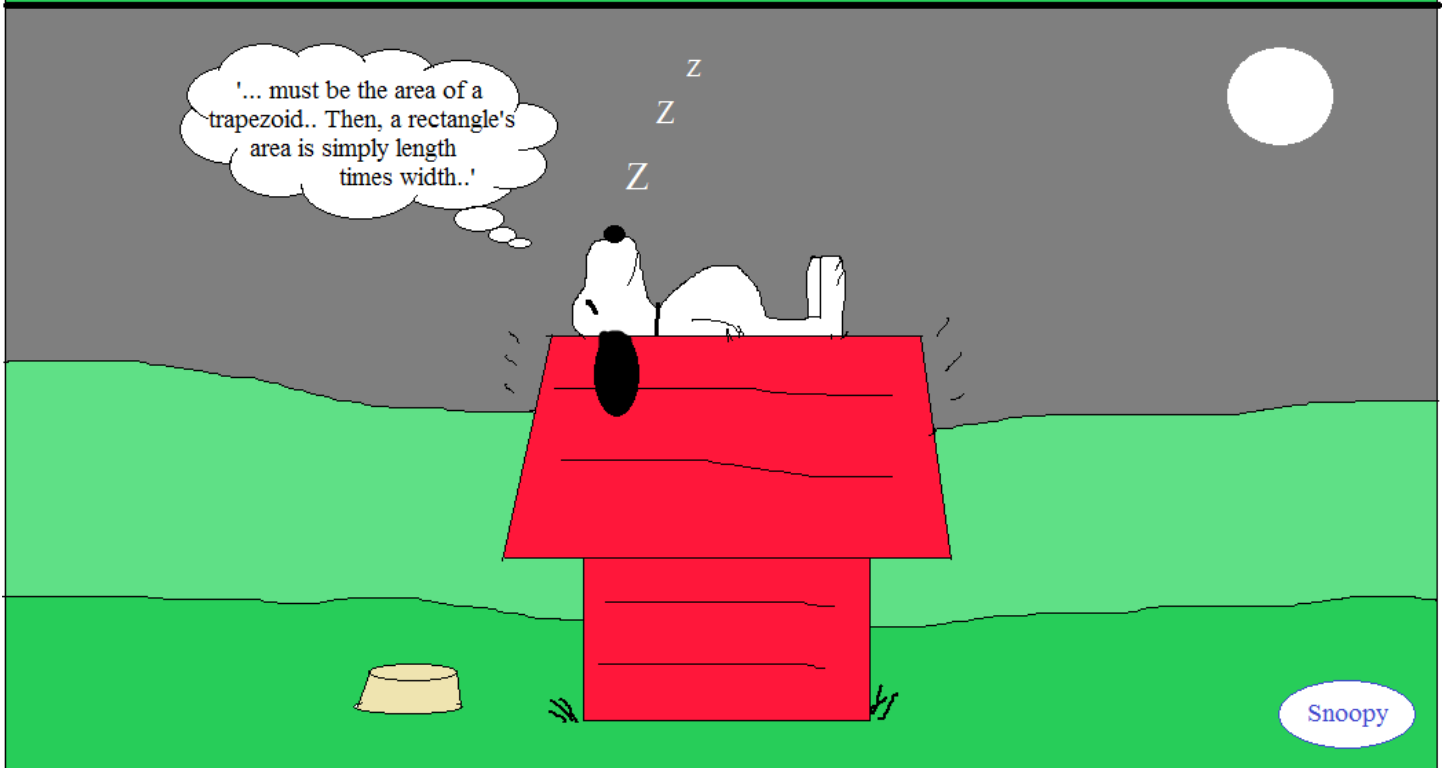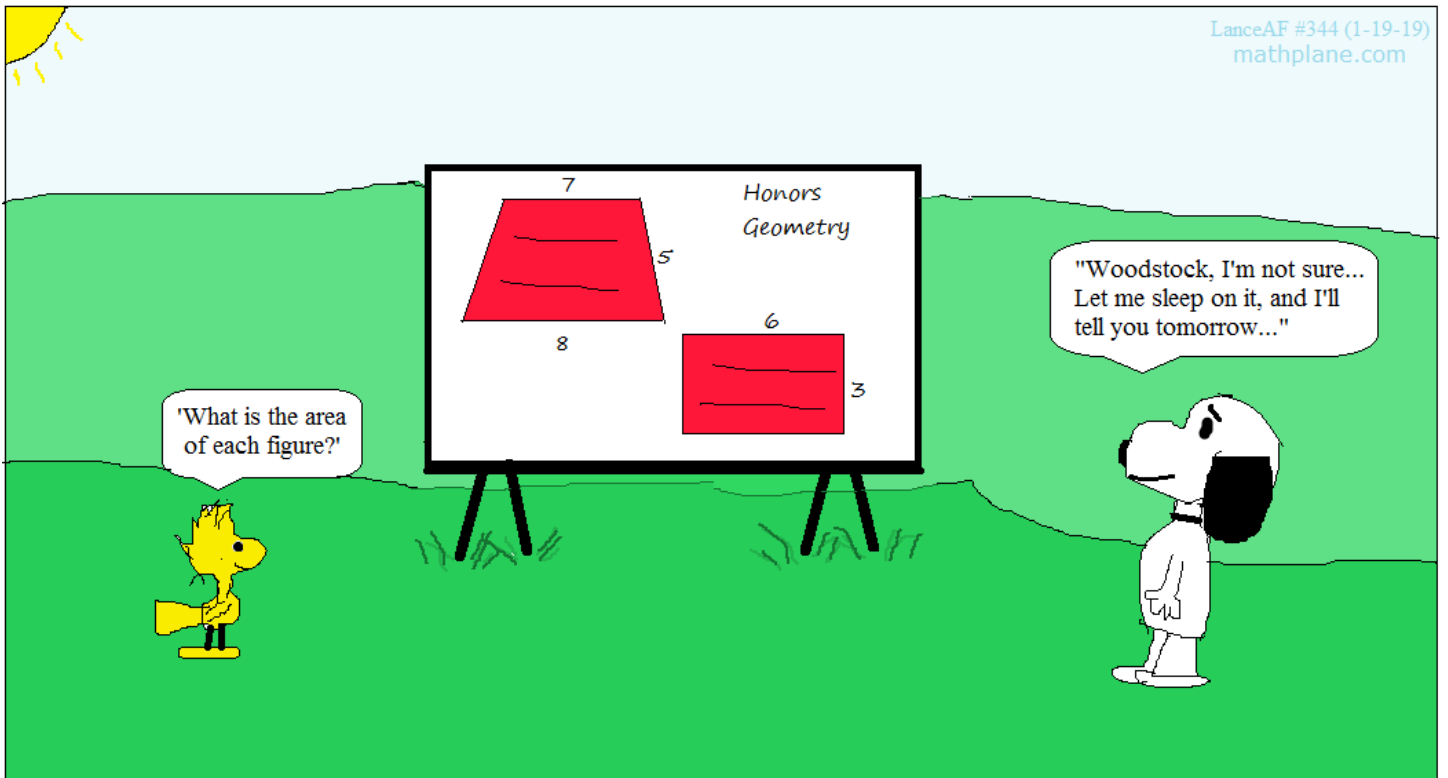
b) What is the 4th vertex of ▱ ADBC ?

Since C ---> B is 1 unit to the right and 5 units down,

    A ---> vertex 4 will be 1 unit to the right and 5 units down: (3, -2)

c) Assuming ▱ ABCD, what is the area?
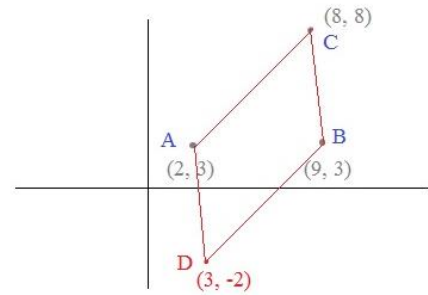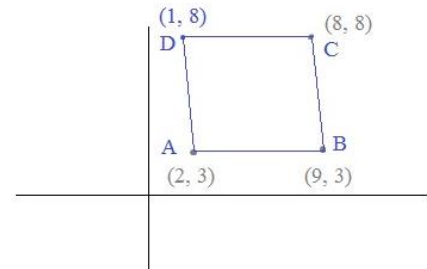
measure of $\overline{AB}$ = 7 units...

   and $\overline{CD}$ = 7 units..

height = 5 units
base = 7 units

Area = bh = 35 sq. units

Note: For parallelogram ADBC, Area = 35 sq units

(1, 8) D ·   (8, 8) C
A (2, 3)   B (9, 3)

(8, 8) C
A (2, 3)   B (9, 3)
D (3, -2)

A triangle has the following vertices: (-7, 11)   (9, 4)   (1, -5)

Using "Encasement" , find the area of the triangle

"Encasement" ('Encase' the triangle with a rectangle; find the area of surrounding right triangles.. Then, subtract area of right triangles from rectangle)

Area of rectangle: l x w = 16 x 16 = 256

Area of I : 1/2 bh = 1/2 (8)(16) = 64

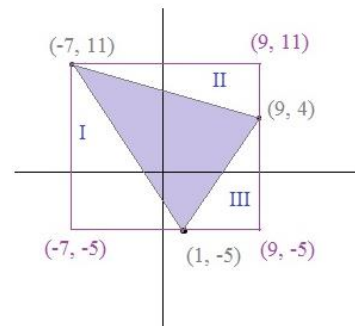Area of II: 1/2 bh = 1/2 (16)(7) = 56

Area of III: 1/2 bh = 1/2 (8)(9) = 36

256
-64
-56
-36
————
100   (inner triangle)
square units

(-7, 11)   (9, 11)
II
(9, 4)
I
III
(-7, -5)   (1, -5) (9, -5)

Identify the Quadrant or Axis of each point.

a) (2, -3)   b) (-2, 3)   c) (1, 210)   d) (-21, -3.44)   e) (0, 9)   f) (9, 0)

  IV   II   I   III   y-axis   x-axis

·c
II   I
·e
b·
·a   f
·d
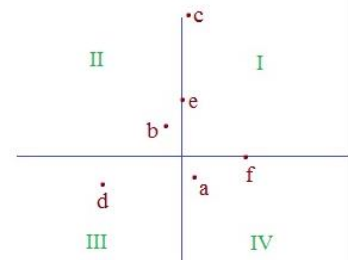III   IV

A rectangle has the following vertices: (1, 1) (7, 1) (1, 4)

a) Where is the 4th vertex?   (7, 4) is the 4th vertex

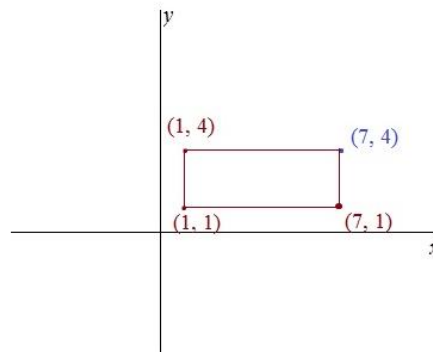b) What is the perimeter of the rectangle?

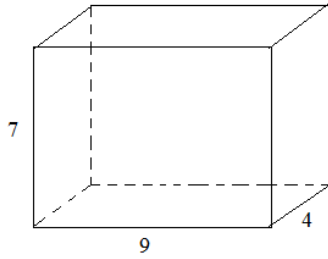length: 6 units
width: 3 units   perimeter: 18 units

c) What is the area of the rectangle?   area = length x width

area = 18 square units

(1, 4)   (7, 4)
(1, 1)   (7, 1)
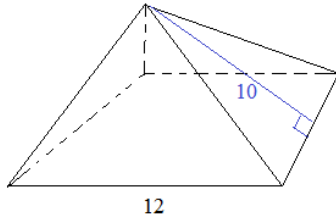
What is the surface area of a box with dimensions 4" x 7" x 9" ?

Area of rectangle = lw

Area of front (and back) = 7" x 9" = 63 sq. inches   Total 126 sq. inches
Area of left (and right) = 7" x 4" = 28 sq. inches   Total 56 sq. inches
Area of bottom (and top) = 9" x 4" = 36 sq. inches   Total 72 sq. inches

Total area of 6 sides: 254 square inches

7
9
4

Find the surface area of the figure:

Base (square) = 12 x 12 = 144 square units

Side (triangle) = $\frac{1}{2}$ (base)(height)

$\frac{1}{2}$ (12)(10) = 60 square units

4 sides: 240 square units

Total of 5 sides: 384 square units

10
12

What is the volume of a 3' x 6' x 9' rectangular prism?
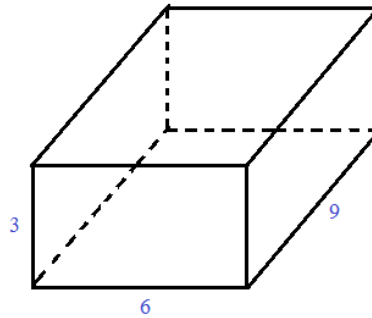
The volume of a rectangular prism is

(area of base) x (height/depth)

Area of base = length x width
rectangle

= 6' x 3' = 18 sq. feet

then, the volume is

18 sq. feet x 9 feet = 162 cubic feet

3
9
6

---

the figure with vertices (-1, 4) (7, 4) (3, 5) (3, -5) is a "kite"

Diagonals are perpendicular
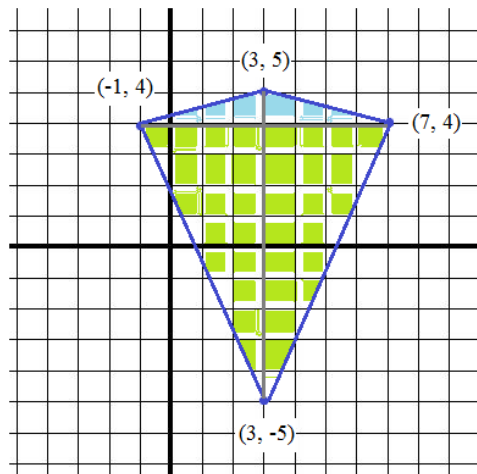
Two pairs of disjointed sides are congruent

What is the area inside the kite?
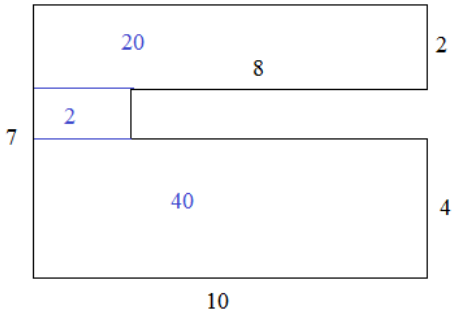
(Hint: Cut into triangles)

Top triangle: base = 8   height = 1
area = 1/2(8)(1) = 4

Bottom (upside) triangle: base = 8   height = 9
area = 1/2(8)(9) = 36

Total area = 40

(3, 5)
(-1, 4)
(7, 4)
(3, -5)

What is the area of the shape?

Area of whole − area of cutout

70 - 8 = 62

Add areas of 3 parts:

20

2

8

2

7

40

4

10

20 + 2 + 40 = 62

2

8

8

7   70

4

10
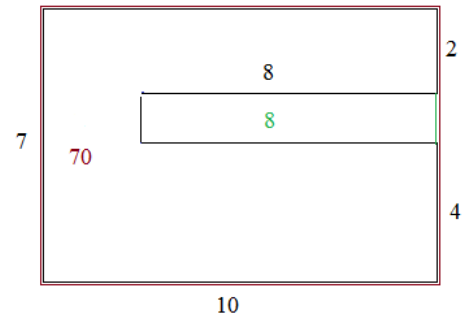
What is the volume and surface area is each block is a 3 x 3 inch cube?
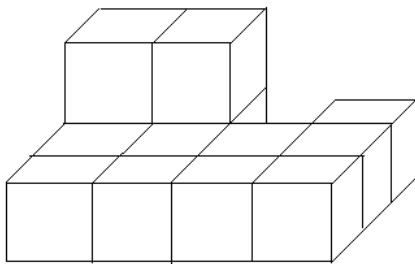
Volume: each block is 3" x 3" x 3" = 27 cubic inches

there are 13 blocks...

total volume: 13 x 27 = 351 cubic inches

Surface area: each exposed 'face' is 3" x 3" = 9 square inches...

facing down -- 11
facing left -- 4
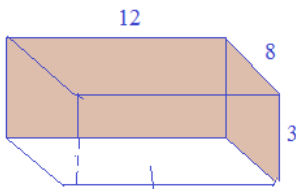facing right -- 5   total faces: 43
facing forward -- 6
facing back -- 6   surface area = 43 x 9 = 387 sq inches
facing up -- 11

A cake is baked in a 8" x 12" x 3" pan.

If you frost the sides and top, how much frosting is needed?
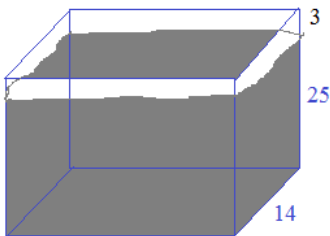
12

8

3

bottom of the cake is
not frosted..

surface area ---   top: 96

lateral area: 72 + 48

(the bottom is excluded)   216 sq inches

A fish tank is 28" tall and 14" wide and 32" long.

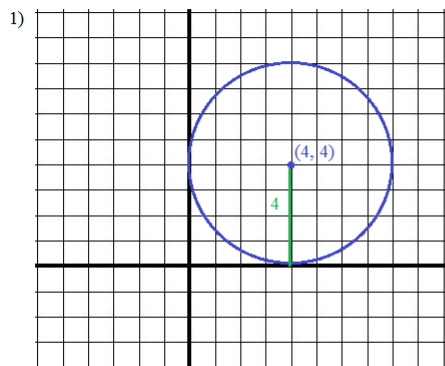How much water is needed to fill the tank to a level 25" high?

3

25

14

32

volume: 14 x 32 x 25 =

11,200 cubic inches of water

Find the area and circumference of each circle. SOLUTIONS

1)

(4, 4)

4

radius: 4

$C = \pi r$

$A = \pi r^2$

Circumference ___8π___

Area ___16π___

2)

(-3, 3) (2, 3) (7, 3)
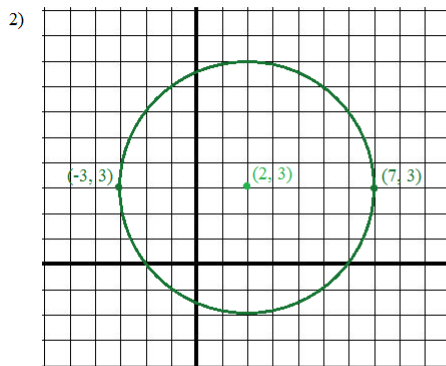
center of circle is midpoint:
(2, 3)

radius: 5   diameter: 10

Circumference ___10 π___

Area ___25π___

$A = \pi r^2$ $C = \pi d$

3)

(-7, 7) 7 (0, 7)

7

(-7, 0)
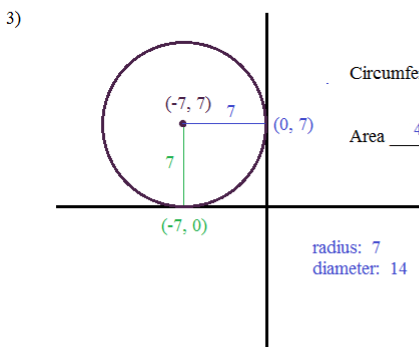
Circumference ___14 π___ units

Area ___49π___ square units

radius: 7
diameter: 14

4)

(9, 6)

6

(9, 0)
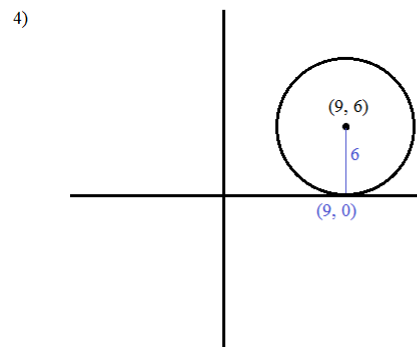
radius: 6 units

Circumference ___12 π___

Area ___36 π___

5)

(11, -2)

6

(11, -8)   6   (17, -8)

Circumference ___12 π___
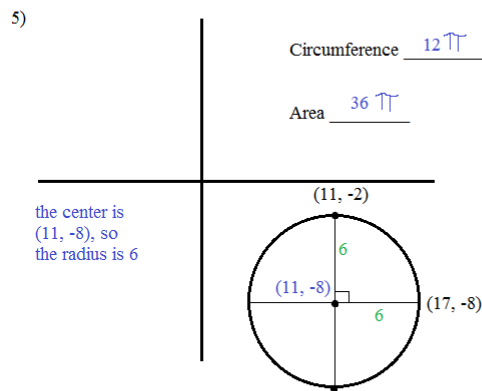
Area ___36 π___

the center is
(11, -8), so
the radius is 6

6)

(-20, 35)

38

(-20, -3)
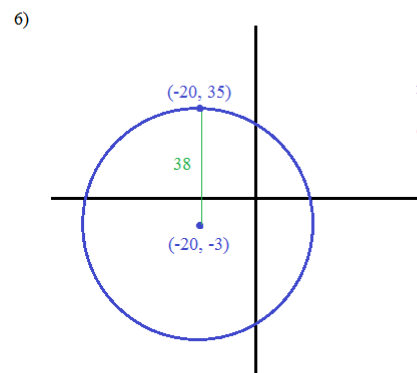
radius: 35 - (-3) = 38

diameter: 76

Circumference ___76 π___ units

Area ___1444 π___ square units

7)

(-20, 7)

13

5

12   (-8, 2)
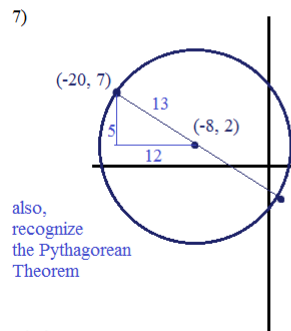
also,
recognize
the Pythagorean
Theorem

distance formula: $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

$\sqrt{(-20 - (-8))^2 + (7 - 2)^2}$

$\sqrt{(12)^2 + (5)^2} = 13$

Circumference ___26 π___

Area ___169 π___

8)

(50, 32)

30

18

(26, 14)   24   (50, 14)
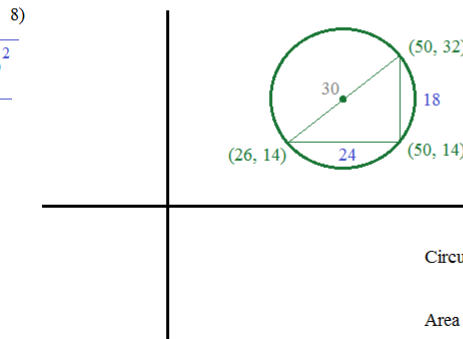
Use Pythagorean Theorem,
or recognize this is a
"3-4-5 Pythagorean Triple"

18 - 24 - 30
3x6   4x6   5x6

diameter: 30
radius: 15

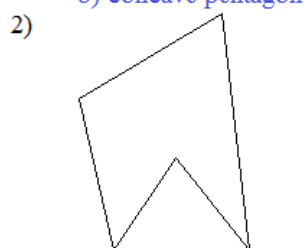Circumference ___30 π___

Area ___225 π___

mathplane.com

I. Classifying Polygons

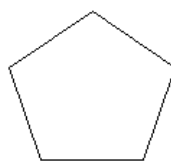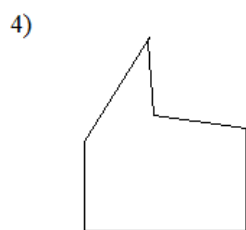Match the figure with its description:

1)
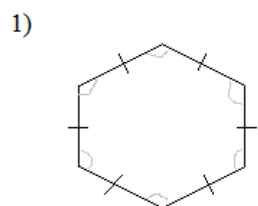
c) regular hexagon

2) b) concave pentagon

3) d) convex pentagon

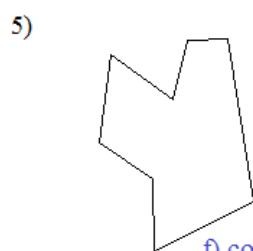(if the sides/
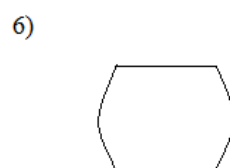angles were
congruent,
then it is
regular
as well...)

a) regular pentagon

b) concave pentagon

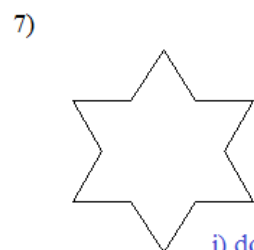c) regular hexagon
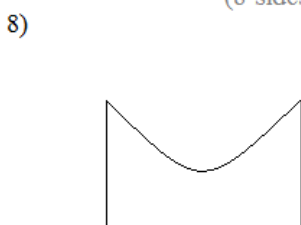
d) convex pentagon

e) non-polygon

f) concave octagon

g) convex octagon

h) hexagon

i) quadrilateral

j) dodecagon

k) heptagon

4)

h) hexagon (concave)

5)

f) concave octagon
(8-sides)

6)

e) non-polygon
(not all sides
are line
segments)

7)

j) dodecagon
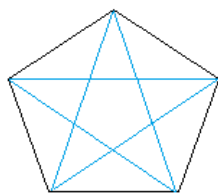(12-sided polygon)

8)

e) non-polygon

9)
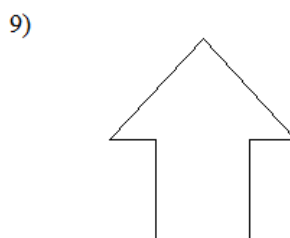
k) heptagon
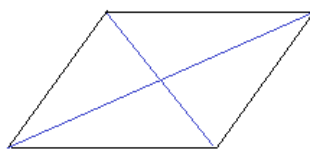(7-sided)

II. Polygon Parts

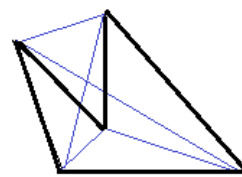1) Draw the diagonals in the polygons

a)

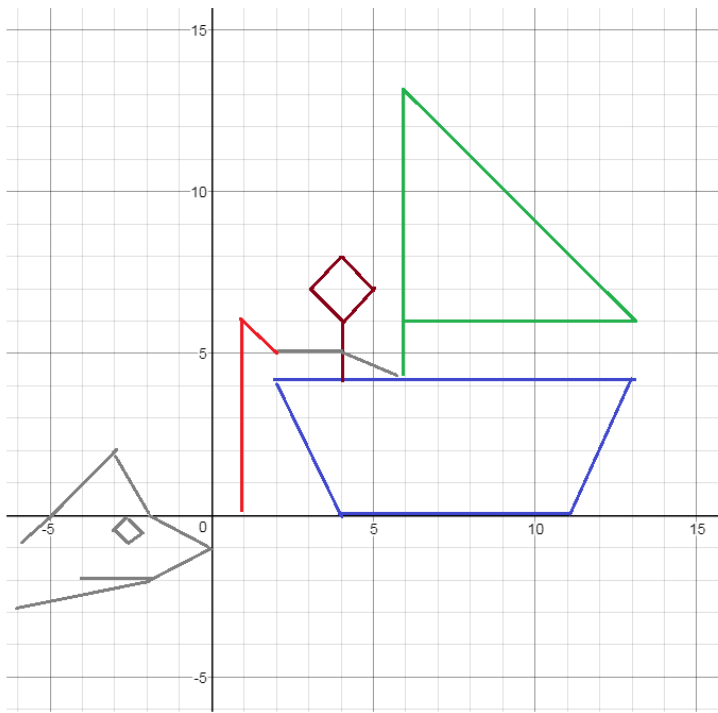5 total
diagonals

b)

c)

(pentagon: 5 total diagonals)

2) How many vertices are in a nonagon?   A nonagon has 9 sides, so it has 9 vertices

3) How many diagonals are in a triangle?   A triangle has ZERO diagonals
(because there are no 'non-consecutive' sides)

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Plot (and connect) the points in the following sequences....

Sequence A: (6, 4) (6, 13) (13, 6) (6, 6)

Sequence B: (2, 5) (1, 6) (1, 0)

Sequence C: (-6, -1) (-3, 2) (-2, 0) (0, -1) (-2, -2) (-6, -3)

Sequence D: (2, 4) (13, 4) (11, 0) (4, 0) (2, 4)

Sequence E: (4, 4) (4, 6) (3, 7) (4, 8) (5, 7) (4, 6)

Sequence F: (-2.5, 0) (-2, -0.5) (-2.5, -1) (-3, -0.5) (-2.5, 0)

Sequence G: (2, 5) (4, 5) (6, 4)

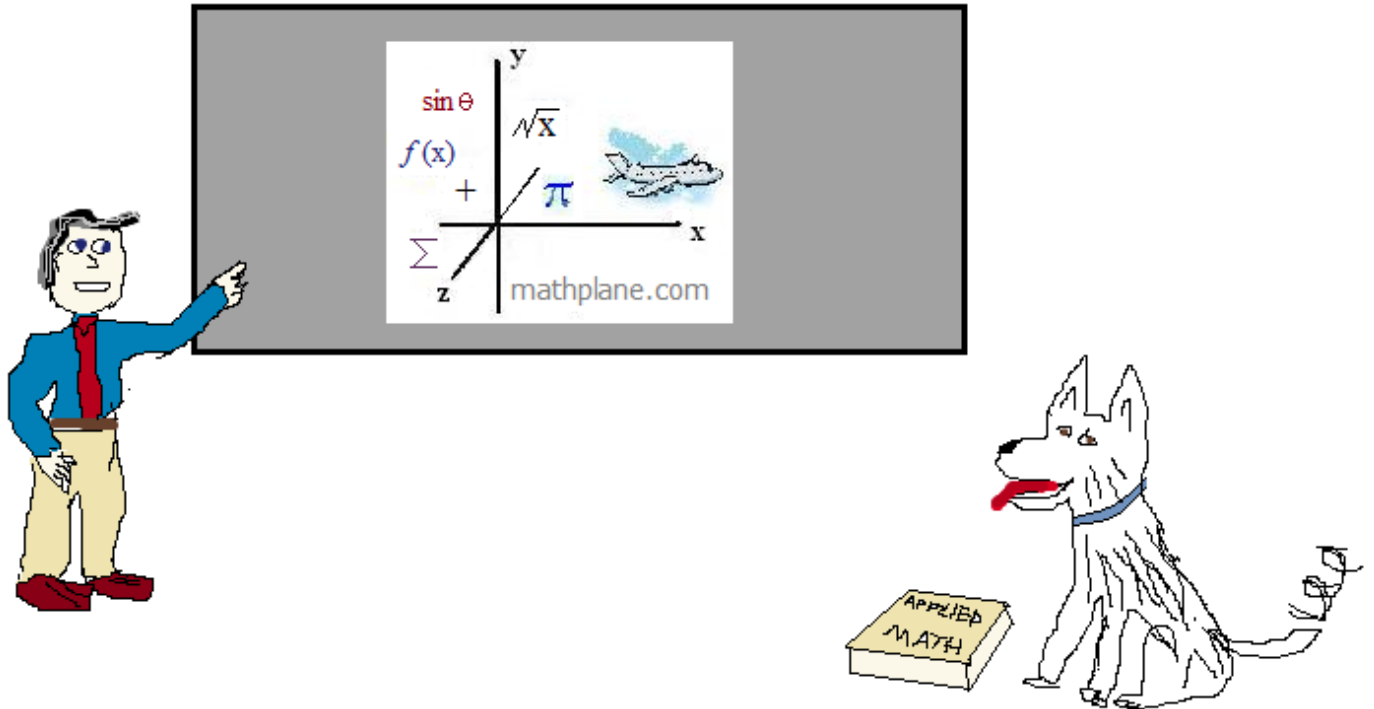Sequence H: (-4, -2) (-2, -2)

Title:
"BLOCKHEAD_GOES_FISHING!"

Title Pieces: Arrange letter pairs in numerical order to reveal title of sketch!

BL
1

OC
2

D _
5

KH
3

EA
4

GO
6

IS
9

ES
7

_F
8

NG
11

HI
10

mathplane.com

Thanks for visiting! (Hope it helped.)

If you have questions, suggestions, or requests, let us know.

Cheers

Also, at Mathplane.ORG for mobile and tablets.

And, our store at TeachersPayTeachers.com