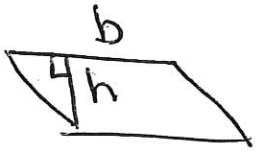
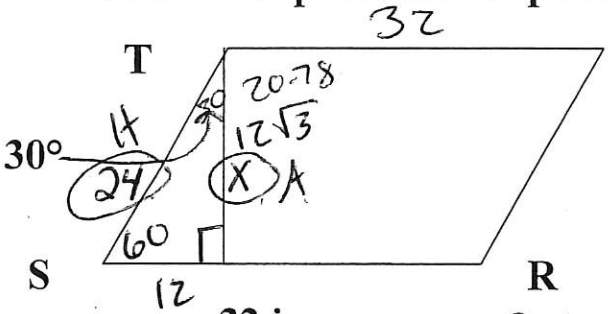
11.1 Areas of Parallelograms



- **Area of Parallelogram = base X height**

Example

Find the area and perimeter of parallelogram RSTU.



$24 \cdot \cos 30 = \frac{X}{24}$ ~~·24~~

20.78

Perimeter

32+32+24+24 =

112 in

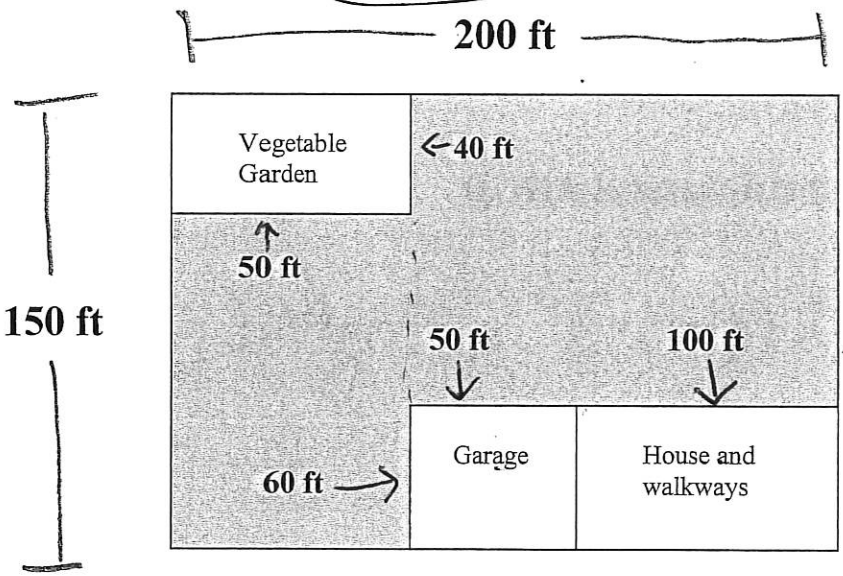
Area

32 · 20.78 in

664.96 in²

Example

The Kanes are planning to sod some parts of their yard find the number of square yards of grass needed.



200 X 150 = 30,000 what

veg 40 X 50 — 2,000

Garage 50 X 60 — 3,000

House 100 X 60 — 6,000

19,000 ft²

9 ft² = 1 yd²

3 ft² = 1 yd

9 ft² = 1 yd²

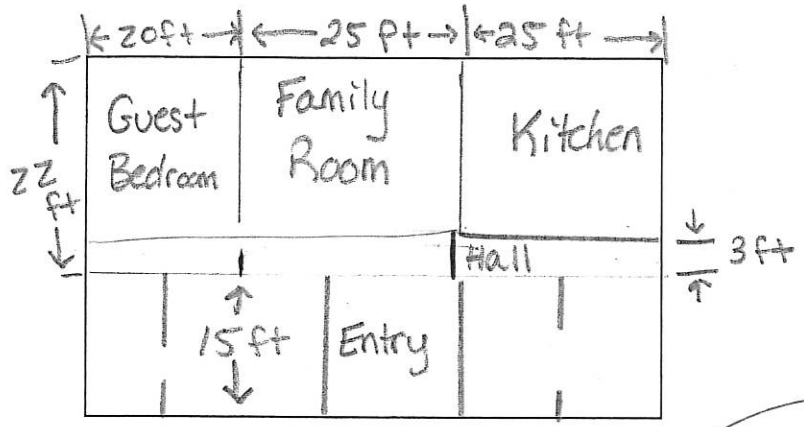
9

2111.1 2111

2112 yds²

Example

The Smith's are planning to have new carpet installed in their guest bedroom, family room, and hallway. Find the number of square yards of carpet they should order.



G Bed 440
FRoom 550
Hall 75

1065

1065 ft²

9

118.3 yds²

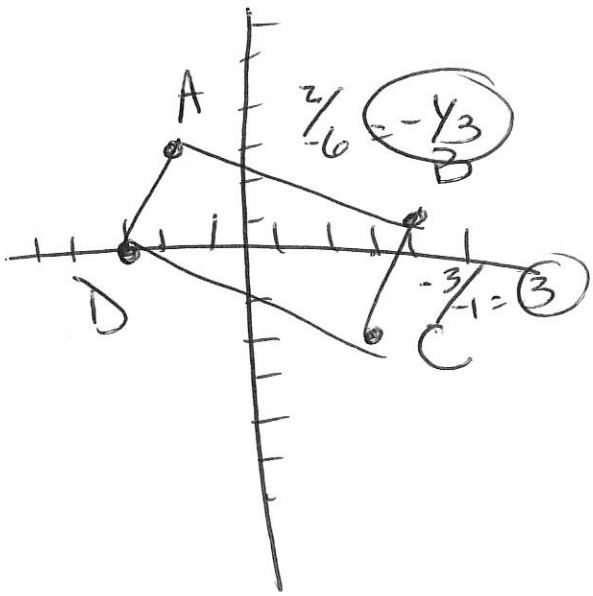
119 yd²

Example

The vertices of a quadrilateral are at A(-2, 3), B(4, 1), C(3, -2) and D (-3, 0).

a) Determine whether the quadrilateral is a square, a rectangle, or a parallelogram.

b) Find the area of quadrilateral ABCD



$AB = \sqrt{(-2-4)^2 + (3-1)^2}$

$-6^2 + 2^2$

$\sqrt{40} = 6.3$

$BC = \sqrt{(4-3)^2 + (1+2)^2}$

$1^2 + 3^2$

$\sqrt{10} = 3.16$

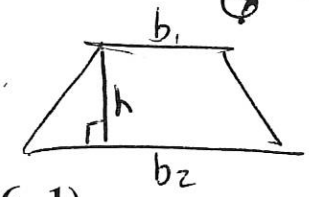
≈20

11.2 Areas of Triangles, Trapezoids, and Rhombi

- **Area of a triangle =** $\frac{1}{2}bh$

↖ has to be perp.

- **Area of a trapezoid =** $\frac{1}{2}h(b_1+b_2)$



Example

Find the area of trapezoid RSTU with vertices R(4,2), S(6,-1), T(-2,-1), and U(-1,2).

$\frac{1}{2}h(b+b)$

$\frac{1}{2} \cdot 3(5+8)$

$\frac{1}{2} \cdot 3 \cdot 13 \quad u^2$

- **Area of a rhombus =** $\frac{1}{2}d_1 d_2$ ↖ diagonal

Example

Find the area of rhombus MNPR with vertices at M(0,1), N(4,2), P(3, -2), and R(-1,-3).

$MP = 4.2 \quad \sqrt{18}$

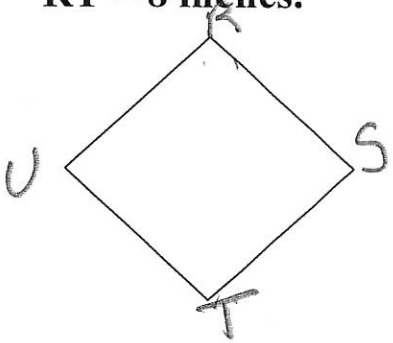
$RN = 7.07.$

$\frac{1}{2} \cdot 4 \cdot 2 \cdot 7.07$

$14.9 \, u^2$

Example

Rhombus RSTU has an area of 64 square inches. Find US if RT = 8 inches.



$\frac{1}{2} d_1 \cdot d_2$

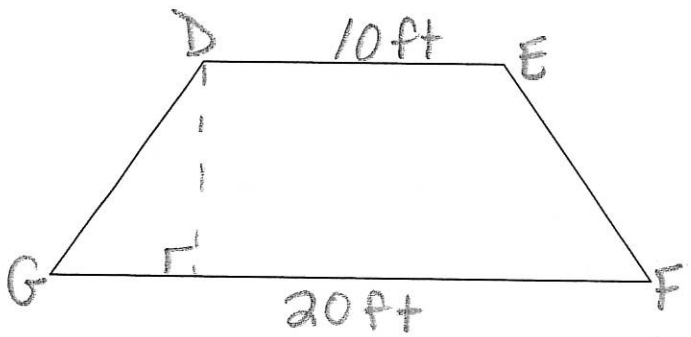
$\frac{1}{2} \cdot 8 \cdot d = 64$

$\frac{4d}{4} = \frac{64}{4}$

$d = 16 \text{ in}$

Example

Trapezoid DEFG has an area of 120 square feet. Find the height of DEFG.



$\frac{1}{2} h (b_1 + b_2)$

$\frac{1}{2} h (10 + 20) = 120$

$\frac{1}{2} h 30 = 120$

$\frac{15h}{15} = \frac{120}{15}$

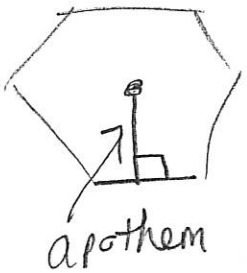
$h = 8 \text{ ft}$

Postulate:

Congruent figures have equal areas

sides =
angles =

11.3 Areas of Regular Polygons and Circles



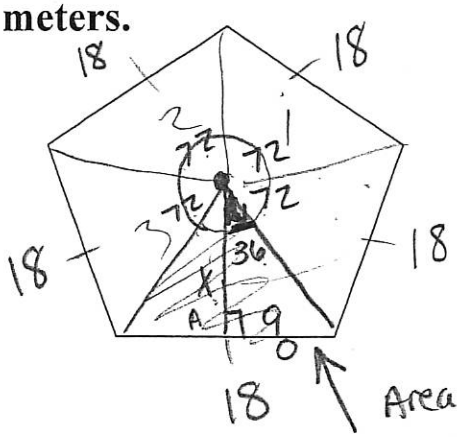
- **Apothem** – a segment drawn from the center of a regular polygon perpendicular to a side of the polygon.

- **Area of a regular polygon =** $\frac{1}{2}Pa$

Perimeter, apothem

Example

Find the area of a regular pentagon with a perimeter of 90 meters.



P=90

360/5

Area △

$\frac{1}{2}bh$

$\frac{1}{2} \cdot 18 \cdot h$

*Always

$\tan 36 = \frac{9}{x}$

$9 \div \tan 36 = x$

$x = 12.38$

$\frac{1}{2} \cdot 18 \cdot 12.38$

111.42

$557.1 m^2$

Try it: Find the area of the following regular polygons.

Find the area of each regular polygon. Round to the nearest tenth.

1. 

$\text{Tan } 60 = \frac{7}{x}$

$7 \div \text{Tan } 60$

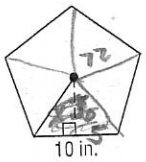
$x = 4.04$

84.84 m^2

$\frac{1}{2} b h$

$\frac{1}{2} \cdot 14 \cdot 4.04$

28.28

2. 

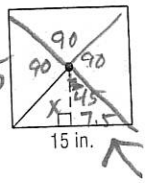
$360 \div 5$

$\text{Tan } 36 = \frac{5}{x}$

$\frac{1}{2} \cdot 6.9 \cdot 10 \quad x = 6.9$

34.5

172.5 in^2

3. 

$\text{Tan } 45 = \frac{7.5}{x}$

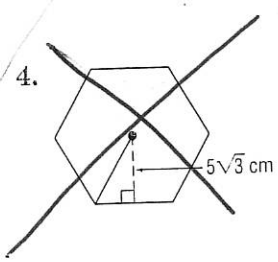
$x = 7.5$

$\frac{1}{2} b h$

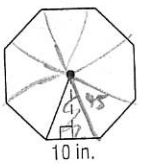
$\frac{1}{2} \cdot 15 \cdot 7.5$

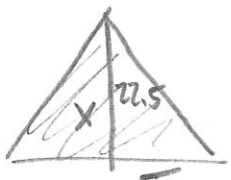
56.25

225 in^2

4. 

2) 3)

5. 

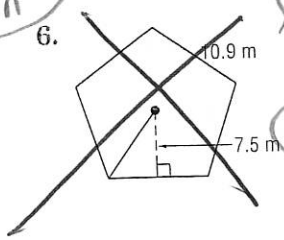


$\text{Tan } 22.5 = \frac{5}{x}$

12.07

$\frac{1}{2} \cdot 10 \cdot 12.07$

482.8 in^2

6. 

5)

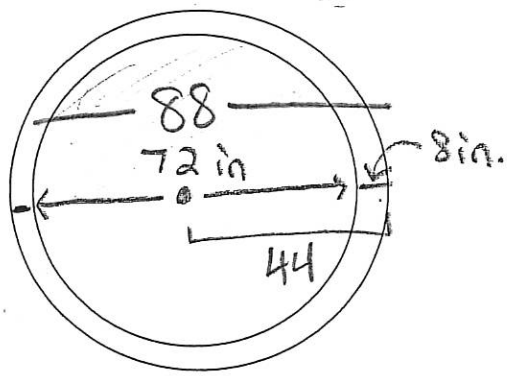
➢ **Area of a circle =** πr^2

π radius

3.14

Example

An outdoor accessories company manufactures circular covers for outdoor umbrellas. If the cover is 8 inches longer than the umbrella on each side, find the area of the cover in square yards.



$\pi 44^2$

$\approx 6082 in^2 / 144$

$1 ft = 12 in$

$1 ft^2 = 144 in^2$

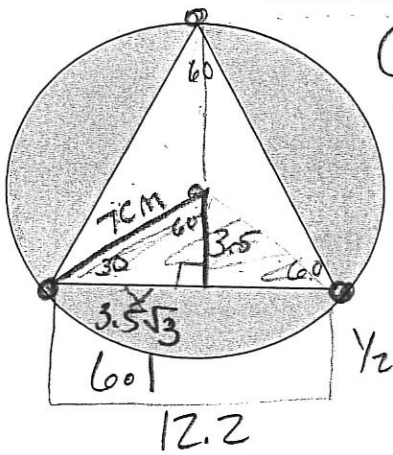
$= 42.23 ft^2$

9

$\approx 4.7 yd^2$

Example

Find the area of the shaded region. Assume that the triangle is equilateral. Round to the nearest tenth.



Circle πr^2

$\pi 7^2 = 153.9$

154 cm^2

Triangle

$\frac{1}{2} \cdot 12.2 \cdot 3.5$

21.35 64.05

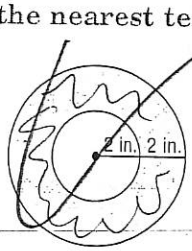
89.95 cm^2

90 cm^2

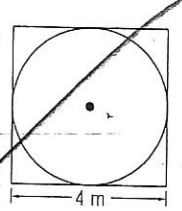
Try It:

Find the area of each shaded region. Assume that all polygons are regular. Round to the nearest tenth.

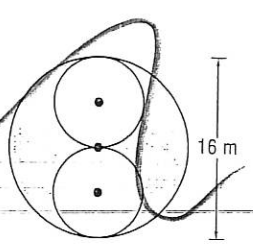
1.



2.

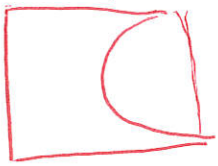


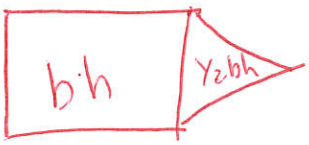
3.



11.4 Areas of Irregular Polygons

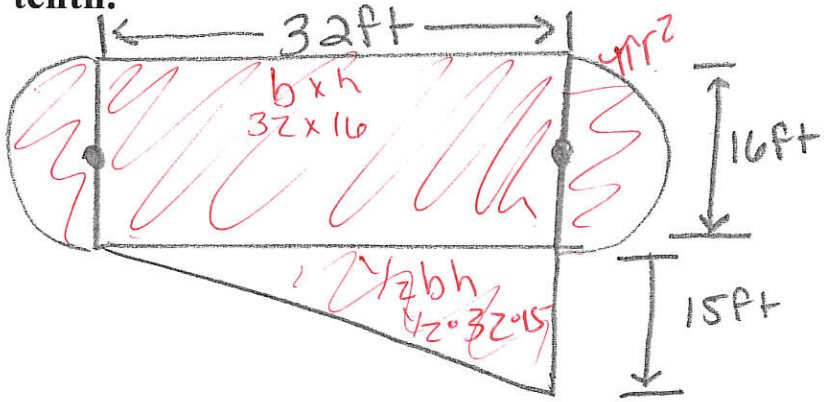
- **Irregular figure** – a figure that cannot be classified into the specific shapes we have studied





Example

Find the area of the figure in square feet. Round to the nearest tenth.

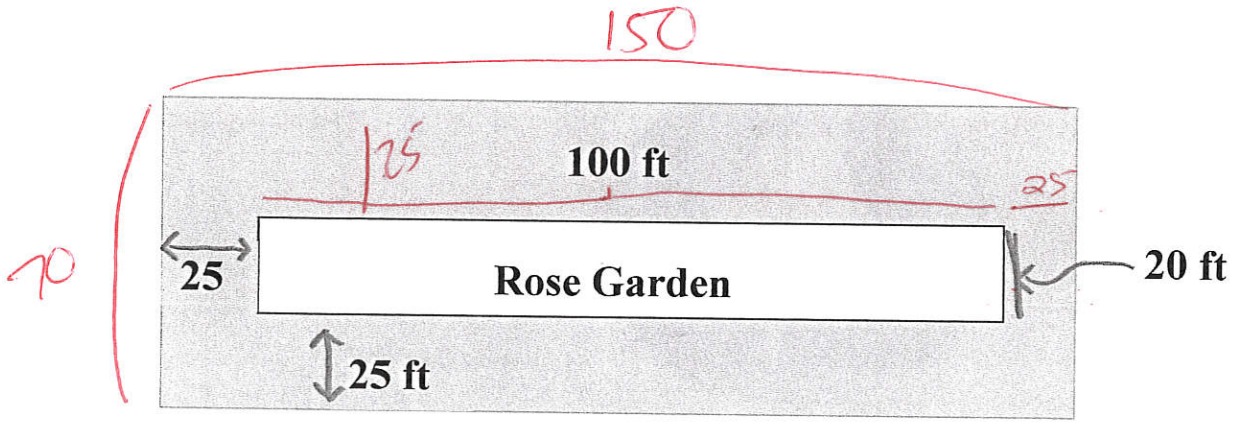


Rect. 512 ft²
Circle ½π8² 201
Triangle 240

953 ft²

Example

A rectangular rose garden is centered in a border of lawn. Find the area of the lawn around the garden in square feet.



100 x 20 2000ft² Garden

70 x 150 10500ft² Yard

NAME _____ DATE _____ PERIOD ____

11-4 Study Guide and Intervention *(continued)*

Areas of Irregular Figures

Irregular Figures on the Coordinate Plane To find the area of an irregular figure on the coordinate plane, break up the figure into known figures. You may need to use the Distance Formula to find some of the dimensions.

Example **Find the area of irregular pentagon *ABCDE*.**

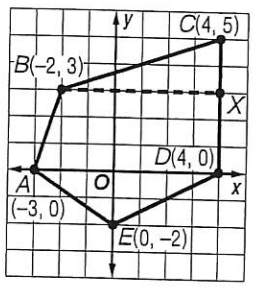
Draw $\overline{BX}$ between $B(-2, 3)$ and $X(4, 3)$ and draw $\overline{AD}$. The area of $ABCDE$ is the sum of the areas of $\triangle BCX$, trapezoid $BXDA$, and $\triangle ADE$.

A = area of $\triangle BCX$ + area of $BXDA$ + area of $\triangle ADE$

$= \frac{1}{2}(2)(6) + \frac{1}{2}(3)(6 + 7) + \frac{1}{2}(2)(7)$

$= 6 + \frac{39}{2} + 7$

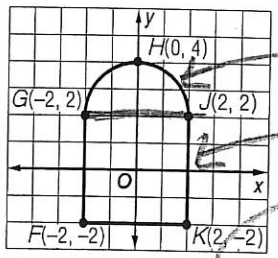
$= 32.5$ square units



Exercises

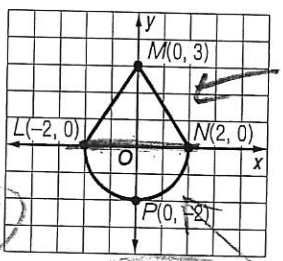
Find the area of each figure. Round to the nearest tenth.

1.



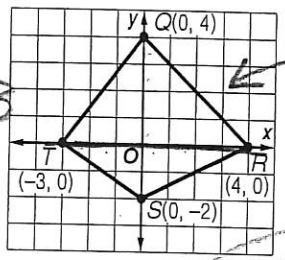
6.3
12.5
16
22.3u²

2.



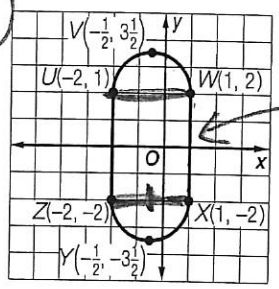
½bh
½·4·3
6
12.3u²
π·2²
6.3

3.



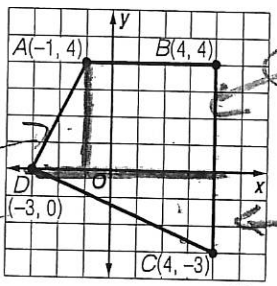
½bh
½·7·4
14
½·7·2
7
21u²

4.



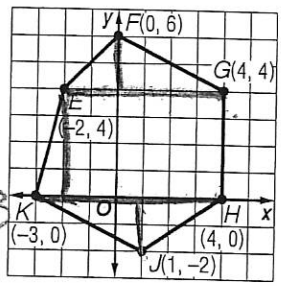
12
½·2·4
4
πr²
π1.5²
7.1
19.1u²

5.



20
½·7·3
10.5
34.5u²

6.



Rect b×h
6·4
24
Tri
½bh
½·7·2
7
½·6·2
6
½·4·1
2
39u²

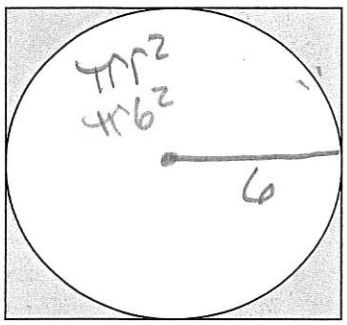
11.5 Geometric Probability

Probability = likeliness of something

$\frac{\text{what looking for}}{\text{total}}$ $\frac{\text{shaded}}{\text{total area}}$

Example

A game board consists of a circle inscribed in a square. What is the chance that a dart thrown at the board will land in the shaded area?



12 inches

shaded $\frac{144-113}{144}$ square $= \frac{31}{144}$

≈ 21.5

21.5%

How can we find the area of the shaded region?

Square - Circle

- **Sector of a Circle –**  "Piece of Pie"

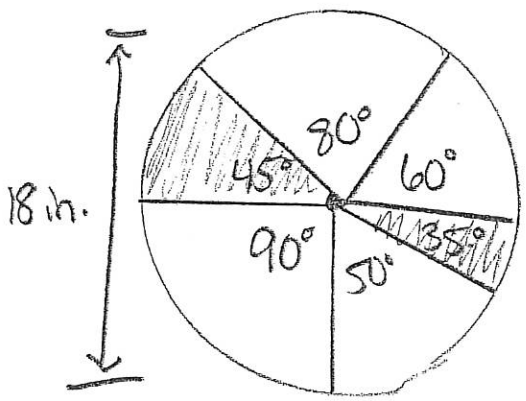
- **Area of a sector =** $\frac{\text{deg}}{360}\pi r^2$

$\frac{80}{360} \cdot \pi 9^2$

Example

Find the area of the shaded sectors. $\frac{\text{deg}}{360} \cdot \pi r^2 = 56.5u^2$

Find the probability that a point chosen at random lies in the shaded region.



$\frac{56.5}{\pi 9^2}$

$\frac{80}{360} \cdot .222$

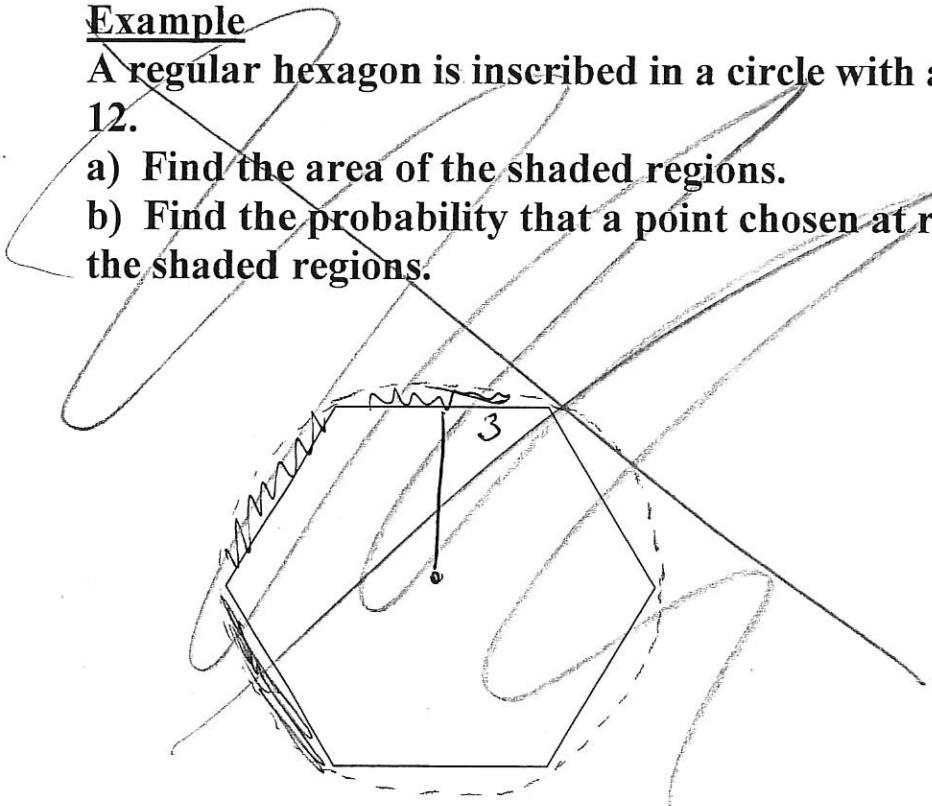
22.2%

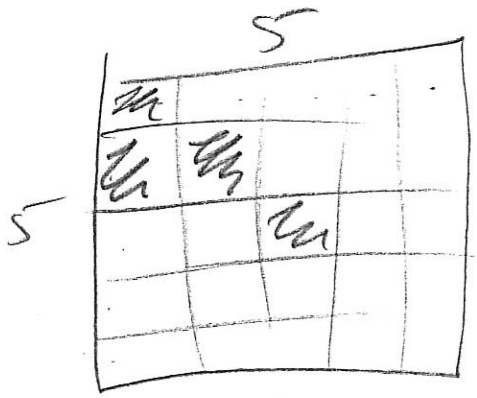
Example

A regular hexagon is inscribed in a circle with a diameter of 12.

a) Find the area of the shaded regions.

b) Find the probability that a point chosen at random lies in the shaded regions.





$\frac{4}{25}$