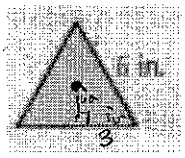
Name: key Date:
Geometry Band:

Unit 10: Area Study Guide

LT#1: Find the area of a regular polygon.

Find the area of each regular polygon. If your answer is not an integer, leave it in simplest radical form.

1.



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

$= \frac{1}{2}(\sqrt{3})(18)$

$= \boxed{9\sqrt{3}}$ in.^{2}

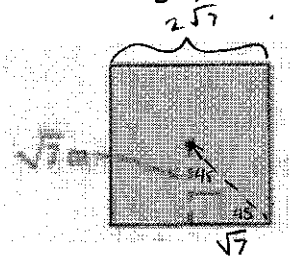
$p = 6(3) = 18$

long leg $= \sqrt{3} \cdot$ short leg

$3 = \sqrt{3} \cdot a$

$a = \frac{3}{\sqrt{3}} = \frac{3\sqrt{3}}{3} = \sqrt{3}$

2.



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

$= \frac{1}{2}(\sqrt{7})(8\sqrt{7})$

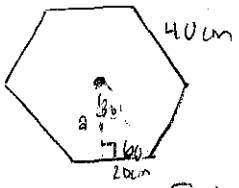
$= 4\sqrt{49}$

$= 4 \cdot 7$

$= \boxed{28}$ m^2

$p = 4(2\sqrt{7}) = 8\sqrt{7}$

3. What is the area of a regular hexagon with a perimeter of 240 cm?



long leg $= \sqrt{3} \cdot$ short leg

$a = \sqrt{3} \cdot 20$

$a = 20\sqrt{3}$

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

$= \frac{1}{2}(20\sqrt{3})(240)$

$= \boxed{2400\sqrt{3}}$ cm^2

4. What is the area of a square with radius 7.5 m?

hyp $= \sqrt{2} \cdot$ leg

$7.5 = \sqrt{2} \cdot a$

$a = \frac{7.5}{\sqrt{2}} = \frac{7.5\sqrt{2}}{2}$

$p = \frac{7.5\sqrt{2}}{2} \cdot 2 \cdot 4 = 30\sqrt{2}$

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

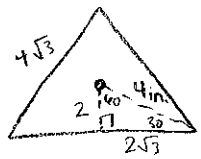
$= \frac{1}{2}\left(\frac{7.5\sqrt{2}}{2}\right)(30\sqrt{2})$

$= 56.25\sqrt{4}$

$= 56.25 \cdot 2 = \boxed{112.5}$ m^2

Sketch each regular polygon with the given radius. Then find its area to the nearest tenth.

5. triangle; radius 4 in.



hyp $= 2 \cdot$ short leg

$4 = 2 \cdot 2$

$2 = 2$

long leg $= \sqrt{3} \cdot$ short leg

$= \sqrt{3} \cdot 2$

$= 2\sqrt{3}$

$p = 4\sqrt{3} \cdot 3 = 12\sqrt{3}$

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

$= \frac{1}{2}(2)(12\sqrt{3})$

$= 12\sqrt{3}$ in.^{2}

$\approx \boxed{20.8}$ in.^{2}

6. Square; radius 8 mm

hyp $= \sqrt{2} \cdot$ leg

$8 = \sqrt{2} \cdot a$

$a = \frac{8}{\sqrt{2}} = \frac{8\sqrt{2}}{2}$

$a = 4\sqrt{2}$

$p = 4 \cdot 8\sqrt{2} = 32\sqrt{2}$

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

$= \frac{1}{2}(4\sqrt{2})(32\sqrt{2})$

$= 64\sqrt{4}$

$= 64 \cdot 2$

$= \boxed{128}$ mm^2

7. hexagon; radius 7 cm

hyp $= 2 \cdot$ short leg

$7 = 2 \cdot a$

$a = 3.5$

long leg $= \sqrt{3} \cdot$ short leg

$= \sqrt{3} \cdot 3.5$

$= 3.5\sqrt{3}$

$p = 7\sqrt{3} \cdot 6 = 42\sqrt{3}$

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

$= \frac{1}{2}(3.5)(42\sqrt{3})$

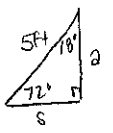
$= 73.5\sqrt{3}$

$\approx \boxed{127.3}$ cm^2

LT#2: Find areas of regular polygons and triangles using trigonometry.

Find the area of each polygon. Round your answers to the nearest tenth.

8. regular decagon with radius 5 ft



$\cos 18° = \frac{a}{15}$

$a = 15\cos 18°$

$\sin 18 = \frac{s}{5}$

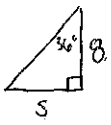
$s = 5\sin 18$

$P = 10 \cdot 2 \cdot 5\sin 18 = 100\sin 18$

$A = \frac{1}{2}(15\cos 18)(100\sin 18)$

$A = 220.4\ ft^2$

9. Regular pentagon with apothem 8 cm



$\tan 36 = \frac{s}{8}$

$s = 8\tan 36$

$P = 5 \cdot 2 \cdot 8\tan 36$

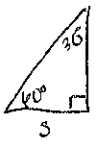
$P = 80\tan 36$

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

$A = \frac{1}{2}(8)(80\tan 36)$

$A = 232.5\ cm^2$

10. Regular hexagon with apothem 6 in.



$\tan 30 = \frac{s}{6}$

$s = 6\tan 30$

$P = 6 \cdot 2 \cdot 6\tan 30$

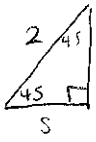
$P = 72\tan 30$

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

$A = \frac{1}{2}(6)(72\tan 30)$

$A = 124.7\ in^2$

11. regular quadrilateral with radius 2 m



$\cos 45 = \frac{a}{2}$

$a = 2\cos 45$

$s = 2\cos 45$

$P = 2 \cdot 4 \cdot 2\cos 45$

$P = 16\cos 45$

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

$A = \frac{1}{2}(2\cos 45)(16\cos 45)$

$A = 8\ m^2$

12. Regular octagon with apothem 10 ft

$\tan 22.5 = \frac{s}{10}$

$s = 10\tan 22.5$

$P = 2 \cdot 8 \cdot 10\tan 22.5$

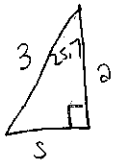
$P = 160\tan 22.5$

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

$A = \frac{1}{2}(10)(160\tan 22.5)$

$A = 331.4\ ft^2$

(13) not on test — Regular heptagon with radius 3 ft not on test



$\cos 25.7 = \frac{a}{3}$

$a = 3\cos 25.7$

$\sin 25.7 = \frac{s}{3}$

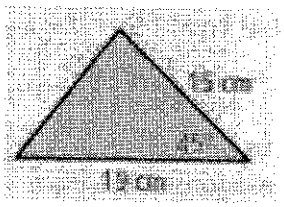
$s = 3\sin 25.7$

$P = 2 \cdot 7 \cdot 3\sin 25.7 = 42\sin 25.7$

$A = \frac{1}{2}(3\cos 25.7)(42\sin 25.7)$

$A = 24.6\ ft^2$

14.

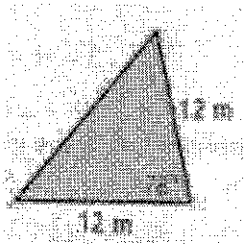


$A = \frac{1}{2}ac\sin B$

$A = \frac{1}{2}(15)(19)\sin 45°$

$A = 100.8\ cm^2$

15.



$A = \frac{1}{2}ac\sin B$

$A = \frac{1}{2}(12)(12)\sin 78$

$A = 70.4\ m^2$

LT#3: Find the areas of circles, sectors, and segments of circles.

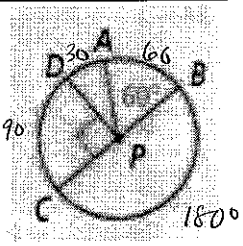
Find each measure.

16. $m\angle APD$

30°.

17. Measure of arc AC

120°



18. measure of arc ABD

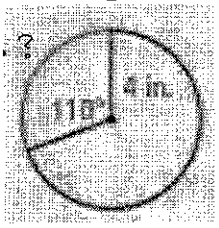
330°

19. $m\angle CPA$

120°

Find the length of each arc shown in red. Leave your answer in terms of π. arc length = $\frac{\text{arc}}{360} \cdot 2\pi r$

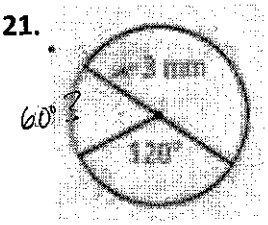
20.



arc length = $\frac{110}{360} \cdot 2\pi(4)$

$= \boxed{2.\overline{4}\pi}$ in.

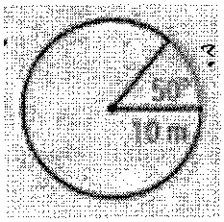
21.



arc length = $\frac{60}{360} \cdot 2\pi(3)$

$\boxed{\pi}$ mm

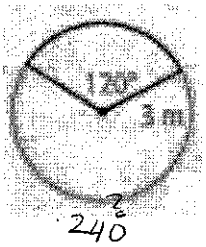
22.



arc length = $\frac{50}{360} \cdot 2\pi(10)$

$= \boxed{2.\overline{7}\pi}$ m

23.

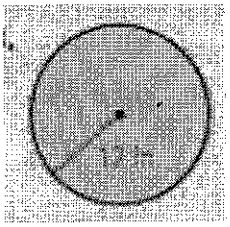


arc length = $\frac{240}{360} \cdot 2\pi(3)$

$= \boxed{4\pi}$ m

What is the area of each circle? Leave your answer in terms of π.

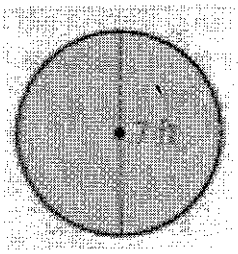
24.



$A = \pi r^2 = \pi(12)^2$

$A = \boxed{144\pi}\ in^2$

25.

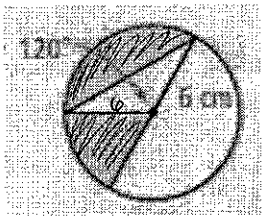


$A = \pi r^2 = \pi(3.5)^2$

$A = \boxed{12.25\pi}\ ft^2$

Find the area of each shaded region. Round your answer to the nearest tenth.

26.

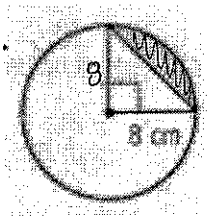


$\text{area} = \frac{180}{360} \cdot \pi(6)^2 - \frac{1}{2}(6)(6)\sin 120$

$= 18\pi - 18\sin 120$

$\approx \boxed{41.0\ cm^2}$

27.

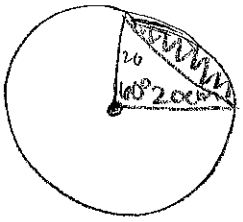


$\text{area} = \frac{90}{360} \cdot \pi(8)^2 - \frac{1}{2}(8)(8)$

$= 16\pi - 32$

$= \boxed{18.3\ cm^2}$

28. A circle has a radius of 20 cm. What is the area of the smaller segment of the circle formed by a 60° arc? Round to the nearest tenth.



area of segment = area of sector − area of $\triangle$

$= \frac{60}{360} \cdot \pi(20)^2 - \frac{1}{2}(20)(20)\sin 60$

$= 66.\overline{6}\pi - 200\sin 60$

$\approx \boxed{36.2\ cm^2}$