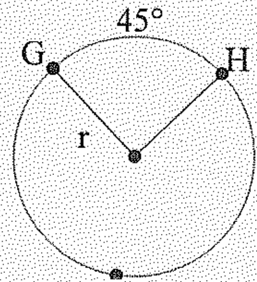
Geometry | PART I | Name Answer Key
Semester 2 Final Exam Review | Date ______ Period ______

Chapter 9: Areas & Pythagorean Theorem

1. Arc length of $\widehat{GH} = 7\pi$ cm, find r.



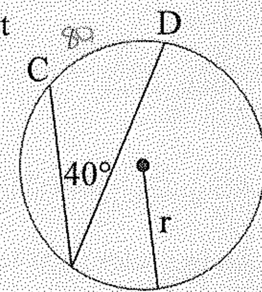
$\frac{\theta}{360}(2\pi r) = AL$

$\frac{45}{360} 2\pi r = 7\pi$

$\frac{1}{4}\pi r = 7\pi$

$\frac{1}{4} r = 7$ $\boxed{r = 28 \text{ cm}}$

2. $r = 18$ ft. Find the exact arc length of $\widehat{CD}$



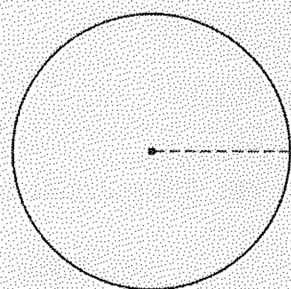
$\frac{\theta}{360}(2\pi r) = AL$

$\frac{80}{360}(2\pi(18)) = AL$

$\frac{2}{9}(36\pi) = AL$

$\boxed{8\pi = AL}$

3. The circumference is 36π cm.
Find the exact area.



$2\pi r = 36\pi$

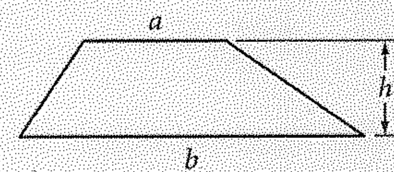
$2r = 36$

$r = 18$

$A = \pi(18)^2$

$\boxed{A = 324\pi \text{ cm}^2}$

4. $h = 18$ cm, $a = 39$ cm, $b = 45$ cm
Find the area.



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

$= \frac{1}{2}(39 + 45)18$

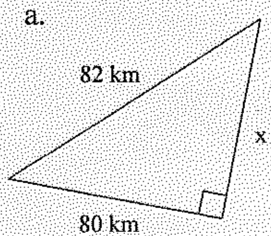
$= \frac{1}{2}(84)18$

$= 42 \cdot 18$

$\boxed{= 756 \text{ cm}^2}$

5. Find the exact lengths of the missing sides.

a.



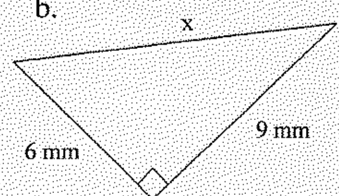
$80^2 + x^2 = 82^2$

$6400 + x^2 = 6724$

$x^2 = 324$

$\boxed{x = 18 \text{ km}}$

b.



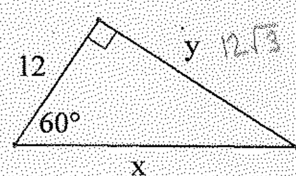
$6^2 + 9^2 = x^2$

$36 + 81 = x^2$

$117 = x^2$

$\boxed{\sqrt{117} = x}$

c.



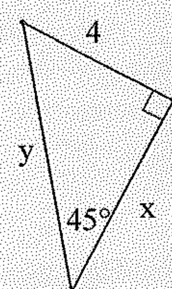
$12\sqrt{3}$

24

$x = 24$

$y = 12\sqrt{3}$

d.



$x = 4$

$y = 4\sqrt{2}$

6. A regular octagon has area 690 square feet and side length 20 feet.
Find the exact value of the apothem. [2]

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

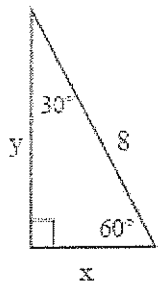
$690 = \frac{1}{2}a \, 20 \cdot 8$

$690 = 40a$ (handwritten; may read 80a)

$\boxed{\frac{69}{4} = a}$

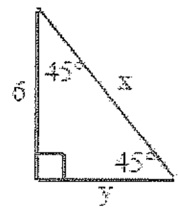
7. Find the missing variables.

a.



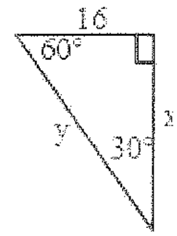
$x =$ 4 $y =$ $4\sqrt{3}$

b.



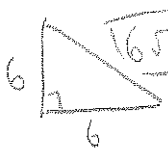
$x =$ $6\sqrt{2}$ $y =$ 6

c.



$x =$ $16\sqrt{3}$ $y =$ 32

8. a. An isosceles right triangle has a side length of 6. What is the hypotenuse?



$\boxed{6\sqrt{2}}$

b. A triangle has side lengths: 5, 7, 10. Is the triangle right?

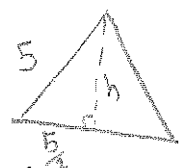
$5^2 + 7^2 = 10^2$

$25 + 49 = 100$

$\boxed{74 \neq 100}$

NO

c. An equilateral triangle has a side length of 5. What is the height of the triangle? What is the area?



$h = \frac{5}{2} \cdot \sqrt{3}$

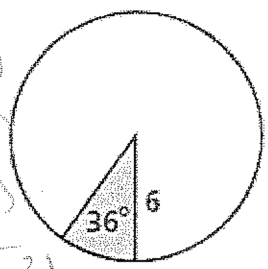
$\boxed{= \frac{5\sqrt{3}}{2}}$

$A = \frac{1}{2}\, 5\left(\frac{5\sqrt{3}}{2}\right)$

$\boxed{= \frac{25\sqrt{3}}{4}}$

10. Find the area of each shaded region to the nearest tenth. Assume units are in centimeters.

a.



$A_{OS} = \frac{\theta}{360}(\pi r^2)$

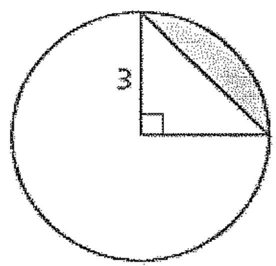
$= \frac{36}{360}(\pi 6^2)$

$= \frac{1}{10}(36\pi)$

$\boxed{= \frac{18}{5}\pi \text{ cm}^2}$

$\boxed{A \approx 11.3 \text{ cm}^2}$

b.



$A = \text{Pizza} - \triangle$

$= \frac{\theta}{360}(\pi r^2) - \frac{1}{2}(b \cdot h)$

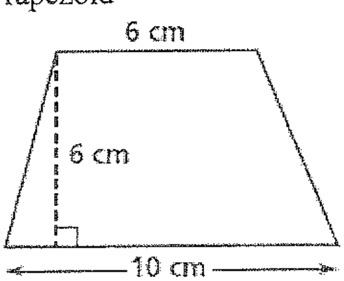
$= \frac{90}{360}(\pi 3^2) - \frac{1}{2}(3 \cdot 3)$

$= \left(\frac{9}{4}\pi - \frac{9}{2}\right) \text{cm}^2$

$\boxed{A \approx 2.6 \text{ cm}^2}$

11. Find the areas.

a. Trapezoid



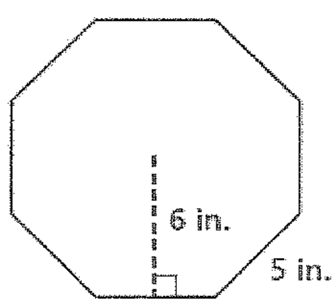
$A = \frac{1}{2}(10 + 6) \cdot 6$

$= \frac{1}{2}(16) \cdot 6$

$= 8 \cdot 6$

$\boxed{= 48 \text{ cm}^2}$

b. Regular Octagon

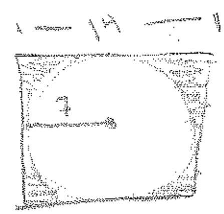


$A = \frac{1}{2} a s n$

$= \frac{1}{2}(6)(5)(8)$

$\boxed{= 80 \text{ in}^2}$

c. The "shaded" Area between a square and a Circle inscribed inside (the circle has a radius of 7).



$A = \square - \bigcirc$

$= b \cdot h - \pi r^2$

$= 14 \cdot 14 - \pi 7^2$

$= (196 - 49\pi) \text{ units}^2$

$\boxed{\approx 42.062 \text{ unit}^2}$

Using Your Algebra Skills (UYAS) & Coordinate Proofs:

MIDPOINT

12. Find the midpoint of the segment with endpoints (6,-7) and (3,-5).

$\left(\frac{6+3}{2}, \frac{-7+-5}{2}\right) \longrightarrow \left(\frac{9}{2}, -6\right)$

13. Find x and y if the midpoint of a segment is (7, 10) and the endpoints are (x,y) and (-5,6).

$\frac{-5+x}{2}=7$

$-5+x=14$

$\boxed{x=19}$ $\boxed{y=14}$

$\boxed{(19, 14)}$

$\frac{6+y}{2}=10$

$6+y=20$

14. Find x and y if the midpoint of a segment is (3, -4) and the endpoints are (x,y) and (9,14).

$\frac{9+x}{2}=3$

$9+x=6$

$x=-3$ $y=-22$

$\boxed{(-3, -22)}$

$\frac{14+y}{2}=-4$

$14+y=-8$

SLOPE, LINE EQUATIONS, PARALLEL/ PERPENDICULAR LINES

Determine the slope of the line that contains the given points.

15. $S(-1,2),\ W(0,4)$

$m=\frac{y_1-y_2}{x_1-x_2}=\frac{4-2}{0-(-1)}=\boxed{\frac{2}{1}}$

16. $G(-2,5),\ H(1,-7)$

$m=\frac{5-1}{-2-(-7)}=\boxed{\frac{4}{5}}$

Determine whether $\overleftrightarrow{AB}$ and $\overleftrightarrow{MN}$ are parallel, perpendicular, or neither.

17. $A(0,3),\ B(5,-7),\ M(-6,7),\ N(-2,-1)$

$AB=\frac{-7-3}{5-0}=\boxed{-\frac{2}{1}}$ $MN=\frac{7-(-1)}{-6-(-2)}=\boxed{-\frac{2}{1}}$

Parallel

18. $A(-1,4),\ B(2,-5),\ M(-3,2),\ N(3,0)$

$AB=-\frac{3}{1}$ $MN=-\frac{1}{3}$

neither

19. What is the slope between (4,5) and (-3,9)?

$m=\frac{9-5}{-3-4}=\boxed{-\frac{4}{7}}$

20. What is x if the slope between (x,-5) and (-3,4) is 2.

$m=\frac{-5-4}{x-(-3)}$

$2=\frac{-9}{x+3}$

$2(x+3)=-9$

$2x+6=-9$

$2x=-15$

$\boxed{x=-\frac{15}{2}}$

Write an equation for each line described:

21. $m=6,\ b=-2$

$\boxed{y=6x-2}$

22. $m=-\frac{5}{3},\ b=0$

$\boxed{y=-\frac{5}{3}x}$

23. Write an equation for the line in slope-intercept form .

a c. A line parallel to $y=3x-2$ through (5,4)

$y=3x+b$ $\boxed{y=3x-11}$

$4=3(5)+b$

$-11=b$

b. A line perpendicular to $y=4x+3$ through (-6,3)

$y=-\frac{1}{4}x+b$ $\boxed{y=-\frac{1}{4}x+\frac{3}{2}}$

$3=-\frac{1}{4}(-6)+b$

$\frac{6}{2}=\frac{3}{2}+b$

24. Write an equation for the line described.
a. slope = 6 and through the point (0,-2)

$\boxed{y = 6x - 2}$

b. slope = 4 and contains (2,5).

$(y-5) = 4(x-2)$ or $y = 4x - 3$

c. Through the points (2,0) and (0,10) ← y-Int

$m = \frac{0-10}{2-0} = -5$

$\boxed{y = -5x + 10}$

d. If the x intercept is (-2,0) and the y intercept is (0,-1) ← y-Int

$m = \frac{0-1}{-2-0} = \frac{1}{2}$ $\boxed{y = \frac{1}{2}x - 1}$

DISTANCE FORMULA

Find the distance between the points.

25. $(-4,-3),(1,4)$

$d^2 = (-4-1)^2 + (-3-4)^2$

$d^2 = (-5)^2 + (-7)^2$

$d^2 = 25 + 49$

$d^2 = 74$

$\boxed{d = \sqrt{74}}$

$d \approx 8.602$

26. $(6,-7),(3,-5)$

$d^2 = ((6-(3))^2 + (-7-(-5))^2$

$d^2 = (3)^2 + (-2)^2$

$d^2 = 9 + 4$

$d^2 = 13$

$\boxed{d = \sqrt{13}}$

$d \approx 3.606$

COORDINATE PROOFS

Triangles:

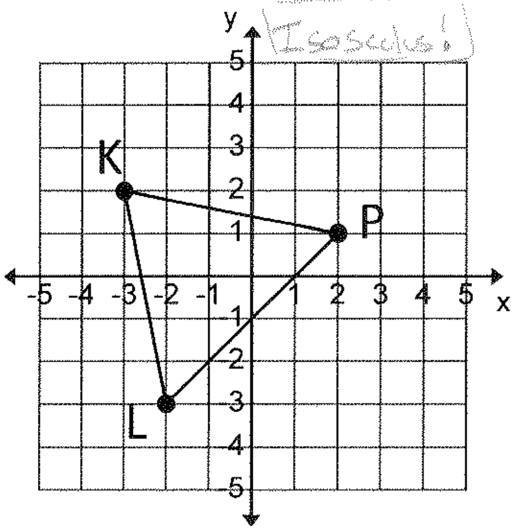
27. Find the measures of the sides of $\triangle KPL$ and classify each triangle by its sides.

a. K (-3, 2), P (2, 1), L (-2, -3)

b. K (5, -3), P (3, 4), L (-1, 1)

c. K (-2, -6), P (-4, 0), L (3, -1)

27a.



Isosceles!

KP – $d^2 = (-3-2)^2 + (2-1)^2$

$d^2 = (-5)^2 + (1)^2$

$\boxed{d = \sqrt{26}}$

PL – $d^2 = (2-(-2))^2 + (1-(-3))^2$

$d^2 = (4)^2 + (4)^2$

$d^2 = 32$

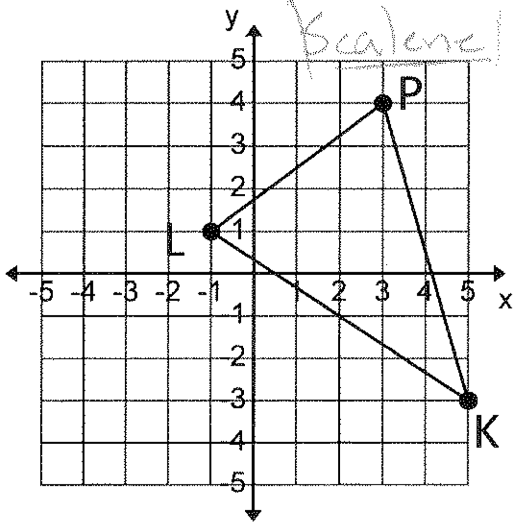
$\boxed{d = \sqrt{32}}$

LK – $(-3-(-2))^2 + (-3-2)^2 = d^2$

$1^2 + (-5)^2 = d^2$

$\boxed{\sqrt{26} = d}$

27b



Scalene

KP – $d^2 = (5-3)^2 + (-3-4)^2$

$= (2)^2 + (-7)^2$

$d = \sqrt{53}$

KL – $d^2 = (5-(-1))^2 + (-3-1)^2$

$= (6)^2 + (-4)^2$

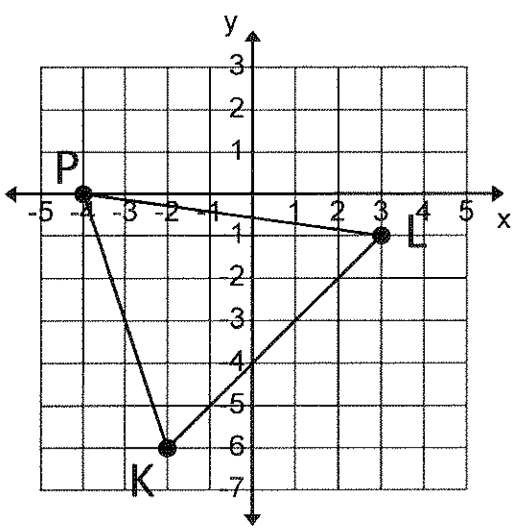
$d = \sqrt{52} = 2\sqrt{13}$

PL – $d^2 = (3-(-1))^2 + (4-1)^2$

$= (4)^2 + (3)^2$

$\boxed{d = 5}$

27c



KP – $d^2 = (-2-(-4))^2 + (-6-0)^2$

$= (2)^2 + (6)^2$

$d = \sqrt{40} = 2\sqrt{10}$

PL – $d^2 = (-4-3)^2 + (0-1)^2$

$d = (-7)^2 + (1)^2$

$d = \sqrt{50} = 5\sqrt{2}$

LK – $d^2 = (3-(-2))^2 + (-1-(-6))^2$

$d = (5)^2 + (5)^2$

$d = \sqrt{50} = 5\sqrt{2}$

28. $\triangle ABC$ has vertices A (2, 3), B (-3, -1), C (4,-9). Prove that $\overline{DE}$ is a midsegment given D is (-1, 1) and E is (3,-3).

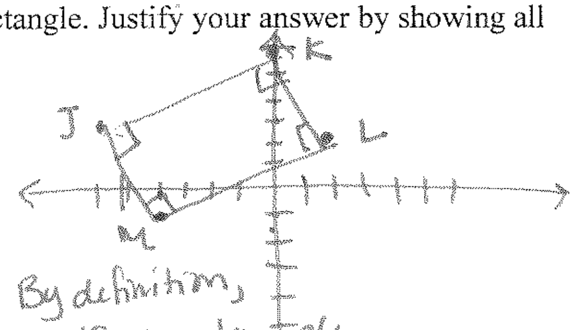
midpoint AB midpoint BC

$\left(\frac{2+(-3)}{2}, \frac{3+(-1)}{2}\right)$ $\left(\frac{-3+4}{2}, \frac{-1+(-9)}{2}\right)$

$= \left(\frac{-1}{2}, -1\right)$ $= \left(\frac{1}{2}, -5\right)$

neither point is an end point on DE, therefore DE is NOT a midsegment

29. 7. Graph the quadrilateral and determine if the figure is a rectangle. Justify your answer by showing all work. J(-6, 3) K(0,6) L(2,2) M (-4,-1)



Slopes

JK $\frac{6-3}{0-6} = \frac{3}{6} = \frac{1}{2}$ JM $\frac{3-(-1)}{-6-(-4)} = \frac{4}{-2} = -2$

ML $\frac{2-(-1)}{2-(-4)} = \frac{3}{6} = \frac{1}{2}$ JK ∥ ML KL ∥ JM ✓

KL $\frac{6-2}{0-2} = \frac{4}{-2} = -2$

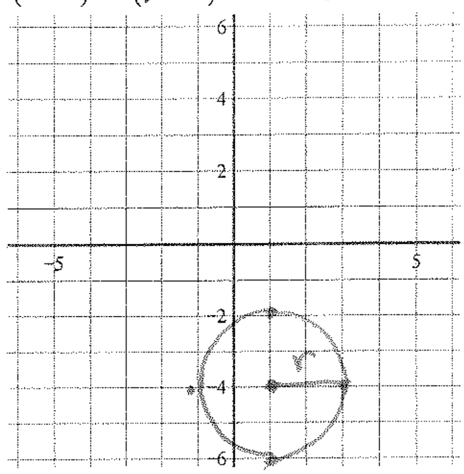
JK ⊥ KL
JK ⊥ JM
ML ⊥ KL
JM ⊥ ML

By definition, this IS a rectangle

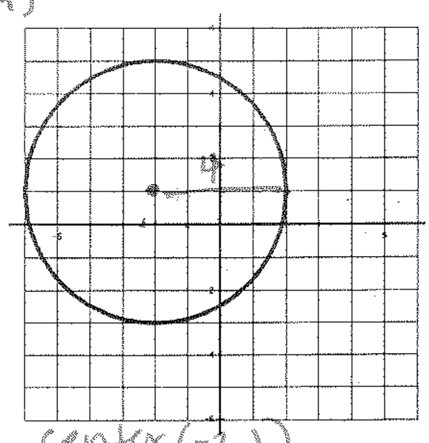
30. Graph the circle.

$(x-1)^2 + (y+4)^2 = 4$

r = 2
center (1, -4)



31. Find the equation of the circle.



center (-2, 1)
$(x-h)^2 + (y-k)^2 = r^2$
$(x+2)^2 + (y-1)^2 = 16$

32. A circle with center (-3, 5) passes through point (-9, -3). Find the circumference of the circle. Leave your answer in terms of π.

center-to-point = r

$r = \sqrt{(-3+9)^2 + (5+3)^2}$
$= \sqrt{6^2 + 8^2}$
$= \sqrt{36+64} = \sqrt{100}$
r = 10
$(x+3)^2 + (y-5)^2 = 100$

33. Describe the center and radius of the following circles.

a. $(x-1)^2 + y^2 = 16$

center = (1, 0)
radius = $\sqrt{16}$
= 4

b. $x^2 + (y+3)^2 = 25$

Center = (0, -3)
radius = $\sqrt{25}$
= 5

34. Consider ΔABC.

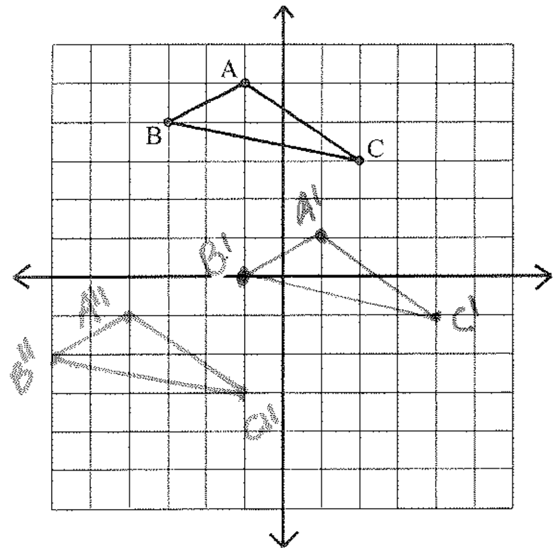
a. Translate ΔABC using the rule $(x, y) \rightarrow (x+2, y-4)$ and label $\Delta A'B'C'$.

b. Translate $\Delta A'B'C'$ using the rule $(x, y) \rightarrow (x-5, y-2)$ and label $\Delta A''B''C''$.

c. Give the ordered pair coordinates for the single transformation from ΔABC to $\Delta A''B''C''$ that is equivalent to the composition of these two translations.

2-5   -4-2

$(x, y) \rightarrow (\underline{X-3}, \underline{X-6})$



35. Consider The following ΔEFG

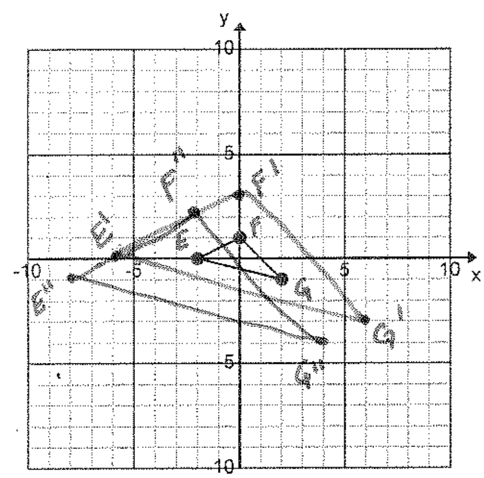
a. Label the points EFG and Translate ΔEFG using the a dialation by a factor of 3 and label $\Delta E'F'G'$.

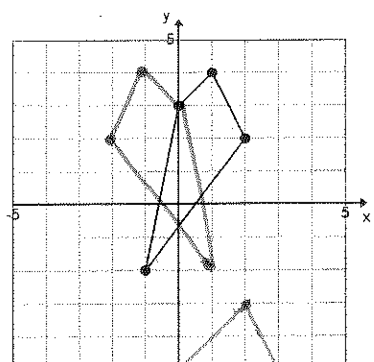
b. What rule describes this transformation?
$(x, y) \rightarrow (\underline{3x}, \underline{3y})$

c. Translate $\Delta E'F'G'$ using the rule $(x, y) \rightarrow (x-2, y-1)$ and label $\Delta E''F''G''$.

d. Give the ordered pair coordinates for the single transformation from ΔEFG to $\Delta E''F''G''$ that is equivalent to the composition of these two transformations.

$(x, y) \rightarrow (\underline{3x-2}, \underline{3y-1})$

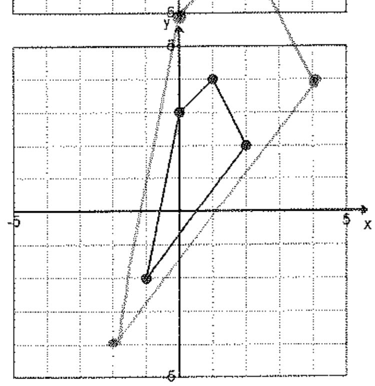




36. This quadrilateral is reflected about they y-axis.
a) Sketch the reflected object.

b) What is the rule for this transformation?

$(x, y) \rightarrow (\underline{-X}, \underline{Y})$



37. This quadrilateral is dilated by a factor of 2.
a) Sketch the dilated object.

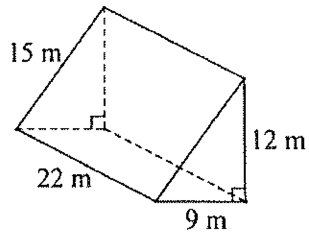
b) What is the rule for this transformation?

$(x, y) \rightarrow (\underline{2X}, \underline{2Y})$

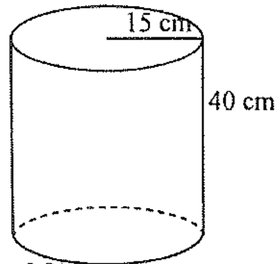
Chapter 10: Volumes & 3D shapes

38. Find the surface area of each solid. Round your answer to two decimal places.

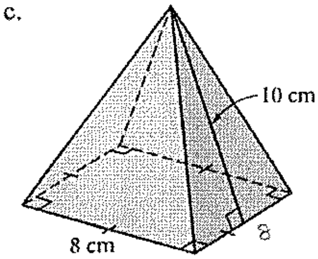
a.



b.



c.



$SA = (15 \cdot 22) + 2\left(\frac{9+12}{2}\right) + (22 \cdot 9) + (12 \cdot 22)$

$SA = 330 + 21 + 198 + 264$

$= \boxed{813\ m^2}$

$SA = 2(\pi(15)^2) + (2\pi 15 \cdot 40)$

$SA = 450\pi + 1200\pi$

$= \boxed{1650\pi\ cm^2}$

$SA = 8 \cdot 8 + 4\left(\frac{10 \cdot 8}{2}\right)$

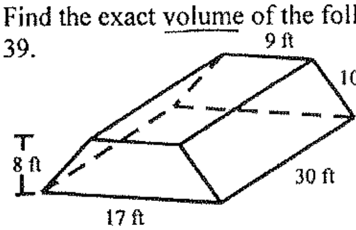
$= 64 + 4(40)$

$= 64 + 160$

$= \boxed{224\ cm^2}$

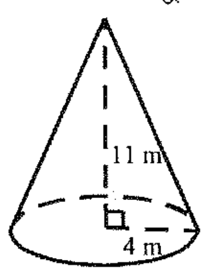
Find the exact volume of the following.

39.

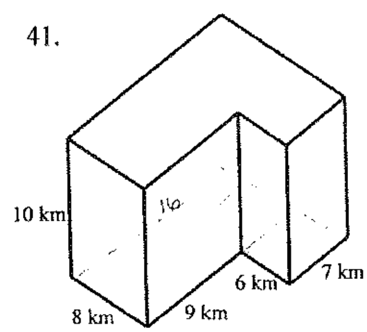


40.

area = $\pi r s \cdot \pi r^2$



41.



$V = \left(\frac{8(9+17)}{2}\right) \cdot 30$

$V = \frac{8(26)}{2} \cdot 30$

$V = 104 \cdot 30$

$\boxed{V = 3120\ ft^3}$

$V = \frac{1}{3} \cdot \pi r^2 \cdot h$

$V = \frac{1}{3}\pi(4)^2 \cdot 11$

$\boxed{V = \frac{176}{3}\pi\ m^3}$

$V = ((8 \cdot 16) + (6 \cdot 7)) \cdot 10$

$= (128 + 42) \cdot 10$

$= 5376 \cdot 10$

$\boxed{= 53760\ Km^3}$

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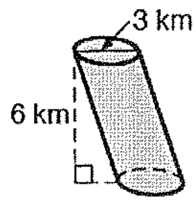
42. Find the exact volume of each solid.

a.



$V = (\pi r^2) \cdot 6$

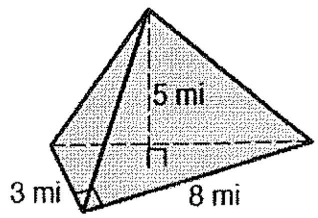
$= 3^2\pi \cdot 6$

$= 9\pi \cdot 6$

$= \boxed{54\pi \text{ Km}^3}$

Volume: ______________

b.



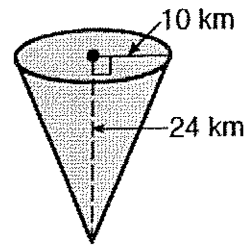
$V = \frac{1}{3}\left(\frac{3 \cdot 8}{2}\right) \cdot 5$

$V = \frac{12 \cdot 5}{3}$

$V = \boxed{20 \text{ mi}^3}$

Volume: ______________

c.



$V = \frac{1}{3}(10^2\pi) 24$

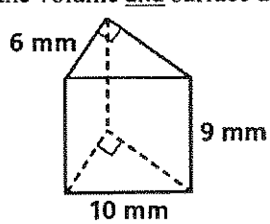
$V = \frac{1}{3} \cdot 100\pi \cdot 24$

$V = \boxed{800\pi \text{ Km}^3}$

Volume: ______________

43. Find the volume and surface area of each solid to the nearest tenth.

a.



$SA = 2(6 \cdot 9) + (10 \cdot 9) + 2\left(\frac{10 \cdot 6}{2}\right)$

$= 108 + 90 + 60$

$= \boxed{258 \text{ mm}^2}$

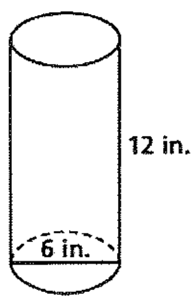
$V = \left(\frac{10 \cdot 6}{2}\right) \cdot 9$

$= \boxed{270 \text{mm}^3}$

Volume: 270 mm^3

Surface Area: 258 mm^2

b.



$SA = (2\pi 6 \cdot 12) + 2(\pi 6^2)$

$= 144\pi + 72\pi$

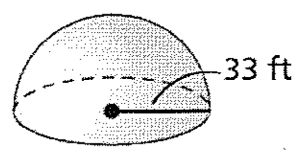
$= \boxed{216 \text{ in}^2}$

$V = \pi 6^2 \cdot 12$

Volume: 432 in^3

Surface Area: 216 in^2

c.



$SA = 4\pi r^2$

$= 4\pi\, 33^2$

$= 4356\pi \text{ ft}^2$

$V = \frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi\, 33^3$

$= 47916$

Volume: 47916 ft^3

Surface Area: $4356\pi \text{ ft}^2$

44. a. What is the radius of a sphere with volume: 243π?

$243\pi = \frac{4}{3}\pi r^3$

$729\pi = \pi r^3$

$\sqrt[3]{729} = \sqrt[3]{r^3}$

$\boxed{9 = r}$

b. What is the radius of a cone with volume: 108π?

not enough info provided

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Chapter 11: Similar Shapes & Similar Triangles

45. The surface areas of two similar solids are 25 cm^2 and 36 cm^2. If the volume of the larger solid is 216 cm^3, find the volume of the smaller solid.

Solid 1   Solid 2

SA = 25cm²   SA = 36cm²

V = 216cm³

$\frac{25}{36} = \frac{x}{216}$

$36x = 5400$

$\boxed{x = 150\ cm^3}$

46. The volume of two similar solids is 8 ft^3 and 125 ft^3. If the surface area of the smaller solid is 4 ft^2, find the surface area of the larger solid.

V = 8ft³   V = 125ft³

SA = 4ft²

$\frac{4}{8} = \frac{x}{125}$

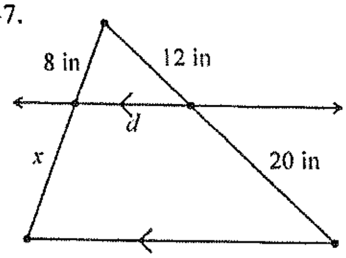
$500 = 8x$

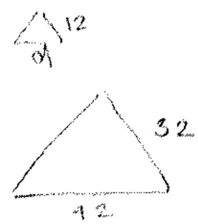
$\frac{125}{2} = x$

$\boxed{62.5ft^2 = A}$

Solve for the missing variables.

47.





$\frac{x}{8} = \frac{20}{12}$

$12x = 160$

$\boxed{x = \frac{40}{3} in}$

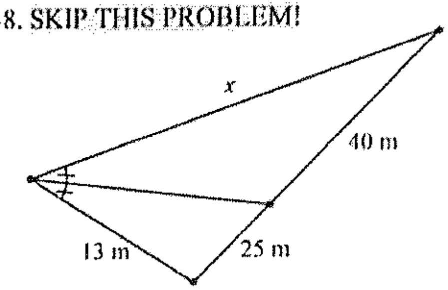
$\frac{d}{42} = \frac{12}{32}$

$32d = 504$

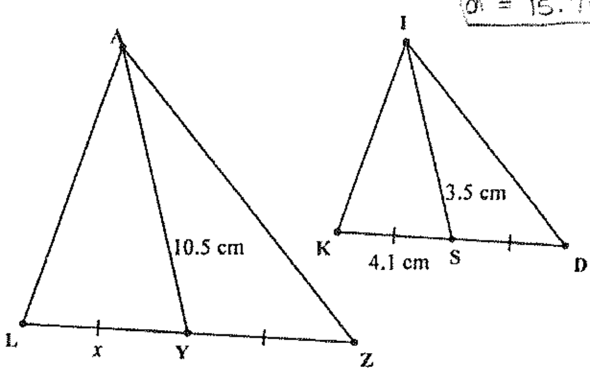
$d = \frac{63}{4} in$

$\boxed{d = 15.75 in}$

48. **SKIP THIS PROBLEM!**



49. $\Delta LZA \sim \Delta KDI$



$\frac{x}{4.1} = \frac{10.5}{3.5}$

$3.5x = 43.05$

$\boxed{x = 12.5\ cm}$

50. What are the shortcuts for similar triangles?

AA ~

SSS ~

SAS ~

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51)

a) $\sqrt[3]{\frac{216}{343}} = \boxed{\frac{6}{7}}$

b) $\sqrt{\frac{25}{81}} = \frac{5}{9} \rightarrow \frac{5^3}{9^3} = \boxed{\frac{125}{729}}$

52) They are similar by AA.

$\frac{5}{7} = \frac{4}{x}$ $\quad 5x = 28$

$\boxed{x = 28/5}$

Trigonometry

53) $\sin 40 = \frac{y}{25}$

$\boxed{y = 16.07\text{m}}$

54) $\tan 32 = \frac{12}{x}$

$\boxed{x = 19.2\text{ in}}$

55) $\cos(p) = 8/12$

$\boxed{p = 48.2°}$

56) $\tan 70 = h/5$

$13.7\text{mm} = h$

$A = \frac{1}{2}(10)(13.7)$

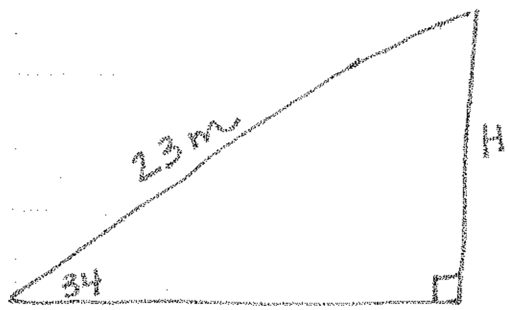
$\boxed{A = 68.5\text{mm}^2}$

57) $\cos 33 = \frac{14}{D}$

$D = 16.7$

$\boxed{R = 8.35 \text{ in}}$

58)

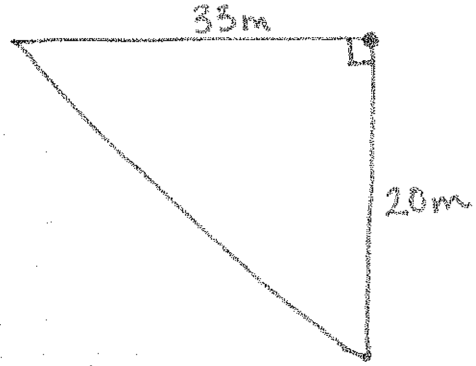


$\sin 34 = \frac{H}{23}$

$\boxed{12.9\text{m} = H}$

59)

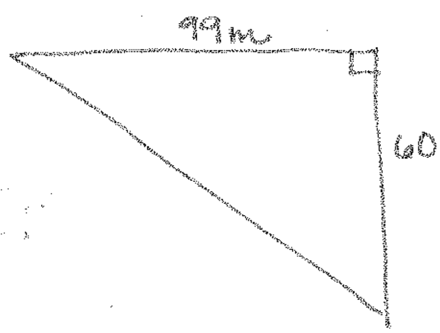
a)



$x^2 = 33^2 + 20^2$

$\boxed{X \approx 38.6 \text{ miles}}$

b)

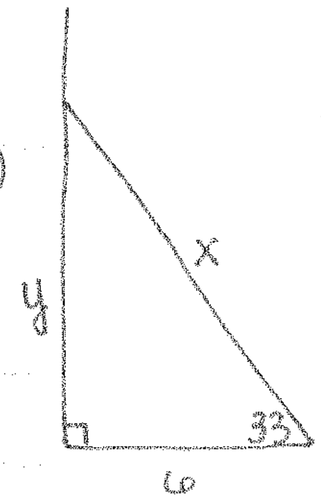


$X^2 = 90^2 + 60^2$

$\boxed{X \approx 108.2 \text{ miles}}$

60)

a)



$\cos 33 = \frac{6}{x}$

$\boxed{x = 7.15 \text{ ft}}$

b)

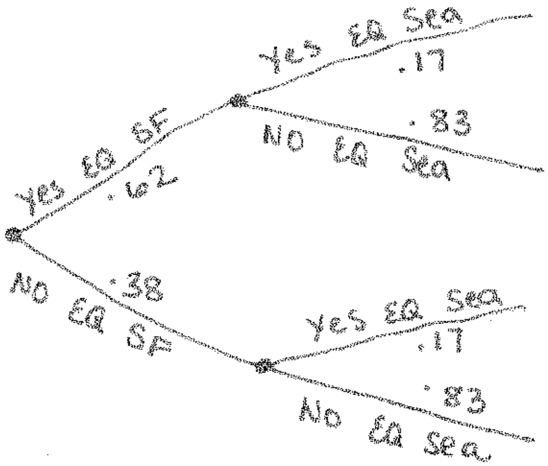
$\tan 33 = \frac{y}{6}$

$\boxed{3.9 \text{ ft} = y}$

Probability

61)

a)



b) $(.62)(.17) = \boxed{.1054}$

c) $(.62)(.83) + (.38)(.17) = \boxed{.5792}$

d) $(.38)(.83) = \boxed{.3154}$

e) $P(SF \mid EQ) = \dfrac{P(SF \cap EQ)}{P(EQ)} = \dfrac{.5146}{.5792} = \boxed{88.8\%}$

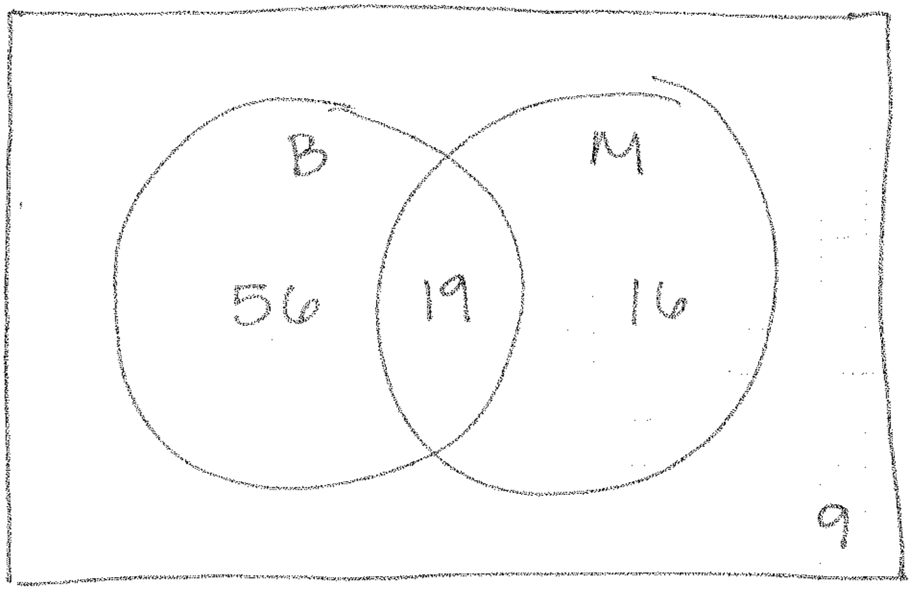
62)

a) ${}_{34}C_4 = \dfrac{34!}{30!\,4!} = \boxed{46{,}376}$

b) ${}_{34}P_4 = \boxed{1{,}113{,}024}$

63)

a)



b) $P(M \mid B) = \dfrac{P(M \cap B)}{P(B)} = \boxed{\dfrac{19}{75}}$

c) $\boxed{9/100}$

d) you choose! ☺