Friendship Jr. High School
Accelerated Math Program
Room 102A (Mr. Lavine)

Algebra

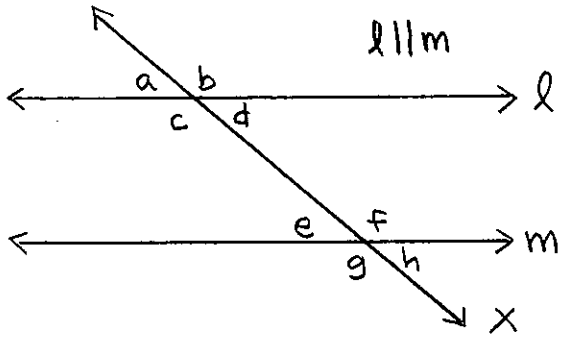
Critical Thinking & Problem Solving

Applications of Algebra and Geometry Concepts

Angle Relationships

GEOMETRY APPLICATIONS: UNIT 1

REVIEW AND STUDY



A) RELATIONSHIP — EXAMPLE

Vertical Angles	$\angle e \cong \angle h$
Corresponding Angles	$\angle g \cong \angle c$
Alternate Interior Angles	$\angle c \cong \angle f$
Supplementary Angles	$\angle g \cong \angle d$
Linear Pair	$\angle a \cong \angle b$
Transversal	x
Parallel Lines	$\ell \cong m$

B) Interior angles in a polygon:

Sum = (# of sides − 2)(180)

C) Perpendicular lines (⊥) form right angles

PROBLEMS TO SOLVE

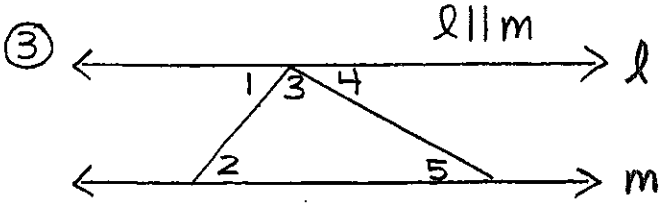
① In the diagram (left), identify the relationship between angles using the terms in (A):

a) $\angle h \cong \angle b$
b) $\angle a \cong \angle e$
c) $\angle b \cong \angle c$
d) $\angle d \cong \angle e$
e) $\angle e \cong \angle f$

② In the diagram (top left) if $a = 32°$, determine:

a) h
b) b − d
c) g − 3e
d) c + d

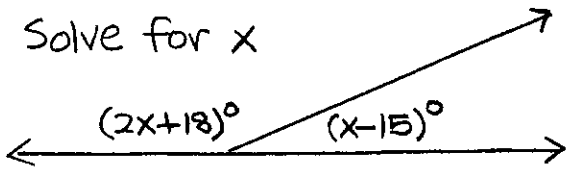
③



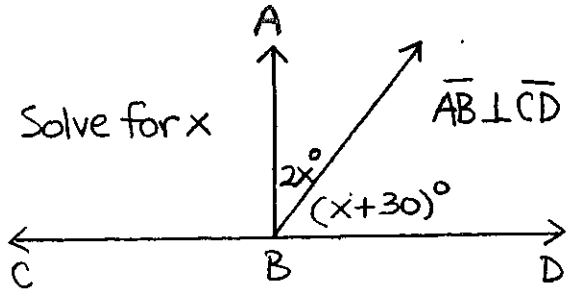
If $\angle 1 = 50°$ and $\angle 5 = 39°$, determine the measures of $\angle 2$, $\angle 3$, and $\angle 4$

④ How many degrees in each angle of a regular octagon?

⑤ Solve for x



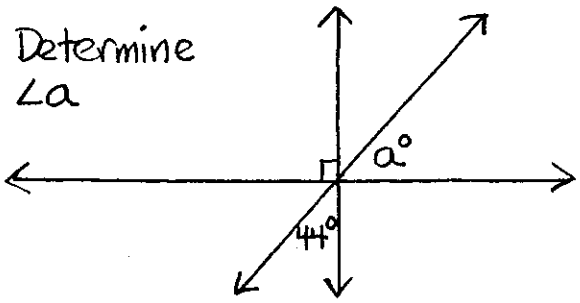
⑥ Solve for x



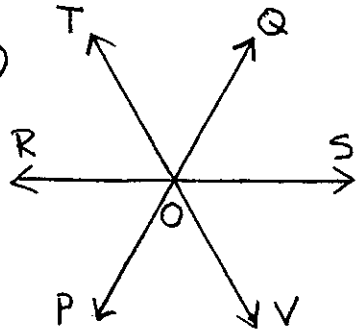
⑦ Find the measure of an angle if its measure is 40° more than its supplement.

⑧ Two angles are complementary. Three times one angle is 30° more than twice the other. Find the larger angle.

⑨ Determine ∠a



⑩

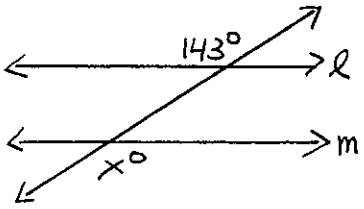


∠ROQ = 142°

∠TOS = 129°

Determine ∠POV

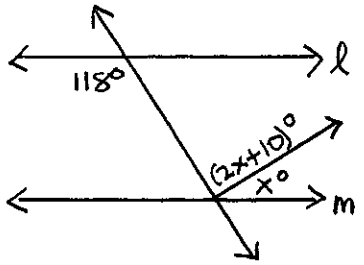
⑪



ℓ ∥ m

Determine x

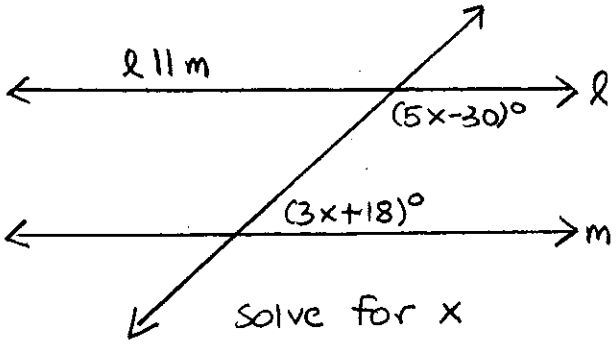
⑫



ℓ ∥ m

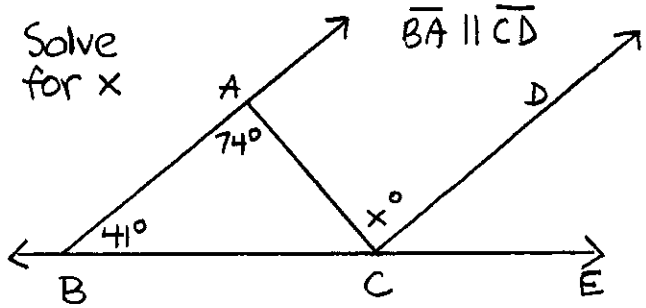
Determine x

⑬

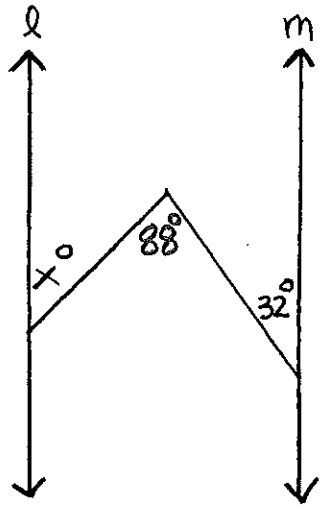


Solve for x

⑭ Solve for x



⑮



ℓ ∥ m

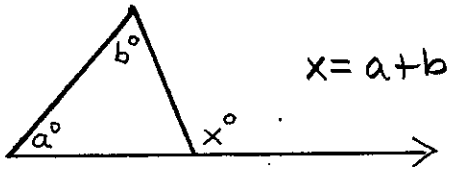
Determine x

Right Triangles

GEOMETRY APPLICATIONS: UNIT 2

REVIEW AND STUDY

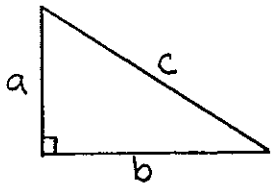
A)



$x = a + b$

x is an exterior angle (formed by extending one side of a triangle). Measure of an exterior angle = sum of the remote ∠s.

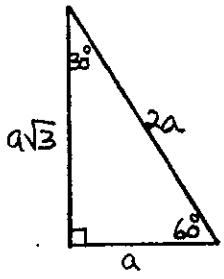
B)

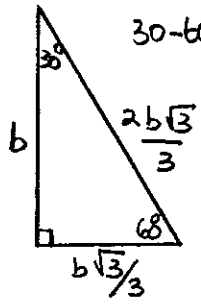


Pythagorean Theorem

$a^2 + b^2 = c^2$

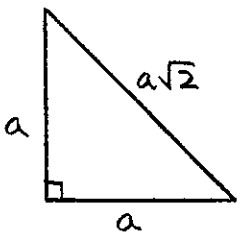
C)

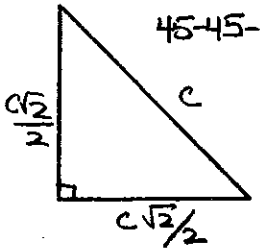




30-60-90 △

D)



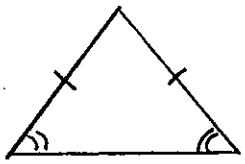


45-45-90 △

E) Common Pythagorean Triples:

3-4-5	8-15-17
5-12-13	7-24-25

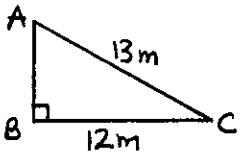
F) Isosceles Triangle



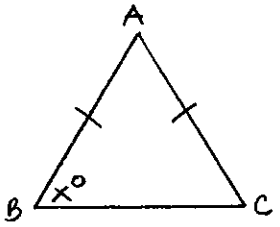
In a triangle, angles opposite equal sides are equal.

In a triangle, sides opposite equal angles are equal.

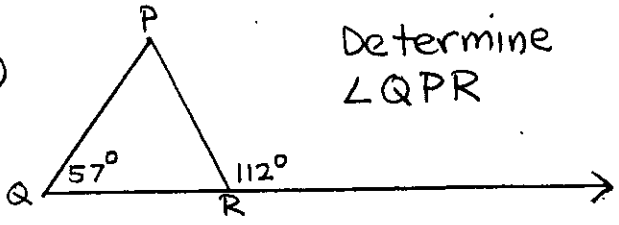
PROBLEMS TO SOLVE

① 

Determine the area of △ABC

② 

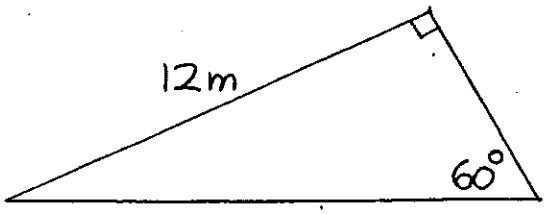
Determine ∠BAC in terms of x

③ 

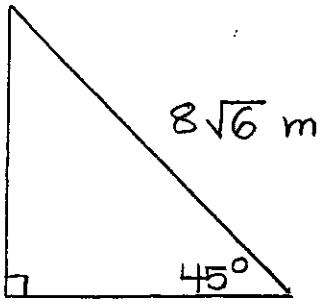
Determine ∠QPR

④ △ABC is equilateral. $\overline{AB} = 6$ m. Determine the area of the triangle.

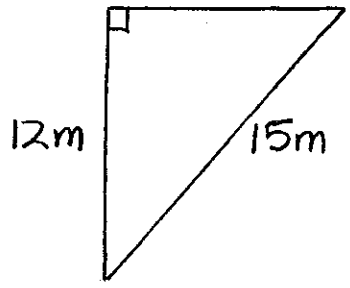
⑤ Determine the perimeter of this triangle:



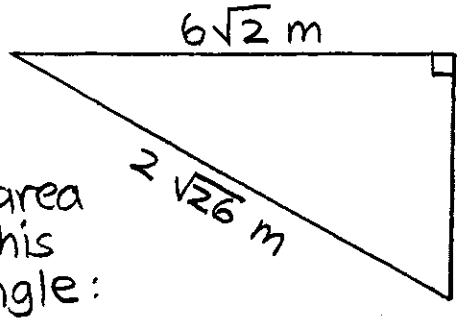
⑥ Determine the area of this triangle:



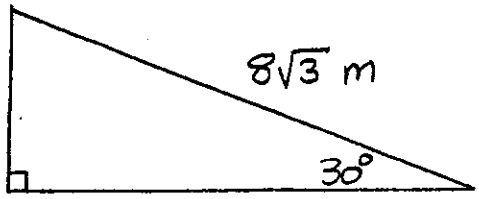
⑦ Determine the perimeter of this triangle:



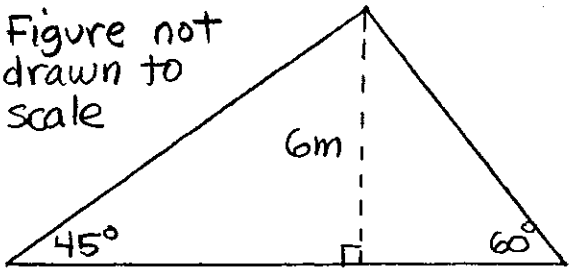
⑧ Find the area of this triangle:

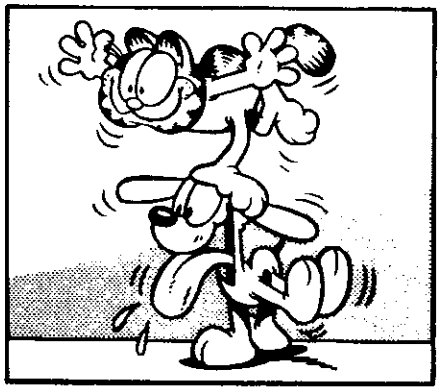


⑨ Determine the area of this triangle:



⑩ Determine the perimeter of this triangle:



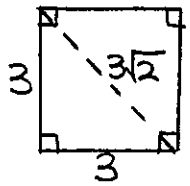


Quadrilaterals

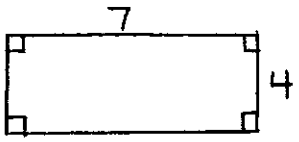
GEOMETRY APPLICATIONS: UNIT 3

REVIEW AND STUDY

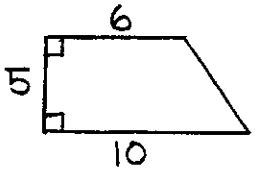
A) Area of Quadrilaterals



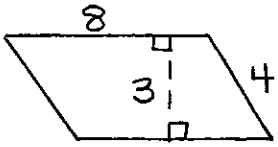
Square:
$A = 3^2$
Diagonal = side$\sqrt{2}$



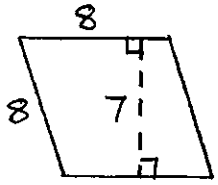
Rectangle
$A = (7)(4)$



Trapezoid
$A = \frac{1}{2}(6+10)(5)$

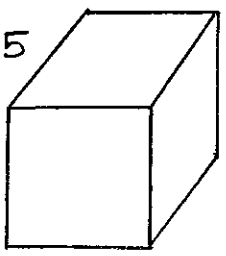


Parallelogram
$A = (8)(3)$

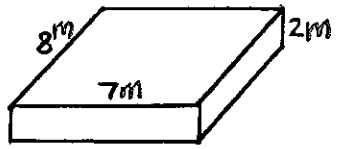


Rhombus
$A = (8)(7)$

B) Volume of Rectangular Prisms

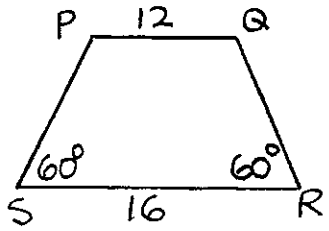


Cube
$V = 5^3$



Prism
$V = (8)(7)(2)$
$V = 112\ m^3$

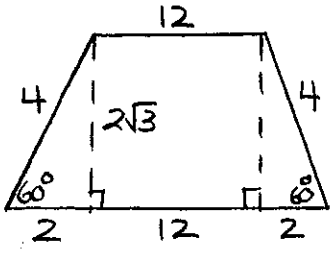
C) Applications



$\overline{PQ} \parallel \overline{SR}$

Determine the area

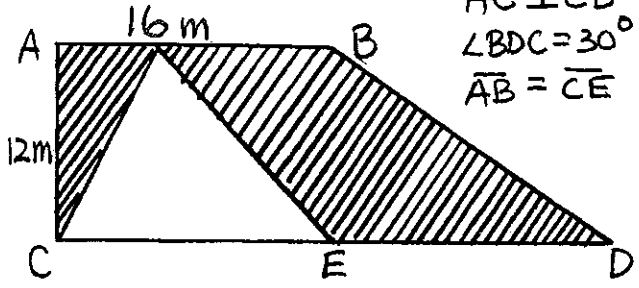
$A = \frac{1}{2}(12+16)(2\sqrt{3})$
$28\sqrt{3}$



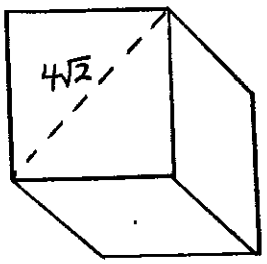
PROBLEMS TO SOLVE

① Find the shaded area:

$\overline{AB} \parallel \overline{CD}$
$\overline{AC} \perp \overline{CD}$
$\angle BDC = 30°$
$\overline{AB} = \overline{CE}$

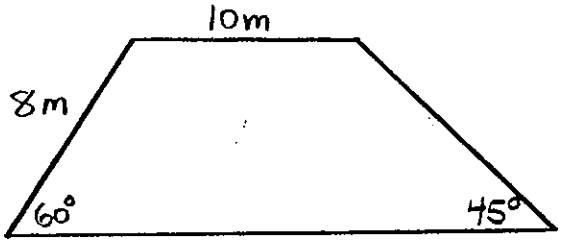


② Determine the volume of this cube.

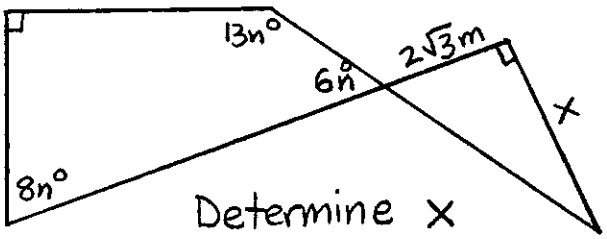


Diagonal = $4\sqrt{2}$ m

③ Determine the perimeter and area of the trapezoid:

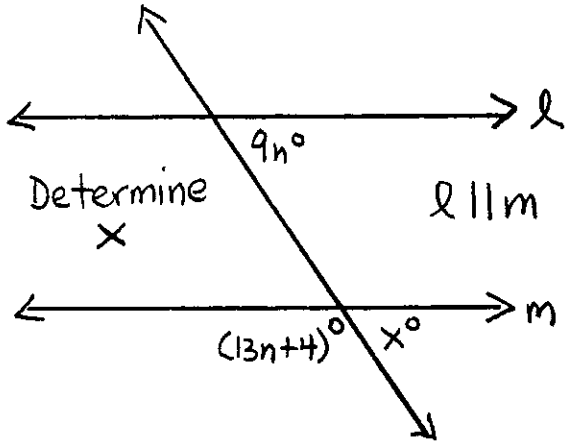


④



Determine x

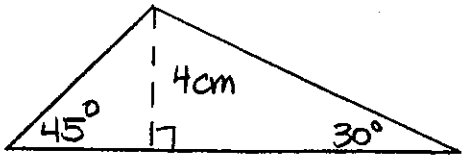
⑤



Determine x

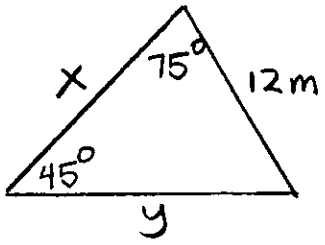
l ∥ m

⑥



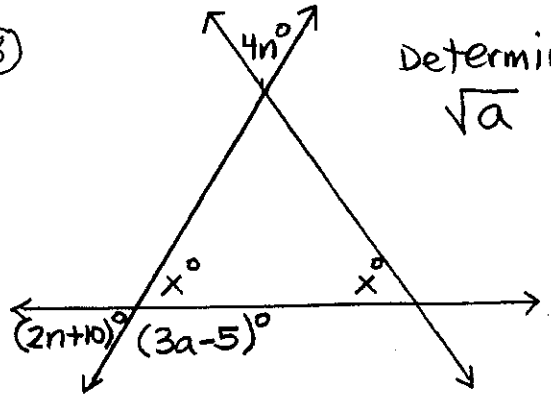
Determine all three sides

⑦



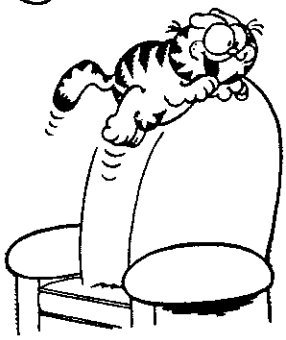
Determine x and y

⑧

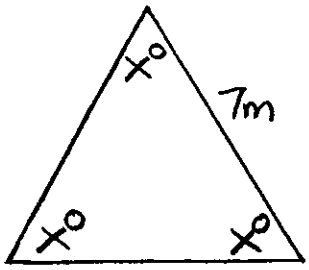


Determine $\sqrt{a}$

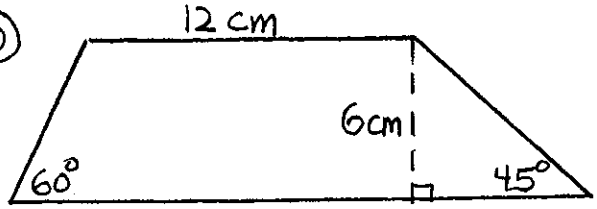
⑨



Determine the height of this triangle

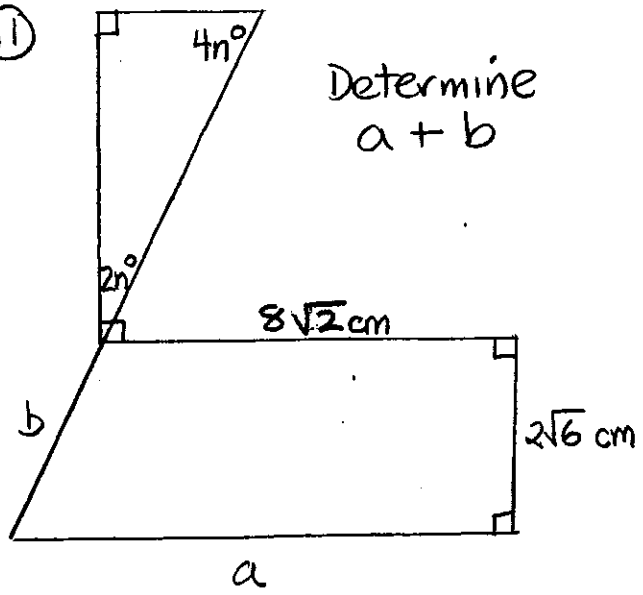


⑩



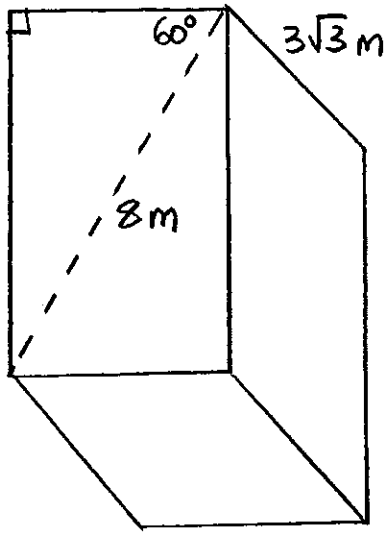
Determine the area of the trapezoid

(11)

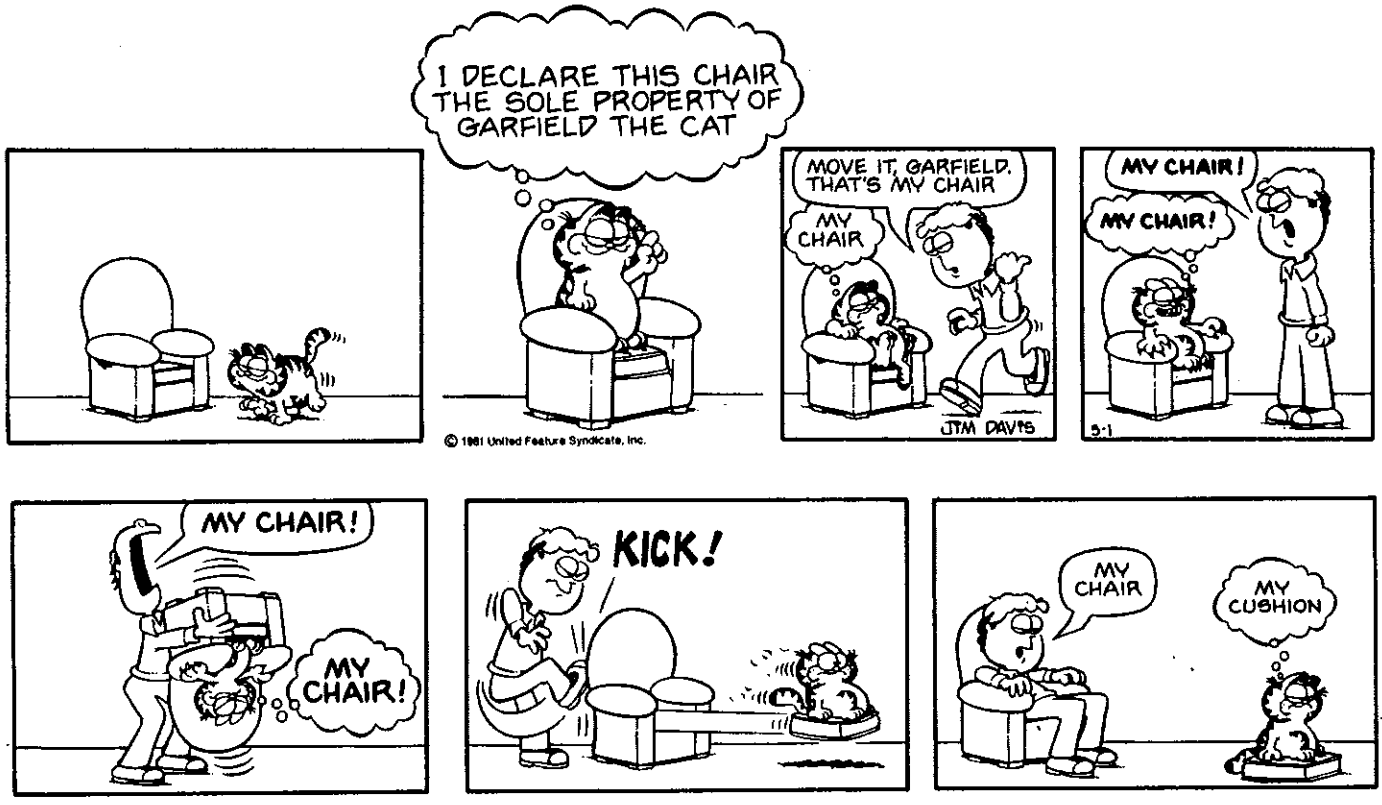


Determine
$a + b$

(12)

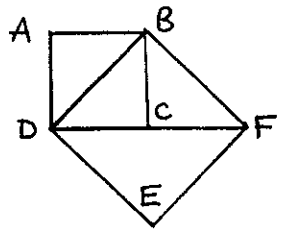


Determine the volume of this rectangular prism



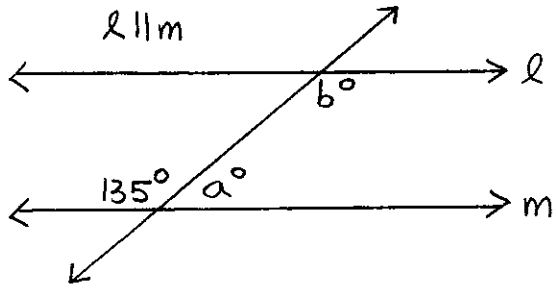
Focus On The S.A.T.

GEOMETRY APPLICATIONS: UNIT 4

① 

ABCD and BFED are squares. $\overline{AD} = 4m$. Determine the area of square BFED.

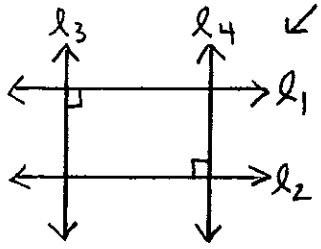
(A) $8\sqrt{2}\ m^2$
(B) $16\ m^2$
(C) $24\ m^2$
(D) $16\sqrt{2}\ m^2$
(E) $32\ m^2$

② 

Determine $b-2a$

(A) 45
(B) 85
(C) 90
(D) 105
(E) 135

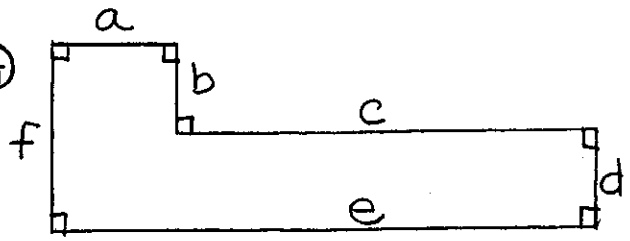
③ not drawn to scale



I. $\ell_1 \parallel \ell_2$
II. $\ell_2 \perp \ell_3$
III. $\ell_4 \parallel \ell_2$

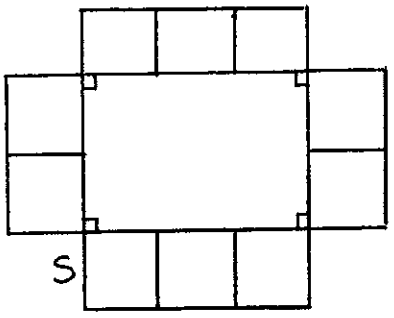
According to the diagram, which must be true?

(A) None
(B) I and III
(C) All
(D) I and II
(E) II and III

④ 

The area of the diagram above is all of the following except:

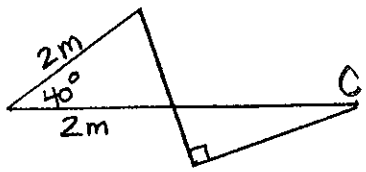
(A) $ab+de$
(B) $af+cd$
(C) $fe-bc$
(D) $af+ed$
(E) $ab+ad+cd$

⑤ 

(A) $10s^2$
(B) $6s^3$
(C) $6s$
(D) $10s^3$
(E) None of these

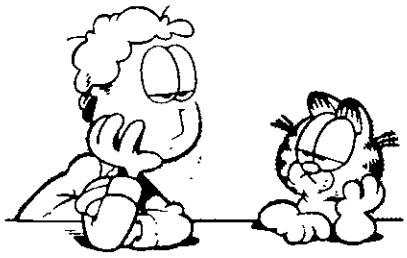
All small squares are equal (side s). Determine the volume if all small squares are folded up and a lid is put on top to form a box.

⑥



Determine $\angle C$ in the diagram.

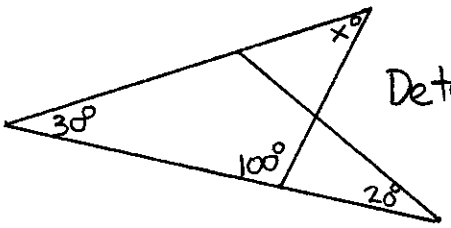
(A) 20°
(B) 40°
(C) 45°
(D) 70°
(E) None of these



⑦ What is the average degree measure of the angles of a triangle?

(A) 30° (B) 45° (C) 60° (D) 90°
(E) Cannot be determined

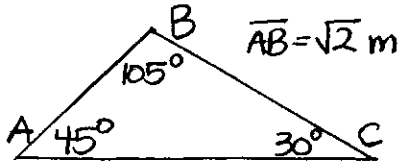
⑧



Determine x

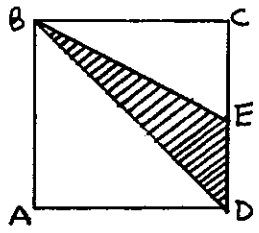
(A) 40
(B) 50
(C) 60
(D) 70
(E) Cannot be determined

⑨ Determine the area of $\triangle ABC$



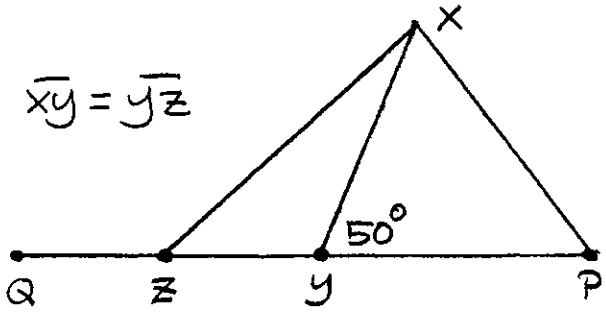
(A) $\frac{1}{2}+\frac{\sqrt{3}}{2}$ m^2
(B) $2\sqrt{2}$ m^2
(C) $1+\sqrt{3}$ m^2
(D) $\frac{1}{2}+\frac{\sqrt{6}}{2}$ m^2
(E) $\frac{\sqrt{2}}{2}+\sqrt{3}$ m^2

⑩



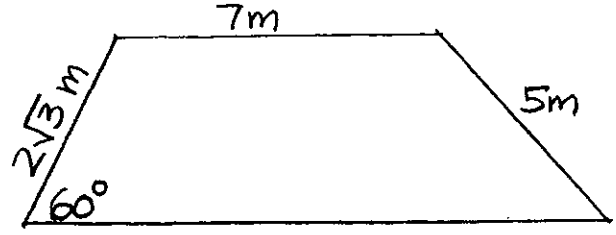
ABCD is a square and E is the mid-point of $\overline{CD}$. Determine the percentage of the square that is unshaded.

⑪



Determine $\angle QzX$

⑫



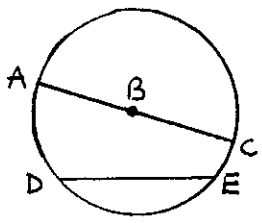
Determine the area of the trapezoid.

Circles and Sectors

GEOMETRY APPLICATIONS: UNIT 5

REVIEW AND STUDY

A) Terminology



$\overline{DE}$ is a chord

$\overline{AB}$ (distance) is a radius

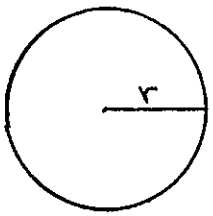
$\overline{AC}$ (distance) is a diameter

B) Area

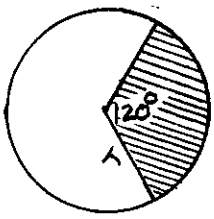
$A = \pi r^2$

Circumference

$C = 2\pi r$



C) Sector



central $\angle$ 120°

$A = \pi r^2\left(\frac{120}{360}\right)$

$C = 2\pi r\left(\frac{120}{360}\right) + 2r$

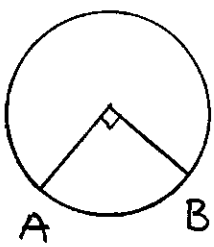
D) Pi (π) $\approx 3.14 \approx 22/7$

$$\pi = \frac{\text{circumference}}{\text{diameter}}$$

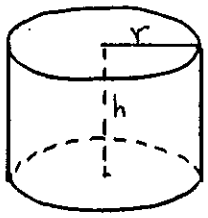
E) Arc

Defined by central angle

$\text{Arc } AB = \frac{90}{360}(2\pi r)$



F) Cylinder

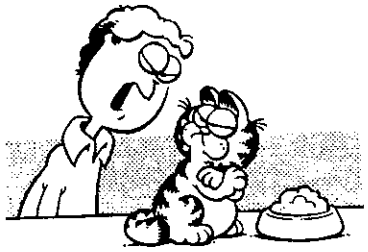


Volume

$V = \pi r^2 h$

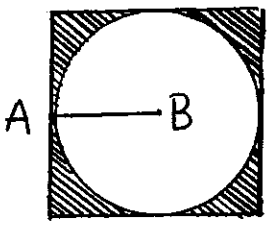
Surface Area

$SA = 2(\pi r^2) + (2\pi r)h$



PROBLEMS TO SOLVE

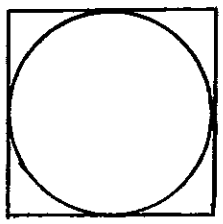
① Determine the area of the shaded region.



$\overline{AB}$ is 2m

② The circumference of a circle is 48π. Determine the radius.

③



A circle is "inscribed" in a square if it is tangent at the midpoint of the sides.

Determine the length of the diagonal of a square that has an inscribed circle with a circumference of 40π.

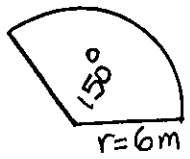
Hint: 1) Determine the radius, 2) Determine a side of the square, 3) Use the Pythagorean Theorem (or special triangle relationships) to determine the diagonal.

④ How far will a wheel of radius 28 in. travel if it makes 240 revolutions? (Use $\pi = 22/7$)

⑤ Determine the surface area and volume. Use $\pi = 3.14$.

r=3m
h=10m

⑥ Determine the area and circumference. (Use π method)

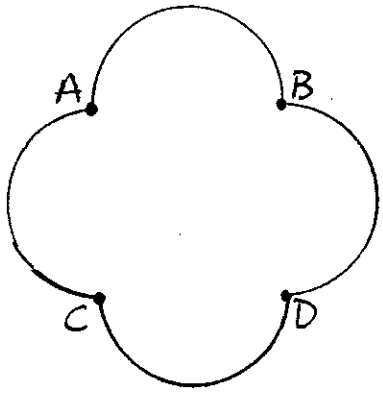


⑦ In a circle of radius 10 in., determine the length of an arc of 144°

⑧ Determine the circumference of the outside of this figure:

All arcs are semicircles in this diagram

Use the π method



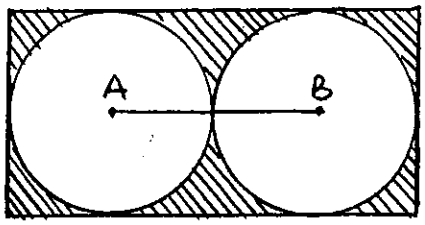
ABCD is a square whose area is $16m^2$

Critical Thinking Skill Review

GEOMETRY APPLICATIONS: UNIT 6

① The central angle of a sector is 45°. The area of the sector is 24π. Determine the radius of the circle.

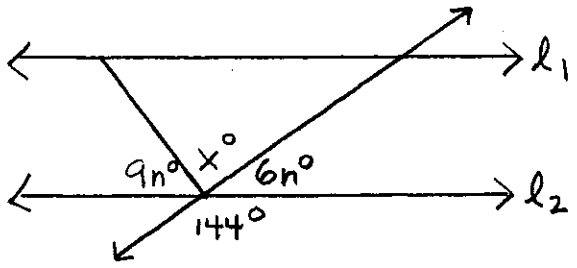
② Determine the shaded area:



$\overline{AB} = 12$ in.
A and B are circle midpoints

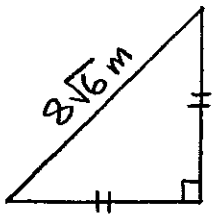
③ A circular pool of radius 12 ft. has 3 ft. of water in it. How many cubic ft. of water in the pool?

④

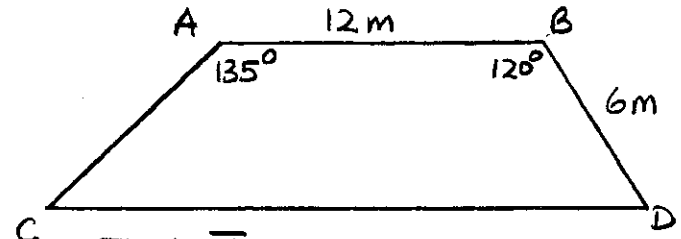


Determine x $l_1 \parallel l_2$

⑤ Determine the area of this triangle

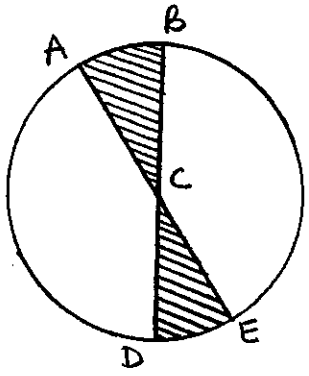


⑥ Determine the perimeter:



$\overline{AB} \parallel \overline{CD}$

⑦



radius = 3

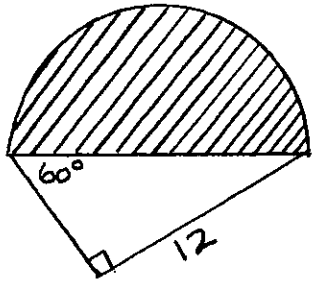
Shaded area equals π

Determine $\angle DCE$

(A) 10° (B) 20° (C) 30° (D) 40° (E) 60°

⑧ Determine area of the shaded semi-circle.

(A) 12π
(B) 24π
(C) 36π
(D) 48π
(E) 96π



Geometric Reasoning

GEOMETRY APPLICATIONS: UNIT 7

① If the circumference of a circle is doubled, then how many times as large is the area of the circle?

(A) 1 (B) 1.5 (C) 2 (D) 3 (E) 4

② The radius of the largest ball that can fit in a 5-inch tall cylinder with a volume of 20 in.^{3}

(A) 2 (B) $\frac{2}{\sqrt{\pi}}$ (C) 4 (D) 4π (E) 5

③ Determine x in the figure at the right.

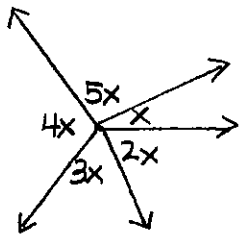
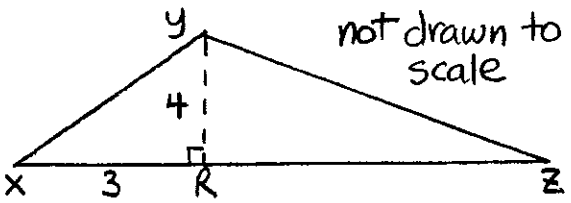


Figure not drawn to scale.

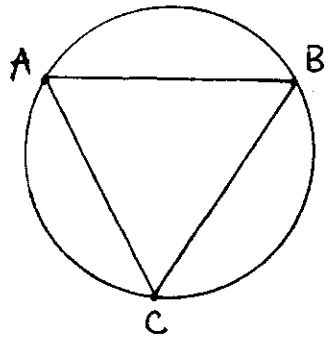
(A) 24 (B) 48 (C) 72 (D) 96 (E) 120

④ Determine $\overline{RZ}$ if $\overline{XR} = 3$, $\overline{YR} = 4$ and the area of $\triangle XYZ$ is 28.



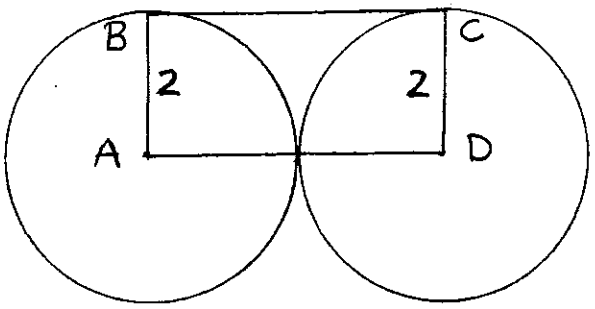
(A) 5 (B) 7 (C) 8 (D) 11 (E) 12

⑤ $\triangle ABC$ is an equilateral triangle. What is the number of degrees in minor arc AB?



(A) 30° (B) 60° (C) 120° (D) 240° (E) 360°

⑥ In the figure below, A and D are the centers of two equivalent circles. Find the area of rectangle ABCD if AB and CD are both radii of the circles with a length of 2.



(A) 1 (B) 2 (C) 4 (D) 6 (E) 8

⑦ The measure of $\angle OAB$ is 20°. If O is the center of the circle, determine the measure of $\angle AOB$.

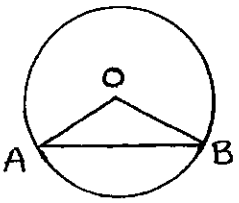
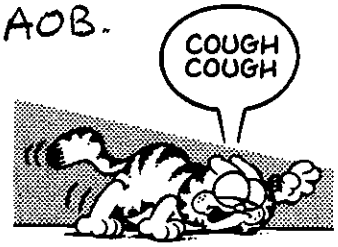
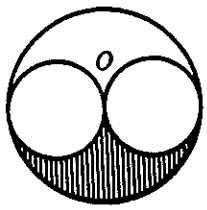


Figure not drawn to scale



(A) 40 (B) 70 (C) 80 (D) 140 (E) 160

⑧ As shown in the figure, two equivalent circles are drawn inside a third circle. There is a point of tangency at the center of the large circle and two additional points of tangency on opposite sides of the large circle. Find the area of the shaded region if the radius of the larger circle is 4.



(A) π (B) 2π (C) 4π (D) $2\pi-2$
(E) $\frac{1}{2}(4\pi-2)$

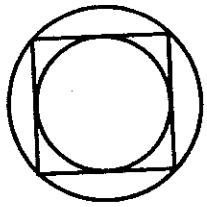
⑨ A cylindrical roller is dipped in paint and then rolled for one complete revolution over a piece of paper. If the line of paint is 4 inches long, what is the radius (in inches) of the roller?

(A) $\frac{2}{\pi}$ (D) 2π

(B) 2 (E) Cannot be determined

(C) π

⑩ A square of side 2 has a circle circumscribed about it and



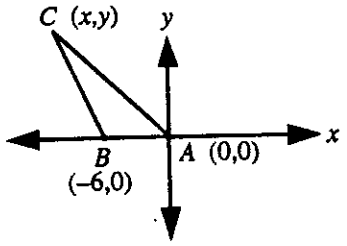
another inscribed within it. Find the ratio of the area of the larger circle to the smaller circle.

(A) 4:1 (D) $\sqrt{2}:1$

(B) $\sqrt{3}:1$ (E) 2:1

(C) 1.5:1

(11) In the figure below, the area of ΔABC is 12. Determine the y-coordinate of point C.



(A) –4 (B) 4 (C) –2 (D) 2

(E) Cannot be determined

(12) If $x > y$, the point (x, y) can be in all of the following <u>except</u>:

(A) Quadrant I

(B) Quadrant II

(C) Quadrant III

(D) Quadrant IV

(E) The x or y axis

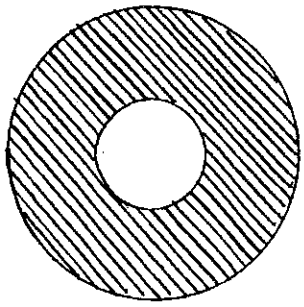
(13) If the midpoint of $\overline{AB}$ is the origin, and the coordinates of point A are (x, y), determine the coordinates of point B.

(A) $(-x, -y)$ (D) (x, y)

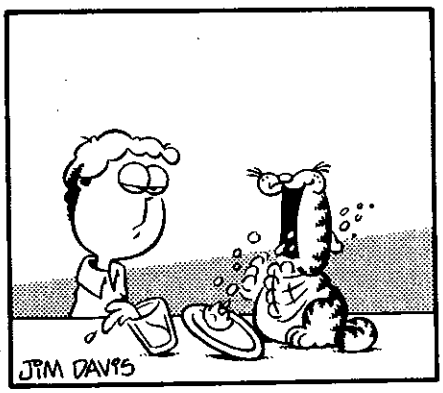
(B) $(-x, y)$ (E) None of these

(C) $(x, -y)$

(14) In the figure, the radius of the smaller circle is $\frac{1}{3}$ the radius of the larger circle. If the circles have the same center point, what is the ratio of the area of the shaded region to the area of the larger circle?



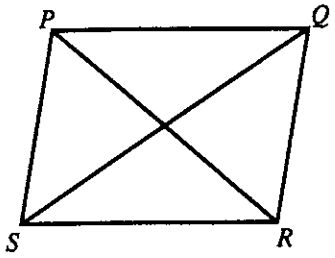
(A) $\frac{1}{9}$ (B) $\frac{2}{9}$ (C) $\frac{2}{3}$ (D) $\frac{3}{4}$ (E) $\frac{8}{9}$



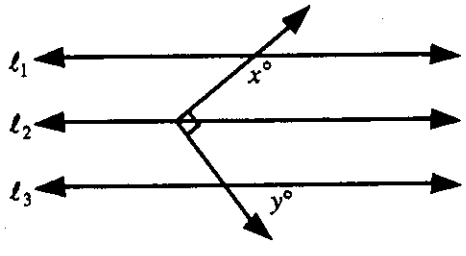
Quantitative Comparisons

GEOMETRY APPLICATIONS: UNIT 8

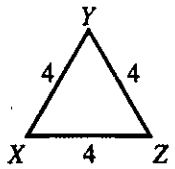
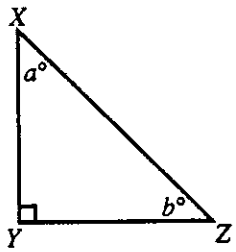
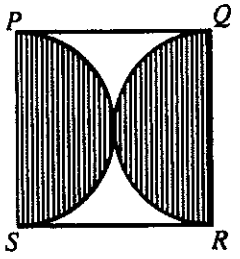
	Column A	Column B	
1.	The length of the hypotenuse of a right triangle with legs of 12 and 16	The length of the hypotenuse of a right triangle with legs of 8 and 15	A O B O C O D O
2.	Volume of a rectangular box with dimensions 4 yards by 3 yards by 15 yards	Volume of a rectangular box with dimensions 1 yard by 12 yards by 2 yards	A O B O C O D O



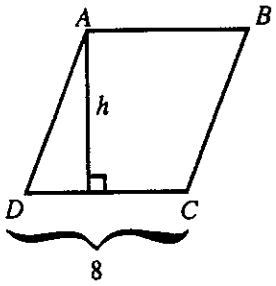
	Parallelogram $PQRS$ $\angle SPQ > \angle PQR$.		
3.	Length of PR	Length of QS	A O B O C O D O
4.	Circumference of a circle with a radius of r	Circumference of a circle with a diameter of $3r$	A O B O C O D O
5.	Area of a circle with a diameter of x^2	Area of a circle with a radius of x	A O B O C O D O

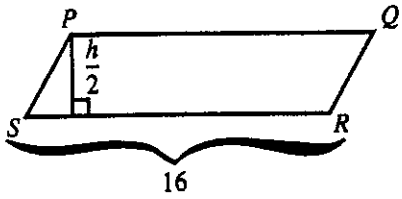


	$\ell_1 \parallel \ell_2 \parallel \ell_3$.		
6.	$x - y$	90	A O B O C O D O

	Column A	Column B	
7.	 The area of ΔXYZ	8	A ○ B ○ C ○ D ○
8.	 $XY = 2$ $XZ = 2\sqrt{2}$	$a°$	A ○ B ○ C ○ D ○
9.	$[x]$ is defined to be the greatest integer less than or equal to the number.	$[-2]$	A ○ B ○ C ○ D ○
10.	  $PQRS$ is a square, and the two shaded regions are semicircles. $PQ = 4$ Area of the unshaded region	4 square units	A ○ B ○ C ○ D ○

Column A | Column B



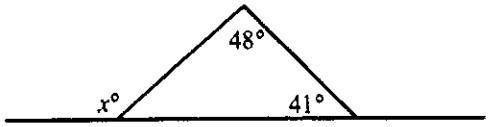


Note: Figures not drawn to scale.

ABCD and *PQRS* are parallelograms.

11. Area of *ABCD* | Area of *PQRS*

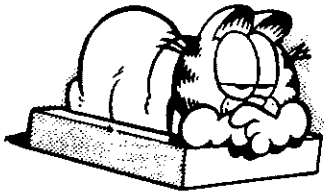
A ○ B ○ C ○ D ○

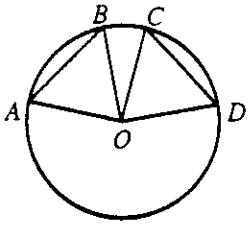


Note: Figure not drawn to scale.

12. x | 89

A ○ B ○ C ○ D ○





Circle with center *O*
Segment *AB* = Segment *CD*

13. $\angle AOB$ | $\angle COD$

A ○ B ○ C ○ D ○

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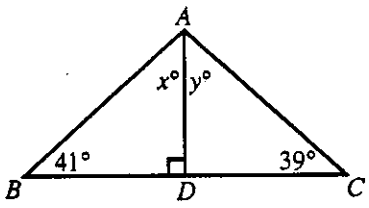
14. The sum of the interior angles of an isosceles triangle | The sum of the exterior angles of a parallelogram

A ○ B ○ C ○ D ○



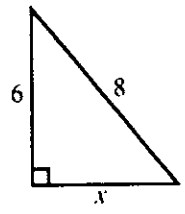
Note: Figure not drawn to scale.

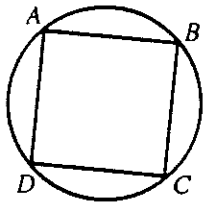
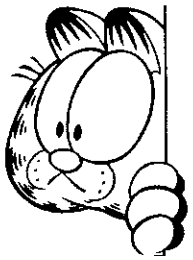
$AD \perp BC$

15. x | y

A ○ B ○ C ○ D ○

	Column A	Column B	
	Let $\triangle_x = \frac{1}{3}x$ if x is odd. Let $\triangle_x = \frac{1}{x}$ if x is even.		A ○ B ○ C ○ D ○
16.	$\triangle_7 \cdot \triangle_4$	$\triangle_2$	

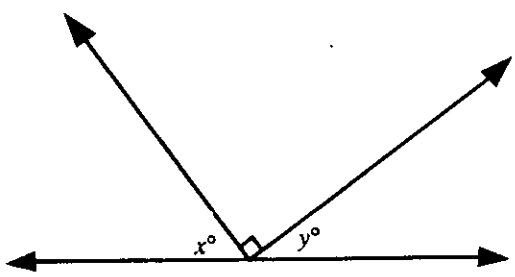
			A ○ B ○ C ○ D ○
17.	6	x	

			A ○ B ○ C ○ D ○
18.	Perimeter of quadrilateral $ABCD$	$4\sqrt{2}$	

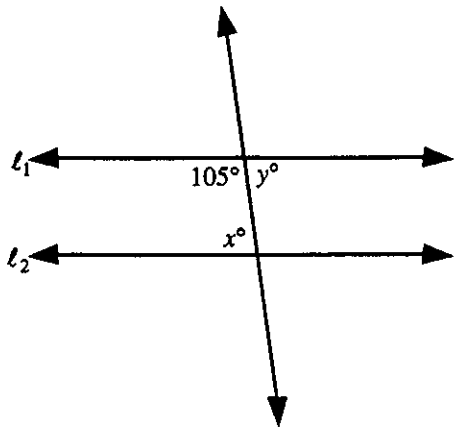
For all positive numbers x and y,

$$x \, O \, y = \frac{x-y}{x+y}$$

19.	$\frac{3}{4} \, O \, \frac{1}{2}$	$\frac{3}{8} \, O \, \frac{1}{8}$	A ○ B ○ C ○ D ○

			A ○ B ○ C ○ D ○
20.	$x° + y°$	90°	

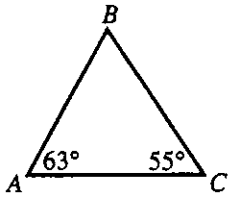
Column A | Column B



$\ell_1 \parallel \ell_2$

21. $105° - x°$ | $y°$

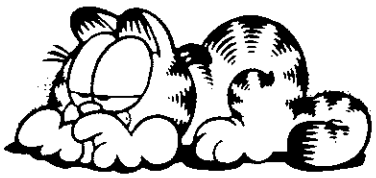
A ○
B ○
C ○
D ○

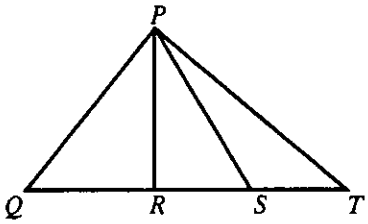


Note: Figure not drawn to scale.

22. Length of AC | Length of BC

A ○
B ○
C ○
D ○



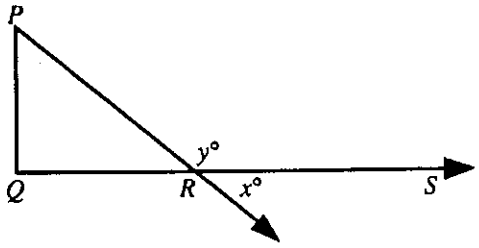


Note: Figure not drawn to scale.

$PR \perp QT$

23. PS | PQ

A ○
B ○
C ○
D ○

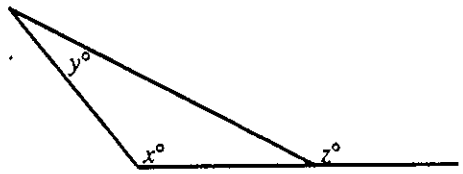


$PQ \perp QS$

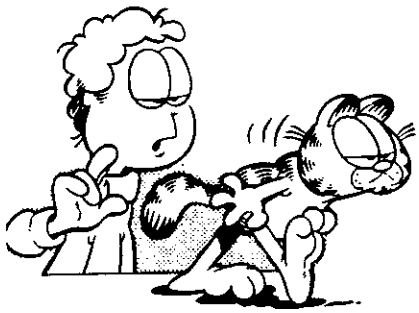
24. $\angle PQR - x°$ | $y°$

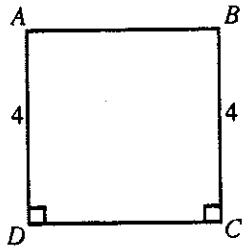
A ○
B ○
C ○
D ○

	Column A		Column B	
		In ΔXYZ $XY > YZ$		A ○ B ○ C ○
25.	$\angle Z$		$\angle Y$	D ○



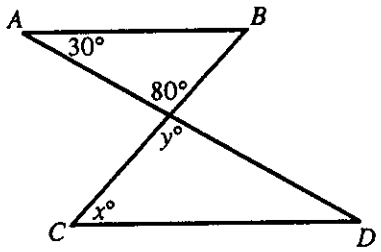
				A ○ B ○ C ○
26.	y		$z - x$	D ○





Note: Figure not drawn to scale.

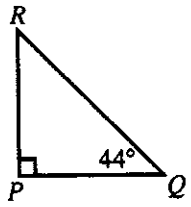
				A ○ B ○ C ○
27.	Area of $ABCD$		Perimeter of $ABCD$	D ○



Note: Figure not drawn to scale.

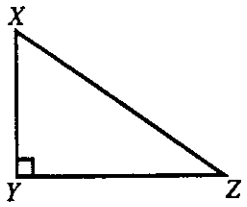
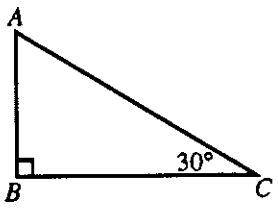
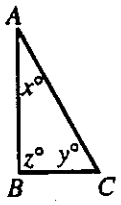
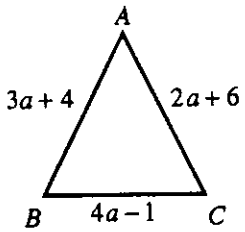
$AB \parallel CD$

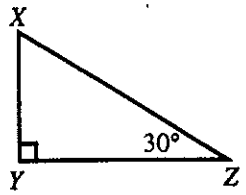
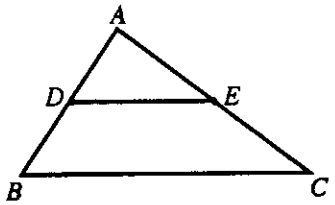
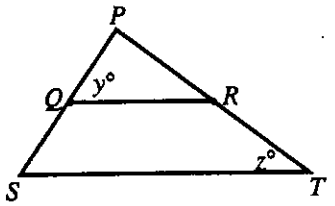
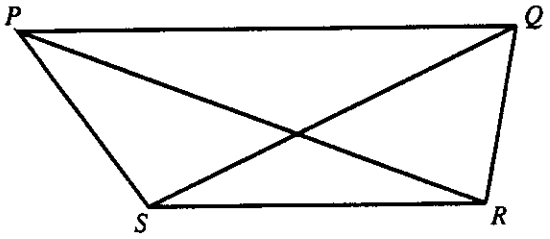
				A ○ B ○ C ○
28.	y		x	D ○

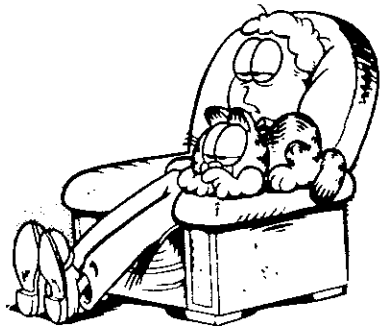
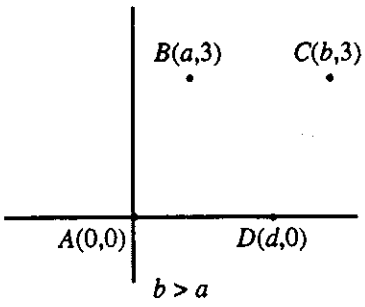
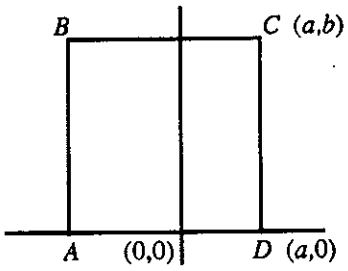
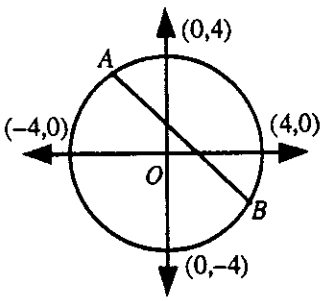


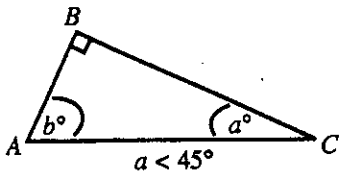
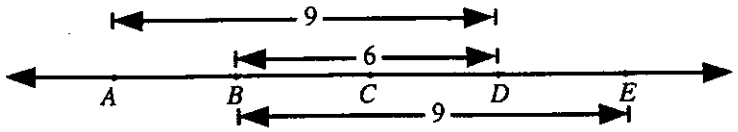
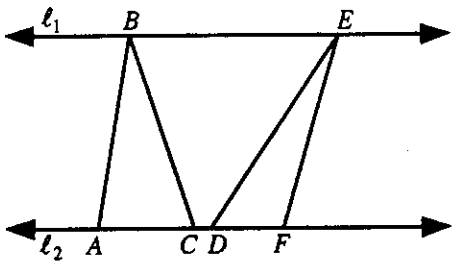
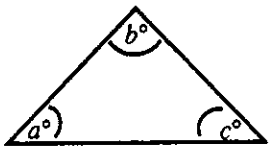
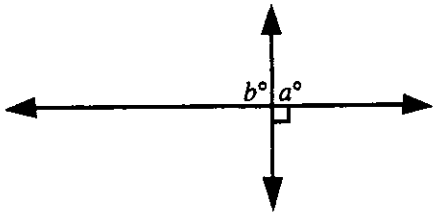
Note: Figure not drawn to scale.

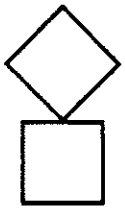
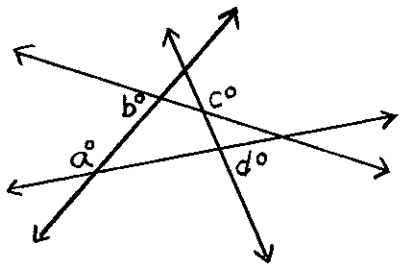
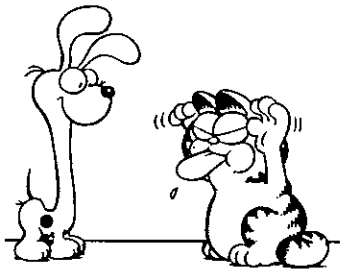
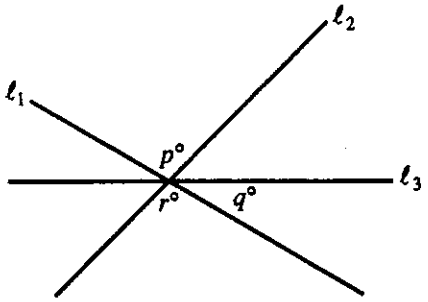
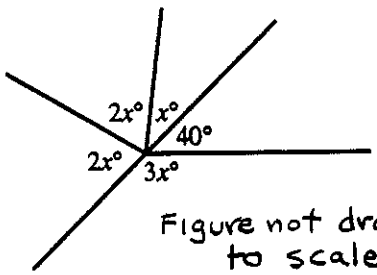
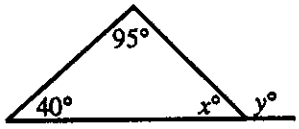
				A ○ B ○ C ○
29.	PR		PQ	D ○

	Column A	Column B	
30.	 Area of $\Delta XYZ = 48$ $XY = 12$ 8	YZ	A ○ B ○ C ○ D ○
31.	 Note: Figure not drawn to scale. $BC = 4$ AB	3	A ○ B ○ C ○ D ○
32.	 $AB \perp BC$ The average of x, y, z	y	A ○ B ○ C ○ D ○
33.	Perimeter of square $ABCD = 12$ Perimeter of equilateral triangle $XYZ = 18$ Area of $ABCD$	Area of ΔXYZ	A ○ B ○ C ○ D ○
34.	  Perimeter of $\Delta ABC = 27$ a	2	A ○ B ○ C ○ D ○

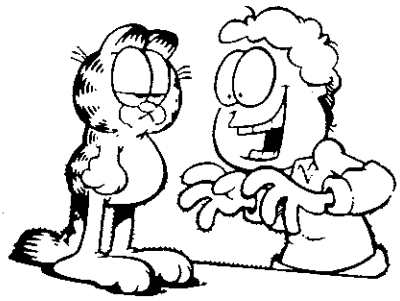
	Column A	Column B	
35.	 Area of $\Delta XYZ = 16\sqrt{3}$ XY	4	A ○ B ○ C ○ D ○
36.	 D and E are the midpoints of AB and AC, respectively. $DE \parallel BC$. Area of ΔADE	$\frac{1}{3}$ area of ΔABC	A ○ B ○ C ○ D ○
37.	  Note: Figure not drawn to scale. $QR \parallel ST$ $PQ = PR$ y	z	A ○ B ○ C ○ D ○
38.	 $PQ \parallel SR$ Area of ΔPSR	Area of ΔQRS	A ○ B ○ C ○ D ○

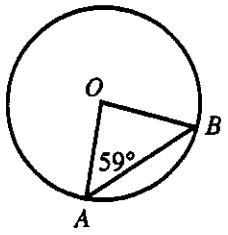
	Column A	Column B	
39.	  Area of triangle *ACD*	Area of triangle *ABD*	A ○ B ○ C ○ D ○
40.	The point (a,b) is on the x-axis. a	b	A ○ B ○ C ○ D ○
41.	 *ABCD* is a square. *D* has coordinates $(a,0)$. *C* has coordinates (a,b). a	b	A ○ B ○ C ○ D ○
42.	 The length of segment *AB*	8	A ○ B ○ C ○ D ○

	Column A		Column B	
43.	 The length of AB		The length of CB	A ○ B ○ C ○ D ○
44.	The length of the third side of a right triangle having two sides of length 1 and $\sqrt{2}$		$\sqrt{3}$	A ○ B ○ C ○ D ○
45.	 Note: Figure not drawn to scale. $BD = 6$ $BE = 9$ $AD = 9$ The length of AC		6	A ○ B ○ C ○ D ○
46.	 Area of ΔABC	$AC = DF$ $\ell_1 \parallel \ell_2$	 Area of ΔDEF	A ○ B ○ C ○ D ○
47.	 $90° - (a + b)$		c	A ○ B ○ C ○ D ○
48.	 a		b	A ○ B ○ C ○ D ○

	Column A		Column B	
49.	 A Perimeter of figure A	The two figures are formed with four equal-size squares.	 B Perimeter of figure B	A ○ B ○ C ○ D ○
50.	 a + b		c + d	A ○ B ○ C ○ D ○
51.	  ℓ_1, ℓ_2, and ℓ_3 intersect at one point. $p + 2q$		$r + 2q$	A ○ B ○ C ○ D ○
52.	 Figure not drawn to scale $2x - 20$		The number of degrees in each angle of an equilateral triangle	A ○ B ○ C ○ D ○
53.	 $3x$		$y - 10$	A ○ B ○ C ○ D ○

	Column A	Column B	
54.	Area of a circle of radius 8 inches	Volume of a cylinder with a base of radius 4 inches and a height of 6 inches	A O B O C O D O

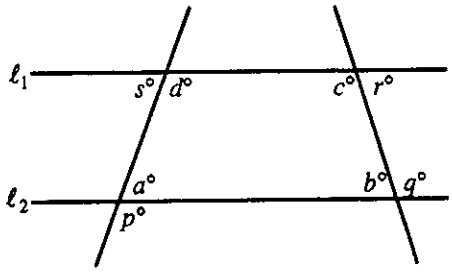




A and B are points on the circle with center O

55.	OA	AB	A O B O C O D O

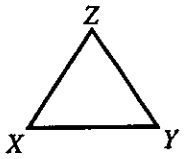
56.	Circumference of a circle of radius 3	Perimeter of a square of side 3.5	A O B O C O D O



$\ell_1 \parallel \ell_2$

57.	$a+b+c+d$	$p+q+r+s$	A O B O C O D O

58.	Surface area of a cube with an edge of length 4 inches	Area of a square of side $6\sqrt{3}$ inches	A O B O C O D O



ΔXYZ is equilateral

59.	Length of the altitude to the side XY	$\frac{1}{2}$ of length XY	A O B O C O D O

S.A.T. - First Practice Exam

SECTION 1

1. $0.2 \times 0.02 \times 0.002 =$

   (A) .08
   (B) .008
   (C) .0008
   (D) .00008
   (E) .000008

2. If it costs $1.30 a square foot to lay linoleum, what will be the cost of laying 20 square yards of linoleum? (3 ft. = 1 yd.)

   (A) $47.50
   (B) $49.80
   (C) $150.95
   (D) $249.00
   (E) $234.00

3. In a family of five, the heights of the members are 5 feet 1 inch, 5 feet 7 inches, 5 feet 2 inches, 5 feet, and 4 feet 7 inches. The average height is

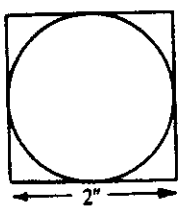
   (A) 4 feet 4 1/5 inches
   (B) 5 feet
   (C) 5 feet 1 inch
   (D) 5 feet 2 inches
   (E) 5 feet 3 inches

4. Three times the first of three consecutive odd integers is 3 more than twice the third. Find the third integer.

   (A) 7
   (B) 9
   (C) 11
   (D) 13
   (E) 15

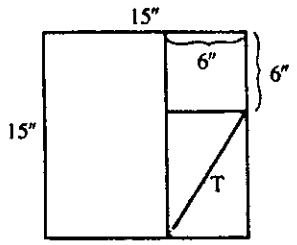
5. In the figure below, the largest possible circle is cut out of a square piece of tin. The area, in square inches, of the remaining piece of tin is approximately

   (A) .14
   (B) .75
   (C) .86
   (D) 1.0
   (E) 3.14



6. The figure shows one square inside another and a rectangle of diagonal T. The best approximation to the value of T, in inches, is given by which of the following inequalities?

   (A) $8 < T < 9$
   (B) $9 < T < 10$
   (C) $10 < T < 11$
   (D) $11 < T < 12$
   (E) $12 < T < 13$



7. If nails are bought at 35 cents per dozen and sold at 3 for 10 cents, the total profit on 5½ dozen is

   (A) 25 cents
   (B) 27.5 cents
   (C) 28.5 cents
   (D) 31.5 cents
   (E) 35 cents

8. The total number of eighths in 2 3/4 is

   (A) 11
   (B) 14
   (C) 19
   (D) 22
   (E) 24

9. What is the difference when $-x-y$ is subtracted from $-x^2 + 2y$?

   (A) $x^2 - x - 3y$
   (B) $-3x + y$
   (C) $x^2 + 3y$
   (D) $-x^2 + x - 3y$
   (E) $-x^2 + x + 3y$

10. If $2^m = 4x$ and $2^w = 8x$, what is m in terms of w?

    (A) w - 1
    (B) w + 1
    (C) 2w - 1
    (D) 2w + 1
    (E) w^2

11. 1¼ subtracted from its reciprocal is

(A) $\frac{9}{20}$

(B) $\frac{1}{5}$ (D) $-\frac{1}{5}$

(C) $-\frac{1}{20}$ (E) $-\frac{9}{20}$

12. The total number of feet in x yards, y feet, and z inches is

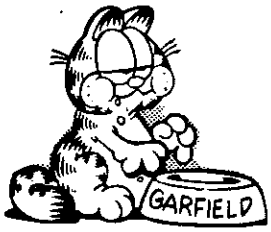
(A) $3x + y + \frac{z}{12}$

(B) $12(x + y + z)$

(C) $x + y + z$

(D) $\frac{x}{36} + \frac{y}{12} + z$

(E) $x + 3y + 36z$



13. If five triangles are constructed having sides of the lengths indicated below, the triangle that will not be a right triangle is

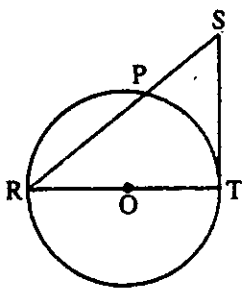
(A) 5, 12, 13
(B) 3, 4, 5
(C) 8, 15, 17
(D) 9, 40, 41
(E) 12, 15, 18

14. Of the following, the one that may be used correctly to compute $26 \times 3\frac{1}{2}$ is

(A) $(26 \times 30) + (26 \times \frac{1}{2})$
(B) $(20 \times 3) + (6 \times 3\frac{1}{2})$
(C) $(20 \times 3\frac{1}{2}) + (6 \times 3)$
(D) $(20 \times 3) + (26 \times \frac{1}{2}) + (6 \times 3\frac{1}{2})$
(E) $(26 \times \frac{1}{2}) + (20 \times 3) + (6 \times 3)$

15. In the figure, ST is tangent to the circle at T. RT is a diameter. If $RS = 12$, and $ST = 8$, what is the area of the circle?

(A) 5π
(B) 8π
(C) 9π
(D) 20π
(E) 40π



16. What would be the marked price of an article if the cost was $12.60 and the gain was 10% of the selling price?

(A) $11.34
(B) $12.48
(C) $13.66
(D) $13.86
(E) $14.00

17. If the average weight of boys who are John's age and height is 105 lbs., and if John weighs 110% of the average, then how many pounds does John weigh?

(A) 110
(B) 110.5
(C) 112
(D) 114.5
(E) 115.5

18. The radius of a circle that has a circumference equal to the perimeter of a hexagon whose sides are each 22 inches long is closest in length to which of the following?

(A) 7
(B) 14
(C) 21
(D) 24
(E) 28

19. In the first year of the United States Stickball League, the Bayonne Bombers won 50% of their games. During the second season of the league the Bombers won 65% of their games. If there were twice as many games played in the second season as in the first, what percentage of the games did the Bombers win in the first two years of the league?

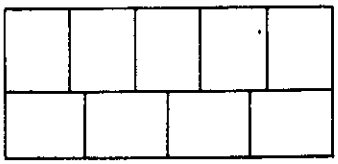
(A) 115%
(B) 60%
(C) 57.5%
(D) 55%
(E) It cannot be determined from the information given.

20. If the total weight of an apple is 4/5 of its weight plus 4/5 of an ounce, what is its weight in ounces?

(A) 1 3/5
(B) 3 1/2 (D) 4 4/5
(C) 4 (E) 5

21. Nine playing cards from the same deck are placed as shown in the figure below to form a large rectangle of area 180 sq. in. How many inches are there in the perimeter of this large rectangle?

(A) 29
(B) 58
(C) 64
(D) 116
(E) 210



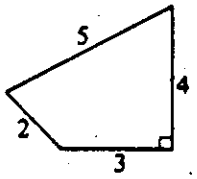
22. If each of the dimensions of a rectangle is increased 100%, the area is increased

(A) 100%
(B) 200%
(C) 300%
(D) 400%
(E) 500%

23. A recipe for a cake calls for 2 1/2 cups of milk and 3 cups of flour. With this recipe, a cake was baked using 14 cups of flour. How many cups of milk were required?

(A) 10 1/3
(B) 10 3/4
(C) 11
(D) 11 3/5
(E) 11 2/3

24.



In the figure above, what is the area of the quadrilateral?

(A) $6 + 2\sqrt{6}$ (B) $2\sqrt{30}$ (C) 11 (D) 13
(E) It cannot be determined from the information given.

25. What is 10% of $\frac{1}{3}x$ if $\frac{2}{3}x$ is 10% of 60?

(A) .1
(B) .2
(C) .3
(D) .4
(E) .5

S.A.T. - First Practice Exam

SECTION 3

1. The total saving in purchasing thirty 13-cent lollipops for a class party at a reduced rate of $1.38 per dozen is:

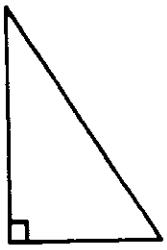
   (A) $.35
   (B) $.38
   (C) $.40
   (D) $.45
   (E) $.50

2. A gallon of water is equal to 231 cubic inches. How many gallons of water are needed to fill a fish tank that measures 11" high, 14" long, and 9" wide?

   (A) 6
   (B) 8
   (C) 9
   (D) 3
   (E) 24

3. The area of a right triangle is 12 square inches. The ratio of its legs is 2:3. Find the number of inches in the hypotenuse of this triangle.

   (A) $\sqrt{13}$
   (B) $\sqrt{26}$
   (C) $3\sqrt{13}$
   (D) $\sqrt{52}$
   (E) $4\sqrt{13}$



4. A rectangular block of metal weighs 3 ounces. How many pounds will a similar block of the same metal weigh if the edges are twice as large?

   (A) 3/8
   (B) 3/4
   (C) 1 1/2
   (D) 3
   (E) 24

5. A college graduate goes to work for x dollars per week. After several months the company gives all the employees a 10% pay cut. A few months later the company gives all the employees a 10% raise. What is the college graduate's new salary?

   (A) $.90x$
   (B) $.99x$
   (C) x
   (D) $1.01x$
   (E) $1.11x$

6. What is the net amount of a bill of $428.00 after a discount of 6% has been allowed?

   (A) $432.62
   (B) $430.88
   (C) $414.85
   (D) $412.19
   (E) $402.32

7. A certain type of board is sold only in lengths of multiples of 2 feet, from 6 ft. to 24 ft. A builder needs a large quantity of this type of board in 5½-foot lengths. For minimum waste, the lengths in feet to be ordered should be

   (A) 6
   (B) 12
   (C) 18
   (D) 22
   (E) 24

8. A cube has an edge which is four inches long. If the edge is increased by 25% then the volume is increased by approximately

   (A) 25%
   (B) 48%
   (C) 73%
   (D) 95%
   (E) 122%

9. The ratio of 1/4 to 3/5 is

   (A) 1 to 3
   (B) 3 to 20
   (C) 5 to 12
   (D) 3 to 4
   (E) 5 to 4

10. Which of the following numbers is the smallest?

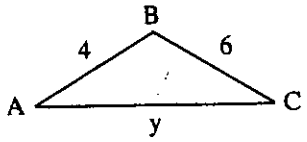
    (A) $\sqrt{3}$
    (B) $\frac{1}{\sqrt{3}}$
    (C) $\frac{\sqrt{3}}{3}$
    (D) $\frac{1}{3}$
    (E) $\frac{1}{3\sqrt{3}}$

S.A.T. - First Practice Exam

SECTION 5

QUANTITATIVE

	Column A	Column B
1.	The number of sides in a polygon	The number of sides in a quadrilateral



2.	Length of side AC	10

$x(y + z) = 0$
$y = -z$

3.	x	$y + z$

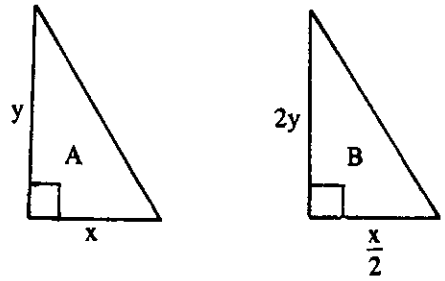
4.	Area of a circle with a radius of $\frac{2r}{3}$	Area of a circle with a diameter of $\frac{4r}{3}$

$a \phi b = (a + b)(a - b)$

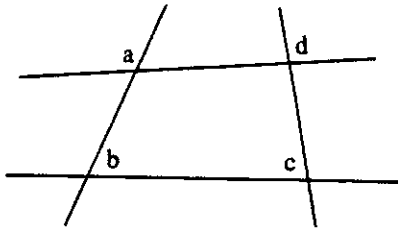
5.	$2 \phi 2$	$-2 \phi -2$

p is an integer

6.	The ratio of p to $(p + 1)$ if $5<p<10$	The ratio of p to $(p + 1)$ if $10<p<15$



7.	Area of triangle A	Area of triangle B



8.	$\frac{a + b + c + d}{4}$	90

Questions 9 and 10 refer to the statement below.

In a sequence of N numbers the first is -1, the second 1, the third is -2, the fourth is 2, and so on.

9.	The ninth number times the eleventh number	The tenth number times the twelfth number
10.	The sum of the first through the fifth numbers	The sum of the sixth through the tenth numbers

$0<k<1$

11.	$2k$	k^2

p is a positive integer

12.

The whole number remainder when $3p + 5$ is divided by 3	The whole number remainder when $7p + 8$ is divided by 7

13.

The number of prime numbers between 1 and 25	9

$$\frac{m^4}{3} = 27$$

14.

m	4

$s > 1$

15.

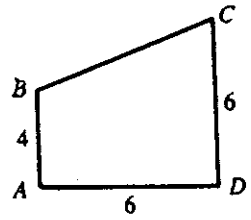
The volume of a cube with a side of s	The volume of a rectangular solid with sides of s, $s + 1$, and $s - 1$

FREE RESPONSE

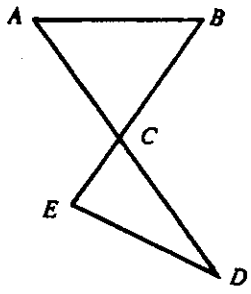
16. The average temperatures for five days were 82°, 86°, 91°, 79°, and 91°. What is the mode for these temperatures?

17. If $-2x + 5 = 2 - (5 - 2x)$, what is the value of x?

18. In the figure below, $BA \perp AD$ and $CD \perp AD$. Using the values indicated in the figure, what is the area of polygon $ABCD$?

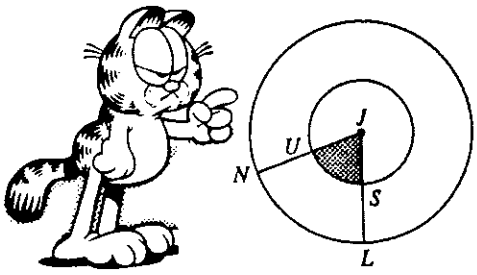


19. In the figure below, $AC = BC$. If $m\angle B = 50°$, what is the measure of $\angle ECD$? (Do not grid the degree symbol)



20. What is the value of $-m^2n^3$, when $m = -2$ and $n = -1$?

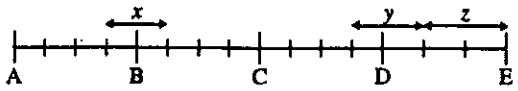
21. Given a square, a rectangle, a trapezoid, and a circle, if one of these figures is selected at random, what is the probability that the figure has four right angles?



22. Given the concentric circles above, if radius JN is 3 times JU, then the ratio of the shaded area to the area of sector NJL is $1:b$. What is the value of b?

23. In a three-hour examination of 350 questions, there are 50 mathematics problems. If twice as much time should be allowed for each problem as for each of the other questions, how many minutes should be spent on the mathematical problems?

24. In a pantry there are 28 cans of vegetables. Eight of these have labels with white lettering, 18 have labels with green lettering, and 8 have labels with neither white nor green lettering. How many cans have both white and green lettering?



25. B, C, and D divide AE into 4 equal parts. AB, BC, CD are divided into 4 equal parts as shown.
DE is divided into 3 equal parts as shown.

$$\frac{x+z}{y} =$$

16. **17.** **18.** **19.** **20.**

21. **22.** **23.** **24.** **25.**

S.A.T. - Second Practice Exam

SECTION 1

1. One angle of a triangle is 82°. The other two angles are in the ratio 2:5. Find the number of degrees in the smallest angle of the triangle.

   (A) 14
   (B) 25
   (C) 28
   (D) 38
   (E) 82

2. Village A has a population of 6,800, which is decreasing at a rate of 120 per year. Village B has a population of 4,200, which is increasing at a rate of 80 per year. In how many years will the population of the two villages be equal?

   (A) 9
   (B) 11
   (C) 13
   (D) 14
   (E) 16

3. If $*x$ is defined such that $*x = x^2 - 2x$, the value of $*2 - *1$ is

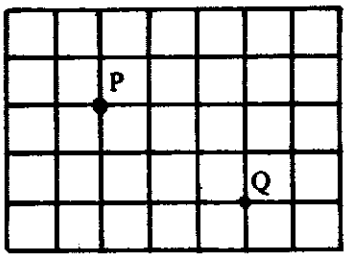
   (A) -1
   (B) 0
   (C) 1
   (D) 2
   (E) 4

4. In a right triangle, the ratio of the legs is 1:2. If the area of the triangle is 25 square units, what is the length of the hypotenuse?

   (A) $\sqrt{5}$
   (B) $5\sqrt{5}$
   (C) $5\sqrt{3}$
   (D) $10\sqrt{3}$
   (E) $25\sqrt{5}$

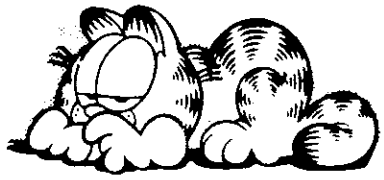
5. In the graph below, the axes and the origin are not shown. If point P has coordinates (3,7), what are the coordinates of point Q, assuming each box is one unit?

   (A) (5,6)
   (B) (1,10)
   (C) (6,9)
   (D) (6,5)
   (E) (5,10)

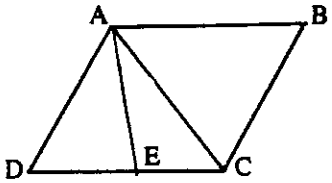


6. If $r = 5x$, how many tenths of r does ½ of x equal?

   (A) 1
   (B) 2
   (C) 3
   (D) 4
   (E) 5



7. $ABCD$ is a parallelogram, and $DE = EC$.



   What is the ratio of triangle ADE to the area of the parallelogram?

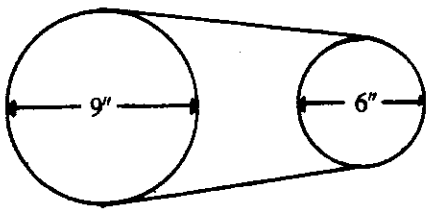
   (A) 2 : 5
   (B) 1 : 2
   (C) 1 : 3
   (D) 1 : 4
   (E) It cannot be determined from the information given.

8. In any square, the length of one side is

   (A) one-half the diagonal of the square
   (B) the square root of the perimeter of the square
   (C) about .7 the length of the diagonal of the square
   (D) the square root of the diagonal
   (E) one-fourth the area

9. A pulley having a 9-inch diameter is belted to a pulley have a 6-inch diameter, as shown in the figure. If the large pulley runs at 120 rpm, how fast does the small pulley run, in revolutions per minute?

   (A) 80
   (B) 100
   (C) 160
   (D) 180
   (E) 240



10. The number of degrees through which the hour hand of a clock moves in 2 hours and 12 minutes is

(A) 66
(B) 72
(C) 126
(D) 732
(E) 792

11. The average of 8 numbers is 6; the average of 6 other numbers is 8. What is the average of all 14 numbers?

(A) 6
(B) 6 6/7
(C) 7
(D) 7 2/7
(E) 8 1/7

12. If x is between 0 and 1, which of the following increases as x increases?

I. $1 - x^2$
II. $x - 1$
III. $\frac{1}{x^2}$

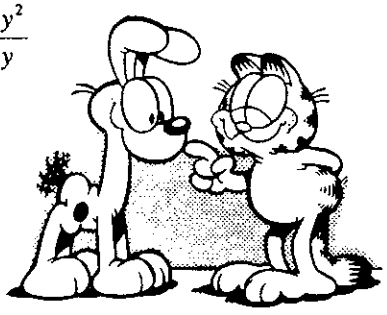
(A) I and II
(B) II and III
(C) I and III
(D) II only
(E) I only

13. In the series 3, 7, 12, 18, 25, . . . the 9th term is

(A) 50
(B) 63
(C) 75
(D) 86
(E) 88

14. Simplify $\frac{x^2-y^2}{x-y}$

(A) $\frac{xy}{x+y}$
(B) $\frac{x+y}{xy}$
(C) $x + y$
(D) xy
(E) $x^2 + y^2 - 1$



15. The front wheels of a wagon are 7 feet in circumference and the back wheels are 9 feet in circumference. When the front wheels have made 10 more revolutions than the back wheels, what distance, in feet, has the wagon gone?

(A) 126
(B) 180
(C) 189
(D) 315
(E) 630

16. A rectangular flower bed, dimensions 16 yards by 12 yards, is surrounded by a walk 3 yards wide. The area of the walk in square yards is

(A) 78
(B) 93
(C) 132
(D) 204
(E) 396

17. If $p > q$ and $r < 0$, which of the following is (are) true?

I. $pr > qr$
II. $p + r > q + r$
III. $p - r < q - r$

(A) I only
(B) II only
(C) I and III only
(D) I and II only
(E) I, II and III

18. A circle is inscribed in a given square and another circle is circumscribed about the same square. What is the ratio of the area of the inscribed to the circumscribed circle?

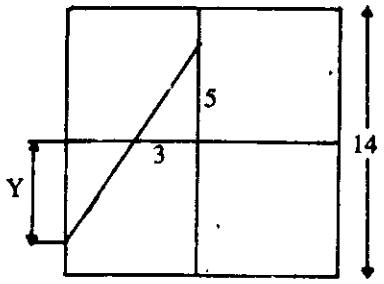
(A) 1 : 4
(B) 4 : 9
(C) 1 : 2
(D) 2 : 3
(E) 3 : 4

19. If 3/7 of a bucket can be filled in 1 minute, how many minutes will it take to fill the rest of the bucket?

(A) 7/3
(B) 4/3
(C) 1
(D) 3/4
(E) 4/7

20. In the figure below, the side of the large square is 14. The four smaller squares are formed by joining the midpoints of opposite sides. Find the value of *Y*.

(A) 5
(B) 6
(C) 6 5/8
(D) 6 2/3
(E) 6.8



21. If the base of a rectangle is increased by 30% and the altitude is decreased by 20%, the area is increased by

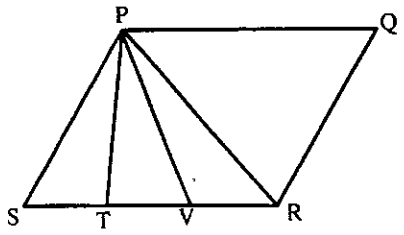
(A) 4%
(B) 5%
(C) 10%
(D) 25%
(E) 104%

22. Using a 9 × 12-inch sheet of paper lengthwise, a typist leaves a 1-inch margin on each side and a 1½-inch margin on top and bottom. What fractional part of the page is used for typing?

(A) 5/12
(B) 7/12
(C) 5/9
(D) 3/4
(E) 21/22

23. In the figure, *PQRS* is a parallelogram, and *ST* = *TV* = *VR*. What is the ratio of the area of triangle *SPT* to the area of the parallelogram? **Note:** Figure is not drawn to scale.

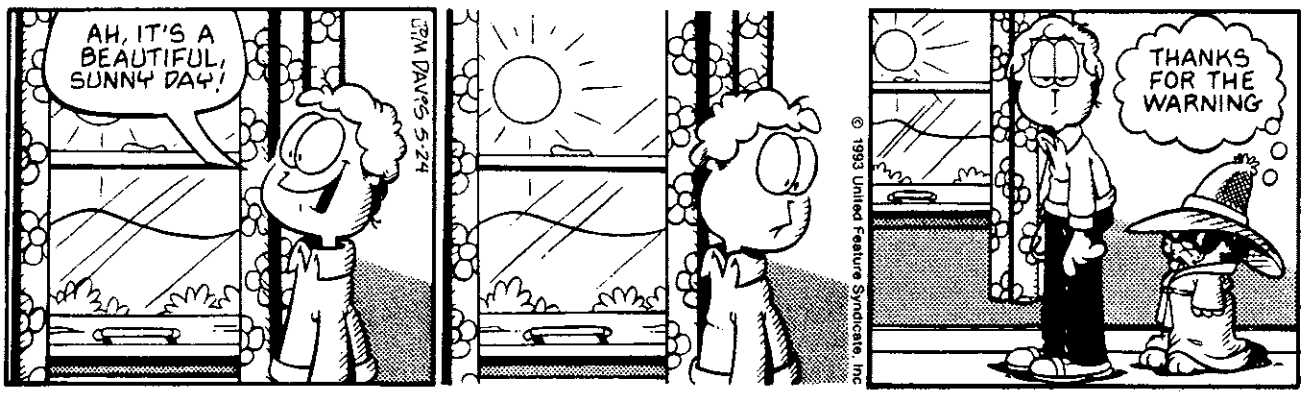
(A) 1/6
(B) 1/5
(C) 2/7
(D) 1/3



(E) Cannot be determined

24. Given formula $A = P(1 + rt)$, then $t =$

(A) $A - P - Pr$
(B) $\frac{A + P}{Pr}$
(C) $\frac{A}{P} - r$
(D) $\frac{A - P}{Pr}$
(E) $\frac{A - r}{Pr}$



S.A.T. - Second Practice Exam

SECTION 3

1. Which one of the following quantities has the lowest numerical value?

   (A) 4/5
   (B) 7/9
   (C) .76
   (D) 5/7
   (E) 9/11

2. A salesperson earns twice as much in December as in each of the other months of a year. What part of this salesperson's entire year's earnings are earned in December?

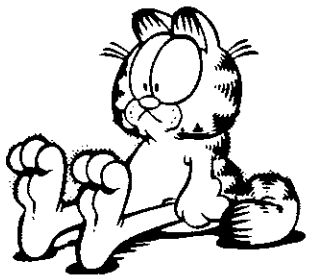
   (A) 1/7
   (B) 2/13
   (C) 1/6
   (D) 2/11
   (E) 3/14

3. If $x = -1$, then $3x^3 + 2x^2 + x + 1 =$

   (A) -5
   (B) -1
   (C) 1
   (D) 2
   (E) 5

4. $.03\% \times .21 =$

   (A) .63
   (B) .063
   (C) .0063
   (D) .00063
   (E) .000063



5. An equilateral triangle 3 inches on a side is cut up into smaller equilateral triangles one inch on a side. What is the greatest number of such triangles that can be formed?

   (A) 3
   (B) 6
   (C) 9
   (D) 12
   (E) 15

6. A square 5 units on a side has one vertex at the point (1,1). Which one of the following points *cannot* be diagonally opposite that vertex?

   (A) (6, 6)
   (B) (−4, 6)
   (C) (−4,−4)
   (D) (6,−4)
   (E) (4,−6)

7. Five equal squares are placed side by side to make a single rectangle whose perimeter is 372 inches. Find the number of square inches in the area of one of these squares.

   (A) 72
   (B) 324
   (C) 900
   (D) 961
   (E) 984

8. The water level of a swimming pool, 75 feet by 42 feet, is to be raised four inches. How many gallons of water must be added to accomplish this?
   (7.48 gal. = 1 cubic ft.)

   (A) 140
   (B) 7,854
   (C) 31,500
   (D) 94,500
   (E) 727, 650

9. What part of the total quantity is represented by a 24-degree sector of a circle graph?

   (A) 6⅔%
   (B) 12%
   (C) 13⅓%
   (D) 15%
   (E) 24%

10. The square of a fraction between 0 and 1 is

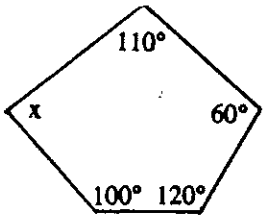
    (A) less than the original fraction
    (B) greater than the original fraction
    (C) twice the original fraction
    (D) less than the cube of the fraction
    (E) not necessarily any of the preceding

S.A.T. - Second Practice Exam

SECTION 5

QUANTITATIVE

	Column A	Column B
1.	$\frac{a^2+b}{2}$	$.5(a^2+b)$



Note: Figure not drawn to scale.

2.	x	90°

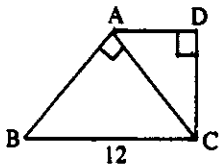
$$\frac{m}{n} = \frac{7}{10}$$

3.	mn	70

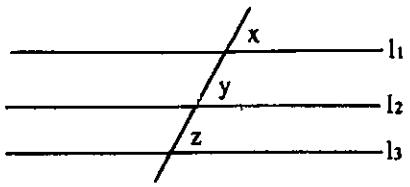
For all real numbers x and y, let Δ be defined as $x \,\Delta\, y = \frac{xy}{x - y}$

4.	$-3 \,\Delta\, -2$	$-2 \,\Delta\, -3$

Note: Figure not drawn to scale.



5.	12	side CD



$\ell_1 \| \ell_2 \| \ell_3$

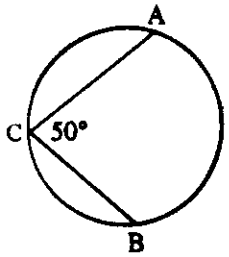
6.	$x + y$	$y + z$

7.	3% of 4%	.0012

A two-pound box of Brand A costs $7.88.
A three-pound box of Brand B costs $11.79.

8.	Cost per pound of Brand A	Cost per pound of Brand B

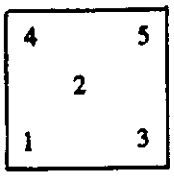
Note: Figure not drawn to scale.

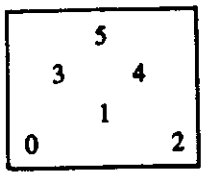


9.	90	Degree measure of arc AB

10.	$\sqrt{8} + \sqrt{24}$	$\sqrt{32}$

11.





BOX A	BOX B
Number of different two-digit numbers that can be constructed using the digits in Box A.	Number of different two-digit numbers that can be constructed using the digits in Box B.

12.

$a(b + c)$	$\frac{b + c}{a}$

$$p^2 - q^2 = 4$$
$$p - q = -1$$

13.

$p + q$	4

40% of the boys in a class are in the band.
60% of the girls in the same class are in the band.

14.

Number of boys not in band.	Number of girls not in band.

p, q, and r are positive

15.

$p \times q \times r$	$p + q + r$

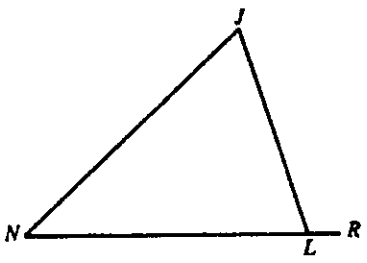
FREE RESPONSE

16. $\left(\sqrt{18} - \sqrt{8}\right)^2 =$

17. The distance from the center of a circle to a chord is 5. If the length of the chord is 24, what is the length of the radius of the circle?

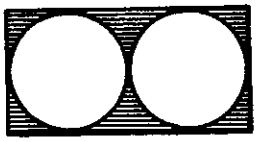
18. If the cost of a party is to be split equally among 11 friends, each would pay \$15.00. If 20 persons equally split the same cost, how much would each person pay?

19. In the figure below, $m\angle N = (9x - 40)°$, $m\angle J = (4x + 30)°$ and $m\angle JLR = (8x + 40)°$. What is the measure of $\angle J$? (Do not grid the degree symbol.)



20. $\frac{2^2 + 3^2}{5^2} + \frac{1}{10} =$

21. In the figure below two circles are tangent to each other and each is tangent to three sides of the rectangle. If the radius of each circle is 3, then the area of the shaded portion is $a - b\pi$. What is the value of a?

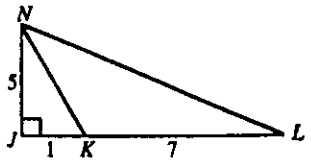


22. The measures of the angles of a triangle are in the ratio of 3:5:7. What is the measure, in degrees, of the smallest angle? (Do not grid the degree symbol.)

23. The length of the line segment whose end points are $(3, -2)$ and $(-4, 5)$ is $b\sqrt{2}$. What is the value of b?

24. Jessica caught five fish with an average weight of 10 pounds. If three of the fish weigh 9, 9, and 10 pounds, respectively, what is the average (arithmetic mean) weight of the other two fish?

25. In the figure below, what is the area of ΔNKL?



16.

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0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

17.

	/	/	
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0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

18.

	/	/	
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0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

19.

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0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

20.

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0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

21.

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0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

22.

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0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

23.

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0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

24.

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0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

25.

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0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9