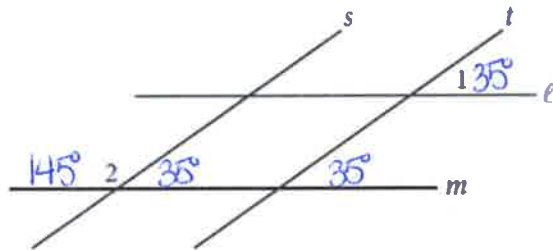


Geometry

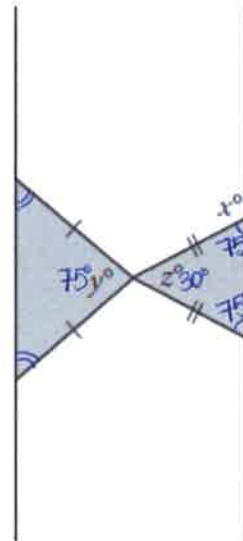
1. Calculator



In the figure above, lines l and m are parallel and lines s and t are parallel. If the measure of $\angle 1$ is 35° , what is the measure of $\angle 2$?

- A) 35°
- B) 55°
- C) 70°
- D) 145°

2. Non-Calculator



$$180 - z = 2(75)$$

$$180 - z = 150$$

$$z = 30$$

Note: Figure not drawn to scale.

Two isosceles triangles are shown above. If $180 - z = 2y$ and $y = 75$, what is the value of x ?

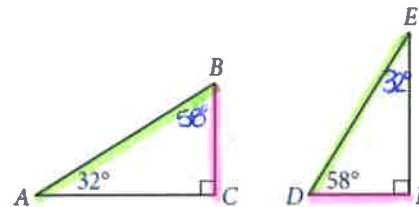
$$x = 105$$

3. Calculator

The painting *The Starry Night* by Vincent van Gogh is rectangular in shape with height 29 inches and width 36.25 inches. If a reproduction was made where each dimension is $\frac{1}{3}$ the corresponding original dimension, what is the height of the reproduction, in inches?

$$29 \left(\frac{1}{3} \right) = \frac{29}{3}$$

4. Calculator

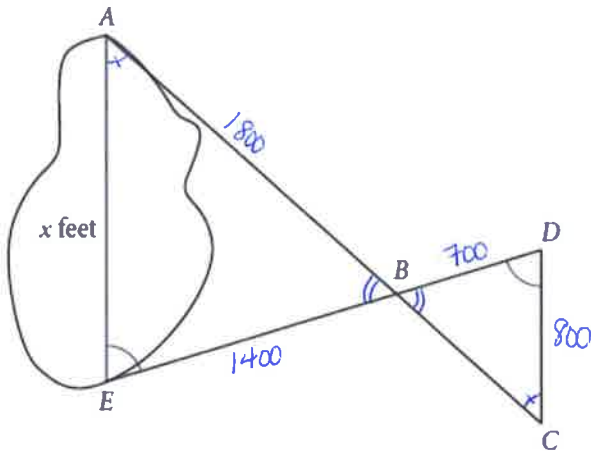


Triangles ABC and DEF are shown above. Which

of the following is equal to the ratio $\frac{BC}{AB}$?

- A) $\frac{DE}{DF}$
- B) $\frac{DF}{DE}$
- C) $\frac{DF}{EF}$
- D) $\frac{EF}{DE}$

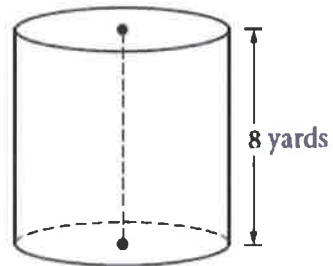
5. Calculator



A summer camp counselor wants to find a length, x , in feet, across a lake as represented in the sketch above. The lengths represented by \overline{AB} , \overline{EB} , \overline{BD} , and \overline{CD} on the sketch were determined to be 1800 feet, 1400 feet, 700 feet, and 800 feet, respectively. Segments AC and DE intersect at B , and $\angle AEB$ and $\angle CDB$ have the same measure. What is the value of x ?

$x = 1600 \text{ ft.}$

6. Calculator



$V = \pi r^2 h$

A dairy farmer uses a storage silo that is in the shape of the right circular cylinder above. If the volume of the silo is 72π cubic yards, what is the diameter of the base of the cylinder, in yards?

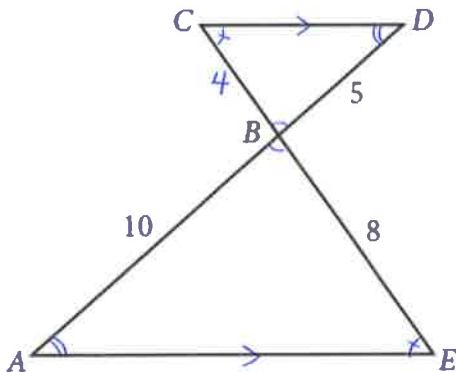
$\frac{72\pi}{8\pi} = \frac{\pi r^2 (8)}{8\pi}$

$9 = r^2$

$r = 3$

diameter = $2r = 2(3) = 6 \text{ yds}$

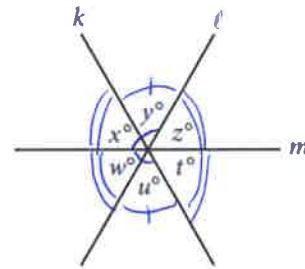
7. Non-Calculator



In the figure above, $\overline{AE} \parallel \overline{CD}$ and segment \overline{AD} intersects segment \overline{CE} at B . What is the length of segment \overline{CE} ?

$\overline{CE} = 4 + 8 = 12$

8. Non-Calculator



Note: Figure not drawn to scale.

In the figure above, lines k , l , and m intersect at a point. If $x + y = u + w$, which of the following must be true?

(I) $x = z$

(II) $y = w$

(III) $z = t$

- A) I and II only
- B) I and III only
- C) II and III only
- D) I, II, and III

$\angle y \cong \angle u$ (vertical angles)

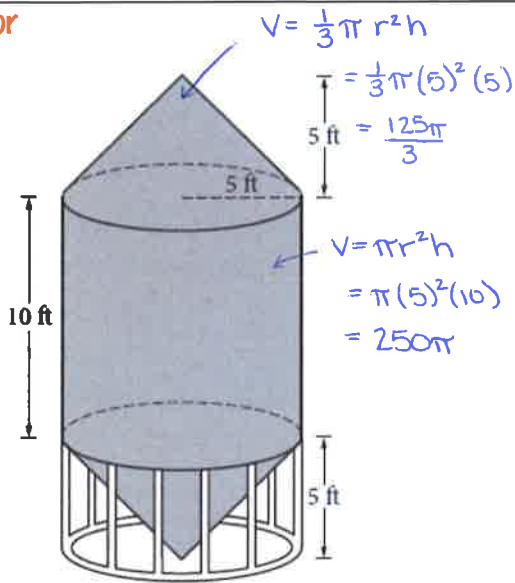
$\angle x \cong \angle w$ (by subtraction)

$\angle w \cong \angle z$ (vertical angles)

$\angle x \cong \angle t$ (vertical angles)

$\angle w \cong \angle x \cong \angle t \cong \angle z$

9. Calculator



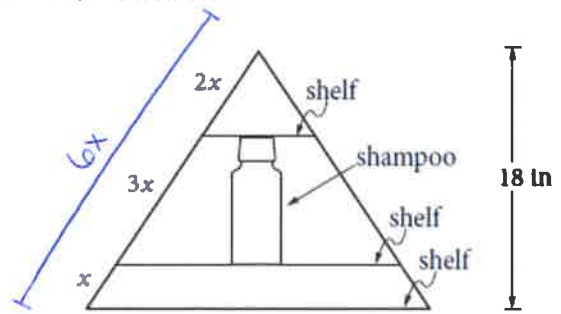
A grain silo is built from two right circular cones and a right circular cylinder with internal measurements represented by the figure above. Of the following, which is closest to the volume of the grain silo, in cubic feet?

- A) 261.8
- B) 785.4
- C) 916.3*
- D) 1,047.2

$$V = 2\left(\frac{125\pi}{3}\right) + 250\pi$$

$$\approx 1047.197551$$

10. Non-Calculator



Jim has a triangular shelf system that attaches to his showerhead. The total height of the system is 18 inches, and there are three parallel shelves as shown above. What is the maximum height, in inches, of a shampoo bottle that can stand upright on the middle shelf?

① $\frac{18}{6x} = \frac{k}{5x}$ $\frac{3}{x} = \frac{y}{2x}$

$\Rightarrow k=15$ $\Rightarrow y=6$

② $\frac{3}{x} = \frac{y}{2x}$

③ $15 - 6 = 9$

9 inches

11. Calculator

Jim has identical drinking glasses each in the shape of a right circular cylinder with internal diameter of $r=1.5$ 3 inches. He pours milk from a gallon jug into each glass until it is full. If the height of milk in each glass is about 6 inches, what is the largest number of full milk glasses that he can pour from one gallon of milk? (Note: There are 231 cubic inches in 1 gallon.)

- A) 2
- B) 4
- C) 5
- D) 6

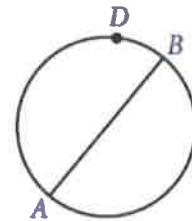
$$V = \pi r^2 h = \pi (1.5)^2 (6) = 13.5\pi$$

$$\approx 42.41 \text{ in}^3$$

~~$$42.41 \text{ in}^3 \times \frac{1 \text{ gallon}}{231 \text{ in}^3} \approx .18 \text{ gallons}$$~~

$$\frac{231 \text{ in}^3}{42.41 \text{ in}^3} \approx 5.4468$$

12. Calculator



In the circle above, segment AB is a diameter. If the length of arc \widehat{ADB} is 8π , what is the length of the radius of the circle?

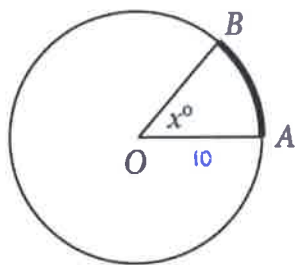
- A) 2
- B) 4
- C) 8
- D) 16

$$\frac{8\pi}{2\pi r} = \frac{180^\circ}{360^\circ}$$

$$\frac{4}{r} = \frac{1}{2}$$

$$\boxed{r=8}$$

13. Calculator



Note: Figure not drawn to scale.

In the figure above, the circle has center O and has radius 10. If the length of arc \widehat{AB} (shown in bold) is between 5 and 6, what is one possible integer

value of x ?

$$\frac{5}{2\pi(10)} = \frac{x}{360}$$

$$20\pi x = 1800$$

$$x \approx 28.6479$$

$$\frac{6}{2\pi(10)} = \frac{x}{360}$$

$$20\pi x = 2160$$

$$x \approx 34.3775$$

Any integer
between
29-34 will
work.

14. Non-Calculator

The volume of right circular cylinder A is 22 cubic centimeters. What is the volume, in cubic centimeters, of a right circular cylinder with twice the radius and half the height of cylinder A?

A) 11

B) 22

C) 44

D) 66

$$22 = \pi r^2 h$$

$$\pi (2r)^2 \left(\frac{h}{2}\right)$$

$$= \pi (4r^2) \left(\frac{h}{2}\right)$$

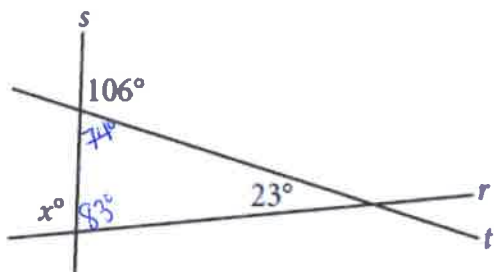
$$= 2\pi r^2 h$$

$$\text{If } 22 = \pi r^2 h, \text{ then}$$

$$44 = 2\pi r^2 h$$

15. Non-Calculator

Intersecting lines r , s , and t are shown below.



What is the value of x ?

$$x = 97^\circ$$

16. Calculator

The surface area of a cube is $6\left(\frac{a}{4}\right)^2$, where a is a positive constant. Which of the following gives the perimeter of one face of the cube?

A) $\frac{a}{4}$

$$\text{Area of one face} = \left(\frac{a}{4}\right)^2$$

(6 faces)

B) a

$$\text{Area} = b \cdot h \text{ or } s^2$$

$$\text{So one side} = \frac{a}{4}$$

C) $4a$

D) $6a$

$$\text{Perimeter} = 4\left(\frac{a}{4}\right) = a$$

17. Calculator



Note: Figure not drawn to scale.

On \overline{PS} above, $\overline{PQ} = \overline{RS}$. What is the length of \overline{PS} ?

$$x-1 = 3x-7$$

$$6 = 2x$$

$$x = 3$$

$$\overline{PS} = 2 + 3 + 2 = \boxed{7}$$

18. Calculator

A landscaper is designing a rectangular garden. The length of the garden is to be 5 feet longer than the width. If the area of the garden will be 104 square feet, what will be the length, in feet, of the garden?

$$l \cdot w = 104 \Rightarrow l = \frac{104}{w}$$

$$l = w + 5$$

$$\frac{104}{w} = w + 5$$

$$104 = w^2 + 5w$$

$$0 = w^2 + 5w - 104$$

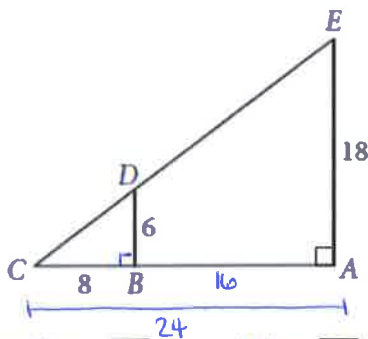
$$0 = (w+13)(w-8)$$

$$w = 8, -13$$

$$l = (8) + 5$$

$$\boxed{l = 13}$$

19. Non-Calculator



In the figure above, \overline{BD} is parallel to \overline{AE} . What is the length of \overline{CE} ?

$$(\overline{CE})^2 = 24^2 + 18^2$$

$$(\overline{CE})^2 = 900$$

$$\boxed{\overline{CE} = 30}$$

20. Calculator

A laboratory supply company produces graduated cylinders, each with an internal radius of 2 inches and an internal height between 7.75 inches and 8 inches. What is one possible volume, rounded to the nearest cubic inch, of a graduated cylinder produced by this company?

$$V = \pi r^2 h$$

$$V = \pi(2)^2(7.75)$$

$$= 31\pi$$

$$\approx 97.3894$$

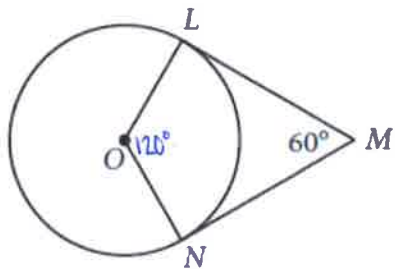
$$V = \pi(2)^2(8)$$

$$= 32\pi$$

$$\approx 100.5310$$

Any value between 98-100 in³

21. Calculator



In the figure above, point O is the center of the circle, line segments LM and MN are tangent to the circle at points L and N , respectively, and the segments intersect at point M as shown. If the circumference of the circle is 96, what is the length of minor arc \widehat{LN} ?

~~$2\pi r = 96$~~
 ~~$\pi r = 48$~~
 ~~$r \approx 15.2789$~~

$$\frac{x}{96} = \frac{120^\circ}{360^\circ}$$

$$360x = 11520$$

$$\widehat{LN} = 32$$

22. Calculator

A rectangle was altered by increasing its length by 10 percent and decreasing its width by p percent. If these alterations decreased the area of the rectangle by 12 percent, what is the value of p ?

- A) 12
- B) 15
- C) 20
- D) 22

$A = l \cdot w$

$A = 1.1l \cdot \left(1 - \frac{p}{100}\right)w$

$(1 - 0.12)A = .88A$

$0.88A = 1.1l \cdot \left(1 - \frac{p}{100}\right)w$

$\frac{0.88A}{1.1} = \frac{1.1 \left(1 - \frac{p}{100}\right) \cdot l \cdot w}{1.1}$

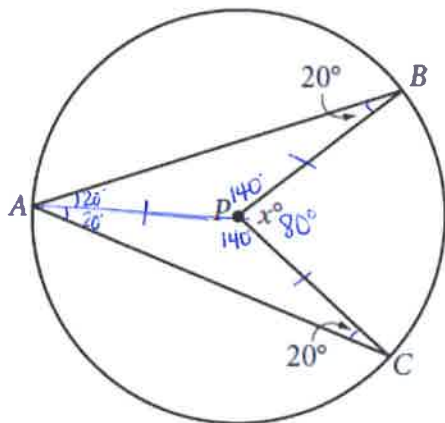
$0.8A = \left(1 - \frac{p}{100}\right) \cdot l \cdot w$

$0.8 = 1 - \frac{p}{100}$

$\frac{-1}{-0.2} = \frac{-1}{-\frac{p}{100}}$

$p = 20$

23. Calculator



Point P is the center of the circle in the figure above. What is the value of x ?

* form two isosceles triangles (since all radii are congruent)

$x = 80^\circ$

24. Non-Calculator

Points A and B lie on a circle with radius 1, and arc \widehat{AB} has length $\frac{\pi}{3}$. What fraction of the circumference of the circle is the length of arc \widehat{AB} ?

$$\frac{\frac{\pi}{3}}{2\pi(1)} = \frac{\frac{\pi}{3}}{2\pi} = \frac{\pi}{3} \cdot \frac{1}{2\pi} = \frac{1}{6}$$