Released Questions for the

Summative Mathematics CST

1. **Which equation is equivalent to**

$$5x - 2(7x + 1) = 14x?$$

(A) $-9x - 2 = 14x$ $\quad 5x-14x-2=14x$

$-9x + 1 = 14x$ $\quad -9x-2=14x$

C $-9x + 2 = 14x$

D $12x - 1 = 14x$

---

2. **Which equation is equivalent to** $4(2-5x)=6-3(1-3x)$? $\Rightarrow$ $8-20x=6-3+9x$

A $8x=5$ $\quad 8-20x=3+9x$

B $8x=17$ $\quad +20x \quad +20x$

(C) $29x=5$ $\quad 8=3+29x$

D $29x=17$ $\quad -3 \quad -3$

$5=29x$

---

3. **The total cost (c) in dollars of renting a sailboat for n days is given by the equation**

$$c = 120 + 60n.$$

If the total cost was $360, for how many days was the sailboat rented? $=C$

A 2

✓ 4 $\quad$ So, $360=120+60n$

C 6 $\quad -120 \quad -120$

D 8 $\quad \frac{240}{60}=\frac{60n}{60}$

$n=4$

---

4. **Solve:** $3(x+5)=2x+35$

$3x+15=2x+35$

$-2x \quad -2x$

$x+15=35$

Step 1: $3x+15=2x+35$

Step 2: $5x+15=35$

Step 3: $5x=20$

Step 4: $x=4$

Which is the first *incorrect* step in the solution shown above?

A Step 1

(B) Step 2

C Step 3

D Step 4

---

5. **A 120-foot-long rope is cut into 3 pieces. The first piece of rope is twice as long as the second piece of rope. The third piece of rope is three times as long as the second piece of rope. What is the length of the longest piece of rope?**

A 20 feet $\quad$ Shortest piece = 2nd piece = x

B 40 feet $\quad$ 1st piece = $2x$

(C) 60 feet $\quad$ 3rd piece = $3x$

D 80 feet $\quad +$

$\frac{6x}{6}=\frac{120}{6}$

$x=20$

longest = $3x=3(20)=60$

---

6. **What is the y-intercept of the graph of** $4x + 2y = 12$?

$x=0$

$4(0)+2y=12$

A -4 $\quad \frac{2y}{2}=\frac{12}{2}$

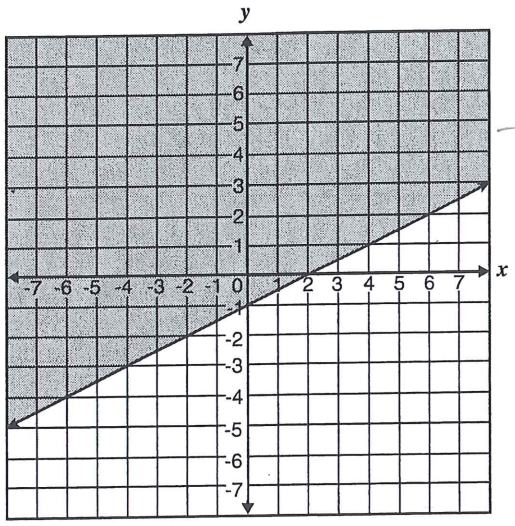
B -2 $\quad y=6$

(C) 6

D 12

---

7. **Which inequality is shown on the graph below?**



→ higher area.

A $y<\frac{1}{2}x-1$

B $y\leq\frac{1}{2}x-1$

C $y>\frac{1}{2}x-1$

(D) $y\geq\frac{1}{2}x-1$

$b=-1$

$m=\frac{1}{2}$

$y \geq \frac{1}{2}x-1$

↓

the area shaded is the higher area.

8. **Which point lies on the line defined by $3x + 6y = 2$?**

Plug in:

A $(0, 2)$ $(1, -\frac{1}{6}) \rightarrow 3(1)+6(-\frac{1}{6}) \stackrel{?}{=} 2$

$3-1 = 2$ ✓

B $(0, 6)$

C $\left(1, -\frac{1}{6}\right)$

D $\left(1, -\frac{1}{3}\right)$

---

9. **What is the equation of the line that has a slope of 4 and passes through the point $(3, -10)$?**

$m=4$

A $y = 4x - 22$ $y - y_1 = m(x - x_1)$

B $y = 4x + 22$ $y + 10 = 4(x - 3)$

C $y = 4x - 43$ $y + 10 = 4x - 12$

D $y = 4x + 43$ $-10 \quad -10$

$y = 4x - 22$

10. **The data in the table show the cost of renting a bicycle by the hour, including a deposit.**

Renting a Bicycle

Hours (h)	Cost in dollars (c)
2	15
5	30
8	45

If hours, h, were graphed on the horizontal axis and cost, c, were graphed on the vertical axis, what would be the equation of a line that fits the data?

Plug in the data on the table to the option A, B, C, D

A $c = 5h$

B $c = \frac{1}{5}h + 5$

C $c = 5h + 5$

$c = 5h + 5$

$15 = 5(2) + 5$ ✓

$30 = 5(5) + 5$ ✓

$45 = 5(8) + 5$ ✓

D $c = 5h - 5$

---

11. **The equation of line l is $6x + 5y = 3$, and the equation of line q is $5x - 6y = 0$. Which statement about the two lines is true?**

$y = -\frac{6}{5}x + \frac{3}{5}$ → $m = -\frac{6}{5}$

$y = \frac{5}{6}x$ → $m = \frac{5}{6}$

A Lines l and q have the same y-intercept.

B Lines l and q are parallel.

C Lines l and q have the same x-intercept.

D Lines l and q are perpendicular.

The slope are opp. reciprocal of each other.

$l \perp q$

12. **Which equation represents a line that is parallel to $y = -\frac{5}{4}x + 2$?**

same slope $=$ → $m = -\frac{5}{4}$

A $y = -\frac{5}{4}x + 1$ $=$

B $y = -\frac{4}{5}x + 2$

C $y = \frac{4}{5}x + 3$

D $y = \frac{5}{4}x + 4$

13. $\frac{15x^3}{10x^7} = \frac{1}{2x^4}$

A $2x^4$

B $\frac{1}{2x^4}$

C $\frac{1}{5x^4}$

D $\frac{x^4}{5}$

---

14. $(4x^2-2x+8)-(x^2+3x-2)=$

A $3x^2+x+6$

B $3x^2+x+10$

C $3x^2-5x+6$

(D) $3x^2-5x+10$

$4x^2-2x+8-x^2-3x+2$

$3x^2-5x+10$

---

15. What is the factored form of $3a^2-24ab+48b^2$?

→ common factor : 3

A $(3a-8b)(a-6b)$

B $(3a-16b)(a-3b)$

(C) $3(a-4b)(a-4b)$

D $3(a-8b)(a-8b)$

$3(a^2-8ab+16b^2)$

$3(a-4b)(a-4b)$

---

16. Which is a factor of $x^2-11x+24$?

A $x+3$

(B) $x-3$

C $x+4$

D $x-4$

$(x-3)(x-8)$

---

17. Which of the following shows $9t^2+12t+4$ factored completely?

(A) $(3t+2)^2$

B $(3t+4)(3t+1)$

C $(9t+4)(t+1)$

D $9t^2+12t+4$

$(3t+2)(3t+2)$

---

18. If x^2 is added to x, the sum is 42. Which of the following could be the value of x?

(A) -7

B -6

C 14

D 42

$x^2+x=42$

$x^2+x-42=0$

$(x+7)(x-6)=0$

$x=-7 \quad x=6$

---

19. What quantity should be added to both sides of this equation to complete the square?

$$x^2-8x=5$$

A 4

B -4

(C) 16

D -16

$a=1, b=-8$

$\left(\frac{b}{2a}\right)^2=\left(\frac{-8}{2(1)}\right)^2=\left(\frac{-8}{2}\right)^2$

$=(-4)^2$

$=16$

---

20. What are the solutions for the quadratic equation $x^2+6x=16$?

A $-2, -8$

B $-2, 8$

(C) $2, -8$

D $2, 8$

$x^2+6x-16=0$

$(x-2)(x+8)=0$

$x=2, \quad x=-8$

---

21. Which is one of the solutions to the equation

$$2x^2-x-4=0?$$

A $\frac{1}{4}-\sqrt{33}$

B $-\frac{1}{4}+\sqrt{33}$

(C) $\frac{1+\sqrt{33}}{4}$

D $\frac{-1-\sqrt{33}}{4}$

$\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

$\frac{-(-1)\pm\sqrt{(-1)^2-4(2)(-4)}}{2(2)}$

$\frac{1\pm\sqrt{1+32}}{4}=\frac{1\pm\sqrt{33}}{4}$

$\frac{1+\sqrt{33}}{4} \quad \frac{1-\sqrt{33}}{4}$

---

22. Which statement *best* explains why there is no real solution to the quadratic equation $2x^2+x+7=0$?

$D=b^2-4ac$

A The value of $1^2-4\cdot2\cdot7$ is positive. $=1^2-4(2)(7)$

B The value of $1^2-4\cdot2\cdot7$ is equal to 0. $=1-56=-55$

(C) The value of $1^2-4\cdot2\cdot7$ is negative.

D The value of $1^2-4\cdot2\cdot7$ is not a perfect square.

Note: Discriminant $=b^2-4ac$.

If $D<0$ → no real solution

If $D=0$ → 1 real solution

If $D>0$ → 2 real solutions

23. **What is the solution set of the quadratic equation $8x^2 + 2x + 1 = 0$?**

$\frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{-2 \pm \sqrt{2^2-4(8)(1)}}{2(8)} = \frac{-2 \pm \sqrt{4-32}}{16} = \frac{-2 \pm \sqrt{-28}}{16}$

A $\left\{-\frac{1}{2}, \frac{1}{4}\right\}$

B $\{-1+\sqrt{2}, -1-\sqrt{2}\}$

C $\left\{\frac{-1+\sqrt{7}}{8}, \frac{-1-\sqrt{7}}{8}\right\}$

(D) no real solution

24. **An object that is projected straight downward with initial velocity v feet per second travels a distance $s = vt + 16t^2$, where t = time in seconds. If Ramón is standing on a balcony 84 feet above the ground and throws a penny straight down with an initial velocity of 10 feet per second, in how many seconds will it reach the ground?**

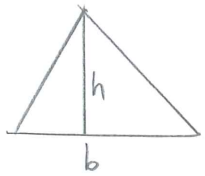
V = initial velocity = 10 ft/sec.
s = distance = 84 ft.
$84 = 10 \cdot t + 16t^2$
$-84 \quad -84$
$0 = -84 + 10t + 16t^2$

(A) 2 seconds
B 3 seconds
C 6 seconds
D 8 seconds

Plug in the option: $t=2 \rightarrow 16(2)^2 + 10(2) - 84 = 0$
$16(4) + 20 - 84 = 0$
$64 + 20 - 84 = 0$ ✓

25. **The height of a triangle is 4 inches greater than twice its base. The area of the triangle is 168 square inches. What is the base of the triangle?** $\rightarrow b$?

$h = 4 + 2b$
$A = 168 \text{ in}^2$



A 7 in.
B 8 in.
(C) 12 in.
D 14 in.

$A = \frac{1}{2} \cdot b \cdot h$
$168 = \frac{1}{2} \cdot b \cdot (4+2b)$
$168 = \frac{1}{2}(4b + 2b^2)$
$168 = 2b + b^2$
$-168 \quad -168$
$b^2 + 2b - 168 = 0$

Plug in the option: $b=12 \rightarrow 12^2 + 2(12) - 168 = 0$
$144 + 24 - 168 = 0$ ✓

26. **What is $\frac{x^2 - 4xy + 4y^2}{3xy - 6y^2}$ reduced to lowest terms?**

$\frac{(x-2y)(x-2y)}{3y(x-2y)}$

A $\frac{x-2y}{3}$

(B) $\frac{x-2y}{3y}$

C $\frac{x+2y}{3}$

D $\frac{x+2y}{3y}$

27. **Simplify $\frac{6x^2 + 21x + 9}{4x^2 - 1}$ to lowest terms.**

$\frac{(3x+9)(2x+1)}{(2x+1)(2x-1)} = \frac{3(x+3)}{2x-1}$

A $\frac{3(x+1)}{2x-1}$

(B) $\frac{3(x+3)}{2x-1}$

C $\frac{3(2x+3)}{4(x-1)}$

D $\frac{3(x+3)}{2x+1}$

28. **A pharmacist mixed some 10%-saline solution with some 15%-saline solution to obtain 100 mL of a 12%-saline solution. How much of the 10%-saline solution did the pharmacist use in the mixture?**

10% → x ml 15% → y ml
12% → 100 ml = x + y

$10x + 15y = 12(100)$
$x + y = 100$

$\cdot 1 \quad 10x + 15y = 1200$
$\cdot -15 \quad -15x - 15y = -1500$
$\frac{-5x}{-5} = \frac{-300}{-5}$

$x = 60$ ml ←

(A) 60 mL
B 45 mL
C 40 mL
D 25 mL

29. **Andy's average driving speed for a 4-hour trip was 45 miles per hour. During the first 3 hours he drove 40 miles per hour. What was his average speed for the last hour of his trip?**

$\text{Ave} = \frac{\text{total distance}}{\text{total hour}}$
$45 = \frac{40+40+40+x}{4}$
$4 \cdot 45 = \frac{120+x}{4} \cdot 4$
$180 = 120 + x$
$-120 \quad -120$
$x = 60$ mph

A 50 miles per hour
(B) 60 miles per hour
C 65 miles per hour
D 70 miles per hour

30. *"Two lines in a plane always intersect in exactly one point."*

Which of the following best describes a *counterexample* to the assertion above?

→ an example that proves that something is wrong.

A coplanar lines

B parallel lines

C perpendicular lines

D intersecting lines

CSG00320

---

31. **Which figure can serve as a counterexample to the conjecture below?**

If one pair of opposite sides of a quadrilateral is parallel, then the quadrilateral is a parallelogram.

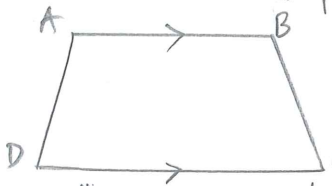
→ Both pairs of opposite sides are parallel.

A rectangle

B rhombus

C square

D trapezoid

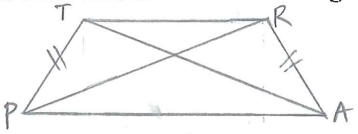


AB ∥ CD. But ABCD ≠ parallelogram

CSG10194

---

32. **Given: *TRAP* is an isosceles trapezoid with diagonals $\overline{RP}$ and $\overline{TA}$. Which of the following *must* be true?**



A $\overline{RP} \perp \overline{TA}$

B $\overline{RP} \parallel \overline{TA}$

C $\overline{RP} \cong \overline{TA}$ ($\overline{RP}$ is congruent to $\overline{TA}$)

D $\overline{RP}$ bisects $\overline{TA}$

CSG00260

---

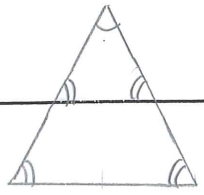
33. **Which triangles must be similar?**

A two obtuse triangles

B two scalene triangles with congruent bases

C two right triangles

D two isosceles triangles with congruent vertex angles



CSG00578

---

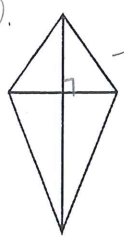
34. **A conditional statement is shown below.**

If a quadrilateral has perpendicular diagonals, then it is a rhombus.

all sides are congruent.

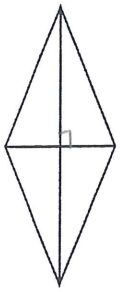
Which of the following is a counterexample to the statement above?

A

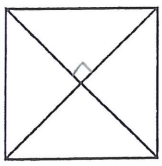


→ Diagonals are ⊥, but not all sides are ≅.

C



B



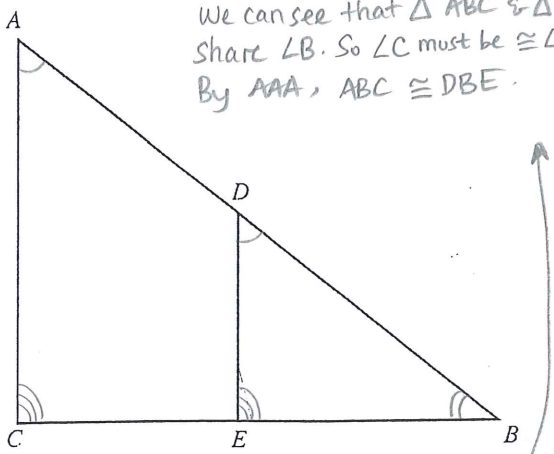
D

It's not even a ⊥ diagonal. It's not a counterexample.

---

35. **Which of the following facts would be sufficient to prove that triangles *ABC* and *DBE* are similar?**

Since $\overline{AC} \parallel \overline{DE}$, then $\angle A \cong \angle D$. We can see that $\triangle ABC$ & $\triangle DBE$ share $\angle B$. So $\angle C$ must be $\cong \angle E$. By AAA, $ABC \cong DBE$.



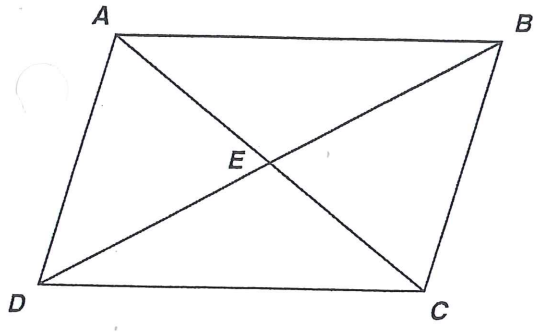
A $\overline{CE}$ and $\overline{BE}$ are congruent.

B $\angle ACE$ is a right angle.

C $\overline{AC}$ and $\overline{DE}$ are parallel.

D $\angle A$ and $\angle B$ are congruent.

36. Parallelogram $ABCD$ is shown below.



Which pair of triangles can be established to be congruent to prove that $\angle DAB \cong \angle BCD$?

A $\triangle ADC$ and $\triangle BCD$

B $\triangle AED$ and $\triangle BEC$

C $\triangle DAB$ and $\triangle BCD$

D $\triangle DEC$ and $\triangle BEA$

CSG10146

---

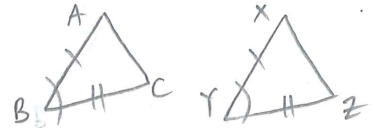
37. If $\triangle ABC$ and $\triangle XYZ$ are two triangles such that $\frac{AB}{XY} = \frac{BC}{YZ}$, which of the following would be sufficient to prove the triangles are similar?

A $\angle A \cong \angle X$

B $\angle B \cong \angle Y$

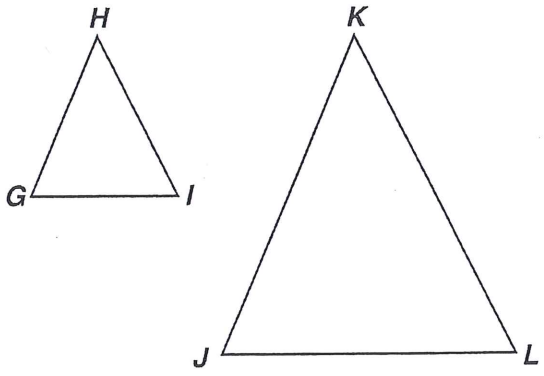
C $\angle C \cong \angle Z$

D $\angle X \cong \angle Y$



If $\angle B \cong \angle Y$, by SAS, $\triangle ABC \cong \triangle XYZ$

38. Which of the following statements must be true if $\triangle GHI \sim \triangle JKL$?



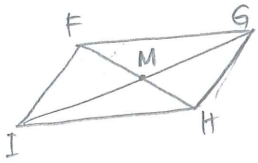
A The two triangles must be scalene.

The two triangles must have exactly one acute angle.

C At least one of the sides of the two triangles must be parallel.

D The corresponding sides of the two triangles must be proportional.

39. In parallelogram $FGHI$, diagonals $\overline{IG}$ and $\overline{FH}$ are drawn and intersect at point M. Which of the following statements *must* be true?



A $\triangle FGI$ must be an obtuse triangle.

B $\triangle HIG$ must be an acute triangle.

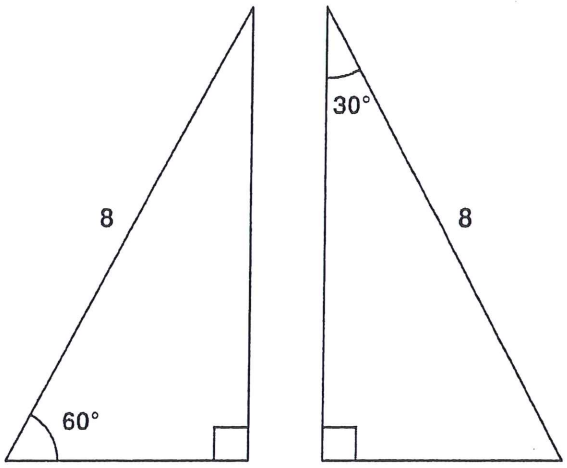
C $\triangle FMG$ must be congruent to $\triangle HMG$.

D $\triangle GMH$ must be congruent to $\triangle IMF$.

CSG00559

---

40. Which of the following *best* describes the triangles shown below?



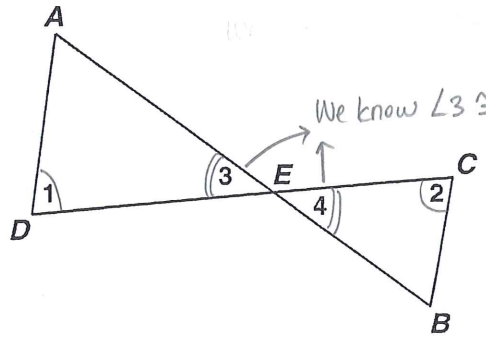
A both similar and congruent

B similar but not congruent

C congruent but not similar

D neither similar nor congruent

41. Given: $\overline{AB}$ and $\overline{CD}$ intersect at point E;
$\angle 1 \cong \angle 2$



Which theorem or postulate can be used to prove $\triangle AED \sim \triangle BEC$?

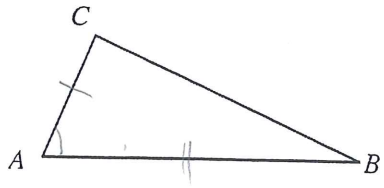
A AA

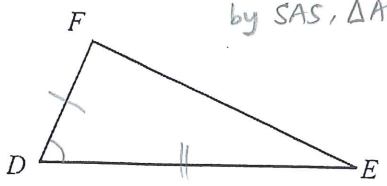
B SSS

C ASA

D SAS

42. In the figure below, $\overline{AC} \cong \overline{DF}$ and $\angle A \cong \angle D$.





If $\overline{AB} \cong \overline{DE}$, then by SAS, $\triangle ABC \cong \triangle DEF$.

Which additional information would be enough to prove that $\triangle ABC \cong \triangle DEF$?

(A) $\overline{AB} \cong \overline{DE}$

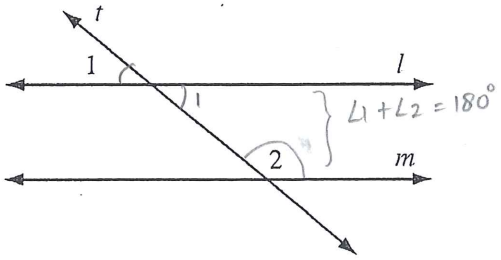
B $\overline{AB} \cong \overline{BC}$

C $\overline{BC} \cong \overline{EF}$

D $\overline{BC} \cong \overline{DE}$

---

43. In the accompanying diagram, parallel lines l and m are cut by transversal t.



Which statement about angles 1 and 2 *must* be true?

A $\angle 1 \cong \angle 2$.

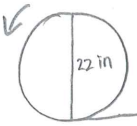
B $\angle 1$ is the complement of $\angle 2$. (sum = 90°)

(C) $\angle 1$ is the supplement of $\angle 2$. (the sum = 180°)

D $\angle 1$ and $\angle 2$ are right angles.

---

44. If a cylindrical barrel measures 22 inches in diameter, how many inches will it roll in 8 revolutions along a smooth surface?



8 rev = 8 times

A 121π in.

B 168π in.

(C) 176π in.

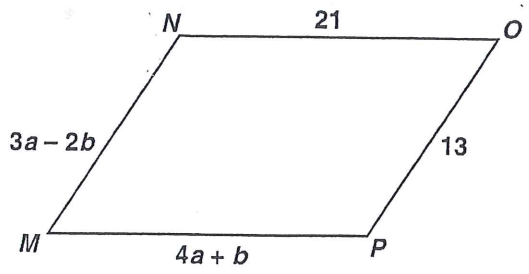
D 228π in.

1 rev = 1 circumference = $\pi \cdot d = 22\pi$

Distance = $8(22\pi) = 176\pi$ in.

---

45. What values of a and b make quadrilateral $MNOP$ a parallelogram? opposite side are $\cong$



A $a = 1, b = 5$

(B) $a = 5, b = 1$

C $a = \frac{11}{7}, b = \frac{34}{7}$

D $a = \frac{34}{7}, b = \frac{11}{7}$

$21 = 4a+b \mid \cdot 2 \;\Rightarrow\; 42 = 8a+2b$

$13 = 3a-2b \mid \cdot 1 \;\Rightarrow\; 13 = 3a-2b$

$\frac{55}{11} = \frac{11a}{11}$

$a = 5$

$13 = 3(5)-2b$

$13 = 15-2b$

$-15 \quad -15$

$\frac{-2}{-2} = \frac{-2b}{-2}$

$b = 1$

CSG10163

---

46. Quadrilateral $ABCD$ is a parallelogram. If adjacent angles are congruent, which statement must be true? (opposite sides are ∥. The sides next to need not be the same length.)

A Quadrilateral $ABCD$ is a square.

B Quadrilateral $ABCD$ is a rhombus.

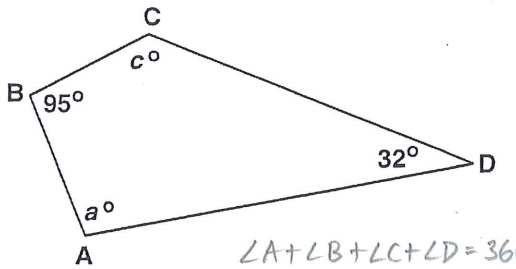
(C) Quadrilateral $ABCD$ is a rectangle.

D Quadrilateral $ABCD$ is an isosceles trapezoid.

If $\angle A \cong \angle B$, they must be both 90° each. The ABCD is a □

---

47. For the quadrilateral shown below, what is $m\angle a + m\angle c$?



A 53°

B 137°

C 180°

(D) 233°

$\angle A + \angle B + \angle C + \angle D = 360°$

$\angle A + 95° + \angle C + 32° = 360°$

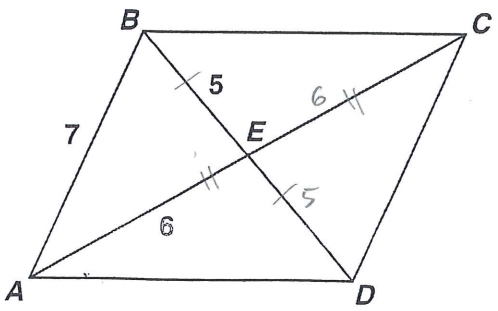
$\angle A + \angle C + 127° = 360°$

$-127° \quad -127°$

$\angle A + \angle C = 233°$

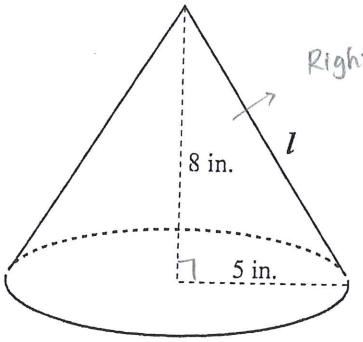
CSG10162

48. If $ABCD$ is a parallelogram, what is the length of segment BD?



(A) 10
B 11
C 12
D 14

49. A right circular cone has radius 5 inches and height 8 inches.



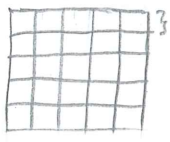
Right Δ: $a^2+b^2=c^2$
$5^2+8^2=l^2$
$25+64=l^2$
$89=l^2$
$l=\sqrt{89}$

$LA=\pi rl$
$=\pi(5)(\sqrt{89})$
$=5\pi\sqrt{89}$

What is the lateral area of the cone? (Lateral area of cone $=\pi rl$, where l = slant height)

A 40π sq in.
B 445π sq in.
C $5\pi\sqrt{39}$ sq in.
(D) $5\pi\sqrt{89}$ sq in.

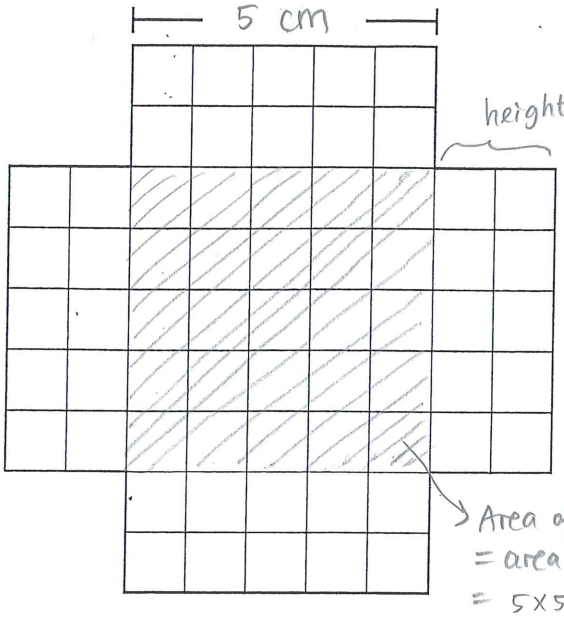
50. A sewing club is making a quilt consisting of 25 squares with each side of the square measuring 30 centimeters. If the quilt has five rows and five columns, what is the perimeter of the quilt?



A 150 cm
B 300 cm
600 cm ✓
D 900 cm

$P=5(30)\times 4$
$=150\times 4$
$=600$ cm

51. The four sides of this figure will be folded up and taped to make an open box.



Area of base
= area of a square
$=5\times 5=25$

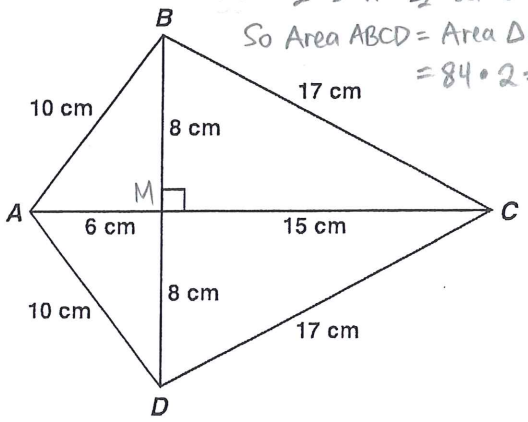
What will be the volume of the box?

(A) 50 cm^3
B 75 cm^3
C 100 cm^3
D 125 cm^3

$V=$ Area of base $\cdot$ height
$=25\cdot 2$
$=50$ cm^3

52. Figure $ABCD$ is a kite.

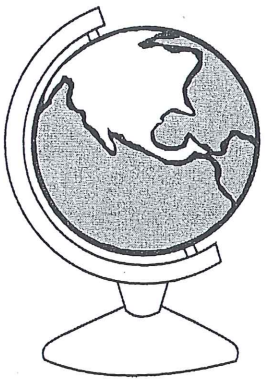
$\Delta ABC \cong \Delta ADC$
$A=\frac{1}{2}\cdot b\cdot h=\frac{1}{2}\cdot 21\cdot 8^4=84$
So Area $ABCD$ = Area $\Delta ABC \cdot 2$
$=84\cdot 2=168$



What is the area of figure $ABCD$, in square centimeters?

A 120
B 154
(C) 168
D 336

53. A classroom globe has a diameter of 18 inches.



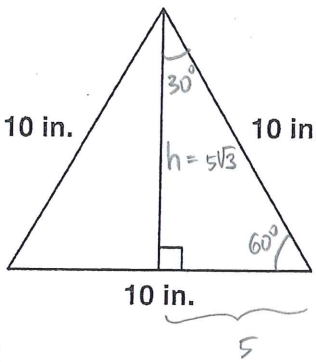
Which of the following is the approximate surface area, in square inches, of the globe? (Surface Area $= 4\pi r^2$)

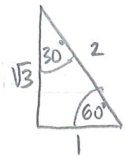
$d = 18 \rightarrow r = 9$

Surface area $= 4\pi r^2$
$= 4(3.14)(81)$
$= 1017.38$

A 113.0
B 226.1
C 254.3
(D) 1017.4

4. What is the area, in square inches (in.), of the triangle below?



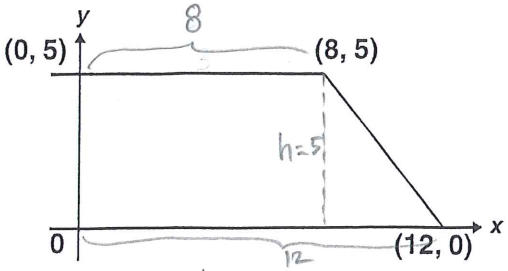


or use pythagorean thm to find h.

$A = \frac{1}{2} \cdot b \cdot h$
$= \frac{1}{2} \cdot 10 \cdot 5\sqrt{3}$
$= 25\sqrt{3}$

A 25
(B) $25\sqrt{3}$
C 50
D $50\sqrt{3}$

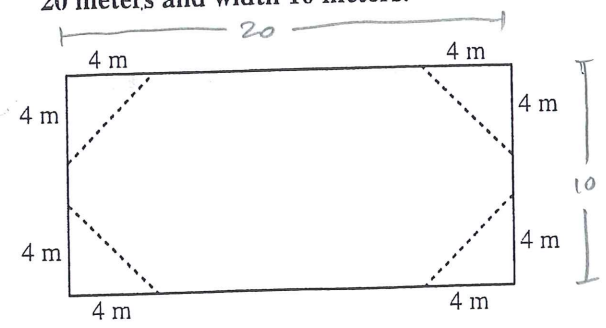
55. What is the area, in square units, of the trapezoid shown below?



Area of trapezoid = (sum of parallel sides) $\cdot \frac{h}{2}$
$= (12+8) \cdot \frac{5}{2}$
$= 20 \cdot \frac{5}{2} = 50$

A 37.5
B 42.5
(C) 50
D 100

56. The rectangle shown below has length 20 meters and width 10 meters.



If four triangles are removed from the rectangle as shown, what will be the area of the remaining figure?

Area of 4 Δs $= 4 \cdot \frac{1}{2} \cdot b \cdot h$
$= 4 \cdot \frac{1}{2} \cdot 4 \cdot 4 = 32\ m^2$

Area of $\square = b \cdot h = 20 \cdot 10 = 200\ m^2$

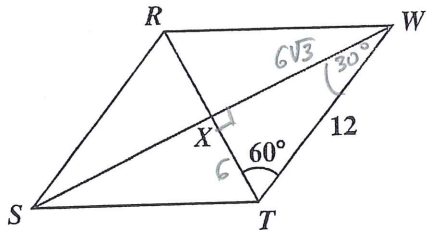
Remaining A $= 200 - 32 = 168\ m^2$

A 136 m²
B 144 m²
(C) 168 m²
D 184 m²

CSG00012

57. If *RSTW* is a rhombus, what is the area of ΔWXT?

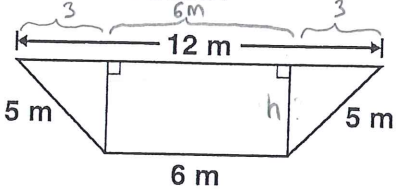
↳ has ⊥ diagonals.



Area of WXT $= \frac{1}{2} \cdot b \cdot h$
$= \frac{1}{2} \cdot 6 \cdot 6\sqrt{3}$
$= 18\sqrt{3}$

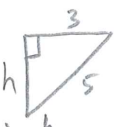
(A) $18\sqrt{3}$
B $36\sqrt{3}$
C 36
D 48

58. What is the area, in square meters (m), of the trapezoid shown below?



Isosceles trapezoid. It means the base of the Δs are =

Need to find h 1st.

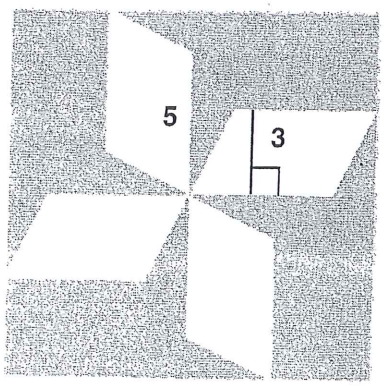


$a^2 + b^2 = c^2$
$3^2 + h^2 = 5^2$
$9 + h^2 = 25$
$h^2 = 25 - 9$
$h = 4$

Area = (sum of 11 sides) $\cdot \frac{h}{2}$
$= (12+6) \cdot \frac{4}{2}$
$= 18 \cdot 2$
$= 36$

A 28
(B) 36
C 48
D 72

59. The figure below is a square with four congruent parallelograms inside.



What is the area, in square units, of the shaded portion?

Area of parallelogram = b.h
= 5.3 = 15

There are 4 of them. So 15.4 = 60

Area of shaded portion = $12^2 - 60$
= 144 - 60
= 84

A 60
B 84
C 114
D 129

60. Lea made two candles in the shape of right rectangular prisms. The first candle is 15 cm high, 8 cm long, and 8 cm wide. The second candle is 5 cm higher but has the same length and width. How much additional wax was needed to make the taller candle?

$V_1 = l.w.h = 8.8.15 = 960.cm^3$
$V_2 = l.w.h = 8.8.20 = 1280\ cm^3$
Additional wax = $V_2 - V_1$
= 1280 - 960
= $320\ cm^3$

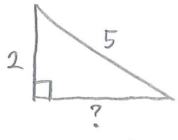
A 320 cm³
B 640 cm³
C 960 cm³
D 1280 cm³

61. The perimeters of two squares are in a ratio of 4 to 9. What is the ratio between the areas of the two squares?

Ratio of 2 areas is always the square of the ratio of the perimeter.
So 4^2 to 9^2 = 16 to 81

A 2 to 3
B 4 to 9
C 16 to 27
D 16 to 81

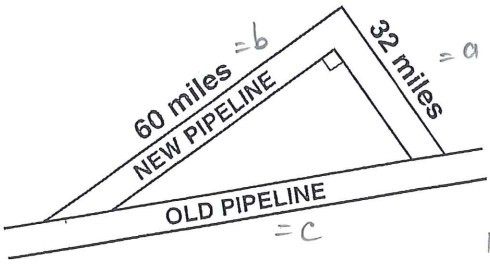
62. A right triangle's hypotenuse has length 5. If one leg has length 2, what is the length of the other leg?



$a^2 + b^2 = 5^2$
$2^2 + x^2 = 5^2$
$x^2 = 25 - 4 = 21$
$x = \sqrt{21}$

A 3
B $\sqrt{21}$
C $\sqrt{29}$
D 7

63. A new pipeline is being constructed to re-route its oil flow around the exterior of a national wildlife preserve. The plan showing the old pipeline and the new route is shown below.



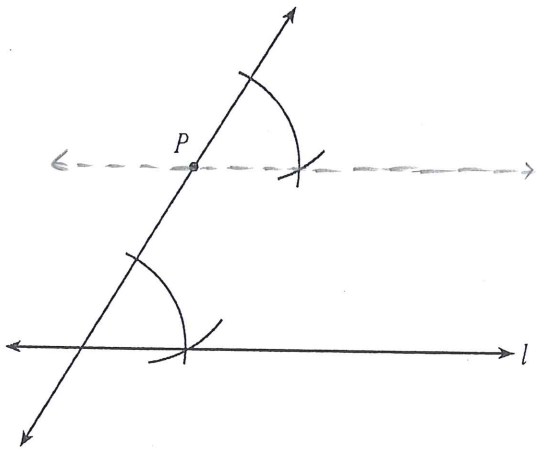
$a^2 + b^2 = c^2$
$32^2 + 60^2 = c^2$
$1024 + 3600 = c^2$
$4624 = c^2$
$c = \sqrt{4624}$
$c = 68$

About how many extra miles will the oil flow once the new route is established?

Old pipeline = 68 miles.
New route = 60 + 32 = 92 miles
The difference = 92 - 68 = 24 miles

A 24
B 68
C 92
D 160

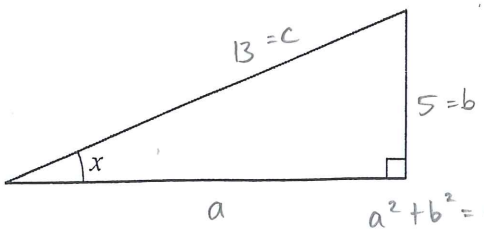
64. Marsha is using a straightedge and compass to do the construction shown below.



Which *best* describes the construction Marsha is doing?

A a line through *P* parallel to line *l*
B a line through *P* intersecting line *l*
C a line through *P* congruent to line *l*
D a line through *P* perpendicular to line *l*

65. In the figure below, if $\sin x = \frac{5}{13}$, what are $\cos x$ and $\tan x$?



$\sin x = \frac{opp}{hyp}$

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

$a^2 + 5^2 = 13^2$

$a = 12$

$\cos x = \frac{adj}{hyp} = \frac{12}{13}$

$\tan x = \frac{opp}{adj} = \frac{5}{12}$

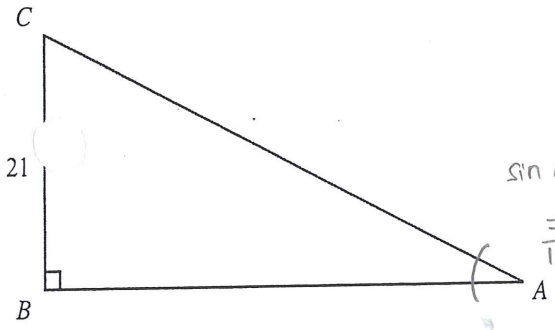
(A) $\cos x = \frac{12}{13}$ and $\tan x = \frac{5}{12}$

B $\cos x = \frac{12}{13}$ and $\tan x = \frac{12}{5}$

C $\cos x = \frac{13}{12}$ and $\tan x = \frac{5}{12}$

D $\cos x = \frac{13}{12}$ and $\tan x = \frac{13}{5}$

66. In the figure below, $\sin A = 0.7$. $= \frac{7}{10}$



$\sin A = \frac{opp}{hyp}$

$\frac{7}{10} = \frac{21}{\overline{AC}}$

$\frac{7\overline{AC}}{7} = \frac{210}{7}$

$\overline{AC} = 30$

What is the length of $\overline{AC}$?

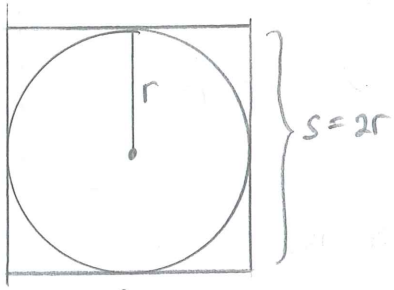
A 14.7

B 21.7

(C) 30

D 32

67. A square is circumscribed about a circle. What is the ratio of the area of the circle to the area of the square?



encloses

A $\frac{1}{4}$

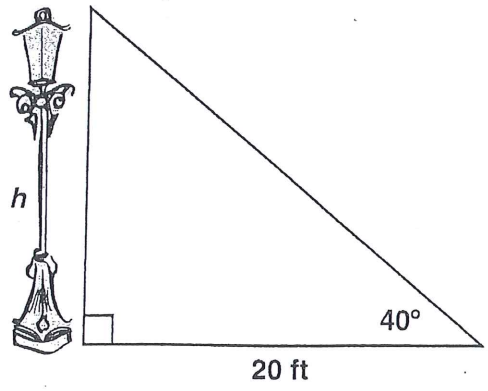
B $\frac{1}{2}$

C $\frac{2}{\pi}$

(D) $\frac{\pi}{4}$

$\frac{A \text{ of } \odot}{A \text{ of } \square} = \frac{\pi r^2}{(2r)^2} = \frac{\pi r^2}{4r^2} = \frac{\pi}{4}$

68. Approximately how many feet tall is the streetlight?



$\sin 40° \approx 0.64$
$\cos 40° \approx 0.77$
$\tan 40° \approx 0.84$

A 12.8

B 15.4

(C) 16.8

D 23.8

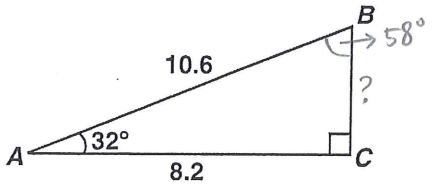
$\tan 40° = \frac{opp}{adj}$

$\frac{0.84}{1} = \frac{h}{20}$

$h = 0.84(20)$

$h = 16.8$

69. Right triangle ABC is pictured below.



Which equation gives the correct value for BC?

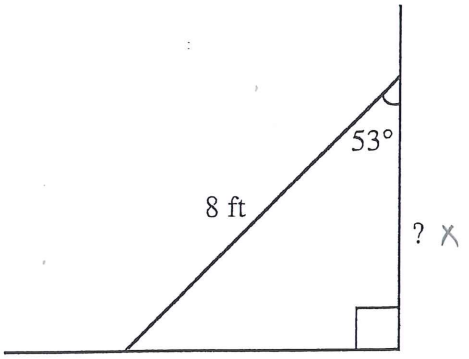
A $\sin 32° = \frac{BC}{8.2}$

B $\cos 32° = \frac{BC}{10.6}$

(C) $\tan 58° = \frac{8.2}{BC}$ $\tan 58° = \frac{opp}{adj} = \frac{8.2}{BC}$

D $\sin 58° = \frac{BC}{10.6}$

70. The diagram shows an 8-foot ladder leaning against a wall. The ladder makes a 53° angle with the wall. Which is closest to the distance up the wall the ladder reaches?



$\sin 53° \approx 0.80$	
$\cos 53° \approx 0.60$	
$\tan 53° \approx 1.33$	

$\cos 53° = \frac{adj}{hyp}$

$\frac{0.60}{1} = \frac{x}{8}$

$x = 4.8$ ft

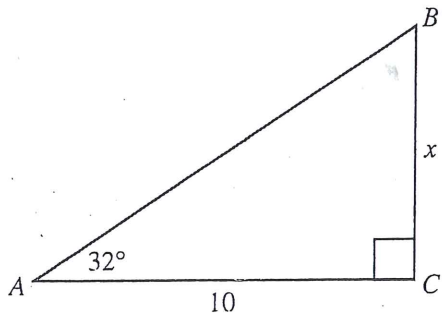
A 3.2 ft

B 4.8 ft

C 6.4 ft

D 9.6 ft

71. In the accompanying diagram, $m\angle A = 32°$ and $AC = 10$. Which equation could be used to find x in $\triangle ABC$?



$\tan 32° = \frac{opp}{adj}$

$\frac{\tan 32°}{1} = \frac{x}{10}$

$x = 10 \tan 32°$

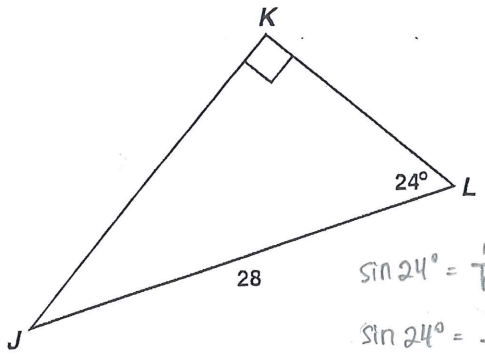
A $x = 10 \sin 32°$

B $x = 10 \cos 32°$

C $x = 10 \tan 32°$

D $x = \frac{10}{\cos 32°}$

72. Triangle JKL is shown below.



$\sin 24° = \frac{opp}{hyp}$

$\sin 24° = \frac{JK}{28}$

Which equation should be used to find the length of $\overline{JK}$?

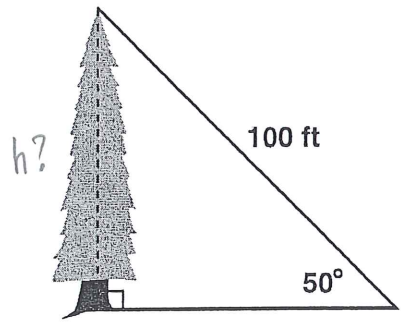
A $\sin 24° = \frac{JK}{28}$

B $\sin 24° = \frac{28}{JK}$

C $\cos 24° = \frac{JK}{28}$

D $\cos 24° = \frac{28}{JK}$

73. What is the approximate height, in feet, of the tree in the figure below?



$\sin 50° \approx 0.766$	
$\cos 50° \approx 0.643$	
$\tan 50° \approx 1.192$	

$\sin 50° = \frac{opp}{hyp}$

$0.766 = \frac{h}{100}$

$h = 0.766\,(100)$

$h = 76.6$ ft

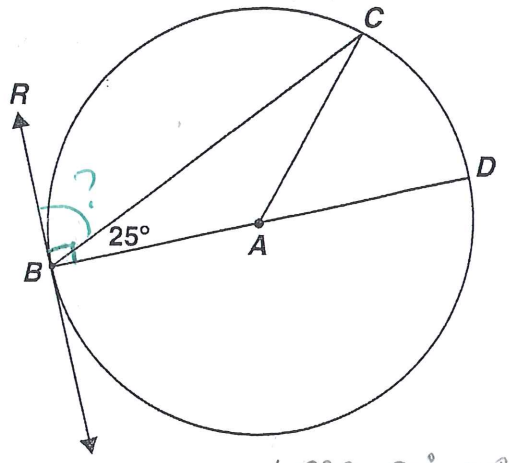
A 64.3

B 76.6

C 119.2

D 130.5

74. $\overline{RB}$ is tangent to a circle, whose center is A, at point B. $\overline{BD}$ is a diameter.

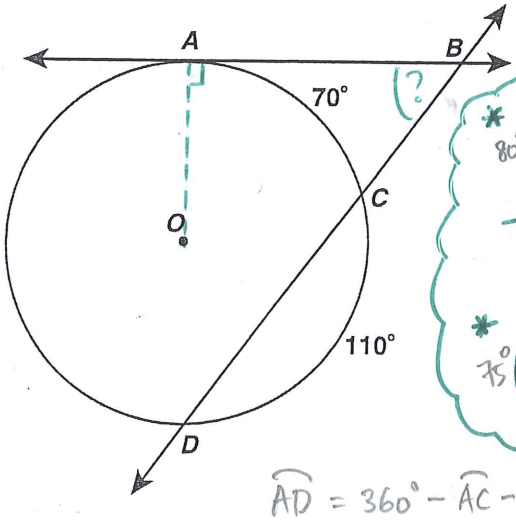


$\angle CBR = 90° - 25°$
$= 65°$

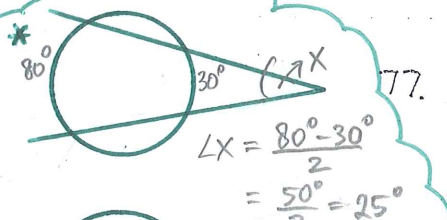
What is $m\angle CBR$?

A 50°
B 65°
C 90°
D 130°

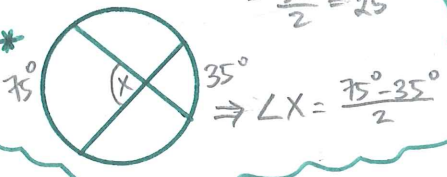
75. In the figure below, $\overline{AB}$ is tangent to circle O at point A, secant $\overline{BD}$ intersects circle O at points C and D, $m\overset{\frown}{AC} = 70°$, and $m\overset{\frown}{CD} = 110°$.



Note:



$\angle X = \frac{80° - 30°}{2}$
$= \frac{50°}{2} = 25°$



$\Rightarrow \angle X = \frac{75° - 35°}{2}$

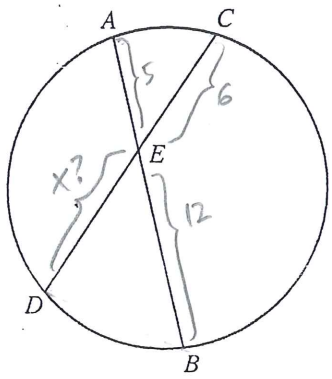
$\overset{\frown}{AD} = 360° - \overset{\frown}{AC} - \overset{\frown}{CD}$
$= 360° - 70° - 110°$
$= 180°$

$\angle B = \frac{\overset{\frown}{AD} - \overset{\frown}{AC}}{2} = \frac{180° - 70°}{2} = \frac{110°}{2} = 55°$

What is $m\angle ABC$?

A 20°
B 40°
C 55°
D 70°

76. In the circle below, $\overline{AB}$ and $\overline{CD}$ are chords intersecting at E.



Note:
$AE \cdot BE = CE \cdot DE$

If $AE = 5$, $BE = 12$, and $CE = 6$, what is the length of $\overline{DE}$?

Or, use proportion:

$\frac{AE}{CE} = \frac{DE}{BE}$

$\frac{5}{6} = \frac{x}{12}$

$\frac{6x}{6} = \frac{5(12)}{6}$

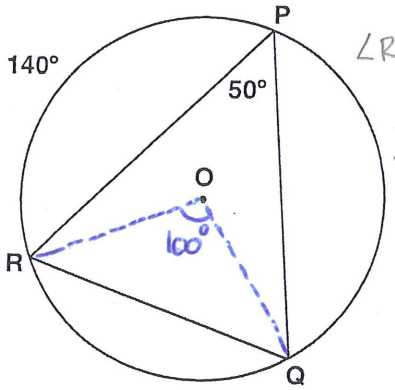
$x = 10$

A 7
B 9
C 10
D 13

CSG00022

NOT an operational test form. Test scores cannot be projected
yright © 2008 California Department of Education.

77. In the circle shown below, the measure of $\overset{\frown}{PR} = 140°$ and the measure of $\angle RPQ = 50°$.



$\angle ROQ = 100°$

$\overset{\frown}{RQ} = 100°$

In a ⊙, total $\angle = 360°$

So $140° + 100° + x = 360°$

$240° + x = 360°$

$-240° \quad -240°$

$x = 120°$

What is the measure of $\overset{\frown}{PQ}$?

A 50°
B 60°
C 70°
D 120°

78. **What is the complete solution to the equation $|3-6x|=15$?**

$3-6x=-15$ or $3-6x=15$

$-3 \quad -3 \qquad -3 \quad -3$

$-6x=-18 \qquad -6x=12$

$\frac{-6x}{-6}=\frac{-18}{-6} \qquad \frac{-6x}{-6}=\frac{12}{-6}$

$x=3 \qquad x=-2$

A $x=2; x=3$

B $x=-2; x=3$

C $x=2; x=-3$

D $x=-2; x=-3$

---

79. **For a wedding, Shereda bought several dozen roses and several dozen carnations. The roses cost $15 per dozen, and the carnations cost $8 per dozen. Shereda bought a total of 17 dozen flowers and paid a total of $192. How many roses did she buy?**

r = # dozen of roses

c = # dozen of carnation

$r+c=17$ ← $\cdot(-8)$ $\quad -8r-8c=-136$

$15r+8c=192$ $\cdot 1$ $\quad 15r+8c=192+$

$\frac{7r}{7}=\frac{56}{7}$

$r=8$

A 6 dozen

B 7 dozen

C 8 dozen

D 9 dozen

---

80. **What is the solution to the system of equations shown below?**

$$\begin{cases} 2x-y+3z=8 & \cdots (1) \\ x-6y-z=0 & \cdots (2) \\ -6x+3y-9z=24 & \cdots (3) \end{cases} \quad *(-3)$$

Observe (1) & (3)! It seems like (3) is obtained by multiplying (1) by −3, except that instead of 24, we should get −24. Therefore the system is inconsistent ⇒ NS!

A $(0, 4, 4)$

B $\left(1, 4, \frac{10}{3}\right)$

C no solution

D infinitely many solutions

---

81. $(-2x^2+6x+1)-2(4x^2-3x+1)$

$-2x^2+6x+1-8x^2+6x-2$

$-10x^2+12x-1$

A $6x^2-1$

B $-10x^2-1$

C $6x^2+12x-1$

D $-10x^2+12x-1$

---

82. $2x+7 \overline{)\,2x^4+21x^3+35x^2-37x+46}$

x^3+7x^2-7x+6

$2x+7 \;/\; 2x^4+21x^3+35x^2-37x+46$

$2x^4+7x^3$

$14x^3+35x^2$

$14x^3+49x^2$

$-14x^2-37x$

$-14x^2-49x$

$12x+46$

$12x+42$

$R=4$

A $x^3+7x^2-7x+6-\frac{4}{2x+7}$

B $2x^3+14x^2-14x+12-\frac{4}{2x+7}$

C $x^3-7x^2+7x-6+\frac{4}{2x+7}$

D $x^3+7x^2-7x+6+\frac{4}{2x+7}$

Note: $a^3+b^3=(a+b)(a^2-ab+b^2)$

$a^3-b^3=(a-b)(a^2+ab+b^2)$

83. $8a^3+c^3=$

$(2a)^3+c^3=(2a+c)(4a^2-2ac+c^2)$

A $(2a+c)(2a+c)(2a+c)$

B $(2a-c)(4a^2+2ac+c^2)$

C $(2a-c)(4a^2+4ac+c^2)$

D $(2a+c)(4a^2-2ac+c^2)$

---

84. **Which polynomial represents $(3x^2+x-4)(2x-5)$?** → Distribute!

$6x^3-15x^2+2x^2-5x-8x+20=6x^3-13x^2-13x+20$

A $6x^3-13x^2-13x-20$

B $6x^3-13x^2-13x+20$

C $6x^3+13x^2+3x-20$

D $6x^3+13x^2+3x+20$

---

85. $\frac{x+3}{x+5}+\frac{6}{x^2+3x-10}=$

$\frac{x+3}{x+5}+\frac{6}{(x+5)(x-2)}$

$\frac{(x+3)(x-2)}{(x+5)(x-2)}+\frac{6}{(x+5)(x-2)}$

$\frac{x^2+3x-2x-6+6}{(x+5)(x-2)}$

$\frac{x^2+x}{x^2+3x-10}$

A $\frac{x^2+x}{x^2+3x-10}$

B $\frac{7x-9}{x^2+3x-10}$

C $\frac{x^2+x+12}{x^2+3x-10}$

D $\frac{x^2+x+1}{x^2+3x-10}$

the difference of square.

86. The total area of a rectangle is $4x^4 - 9y^2$. Which factors could represent the length times width?

(A) $(2x^2 - 3y)(2x^2 + 3y)$ $= 4x^2 - 6x^2y + 6x^2y - 9y^2$ $= 4x^2 - 9y^2$

B $(2x^2 + 3y)(2x^2 + 3y)$

C $(2x - 3y)(2x - 3y)$

D $(2x + 3y)(2x - 3y)$

87. Which is a simplified form of $\dfrac{3a^2b^3c^{-2}}{(a^{-1}b^2c)^3}$?

(A) $\dfrac{3a^5}{b^3c^5}$ $\dfrac{3a^2b^3c^{-2}}{a^{-3}b^6c^3}$

B $\dfrac{3ab}{c^5}$ $\dfrac{a^3 \cdot 3a^2b^3}{b^6c^3c^2} = \dfrac{3a^5b^3}{b^{6-3}c^5}$

C $\dfrac{3}{b^2c^5}$ $= \dfrac{3a^5}{b^3c^5}$

D $\dfrac{3}{ab^3c^5}$

88. What is $\dfrac{20x^{-4}}{27y^2} \div \dfrac{8x^{-3}}{15y^{-5}}$? $\Rightarrow \dfrac{20x^{-4}}{27y^2} \cdot \dfrac{15y^{-5}}{8x^{-3}}$

A $\dfrac{32y^3}{81x}$ $\dfrac{20 \cdot 5}{9 \cdot 27y^2x^{4-1} \cdot 5 \cdot 15x^3}$ $\dfrac{}{28y^5}$

B $\dfrac{32}{81xy^7}$ $\dfrac{25}{18xy^7}$

C $\dfrac{25y^3}{18x}$

(D) $\dfrac{25}{18xy^7}$

89. If $i = \sqrt{-1}$, what is the value of i^4? $\rightarrow i^2 = -1$

A i

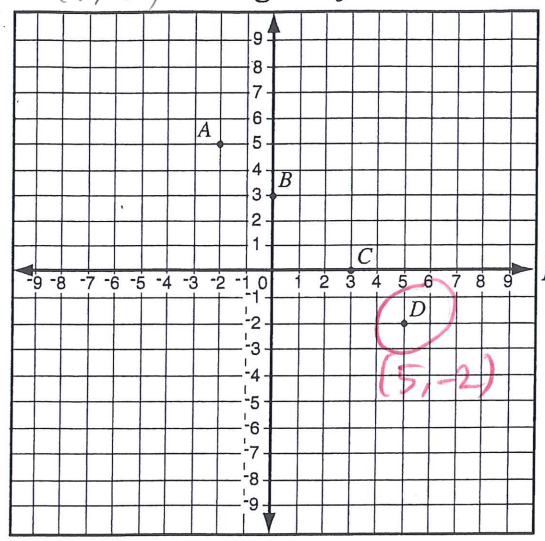
B $-i$ $i^4 = i^2 \cdot i^2$

(C) 1 $= (-1) \cdot (-1)$

D -1 $= 1$

90. If $i = \sqrt{-1}$, which point shows the location of $5 - 2i$ on the plane?

$(5, -2)$ *Imaginary*



A point A

B point B

C point C

(D) point D

91. If $i = \sqrt{-1}$, then $4i(6i) =$ $i^2 = -1$ $24i^2 = 24(-1)$ $= -24$

A 48

B 24

(C) -24

D -48

92. What is an equivalent form of $\dfrac{2}{3+i}$? $\cdot \dfrac{(3-i)}{(3-i)}$

A $\dfrac{3-i}{4}$ $\dfrac{6-2i}{9-3i+3i-i^2}$

(B) $\dfrac{3-i}{5}$ $\dfrac{6-2i}{9-(-1)}$

C $\dfrac{4-i}{4}$ $\dfrac{6-2i}{10} = \dfrac{2(3-i)}{10 \cdot 5}$

D $\dfrac{4-i}{5}$ $\boxed{\dfrac{3-i}{5}}$

93. What is the product of the complex numbers $(3+i)$ and $(3-i)$?

A 8

B 10

C $9-i$

D $10-6i$

$(3+i)(3-i)$

$9-3i+3i-i^2$ ($i^2=-1$)

$9-(-1)$

$9+1=10$

94. What are the solutions to the equation $x^2 + 2x + 2 = 0$?

A $x=0; x=-2$

B $x=0; x=-2i$

C $x=-1+i; x=-1-i$

D $x=-1+2\sqrt{2}; x=-1-2\sqrt{2}$

$\frac{-b\pm\sqrt{b^2-4ac}}{2a} = \frac{-2\pm\sqrt{2^2-4(1)(2)}}{2(1)}$

$= \frac{-2\pm\sqrt{4-8}}{2}$

$= \frac{-2\pm\sqrt{-4}}{2}$

$= \frac{-2\pm 2i}{2}$

$= \frac{2(-1\pm i)}{2}$

95. What are the solutions to the equation $\frac{x^2}{x^2}\cdot 1+\frac{1}{x^2}=\frac{3}{x}\cdot\frac{x}{x}$?

A $x=\frac{3}{2}+\frac{\sqrt{5}}{2}; x=\frac{3}{2}-\frac{\sqrt{5}}{2}$

B $x=3+\frac{\sqrt{5}}{2}; x=3-\frac{\sqrt{5}}{2}$

C $x=\frac{3}{2}+\frac{\sqrt{13}}{2}; x=\frac{3}{2}-\frac{\sqrt{13}}{2}$

D $x=3+\frac{\sqrt{13}}{2}; x=3-\frac{\sqrt{13}}{2}$

$x^2(\frac{x^2+1}{x^2}) = (\frac{3x}{x^2})x^2$

$x^2+1=3x$

$x^2-3x+1=0$

$\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

$\frac{-(-3)\pm\sqrt{(-3)^2-4(1)(1)}}{2(1)}$

$\frac{3\pm\sqrt{9-4}}{2} = \frac{3\pm\sqrt{5}}{2}$

96. There are two numbers with the following properties.

1) The second number is 3 more than the first number.

2) The product of the two numbers is 9 more than their sum.

Which of the following represents possible values of these two numbers?

A $-6, -3$

B $-4, -1$

C $-1, 4$

D $-3, 6$

1st # : x

2nd # : y

$y = 3+x$

$xy = 9+(x+y)$ substitute

$x(3+x) = 9+x+(3+x)$

$3x+x^2 = 2x+12$

$-12 \quad -2x \qquad -2x \quad -12$

$x^2+x-12=0$

$(x+4)(x-3)=0$

97. The graph of $\left(\frac{x}{2}\right)^2-\left(\frac{y}{3}\right)^2=1$ is a hyperbola.

Which set of equations represents the asymptotes of the hyperbola's graph?

(like finding a slope: $\frac{\Delta y}{\Delta x}$)

A $y=\frac{3}{2}x, y=-\frac{3}{2}x$

B $y=\frac{2}{3}x, y=-\frac{2}{3}x$

C $y=\frac{1}{2}x, y=-\frac{1}{2}x$

D $y=\frac{1}{3}x, y=-\frac{1}{3}x$

$y = \frac{\sqrt{\#\text{under } y}}{\sqrt{\#\text{under } x}}x$

$y=\frac{3}{2}x$

Note: Complete the square: add $(b/2a)^2$

98. $4x^2-5y^2-16x-30y-9=0$

$+9 \quad +9$

What is the standard form of the equation of the conic given above?

$4x^2-16x-5y^2-30y=9$

$4(x^2-4x+?)-5(y^2+6y+?)=9$

A $\frac{(x-4)^2}{11}-\frac{(y-3)^2}{4}=1$

$4(x^2-4x+4)-5(y^2+6y+9)=9$

$+16 \quad -45 \quad +16-45$

B $\frac{(y+3)^2}{4}-\frac{(x-2)^2}{5}=1$

$\frac{4(x-2)^2}{-20} - \frac{5(y+3)^2}{-20} = \frac{-20}{-20}$

C $\frac{(y-3)^2}{6}-\frac{(x+2)^2}{9}=1$

$\frac{(y+3)^2}{4}-\frac{(x-2)^2}{5}=1$

D $\frac{(x-4)^2}{11}+\frac{(y-3)^2}{4}=1$

99. What is the solution to the equation $5^x = 17$?

A $x = 2$

B $x = \log_{10} 2$

C $x = \log_{10} 17 + \log_{10} 5$

D $x=\frac{\log_{10} 17}{\log_{10} 5}$

$\log 5^x = \log 17$

$x\log 5 = \log 17$

$\frac{x\log 5}{\log 5} = \frac{\log 17}{\log 5}$

$x = \frac{\log 17}{\log 5}$

100. If $\log_{10} x = -2$, what is the value of x?

A $x = -\sqrt{\frac{1}{10}}$

B $x = \sqrt{\frac{1}{10}}$

C $x = \frac{1}{100}$

D $x = 100$

101. Which equation is equivalent to $\log_3 \frac{1}{9} = x$?

A $\frac{1}{9}^3 = x^3$

B $\left(\frac{1}{9}\right)^3 = x$

C $3^x = \frac{1}{9}$

D $3^{\frac{1}{9}} = x$

102. What are the x-intercepts of the graph of $y = 12x^2 - 5x - 2$?

A 1 and $-\frac{1}{6}$

B -1 and $\frac{1}{6}$

C $\frac{2}{3}$ and $-\frac{1}{4}$

D $-\frac{2}{3}$ and $\frac{1}{4}$

103. Given the equation $y = x^n$ where $x > 0$ and $n < 0$, which statement is valid for real values of y?

A $y > 0$

B $y = 0$

C $y < 0$

D $y \leq 0$

104. A certain radioactive element decays over time according to the equation $y = A\left(\frac{1}{2}\right)^{\frac{t}{300}}$, where A = the number of grams present initially and t = time in years. If 1000 grams were present initially, how many grams will remain after 900 years?

A 500 grams

B 250 grams

C 125 grams

D 62.5 grams

105. Bacteria in a culture are growing exponentially with time, as shown in the table below.

Bacteria Growth

Day	Bacteria
0	100
1	200
2	400

Which of the following equations expresses the number of bacteria, y, present at any time, t?

A $y = 100 + 2^t$

B $y = (100) \cdot (2)^t$

C $y = 2^t$

D $y = (200) \cdot (2)^t$

106. If the equation $y = 2^x$ is graphed, which of the following values of x would produce a point closest to the x-axis?

A $\frac{1}{4}$

B $\frac{3}{4}$

C $\frac{5}{3}$

D $\frac{8}{3}$

107. **What is the value of $\log_3 27$?**

$\log_3 27 = x$

$3^x = 27$

$x = 3$

A 2

B 3

C 6

D 9

108. **If $\log 2 \approx 0.301$ and $\log 3 \approx 0.477$, what is the approximate value of $\log 72$?**

$\log 72 = \log(9 \cdot 8)$

$= \log(3^2 \cdot 2^3)$

$\Rightarrow \log 3^2 + \log 2^3$

$\Rightarrow 2\log 3 + 3\log 2$

$2(0.477) + 3(0.301)$

$0.954 + 0.903 = 1.857$

A 0.051

B 0.778

C 0.861

D 1.857

109. **If x is a real number, for what values of x is the equation $\frac{3x-9}{3} = x-3$ true?**

There is no excluded value in the domain. Therefore all xs!

A all values of x

B some values of x

C no values of x

D impossible to determine

110. **On a recent test, Jeremy wrote the equation $\frac{x^2-16}{x-4} = x+4$. Which of the following statements is correct about the equation he wrote?**

$x - 4 \neq 0$

$+4 \quad +4$

$x \neq 4$

A The equation is always true.

B The equation is always true, except when $x = 4$.

C The equation is never true.

D The equation is sometimes true when $x = 4$.

111. **Abelardo wants to create several different 7-character screen names. He wants to use arrangements of the first 3 letters of his first name (abe), *followed by* arrangements of 4 digits in 1984, the year of his birth. How many different screen names can he create in this way?**

$6 \cdot 24 = 144$

A 72

B 144

C 288

D 576

112. **Teresa and Julia are among 10 students who have applied for a trip to Washington, D.C. Two students from the group will be selected at random for the trip. What is the probability that Teresa and Julia will be the 2 students selected?**

9 candidates

$\frac{2}{10} \cdot \frac{1}{9} = \frac{1}{45}$

We have 2 candidates: Teresa or Julia, out of 10 students

Assume either Terese or Julia is selected, we only have 1 more candidate out of 9 students.

A $\frac{1}{45}$

B $\frac{2}{45}$

C $\frac{1}{5}$

D $\frac{2}{5}$

113. **What is the sum of the infinite geometric series $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \ldots$?**

$r = \frac{t_2}{t_1} = \frac{1/4}{1/2} = \frac{1}{4} \cdot \frac{2}{1} = \frac{1}{2}$

$t_1 \quad t_2 \quad t_3 \ldots$

$|r| < 1$ ✓

$S = \frac{t_1}{1-r} = \frac{1/2}{1-1/2} = \frac{1/2}{1/2} = 1$

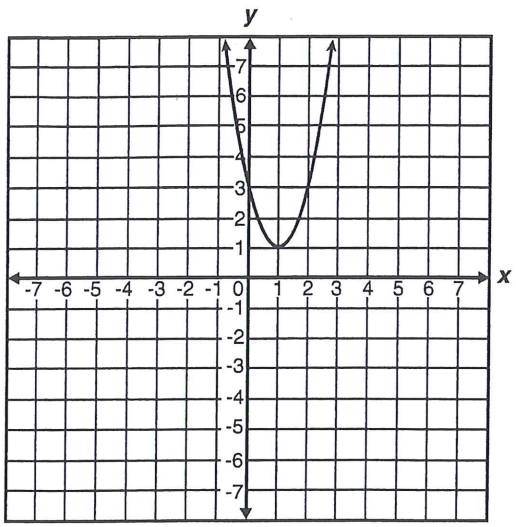
A 1

B 1.5

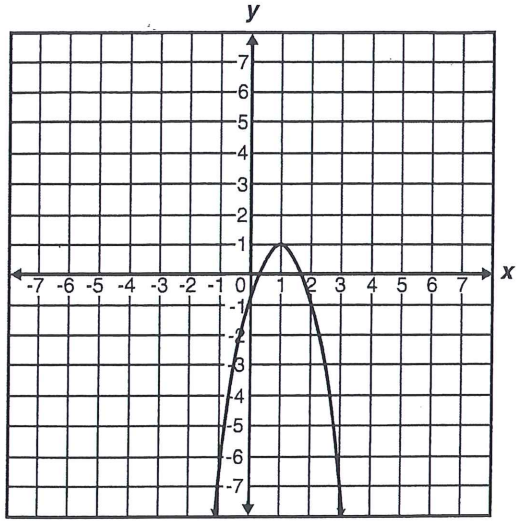
C 2

D 2.5

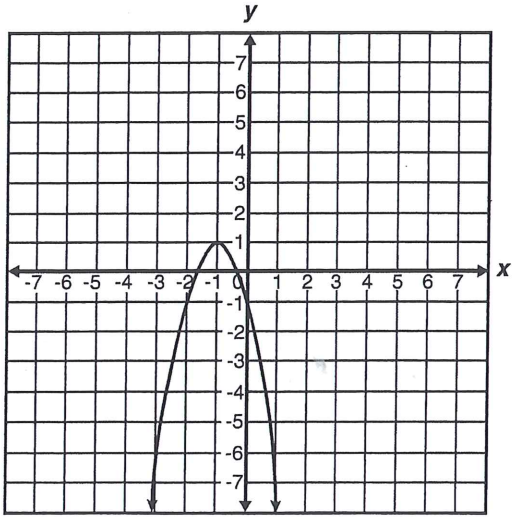
114. Which is the graph of $y = -2(x-1)^2 + 1$? → V = (1,1)



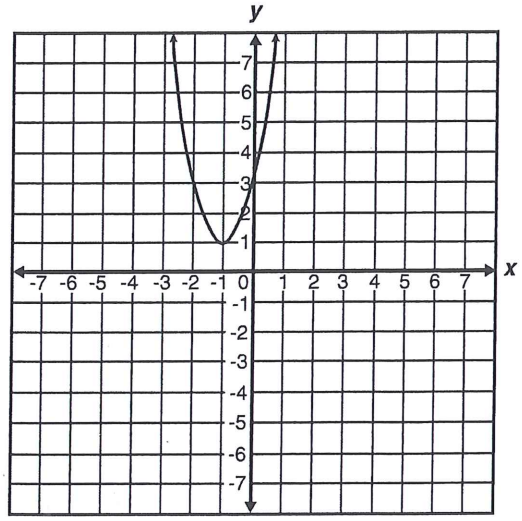
A



C

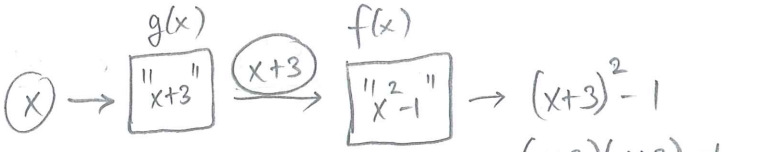


B



D

115. Which expression represents $f(g(x))$ if $f(x) = x^2 - 1$ and $g(x) = x + 3$?



(x+3)(x+3) - 1

x² + 3x + 3x + 9 - 1

x² + 6x + 8

A $x^3 + 3x^2 - x - 3$

B $x^2 + 6x + 8$

C $x^2 + x + 2$

D $x^2 + 8$

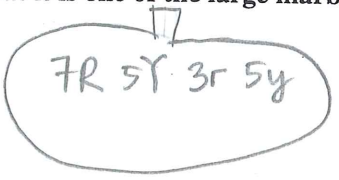
116. **A box contains 7 large red marbles, 5 large yellow marbles, 3 small red marbles, and 5 small yellow marbles. If a marble is drawn at random, what is the probability that it is yellow, given that it is one of the large marbles?**

A $\frac{5}{12}$

B $\frac{7}{20}$

C $\frac{5}{8}$

D $\frac{1}{5}$



$\frac{5 \text{ large yellow}}{\text{total Large}}$

$\frac{5}{12}$

Because it's given that it is one of the large marbles, we ignore the existance of the small marbles

117. **A small-business owner must hire seasonal workers as the need arises. The following list shows the number of employees hired monthly for a 5-month period.**

4, 13, 5, 6, 9 → n=5
X1 X2 X3 X4 X5

If the mean of these data is approximately 7, what is the population standard deviation for these data? (Round the answer to the nearest tenth.) $\bar{x}$

A 3.3

B 7.4

C 10.8

D 13.5

$SD = \sqrt{\text{Variance}}$, $\text{Variance} = \frac{(x_1-\bar{x})^2+(x_2-\bar{x})^2+(x_3-\bar{x})^2+(x_4-\bar{x})^2+(x_5-\bar{x})^2}{n}$

$SD = \sqrt{10.8}$

$\approx 3....$

$= \frac{(4-7)^2+(13-7)^2+(5-7)^2+(6-7)^2+(9-7)^2}{5}$

$= \frac{9+36+4+1+4}{5}$

$= \frac{54}{5} = 10.8$

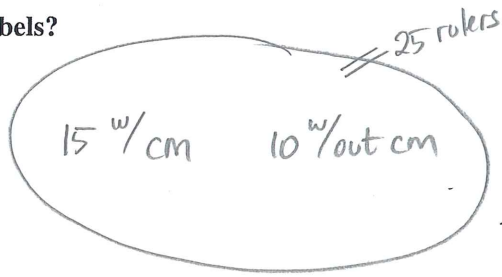
118. **A math teacher is randomly distributing 15 rulers with centimeter labels and 10 rulers without centimeter labels. What is the probability that the first ruler she hands out will have centimeter labels and the second ruler will *not* have labels?**

A $\frac{1}{24}$

B $\frac{1}{4}$

C $\frac{2}{5}$

D $\frac{23}{25}$



P(w/ cm) & P(w/out cm)

$\frac{15}{25} \downarrow \cdot \frac{10}{24}$

$\frac{3}{5} \cdot \frac{5}{12} = \frac{1}{4}$

119 Which equation is equivalent to $3[7x-4(x-3)]+1=16$?

A $9x-2=16$ $3[7x-4x+12]+1=16$

B $9x+37=16$ $3[3x+12]+1=16$

C $17x-2=16$ $9x+36+1=16$

D $17x+13=16$ $9x+37=16$

120 Beth is two years older than Julio. Gerald is twice as old as Beth. Debra is twice as old as Gerald. The sum of their ages is 38. How old is Beth?

Julio is the youngest = x

Julio $= x$

Beth $= 2+$ julio $= 2+x$

Gerald $= 2 \cdot$ Beth $= 2(2+x) = 4+2x$

Debra $= 2 \cdot$ Gerald $= 2(4+2x) = 8+4x$

$8x+14=38$

$-14 \quad -14$

$\frac{8x=24}{8 \quad 8}$

$x=3$

Beth $= 2+x = 2+3 = 5$

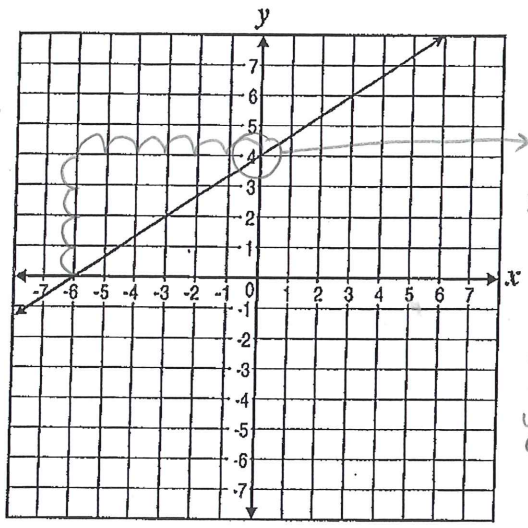
A 3

B 5

C 6

D 8

121 Which equation represents the line shown in the graph below?



y int $= 4 = b$

Slope (+) → rising.

$m = \frac{4}{6} = \frac{2}{3}$

$y = mx+b$

$y = \frac{2}{3}x+4$

A $y=\frac{2}{3}x+4$

B $y=\frac{2}{3}x-6$

C $y=\frac{3}{2}x+4$

D $y=\frac{3}{2}x-6$

122 What is the x-intercept of the line defined by $-2x+3y=12$?

$y=0$

$-2x+3(0)=12$

$\frac{-2x}{-2} = \frac{12}{-2}$

$x=-6$

A 6

B 4

C -4

D -6

123 Which point lies on the line represented by the equation below?

$5x+4y=22$

Plug in!

$(2,3) \rightarrow 5(2)+4(3) \stackrel{?}{=} 22$

$10+12=22$ ✓

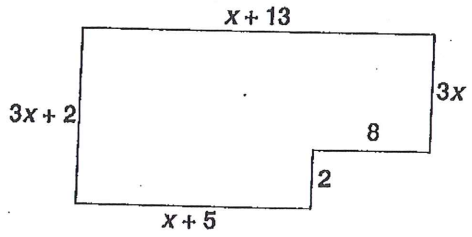
A $\left(-2,\frac{11}{4}\right)$

B $\left(-1,\frac{17}{4}\right)$

C $(2,3)$

D $(6,2)$

124 What is the perimeter of the figure shown below, which is not drawn to scale?



P = add up all the sides

$= x+13+3x+8+2+x+5+3x+2$

$= 8x+30$

A $5x+33$

B $5x^3+33$

C $8x+30$

D $8x^4+30$

125 What are the solutions for the quadratic equation $x^2-8x=9$?

$-9 \quad -9$

$x^2-8x-9=0$

$(x-9)(x+1)=0$

$x=9 \quad x=-1$

A 3

B $3,-3$

C $1,-9$

D $-1,9$

126 What are the solutions to the equation

$$3x^2+3=7x?$$

$-7x \quad -7x \Rightarrow 3x^2-7x+3=0$

$\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

$\frac{-(-7)\pm\sqrt{(-7)^2-4(3)(3)}}{2(3)}$

$\frac{7\pm\sqrt{49-36}}{6}$

$\frac{7\pm\sqrt{13}}{6}$

A $x=\frac{7+\sqrt{85}}{6}$ or $x=\frac{7-\sqrt{85}}{6}$

B $x=\frac{-7+\sqrt{85}}{6}$ or $x=\frac{-7-\sqrt{85}}{6}$

C $x=\frac{7+\sqrt{13}}{6}$ or $x=\frac{7-\sqrt{13}}{6}$

D $x=\frac{-7+\sqrt{13}}{6}$ or $x=\frac{-7-\sqrt{13}}{6}$

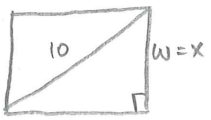
127 A rectangle has a diagonal that measures 10 centimeters and a length that is 2 centimeters longer than the width. What is the width of the rectangle in centimeters?

$L=2+w$

width is shorter than length.

$\Rightarrow w=x$

$L=2+w=2+x$



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

$(2+x)^2+x^2=10^2$

$4+4x+x^2+x^2=100$

$2x^2+4x+4=100$

A 5

B 6

C 8

D 12

128 What is the simplest form of the fraction $\frac{x^2-1}{x^2+x-2}$?

$\Downarrow$

$\frac{(x-1)(x+1)}{(x+2)(x-1)}$

Plug in the option:

$x=6 \rightarrow 2(6)^2+4(6)+4 \stackrel{?}{=} 100$

$2(36)+24+4 \stackrel{?}{=} 100$

$72+28=100$ ✓

A $\frac{-1}{x-2}$

B $\frac{x-1}{x-2}$

C $\frac{x-1}{x+2}$

D $\frac{x+1}{x+2}$

129 What is the solution to the following system of equations?

$$\begin{cases} 2x-3y=4 \\ 4x+y=-6 \end{cases}$$

$\cdot 1 \quad 2x-3y=4$

$\cdot 3 \quad 12x+3y=-18$ +

$\frac{14x}{14}=\frac{-14}{14}$

$x=-1$

A $(5,-2)$

B $(-2,5)$

C $(-1,-2)$

D $(-2,-1)$

130

Jena's Vacation

Miles Traveled	600	450	300	960
Gallons of Gasoline	20	15	10	x

Jena's car averaged 30 miles per gallon of gasoline on her trip. What is the value of x in gallons of gasoline?

Ave $=\frac{\text{total miles}}{\text{total gallon}}$

$30=\frac{600+450+300+960}{20+15+10+x}$

$\frac{30}{1}=\frac{2310}{45+x} \Rightarrow 2310=30(45+x)$

$2310=1350+30x$

$-1350 \quad -1350$

$\frac{960}{30}=\frac{30x}{30}$

$x=32$

A 32

B 41

C 55

D 80

131 $25x^2-40xy+16y^2=$

$(5x-4y)(5x-4y)$

A $(5x-4y)^2$

B $(5x+10-4y)^3$

C $5(5x-4y)^2$

D $5(4xy)^2$

132 $\frac{2x^2-10x}{x^2+8x+16}\cdot\frac{4x+16}{x^2-25}=$

$\Downarrow$

$\frac{2x(x-5)}{(x+4)(x+4)}\cdot\frac{4(x+4)}{(x-5)(x+5)}$

$\frac{8x}{(x+4)(x+5)}$

A $\frac{8x}{(x+4)(x-5)}$

B $\frac{2x+4}{(x+4)(x+5)}$

C $\frac{8x}{(x+4)(x+5)}$

D $\frac{2x+4}{x^2+20}$

133 $\frac{4(x+y)}{5x^2y^3}\div\frac{-2x-2y}{10}=$

$\frac{4(x+y)}{5x^2y^3}\cdot\frac{10}{-2(x+y)}$

$\frac{4}{-x^2y^3}$

A $-\frac{4}{x^2y^3}$

B $\frac{4}{x^2y^3}$

C $-\frac{4(x+y)}{x^2y^3(x-y)}$

D $\frac{4(x+y)^2}{5x^2y^3}$

134 Which expression represents $(-3-2i)-(-5+i)$?

A $-8-3i$

B $-8-i$

C $2-i$

D $2-3i$

135 What are the solutions to the equation $1+\frac{1}{x^2}=\frac{3}{x}$?

A $x=\frac{3}{2}+\frac{\sqrt{5}}{2}; x=\frac{3}{2}-\frac{\sqrt{5}}{2}$

B $x=3+\frac{\sqrt{5}}{2}; x=3-\frac{\sqrt{5}}{2}$

C $x=\frac{3}{2}+\frac{\sqrt{13}}{2}; x=\frac{3}{2}-\frac{\sqrt{13}}{2}$

D $x=3+\frac{\sqrt{13}}{2}; x=3-\frac{\sqrt{13}}{2}$

136 Two consecutive positive integers have the property that one integer times twice the other equals 612. What is the sum of these two integers?

A 33

B 35

C 37

D 39

137 What are the solutions to the equation $x^2-6x+5=-8$?

A 2 and 3

B $2i$ and $3i$

C $3+2\cdot3$ and $3-2\cdot3$

D $3+2i$ and $3-2i$

138 If $\log_x y=2$, which of the following is true?

A $y=x^2$

B $y=2x$

C $x=y^2$

D $x=2y$

139 In 1997 the population of a small town was 700. If the annual rate of increase is about 0.8%, which value below expresses the population five years later?

A $5(700)(0.008)$

B $5(700)(1.008)$

C $(700)(0.008)^5$

D $(700)(1.008)^5$

140 Which of the following is a simplified form of the expression $\log_{21}5+\log_{21}4-\log_{21}2$?

A $\log_{21}10$

B $\log_{10}21$

C $\log_{21}7$

D $\log_7 21$

141 If x is a real number, for what values of x is the equation $\log_5 5^x=x$ true?

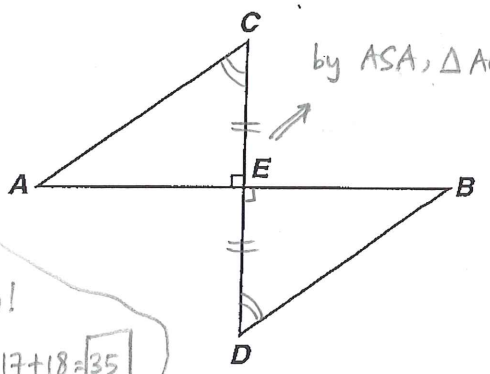
A all values of x

B some values of x

C no values of x

D impossible to determine

142 Given: E is the midpoint of $\overline{CD}$; $\angle C\cong\angle D$



Which of the following statements *must* be true?

A $\angle A\cong\angle D$

B $\angle B\cong\angle C$

C $\overline{CE}\cong\overline{BE}$

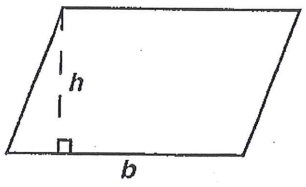
D $\overline{AC}\cong\overline{BD}$

143 **Students in a class rewrote theorems in their own words. One student wrote the following statement.**

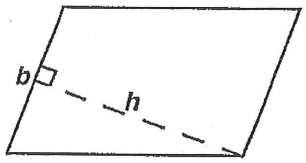
> The area of a parallelogram is the product of any base (b) and any height (h).

Which figure shows a counterexample to prove the statement *false*?

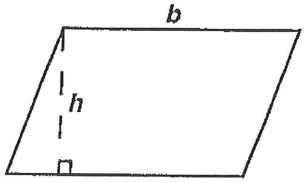
A



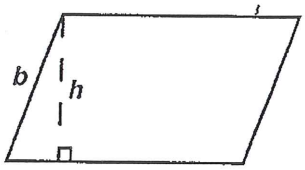
B



C



D



b & h must ⊥ to each other!

144 **Which method listed below could *not* be used to prove that two triangles are congruent?**

A Prove all three sets of corresponding sides congruent. ✓

B Prove all three sets of corresponding angles congruent. AAA is only for similar Δs, not congruent Δs.

C Prove that two sides and an included angle of one triangle are congruent to two sides and an included angle of the other triangle. ✓

D Prove that two angles and an included side of one triangle are congruent to two angles and an included side of the other triangle. ✓

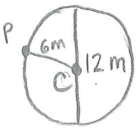
145 **The diameter of a circle is 12 meters. If point P is in the same plane as the circle, and is 6 meters from the center of the circle, which *best* describes the location of point P?**

A Point P must be on the circle.

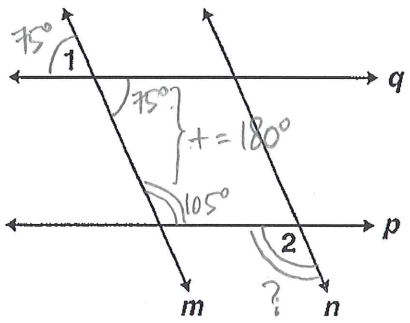
B Point P must be inside the circle.

C Point P may be either outside the circle or on the circle.

D Point P may be either inside the circle or on the circle.



146 **Given:** $p \parallel q$;
$m \parallel n$;
$m\angle 1 = 75°$



What is $m\angle 2$?

A 15°

B 75°

C 90°

D 105°

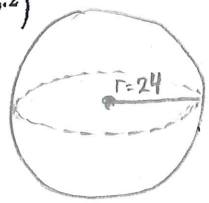
147 **Vik is constructing a spherical model of Earth for his science fair project. His model has a radius of 24 inches. Since roughly 75% of Earth's surface is covered by water, he wanted to paint 75% of his model blue to illustrate this fact. Approximately how many square inches on his model will be painted blue?**
(Surface Area = $4\pi r^2$)

A 5426

B 7235

C 43,407

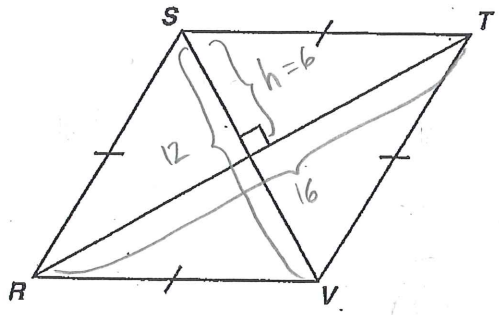
D 57,877



$75\% = \frac{75}{100} = \frac{3}{4}$

Blue area $= \frac{3}{4} \cdot 4 \cdot \pi r^2$
$= 3(3.14)(24)^2$
≈ 5426

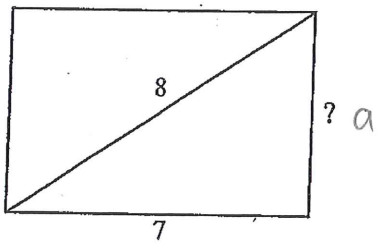
148 What is the area, in square centimeters, of rhombus $RSTV$ if $RT = 16$ cm and $SV = 12$ cm?



Area of RSTV = 2. ΔSRT
= 2 · ½ · b · h
= 16 · 6
= 96

A 40
B 48
C 96
D 192

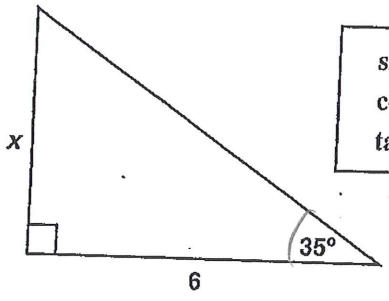
149 What is the height of this rectangle?



$a^2 + b^2 = c^2$
$a^2 + 7^2 = 8^2$
$a = \sqrt{64-49}$
$a = \sqrt{15}$

A 1 unit
B 6 units
C $\sqrt{15}$ units
D $\sqrt{113}$ units

150 What is the approximate value of x in the triangle below?



$\sin 35° \approx 0.57$
$\cos 35° \approx 0.82$
$\tan 35° \approx 0.7$

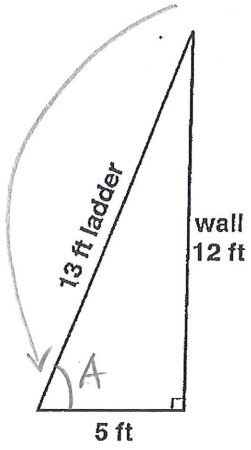
$\tan 35° = \frac{opp}{adj}$

$\frac{0.7}{1} = \frac{x}{6}$

$x = 6(0.7)$
$x = 4.2$

A 3.4 units
B 4.2 units
C 4.9 units
D 7.3 units

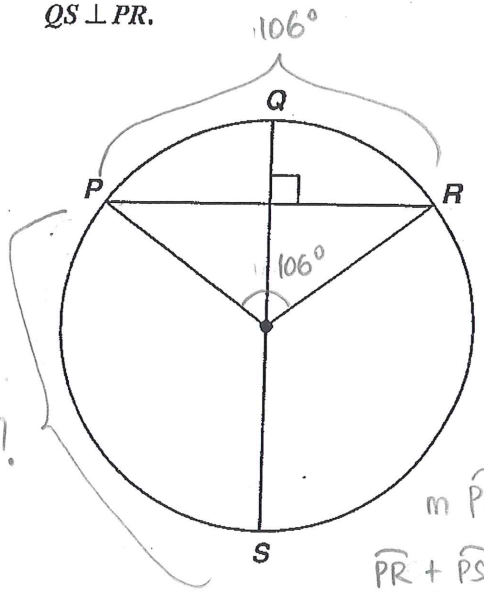
151 A 13-foot ladder is leaning against a brick wall. The top of the ladder touches the wall 12 feet (ft) above the ground. The bottom of the ladder is 5 ft from the bottom of the wall. What is the sine of the angle formed by the ground and the base of the ladder? → sin A ?



$\sin A = \frac{opp}{hyp} = \frac{12}{13}$

A $\frac{5}{12}$
B $\frac{5}{13}$
C $\frac{12}{13}$
D $\frac{13}{5}$

152 $\overline{QS}$ is a diameter of the circle below, and $\overline{QS} \perp \overline{PR}$.



$m\widehat{PS} = m\widehat{RS} = x$
$\widehat{PR} + \widehat{PS} + \widehat{RS} = 360°$
$106° + x + x = 360°$
$106° + 2x = 360°$
$-106° \quad -106°$
$\frac{2x}{2} = \frac{254°}{2}$
$x = 127°$
$\widehat{PS} = 127°$

If $m\widehat{PQR} = 106°$, what is $m\widehat{PS}$?

A 53°
B 74°
C 106°
D 127°