



(3/4) of a number, decreased by 8, equals 13. What is the number?

- A) 20  
B) 21  
C) 28  
D) 32
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### Q5. [Percent (Two-Step)]

■ MEMORY KEY: KEY: "P% of W = A" →  $W = A / (P/100)$ . Then find the second percent of W.

40% of a certain number is 26. What is 75% of that same number?

- A) 39  
B) 45.5  
C) 48.75  
D) 65
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### Q6. [Consecutive Integers]

■ MEMORY KEY: KEY: Label consecutive integers  $n, n+1, n+2, n+3$ . Set up the sum equation, solve for  $n$ , then find the asked-for value.

The sum of four consecutive integers is 94. What is the largest of the four integers?

- A) 22  
B) 23  
C) 24  
D) 25
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### Q7. [Work Rate]

■ MEMORY KEY: KEY: Rate =  $1/\text{Time}$ . Together: add the rates, then flip. NEVER add the times directly.

Pipe A fills a tank in 3 hours, Pipe B fills the same tank in 6 hours. If both are opened simultaneously, how many hours does it take to fill the tank?

- A) 1.5 hours  
B) 2 hours  
C) 2.5 hours  
D) 4.5 hours
- 

### Q8. [Absolute Value]

■ MEMORY KEY: KEY:  $|x| = k$  means TWO cases:  $x = k$  OR  $x = -k$ . Always solve BOTH.

Solve:  $|3x - 7| = 14$ . What is the positive solution for  $x$ ?

- A)  $x = 7/3$   
B)  $x = 5$   
C)  $x = 7$   
D)  $x = 3$
- 

### Q9. [Percent Change (Double)]

■ MEMORY KEY: KEY: +p% then -p% is NOT zero. Net =  $(1+r)(1-r) = 1 - r^2$ . Always apply to the NEW value each time.

The price of a jacket increases by 20%, then later decreases by 20%. The final price compared to the original is:

A) The same (no change)

B) 2% less

C) 4% less

D) 4% more

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**Q10. [Combined Work (Fractions)]**

■ MEMORY KEY: KEY SHORTCUT: Together =  $(a \times b) / (a + b)$ . Faster than rate method for two workers.

Alice completes a project in 8 days. Bob completes the same project in 12 days. Working together, how many days will it take?

A) 5 days

B)  $24/5$  days

C) 10 days

D)  $20/3$  days

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## Geometry

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### Q11. [Triangle Area]

■ MEMORY KEY: KEY: Area of triangle =  $(1/2) \times \text{base} \times \text{height}$ . The height must be PERPENDICULAR to the base.

A triangle has a base of 14 cm and a height of 9 cm. A rectangle has the same area as this triangle. If the rectangle's length is 7 cm, what is its width?

- A) 7 cm  
B) 9 cm  
C) 10.5 cm  
D) 63 cm
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### Q12. [Circle: Circumference & Area]

■ MEMORY KEY: KEY:  $C = 2\pi r = \pi d$ . Area =  $\pi r^2$ . Diameter =  $2r$ . Always identify radius first.

A circle has a diameter of 14 cm. What is the exact circumference and area? (Leave in terms of pi.)

- A)  $C = 14\pi$  cm,  $A = 49\pi$  cm<sup>2</sup>  
B)  $C = 7\pi$  cm,  $A = 49\pi$  cm<sup>2</sup>  
C)  $C = 14\pi$  cm,  $A = 196\pi$  cm<sup>2</sup>  
D)  $C = 28\pi$  cm,  $A = 49\pi$  cm<sup>2</sup>
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### Q13. [Pythagorean Theorem]

■ MEMORY KEY: KEY TRIPLES to memorize: 3-4-5, 5-12-13, 8-15-17, 7-24-25. Scale these to save time.

A right triangle has legs of length 5 and 12. A square is drawn on the hypotenuse. What is the area of that square?

- A) 119  
B) 144  
C) 169  
D) 196
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### Q14. [Complementary Angles]

■ MEMORY KEY: KEY VOCAB: Complementary = 90 degrees. Supplementary = 180 degrees. "C for Corner (90), S for Straight (180)."

Two angles are complementary. One measures  $3x$  degrees and the other  $(x+10)$  degrees. What is the measure of the larger angle?

- A) 20 deg  
B) 30 deg  
C) 60 deg  
D) 70 deg
- 

### Q15. [Rectangle: Perimeter & Area]

■ MEMORY KEY: KEY: Perimeter shortcut  $\rightarrow l + w = P/2$ . Write  $l$  in terms of  $w$ , substitute, solve.



■ MEMORY KEY: KEY: Diagonal of rectangle  $\rightarrow$  use Pythagorean theorem:  $d = \sqrt{l^2 + w^2}$ .  
Memorize 6-8-10 = 3-4-5 x 2.

A rectangle has sides of 6 cm and 8 cm. A diagonal divides it into two triangles. What is the perimeter of one of those triangles?

A) 24 cm

B) 28 cm

C) 30 cm

D) 10 cm

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## Answer Key & Solutions

### Section 01 — Pre-Algebra

**Q1.** [Ratios] Answer: B) 48

Solution: Red = 3 parts = 18  $\rightarrow$  1 part = 6. Total = 8 parts =  $8 \times 6 = 48$ .

**Q2.** [LCM] Answer: C) 36

Solution:  $4 = 2^2$ ,  $6 = 2 \times 3$ ,  $9 = 3^2$ . LCM =  $2^2 \times 3^2 = 4 \times 9 = 36$  hours.

**Q3.** [Distance & Rate] Answer: B) 37.5 miles

Solution: Relative speed =  $60 - 45 = 15$  mph. Gap =  $15 \times 2.5 = 37.5$  miles.

**Q4.** [Equations with Fractions] Answer: C) 28

Solution:  $(\frac{3}{4})n - 8 = 13 \rightarrow (\frac{3}{4})n = 21 \rightarrow n = 21 \times (\frac{4}{3}) = 28$ .

**Q5.** [Percent (Two-Step)] Answer: C) 48.75

Solution:  $0.40 \times n = 26 \rightarrow n = 65$ . Then  $0.75 \times 65 = 48.75$ .

**Q6.** [Consecutive Integers] Answer: D) 25

Solution:  $n+(n+1)+(n+2)+(n+3) = 94 \rightarrow 4n+6 = 94 \rightarrow n = 22$ . Largest =  $n+3 = 25$ .

**Q7.** [Work Rate] Answer: B) 2 hours

Solution:  $\frac{1}{3} + \frac{1}{6} = \frac{2}{6} + \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$  tank/hr. Time =  $1 / (\frac{1}{2}) = 2$  hours.

**Q8.** [Absolute Value] Answer: C)  $x = 7$

Solution: Case 1:  $3x-7=14 \rightarrow 3x=21 \rightarrow x=7$  (positive). Case 2:  $3x-7=-14 \rightarrow x=-7/3$  (negative). Positive solution = 7.

**Q9.** [Percent Change (Double)] Answer: C) 4% less than original

Solution:  $\$100 \times 1.20 = \$120$ . Then  $\$120 \times 0.80 = \$96$ . Net = -4%. Formula:  $1 - (0.2)^2 = 0.96$ .

**Q10.** [Combined Work (Fractions)] Answer: B)  $\frac{24}{5}$  days (= 4.8 days)

Solution: Rate:  $\frac{1}{8} + \frac{1}{12} = \frac{3}{24} + \frac{2}{24} = \frac{5}{24}$  per day. Time =  $\frac{24}{5}$  days. Check:  $(\frac{8 \times 12}{8+12}) = \frac{96}{20} = \frac{24}{5}$ . ✓

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### Section 02 — Geometry

**Q11.** [Triangle Area] Answer: B) 9 cm

Solution: Triangle area =  $(\frac{1}{2})(14)(9) = 63$  cm<sup>2</sup>. Rectangle:  $7 \times w = 63 \rightarrow w = 9$  cm.

**Q12.** [Circle: Circumference & Area] Answer: A)  $C = 14\pi$  cm, Area =  $49\pi$  cm<sup>2</sup>

Solution:  $r = \frac{14}{2} = 7$ .  $C = 2\pi \times 7 = 14\pi$ . Area =  $\pi \times (7)^2 = 49\pi$ .

**Q13.** [Pythagorean Theorem] Answer: C) 169

Solution:  $c^2 = 5^2 + 12^2 = 25 + 144 = 169$ . Area of square =  $c^2 = 169$ . ( $c = 13$ , the 5-12-13 triple!)

**Q14.** [Complementary Angles] Answer: C) 60 degrees

Solution:  $3x + (x+10) = 90 \rightarrow 4x = 80 \rightarrow x = 20$ . Angles:  $3(20)=60$  deg and  $20+10=30$  deg. Larger = 60 deg.

**Q15.** [Rectangle: Perimeter & Area] Answer: C) 152 cm<sup>2</sup>

Solution:  $w =$  width,  $l = 2w+3$ .  $2(w + 2w+3) = 54 \rightarrow 3w+3 = 27 \rightarrow w = 8$ ,  $l = 19$ . Area =  $19 \times 8 = 152$  cm<sup>2</sup>.

**Q16.** [Volume: Cylinder] Answer: C)  $90\pi$  cm<sup>3</sup>

Solution:  $V = \pi \times r^2 \times h = \pi \times (3)^2 \times (10) = \pi \times 9 \times 10 = 90\pi$  cm<sup>3</sup>.

**Q17.** [Exterior Angle Theorem] Answer: A) 45 degrees

Solution: Exterior = sum of remote interiors:  $110 = 65 + x \rightarrow x = 45$  deg. Check:  $65+45+70 = 180$  deg. ✓

**Q18.** [Similar Triangles] Answer: C) 15

Solution: Scale factor =  $9/6 = 1.5$ . Longest side =  $10 \times 1.5 = 15$ . (Second triangle: 9-12-15, a 3-4-5 triple  $\times 3$ .)

**Q19.** [Sector Area] Answer: B)  $6\pi$  cm<sup>2</sup>

Solution: Full circle area =  $\pi(6)^2 = 36\pi$ . Fraction =  $60/360 = 1/6$ . Sector =  $(1/6) \times 36\pi = 6\pi$  cm<sup>2</sup>.

**Q20.** [Rectangle Diagonal & Triangle Perimeter] Answer: A) 24 cm

Solution: Diagonal =  $\sqrt{6^2 + 8^2} = \sqrt{100} = 10$  cm. Triangle sides: 6, 8, 10. Perimeter =  $6+8+10 = 24$  cm.