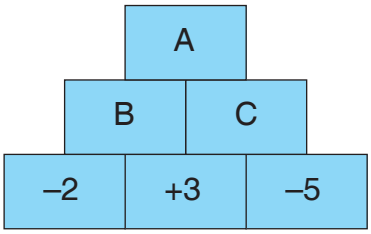
QUESTIONS AND CONCLUSIONS

QUESTIONS 7-8

Q1:



In the figure above, each number in the top box is equal to the sum of the two numbers in the boxes directly below it.

What is the value of A + B + C? (1 point)

A) 2 B) 0 C) –2 D) –3

CONCLUSIONS

Q1: We know the following relationships from the problem:

- B is the sum of the two numbers directly below it: $-2 + 3 = 1$
- C is the sum of the two numbers directly below it: $3 + (-5) = -2$
- A is the sum of B and C, so:
  $A = B + C = 1 + (-2) = -1$

Now, we need to calculate A + B + C:

$A + B + C = -1 + 1 + (-2) = -2$

So the correct answer is C.

SOLUTION IS C

Q2:

I	II	III	IV
64^1	$(-8)^2$	$(-2)^6$	$(-4)^3$
1^{64}	4^3	8^2	$(-2)^6$

In the table above, which columns have equal results for the numbers in the top and bottom boxes? (2 points)

A) I and II B) I and III

C) II and III D) III and IV

CONCLUSIONS

Q2: Let's evaluate the numbers in each column:

Column I:

- $64^1 = 64$
- $1^{64} = 1$

So, the numbers in column I are not equal.

Column II:

- $(-8)^2 = (-8) \times (-8) = 64$
- $4^3 = 4 \times 4 \times 4 = 64$

So, the numbers in column II are equal.

Column III:

- $(-2)^6 = (-2) \times (-2) \times (-2) \times (-2) \times (-2) \times (-2) = 64$
- $8^2 = 8 \times 8 = 64$

So, the numbers in column III are equal.

Column IV:

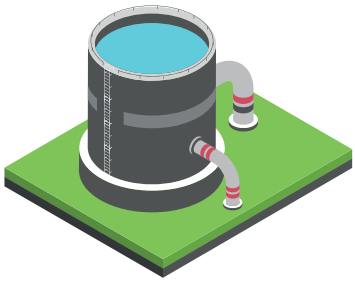
- $(-4)^3 = (-4) \times (-4) \times (-4) = -64$
- $(-2)^6 = 64$

So, the numbers in column IV are not equal.

The columns where the numbers are equal are II and III. The correct answer is C

SOLUTION IS C

Q3:



A tank is filled with water to two-sevenths of its capacity. After adding 45 liters of water, the tank becomes half full.

What is the total capacity of the tank? (3 points)

A) 105 B) 196 C) 210 D) 240

CONCLUSIONS

Q3: Let's use algebra to solve this. Let x represent the total capacity of the tank in liters.

Initially, the tank has $\frac{2}{7} \times x$ liters of water.

After adding 45 liters, the tank has $\frac{1}{2} \times x$ liters.

So, the equation is: $\frac{2}{7} \times x + 45 = \frac{1}{2} \times x$

First, eliminate the fractions by multiplying the entire equation by 14 (the least common multiple of 7 and 2):

$$14 \times \left(\frac{2}{7} \times x + 45\right) = 14 \times \frac{1}{2} \times x$$

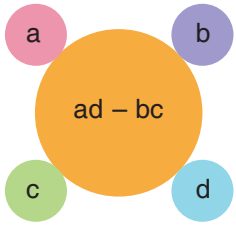
Simplify: $4x + 630 = 7x$

Subtract 4x from both sides: $630 = 3x$

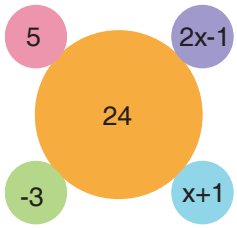
Divide both sides by 3: $x = 210$ liters

SOLUTION IS C

Q4: In the circular figure below, the number inside the large circle is written according to a specific rule.



This rule is defined as follows:



According to this, what is the value of x? (4 points)

A) –1 B) 1 C) 2 D) 3

CONCLUSIONS

Q4: We are given the rule ad–bc, and the number in the center of the circle is 24. Let's substitute the given values into the equation.

$ad - bc = 24$

Substitute the values of a, b, c, and d:

$5(x + 1) - (-3)(2x - 1) = 24$

Simplify both parts:

For $5(x + 1)$:

$5(x + 1) = 5x + 5$

For $-(-3)(2x - 1)$:

$-(-3)(2x - 1) = 3(2x - 1) = 6x - 3$

Now, substitute these back into the equation:

$5x + 5 + 6x - 3 = 24$

Combine like terms:

$11x + 2 = 24$

Subtract 2 from both sides:

$11x = 22$

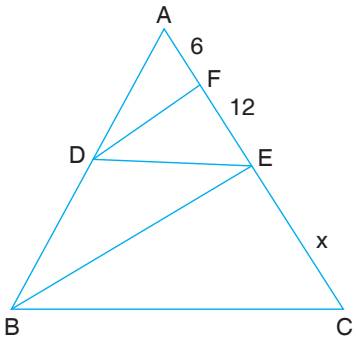
Now, divide by 11:

$x = \frac{22}{11} = 2$

The value of x is 2, so the correct answer is C.

SOLUTION IS C

Q5:



In triangle ABC, it is given that:

- DF // BE and DE // BC,
- IAFI = 6 cm,
- IFEI = 12 cm,
- IECI = x cm.

According to the information given, what is the value of x? (5 points)

A) 12 cm B) 24 cm

C) 36 cm D) 48 cm

CONCLUSIONS

Q5: Since DF // BE and DE // BC, the triangles ADF, ABE, and ABC are similar. This means the corresponding sides of these triangles are proportional.

In triangle ABC, the line segments AF, FE, and EC are given:

- AF = 6 cm
- FE = 12 cm
- EC = x cm

Since the triangles are similar, the proportional relationship holds. Let's now calculate the total length of AC, which is the sum of these segments:

$$AC = AF + FE + EC = 6 + 12 + x$$

The ratio between AF and FE is:

$$\frac{AF}{FE} = \frac{6}{12} = \frac{1}{2}$$

This ratio applies to the remaining segment EC, meaning EC should be twice as long as FE, since the proportional relationship continues along the length of the triangle. Thus:

$$EC = 2 \times (AF + FE)$$

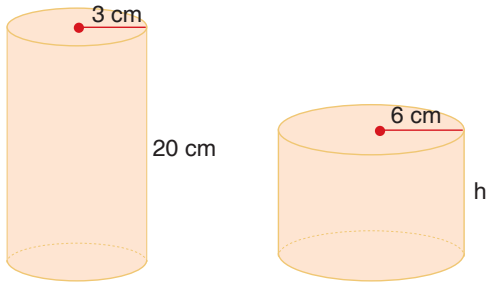
Substituting the known values:

$$EC = 2 \times (6 + 12) = 2 \times 18 = 36 \text{ cm}$$

The length of EC, or x, is 36 cm.

SOLUTION IS C

Q6:



A cylinder with a base radius of 3 cm and a height of 20 cm is completely filled with water. This water is then poured into another cylinder with a base radius of 6 cm, filling it completely.

What is the height h of the second cylinder?
(6 points)

A) 4 cm
B) 5 cm
C) 10 cm
D) 20 cm

CONCLUSIONS

Q6: The volume of a cylinder is given by the formula: $V = \pi r^2 h$ where:

- r is the radius of the base
- h is the height of the cylinder
- π is a constant.

The first cylinder has a radius of 3 cm and a height of 20 cm. So, its volume is:

$$V_1 = \pi 3^2 \times 20 = \pi \times 9 \times 20 = 180\pi \text{ cm}^3$$

The second cylinder has a base radius of 6 cm, and we need to find its height h. Since the water fills the second cylinder completely, the volume of the second cylinder must be equal to the volume of the first cylinder:

$$V_2 = V1 = 180\pi \text{ cm}^3$$

The volume of the second cylinder is also given by the formula:

$$V_2 = \pi 6^2 \times h = \pi \times 36 \times h = 36\pi$$

Since $V_2 = V_1$, we can set the volumes equal to each other:

$$36\pi h = 180\pi$$

Canceling π from both sides:

$$36h = 180$$

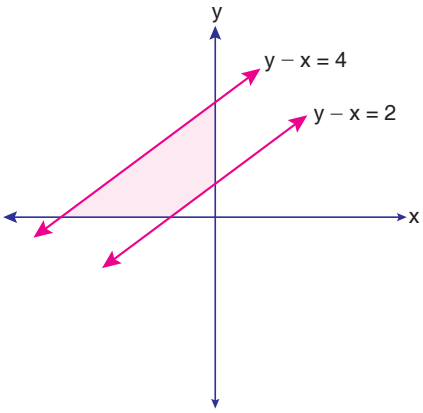
Now, divide both sides by 36:

$$h = \frac{180}{36} = 5 \text{ cm}$$

The height of the second cylinder is 5 cm, so the correct answer is B.

SOLUTION IS B

Q7:



In the coordinate system above, the graphs of the lines $y - x = 2$ and $y - x = 4$

Based on this information, what is the area of the shaded region? (7 points)

A) 2 B) 4 C) 6 D) 8

CONCLUSIONS

Q7: We are given two lines:

- $y - x = 2$, or equivalently $y = x + 2$
- $y - x = 4$, or equivalently $y = x + 4$

The lines are parallel and the region between them forms a parallelogram-like shape, but we will approach it by considering two right triangles instead.

X–axis intercepts:

Set $y = 0$ to find the x–intercepts.

- For $y = x + 2$:

  $0 = x + 2 \Rightarrow x = -2$

  So, the x-intercept is $(-2,0)$.

- For $y = x + 4$:

  $0 = x + 4 \Rightarrow x = -4$

  So, the x-intercept is $(-4, 0)$.

Y–axis intercepts:

Set $x = 0$ to find the y–intercepts.

- For $y = x + 2$, when $x = 0$: $y = 2$.

  So, the y–intercept is $(0,2)$.

- For $y = x + 4$, when $x = 0$: $y = 4$.

  So, the y–intercept is $(0, 4)$.

For the line $y = x + 2$:

- The x–intercept is $(-2, 0)$
- The y–intercept is $(0, 2)$

For the line $y = x + 4$:

- The x–intercept is $(-4, 0)$
- The y–intercept is $(0, 4)$

By focusing on the two triangles formed between the lines and the axes, we get:

Triangle 1:

This is the triangle formed by the points $(-2,0)$, $(0,2)$, and the origin $(0,0)$.

- The base of the triangle (along the x–axis) is 2 units (from x = –2 to x = 0).
- The height of the triangle (along the y–axis) is 2 units (from y = 0 to y = 2).

The area of Triangle 1 is:

$$\text{Area} = \frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 2 \times 2 = 2 \text{ square units}$$

Triangle 2:

This is the triangle formed by the points (–4, 0), (0, 4), and the origin (0, 0).

- The base of the triangle (along the x-axis) is 4 units (from x = –4 to x = 0).
- The height of the triangle (along the y-axis) is 4 units (from y = 0 to y = 4).

The area of Triangle 2 is:

$$\text{Area} = \frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 4 \times 4 = 8 \text{ square units}$$

The shaded region is the difference between the area of Triangle 2 and Triangle 1. So, the total shaded area is:

Shaded Area = 8 – 2 = 6 square units.

The area of the shaded region is 6 square units, so the correct answer is C.

SOLUTION IS C