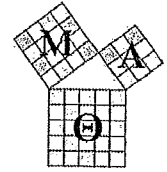


Name: Key

School: \_\_\_\_\_

Grade: \_\_\_\_\_

April 15, 2023 (Saturday)

<b>Round 2: Multiple Choice Test</b>
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## Rules:

1. You will have 60 minutes to complete the exam.
2. The exam consists of 30 problems each with five choices.
3. Each correct answer is worth 6 points and **there is NO penalty for guessing** so you should answer every problem!
4. No calculators, phones, smartwatches, or any other aids are allowed during the test.
5. If you finish before time is called, review your answers. When time is called, stop and put your pencil down. You may not answer any more questions after this point.
6. If you need a pencil or scratch paper during the test, raise your hand.
7. Figures are not necessarily drawn to scale.

Multiple Choice Test:

1. Jack ate  $\frac{5}{8}$  of a pizza, and Jordan ate  $\frac{1}{4}$  of the same pizza. What fraction of the pizza did Jack and Jordan eat?

A.  $\frac{1}{2}$

B.  $\frac{3}{4}$

C.  $\frac{7}{8}$

D. the whole pizza

C

$$\frac{5}{8} + \frac{2}{8} = \frac{7}{8}$$

2. Evaluate the following expression, writing your answer as an improper fraction:

$$2 + 6/72 * 2/24$$

A: 25/12

B: 25/144

C: 289/144

D: 1/12

C

$$2 + \frac{6}{72} \cdot \frac{2}{24} \rightarrow 2 + \frac{1}{144} = \frac{288}{144} + \frac{1}{144} = \frac{289}{144}$$

3. Jim has paid 50 cents for 3 pens and 2 pencils. He also paid 31 cents for 2 pens and one pencil. Assuming both products have kept the same price, how much is a pencil worth?

A: 12 cents

B: 7 cents

C: 4 cents

D: 9 cents

B

$$\begin{array}{l} x = \text{price per pen} \\ y = \text{price per pencil} \end{array} \left| \begin{array}{l} 3x + 2y = 50 \\ 2x + 1y = 31 \end{array} \right. \begin{array}{l} 3x + 2y = 50 \\ -2(2x + 1y = 31) \end{array} \left| \begin{array}{l} 3x + 2y = 50 \\ -4x - 2y = -62 \end{array} \right. \begin{array}{l} x = 12 \\ 2(12) + y = 31 \\ \boxed{y = 7} \end{array}$$

4. How many different combinations of dimes, nickels, pennies, and quarters can total to 15 cents?

A: 6

B: 7

C: 4

D: 9

A

- i) 3n
- ii) 2n and 5p
- iii) 1n and 1d
- iv) 1n and 10p
- v) 15p
- vi) 5p and 1d

5. My older brother is 8 years older than I am, and the sum of our ages is 20. How old is my brother?

A: 8

B: 10

C: 12

D: 14

D

$$\begin{array}{l} x = \text{my age} \\ y = \text{brother's age} \end{array} \left| \begin{array}{l} y = 8 + x \\ x + y = 20 \end{array} \right. \begin{array}{l} -x + y = 8 \\ x + y = 20 \end{array} \left| \begin{array}{l} 2y = 28 \\ \boxed{y = 14} \end{array} \right.$$

6. A square has a perimeter of 40 cm. What is the area of a square with double the perimeter?

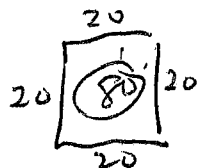
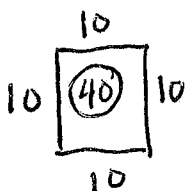
A: 1600

B: 80

C: 100

D: 400

D



$$\text{Area} = 20 \times 20 = 400 \text{ cm}$$

7. A cube has sides that measure 6 cm each. What is the surface area of the cube?

A: 36

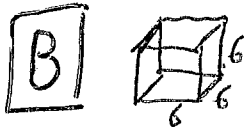
**B: 216**

C: 18

D: 144

Each side has area of  $36\text{ cm}^2$

Total of 6 sides:  $36 \times 6 = 216\text{ cm}^2$



8. Bob slices  $\frac{3}{8}$  of a cake and gives the slice to his sister. Then his sister eats exactly  $\frac{8}{17}$  of the slice. How much of the total cake did Bob's sister eat?

A:  $\frac{51}{64}$

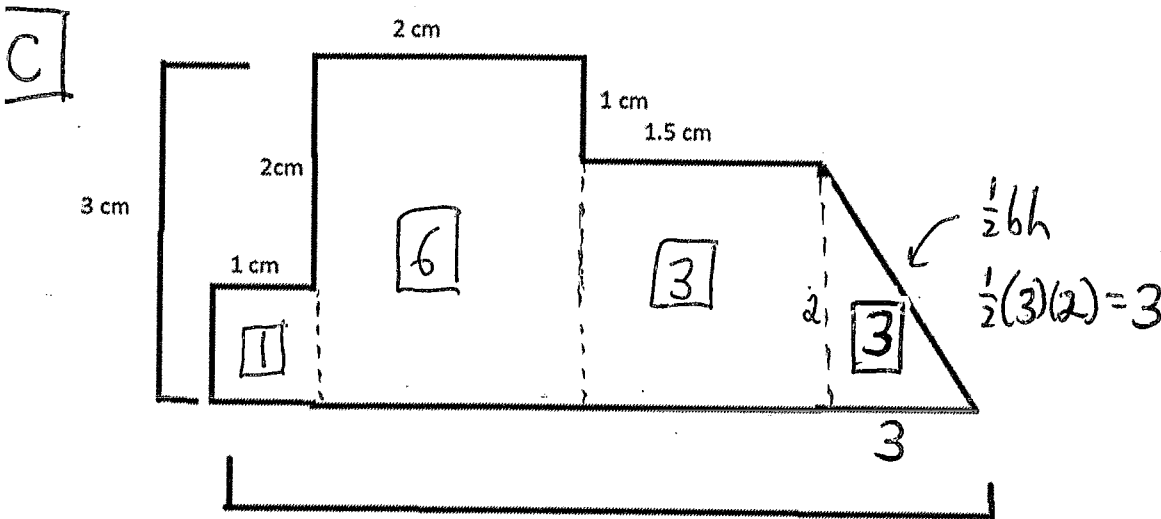
B:  $\frac{5}{17}$

**C:  $\frac{3}{17}$**

D:  $\frac{13}{64}$

**C**  $\frac{3}{8} \cdot \frac{8}{17} = \frac{3}{17}$

9. Find the area of the following figure (the drawing is not to scale):



A: 11.5 cm

B: 10 cm

**C: 13 cm**

D: 11 cm

10. Jack is playing a game where he repeatedly rolls a pair of fair, six-sided dice. He wins the game if he rolls doubles. What is the chance that he rolls doubles in the first three rolls of the dice?

A:  $\frac{1}{36}$

**B:  $\frac{91}{216}$**

C:  $\frac{1}{6}$

D:  $\frac{25}{216}$

**B**  $\frac{1}{6} + \frac{5}{36} + \frac{25}{216} = \frac{91}{216}$

11. Evaluate the following expression, writing your answer in the simplest form:

$$5/13 + (7/3 - (6/7 - 8/7)) =$$

A. 410/137

B. 766/432

C. 820/273

D. 978/300

C

$$\frac{7}{3} + \frac{2}{7} \rightarrow \frac{49}{21} + \frac{6}{21} = \frac{55}{21}$$

$$\frac{5}{13} + \frac{55}{21} \rightarrow \frac{105}{273} + \frac{715}{273} \rightarrow \frac{820}{273}$$

12. Ananya is at a pizza shop that sells circular pizzas. She can either buy 4 small pizzas, 2 medium pizzas, or 1 large pizza. A small pizza is 5 cm in diameter, a medium pizza is 7 cm in diameter, and a large pizza is 11 cm in diameter. Ananya wants to buy the most pizza possible to share with her friends. If she can only choose one of these three options, what is the maximum area of pizza she can buy? Note: The formula for an area of a circle is  $\pi r^2$ , with  $r$  being the radius of the circle. The radius is equal to  $\frac{1}{2}$  the diameter.

A: 30.25 cm<sup>2</sup>

B: 25 cm<sup>2</sup>

C: 24.5 cm<sup>2</sup>

D: 35.25 cm<sup>2</sup>

13. Find the next number in the sequence:

-4, 5, 14, 23, 32, ...

41

A

A. 41

B. 39

C. 40

D. 29

14. Zechariah wants to buy a birthday present for his brother. He finds a set of legos that originally cost R dollars but finds out the price has been marked down by 20%. How much did the set of legos originally cost if Zechariah paid \$25 for the set?

B

A. 32.50

B. 31.25

C. 27.25

D. 25.20

Let  $x$  be the original price:

$$\frac{25}{x} = \frac{80}{100}$$

$$\frac{25}{x} = 0.8$$

$$0.8x = 25$$

$$x = \frac{25}{0.8}$$

$$x = 31.25$$

10. Jack is playing a game where he repeatedly rolls a pair of fair, six-sided dice. He wins the game if he rolls doubles. What is the chance that he rolls doubles in the first three rolls of the dice?

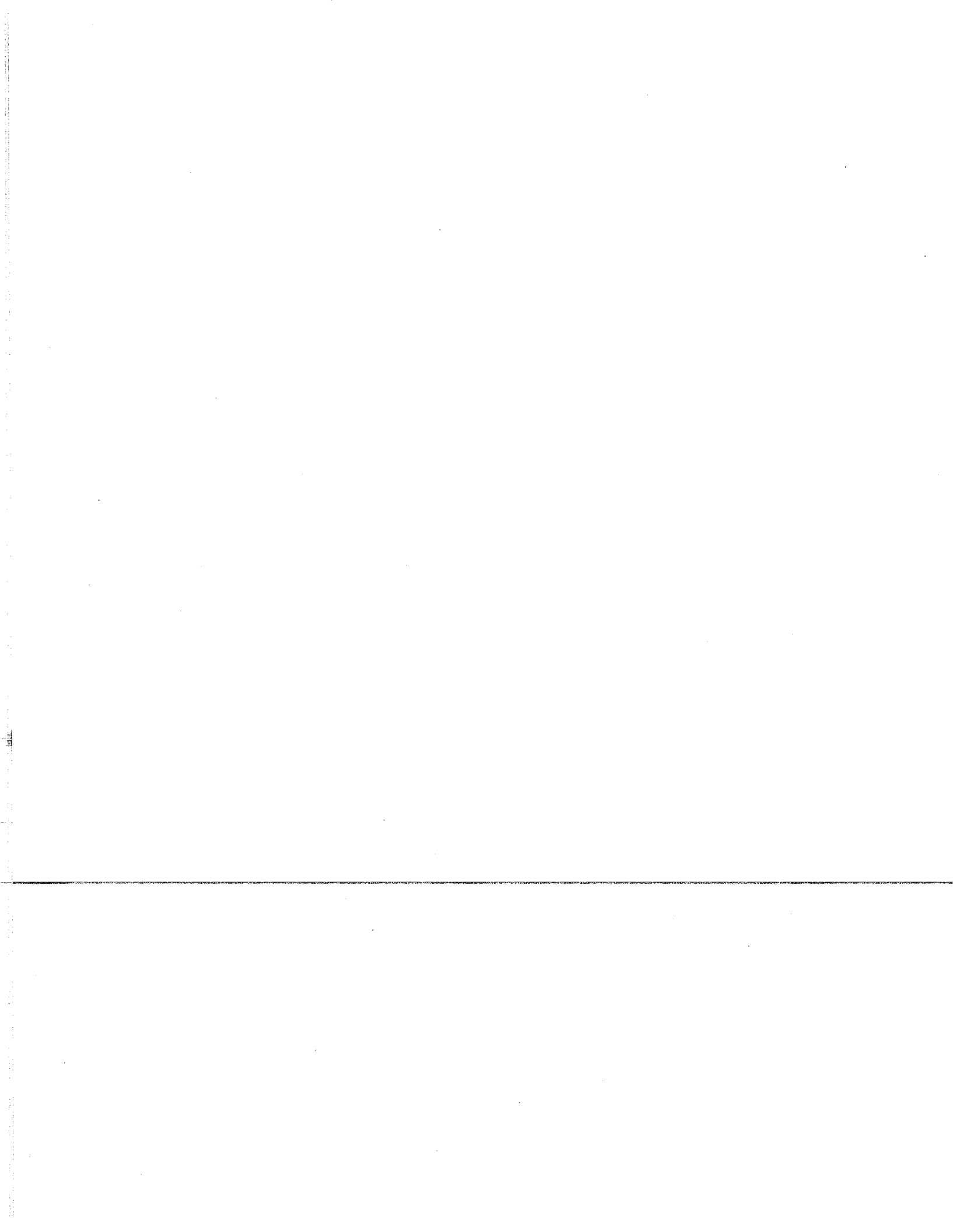
- A:  $\frac{5}{36}$       B:  $\frac{91}{216}$       C:  $\frac{1}{6}$       D:  $\frac{25}{216}$       E:  $\frac{1}{36}$

Explanation: There are  $6^2 = 36$  possible rolls. Of these possibilities, the doubles combinations are (1, 1), (2, 2), (3, 3), (4, 4), (5, 5), and (6, 6), so the probability of rolling doubles is  $\frac{6}{36} = \frac{1}{6}$ . The chance that Jack wins within three rolls of the dice is the sum of the chance that he wins on the first turn  $\frac{1}{6}$ , the chance that he wins on the second turn  $\left(\frac{5}{6}\right)\left(\frac{1}{6}\right) = \frac{5}{36}$ , and the chance that he wins on the third turn  $\left(\frac{5}{6}\right)^2\left(\frac{1}{6}\right) = \frac{25}{216}$ . So, the chance that Jack wins within three rolls of the dice is  $\frac{1}{6} + \frac{5}{36} + \frac{25}{216} = \frac{91}{216}$ .

12. Ananya is at a pizza shop that sells circular pizzas. She can either buy 4 small pizzas, 2 medium pizzas, or 1 large pizza. A small pizza is 5 cm in diameter, a medium pizza is 7 cm in diameter, and a large pizza is 11 cm in diameter. Ananya wants to buy the most pizza possible to share with her friends. If she can only choose one of these three options, what is the maximum area of pizza she can buy? Note: The formula for an area of a circle is  $\pi r^2$ , with  $r$  being the radius of the circle. The radius is equal to  $\frac{1}{2}$  the diameter.

- A:  $30.25\pi \text{ cm}^2$       B:  $25\pi \text{ cm}^2$       C:  $24.5\pi \text{ cm}^2$       D:  $35.25\pi \text{ cm}^2$

Explanation: The area of a circle is  $\pi r^2$ . If Ananya buys 4 small pizzas, which each have radius  $r = \frac{5}{2} = 2.5$  cm, the area of pizza she buys is  $4\pi(2.5)^2 = 25\pi \text{ cm}^2$ . If Ananya buys 2 medium pizzas, which each have radius  $r = \frac{7}{2} = 3.5$  cm, the area of pizza she buys is  $2\pi(3.5)^2 = 24.5\pi \text{ cm}^2$ . If Ananya buys 1 large pizza, which each have radius  $r = \frac{11}{2} = 5.5$  cm, the area of pizza she buys is  $\pi(5.5)^2 = 30.25\pi \text{ cm}^2$ . Thus, the maximum area of pizza Ananya can buy is  $30.25\pi \text{ cm}^2$ .



15. Shreya moves two miles north from (0,0) to (0,2) in 2 minutes. What is Shreya's speed in miles per hour? (There are 60 minutes in an hour)

- A. 1                      B. 6                      C. 100

D. 60

$$\frac{2 \text{ miles}}{2 \text{ mins}} \cdot \frac{60 \text{ mins}}{1 \text{ hr}} \rightarrow 60 \text{ miles/hr}$$

16) Compute the following:

$$\frac{11}{4} \cdot \frac{2}{5} \cdot \frac{3}{6} \cdot \frac{4}{7} \cdot \frac{5}{8} \cdot \frac{6}{9} \cdot \frac{7}{10} \cdot \frac{8}{11} = ?$$

A. 2/15

B. 1/99

C. 11/2

D. 1/15

$$\frac{6}{9} \cdot \frac{1}{10} = \frac{2}{3} \cdot \frac{1}{10} = \frac{2}{30} = \frac{1}{15}$$

17. What is 42% of 10?

A. 5.1

B. 5.0

C. 5.3

D. 4.2

$$0.42 \times 10 \rightarrow 4.2$$

18. What is the greatest prime number between 1 through 10?

A. 13

B. 5

C. 15

D. 7

19. Lauren can grade  $\frac{5}{8}$  of a calculus test in 25 minutes. How many calculus tests can she grade in 1 hour?

A: 5

B: 8

C: 2.5

D: 1.5

$$\frac{5/8 \text{ test}}{25 \text{ mins}} \cdot \frac{60 \text{ mins}}{1 \text{ hr}} \rightarrow \frac{5}{8} \cdot \frac{60}{25} \rightarrow 1.5 \text{ test/hr}$$


**A** 20. In a jar of yellow, orange, and black marbles, all but 4 are yellow marbles, all but 12 are orange, and all but 6 are black. How many marbles are in the jar?

- A. 11                      B. 22                      C. 33                      D. not enough information

$$\begin{array}{l|l}
 y = \# \text{ of yellow marbles} & o + b = 4 \\
 o = \# \text{ of orange marbles} & y + b = 12 \\
 b = \# \text{ of black marbles} & y + o = 6
 \end{array}
 \quad \left| \quad \begin{array}{l}
 * \text{ Add all 3 equations together} \\
 2y + 2b + 2o = 22 \\
 * \text{ divide equation by 2} \\
 y + b + o = 11
 \end{array}$$

21. A can is halfway filled with water. If the height of the can is 4 cm and the can's cap has an area of  $16\pi$ , how much water is in the cylinder.

- D** A. 64 Pi                      B. 16 Pi                      C. 24 pi                      **D. 32 pi**



$$\begin{array}{l|l}
 \pi r^2 = 16\pi & \text{Volume of can is } \pi r^2 h \rightarrow \pi(4)^2(4) = 64\pi \\
 r^2 = 16 & \\
 r = 4 & \text{Half the volume is } \boxed{32\pi}
 \end{array}$$

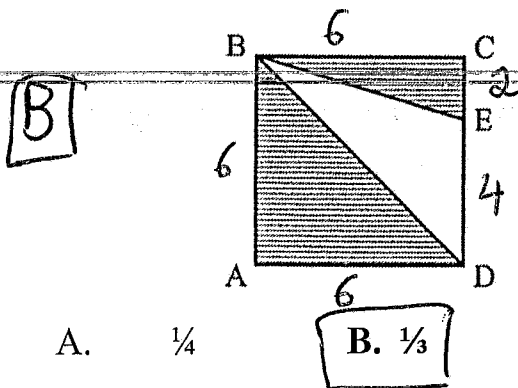
22. If  $a @ b = a/b + b/a$  then what is the value of  $(3@4)@5$ ?

- A** A. 169/60                      B. 3/20                      C. 12/5                      D. 1

**A**  $3 @ 4 \rightarrow \frac{3}{4} + \frac{4}{3} \rightarrow \frac{9}{12} + \frac{16}{12} = \frac{25}{12}$

$\frac{25}{12} @ 5 \rightarrow \frac{25}{12} \div 5 + \frac{5}{25} \rightarrow \frac{25}{60} + \frac{60}{25} \rightarrow \frac{25}{60} + \frac{144}{60} = \frac{169}{60}$

23. Square ABCD has an area of  $36\text{m}^2$ .  $DE = 2EC$ . What is the ratio of the area of  $\triangle BED$  to the area of square ABCD? Express your answer as a common fraction.



Area  $\triangle BED = \frac{1}{2}bh \rightarrow \frac{1}{2}(4)(6) \rightarrow 12$

Area of square = 36

Ratio  $\rightarrow \frac{12}{36} \rightarrow \frac{1}{3}$

- A.  $\frac{1}{4}$                       **B.  $\frac{1}{3}$**                       C.  $\frac{1}{2}$                       D.  $\frac{2}{3}$



24. How many ways are there to arrange the letters in the word SAVVY?

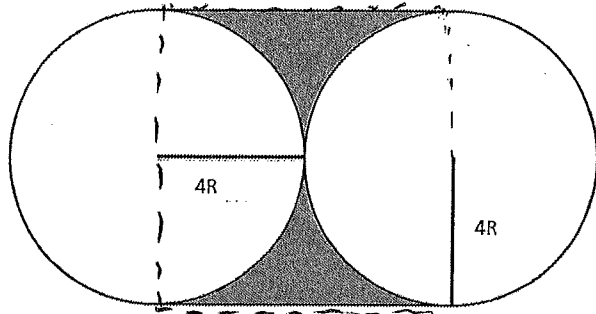
- A. 10      B. 60      C. 120      D. 240

B

$$\frac{5!}{2!} \rightarrow 60$$

25. If the radii of the two circles below are each  $4R$ , then what is the area of half the shaded region?

B



$$\text{Shaded Region} = \text{Area}(\text{square}) - \text{Area}(\text{circle})$$

$$\rightarrow (8R)(8R) - \pi(4R)^2$$

$$\rightarrow 64R^2 - 16\pi R^2$$

$$\text{half of Shaded Region} \rightarrow \frac{1}{2}(64R^2 - 16\pi R^2) \rightarrow 32R^2 - 8\pi R^2$$

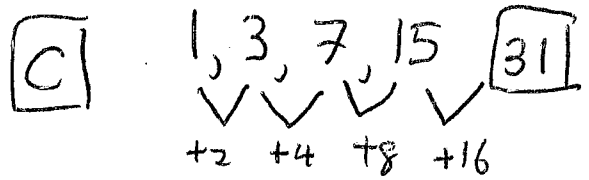
- A.  $\pi(4R)^2$       B.  $8R^2(4 - \pi)$       C.  $16R^2(4 - \pi)$       D.  $\pi(4R)^2 - \frac{1}{2}(4R)$

$$\downarrow$$

$$8R^2(4 - \pi)$$

26. Consider the following sequence: 1, 3, 7, 15... What is the next item in the sequence?

- A. 17      B. 30      C. 31      D. 225



27. What is  $(-4a^4)^3$  equivalent to?

D

- A.  $12a^{12}$       B.  $64a^7$       C.  $-4a^{12}$       D.  $-64a^{12}$

$$(-4)^3 \cdot (a^4)^3 \rightarrow -64a^{12}$$

28. Bartholomew is baking perfectly spherical cupcakes. She wants to find the surface area of the sphere for fun. If the formula is  $4\pi r^2$ , and 9 times the diameter of the sphere is 36, find the surface area of the cupcake.

A.  $25\pi$

**B.  $16\pi$**

C.  $36\pi$

D.  $144\pi$

**B**  $\frac{36}{9} = 4 \rightarrow 4$  is the diameter

Radius is 2

$$S = 4\pi r^2$$

$$S = 4\pi(2)^2$$

$$S = 16\pi$$

29. How many square units bigger is  $5 \times 5$  square than a  $4 \times 4$  square?

**A. 9**

B. 14

C. 8

D. 6

**A**  $5 \times 5$  square  $\rightarrow 25$  units<sup>2</sup>  
 $4 \times 4$  square  $\rightarrow 16$  units<sup>2</sup>

$$25 - 16 = 9 \text{ units}^2$$

30. One angle in a triangle measures 41 degrees. The second angle is 3 degrees less than double the first angle. What is the measure of the third angle?

**A. 60 degrees**

B. 79 degrees

C. 120 degrees

D. 240 degrees

**A**  $\angle a = 41^\circ$

$$\angle b = 2(a) - 3 \rightarrow 2(41) - 3 = 79$$

$$\angle c = \_?$$

$$a + b + c = 180$$

$$41 + 79 + c = 180$$

$$120 + c = 180$$

$$c = 180 - 120$$

$$c = 60^\circ$$