

MATHEMATICS TIPS (NOVEMBER 2020)

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1. If $m \otimes n = m(n + 17)$, then find the value of $(5 \otimes (2 \otimes 3))$.

(A) 225 (B) 285 (C) 195 (D) 255 (E) 315

$$\begin{aligned} 2 \otimes 3 &= 2(3 + 17) = 2(20) = 40 \\ 5 \otimes (2 \otimes 3) &= 5 \otimes 40 = 5(40 + 17) = 5(57) = 285 \end{aligned}$$

2. Mark has a bag of 42 marbles that are either yellow or green. There are twice as many yellow marbles as one-third the number of green marbles. How many yellow marbles are in Mark's bag?

(A) 24 (B) 18 (C) 36 (D) 32 (E) 6

Let Y = number of yellow marbles, then $42 - Y$ = number of green marbles in the bag.

$$2Y = \frac{1}{3}(42 - Y)$$

$$6Y = 42 - Y ; 7Y = 42 ; Y = 6$$

3. Mark, Lucy, Michelle, Steve, Ahmed and Cai are on a team for a three-on-three basketball tournament. If only three of the friends can play at a time, in how many ways can a team of three be formed from the friends?

(A) 8 (B) 9 (C) 60 (D) 12 (E) 20

$${}^6C_3 = \frac{6!}{3!3!} = \frac{(6)(5)(4)}{(3)(2)(1)} = 20$$

4. A triangle has its vertices at (5, 8), (5, - 2), and (29, - 2). If the triangle is dilated by a scale factor of $\frac{1}{2}$, then what is the new perimeter of the triangle.

(A) 34 units (B) 37 units (C) 36 units (D) 30 units (E) 32 units

Use the distance formula to find the length of the sides of the original triangle. $D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$$\sqrt{(5 - 5)^2 + (8 - (-2))^2} = \sqrt{10^2} = 10$$

$$\sqrt{(29 - 5)^2 + (-2 - (-2))^2} = \sqrt{24^2} = 24$$

$\sqrt{(29 - 5)^2 + (-2 - 8)^2} = \sqrt{676} = 26$; Note: If you you're your Pythagorean Triplets (5, 12, 13 ; 5, 24, 26, ...) you could have found the length of the third side easily.

Perimeter of the original triangle is $10 + 24 + 26 = 60$.

After the $\frac{1}{2}$ dilation the new perimeter will be 30 units

5. What is the area of the quadrilateral with vertices located at (7, 1), (- 1, 4), (- 5, - 2), and (2, - 5)?

(A) 56.25 units² (B) 56.5 units² (C) 58.5 units² (D) 108.25 units²
(E) 117 units²

Given (x_1, y_1) , (x_2, y_2) , (x_3, y_3) and (x_4, y_4) , the area is

$$\frac{1}{2}[x_1y_2 + x_2y_3 + x_3y_4 + x_4y_1 - x_2y_1 - x_3y_2 - x_4y_3 - x_1y_4]$$

(7, 1), (- 1, 4), (- 5, - 2), (2, - 5)

$$\frac{1}{2}[(7)(4) + (- 1)(- 2) + (- 5, - 5) + (2, 1) - (- 1)(1) - (- 5)(4) - (2)(- 2) - (7)(- 5)]$$

$$\frac{1}{2}[28 + 2 + 25 + 2 + 1 + 20 + 4 + 35]$$

$$\frac{1}{2}[117] = 58.5$$