

8TH GRADE OPEN RESPONSE
MATH-A-THON

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The **academic expectations** addressed by “Math-A-Thon” are:

- 1.5 Students use mathematical ideas and procedures to communicate, reason, and solve problems.
- 2.8 Students understand various mathematical procedures and use them appropriately and accurately.
- 2.11 Students understand mathematical change concepts and use them appropriately and accurately.

The **core content** addressed by this item includes:

- MA-M-4.1.1: Students will describe properties of, define, give examples of, and/or apply to both real-world and mathematical situations: Variables, equations, and algebraic expressions.
- MA-M-4.1.2: Students will describe properties of, define, give examples of, and/or apply to both real-world and mathematical situations: Functions through tables, graphs, verbal rules, and algebraic notation.
- MA-M-4.2.5: Students will perform the following mathematical operations and/or procedures accurately and efficiently, and explain how they work in real-world or mathematical situations: Represent and use functions through tables, graphs, verbal rules, and equations.
- MA-M-4.2.6: Students will perform the following mathematical operations and/or procedures accurately and efficiently, and explain how they work in real-world or mathematical situations: Write and solve equations that represent everyday situations.
- MA-M-4.3.1: Students will show connections and how connections are made between concepts and skills, explain why procedures work, and make generalizations about mathematics in meaningful ways for the following relationships: how everyday situations, patterns, verbal rules relate to each other.

STATEMENT OF PROBLEM

The student's at Williamstown High School's math classes are participating in the St. Jude's Math-A-Thon this year. The Math club decided to buy T-shirts to advertise the Math-A-Thon. Michelle got two different quotes for the cost of the shirts.

One Size Fits All charges \$4 per shirt.

You Draw It/We Print It charges \$75 plus \$3 per shirt.

- a. For each company, what would the total cost be for the T-shirts if the math club decides to order 115 shirts? Explain how you got your answer.
- b. Some of the students in the math club think that the club should pay for the T-shirts. The club has \$250 in its' treasury. How many shirts could the club buy, from each company, with this much money? Explain how you got your answer.
- c. For what number of T-shirts is the cost the same for both companies? Explain how you got your answer.
- d. Which company do you think the class should buy shirts from? What factors influenced your decision?

8th Grade Open-Response Question
MATH-A-THON

Complete the following problem. Demonstrate your knowledge by giving clear, concise solutions.

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- For what number of T-shirts is the cost the same for both companies?
Explain how you got your answer.
- Which company do you think the class should buy T-shirts from? What factors influenced your decision?

SCORING GUIDE

MATH-A-THON

Score	Description
4	Students scores 6 points.
3	Students scores 4 to $5\frac{1}{2}$ points.
2	Student scores 2 to $3\frac{1}{2}$ points.
1	Student scores $\frac{1}{2}$ to $1\frac{1}{2}$ points.
0	Response is totally incorrect or irrelevant.

Score Points:

Part a:	1 point	correct total cost of T-shirts from One Size Fits All with explanation
	1 point	correct total cost of T-shirts from You Draw It/We Print It with explanation
	0.5 point	correct total cost of T-shirts from One Size Fits All with no explanation
	0.5 point	correct total cost of T-shirts from You Draw It/We Print It with no explanation
Part b:	1 point	correct number of T-shirts bought with \$250 from One Size Fits All with explanation
	1 point	correct number of T-shirts bought with \$250 from You Draw It/We Print It with explanation
	0.5 point	correct number of T-shirts bought with \$250 from One Size Fits All with no explanation
	0.5 point	correct number of T-shirts bought with \$250 from You Draw It/We Print It with no explanation
Part c:	1 point	correct number of T-shirts when the cost is the same for both companies with explanation
	0.5 point	correct number of T-shirts when the cost is the same for both companies with no explanation
Part d:	1 point	appropriate response with reasoning/explanation
	0.5 point	appropriate response without reasoning/explanation Or incorrect response with reasoning/explanation

8th Grade Open-Response
Math-A-Thon
Distinguished Response Example – Equation

The company One Size Fits All charges \$4 per shirt. Therefore, my equation for this company will be $C = 4(t)$, where C is the cost in dollars and t is the number of T-shirts. The company You Draw It/We Print It charges \$75 plus \$3 per shirt. For this equation, I must first show the fixed amount of \$75. Then, there is the charge of \$3 per shirt. My equation will be $C = 75 + 3(t)$, where C is the cost in dollars and t is the number of shirts. Once the equations are written, questions can be answered by solving for the unknown variable.

a. To answer question a, I need to find the total cost for each company if 115 shirts are ordered. Therefore, I am solving for C or cost in my equation. I need to substitute 115 in my equation for the variable t .

One Size Fits All

$$\begin{aligned} C &= 4t \\ C &= 4(115) \\ C &= \$460 \end{aligned}$$

You Draw It/ We Print It

$$\begin{aligned} C &= 75 + 3t \\ C &= 75 + 3(115) \\ C &= 75 + 345 \\ C &= \$420 \end{aligned}$$

b. To answer question b, I am solving for the number of T-shirts ordered (t) if the cost (C) is \$250. Therefore, I am solving for the variable t and substituting \$250 in the equation for C .

One Size Fits All

$$\begin{aligned} C &= 4t \\ 250 &= 4t \\ \frac{250}{4} &= \frac{4t}{4} \\ 62.5 &= t \end{aligned}$$

You Draw It/We Print It

$$\begin{aligned} C &= 75 + 3t \\ 250 &= 75 + 3t \\ 250 - 75 &= 75 + 3t - 75 \\ 175 &= 3t \\ \frac{175}{3} &= \frac{3t}{3} \\ 58.\overline{3} &= t \end{aligned}$$

With these solutions for the variable t ; One Size Fits All $t = 62.5$ and You Draw It/We Print It $t = 58.\overline{3}$, the students must think about whether their answers are "reasonable" or not. Since we would not order $\frac{1}{2}$ of a T-shirt or $\frac{1}{3}$ of a shirt, the number of shirts ordered must be a whole number. The solutions would therefore be 62 T-shirts for One Size Fits All and 58 T-shirts from You Draw It/We Print It.

c. To answer question c, I need to find when the costs are equal for both companies. Therefore, I will make the two equations equal and solve for t . This will be when the cost is the same.

$$\begin{aligned} 4t &= 75 + 3t \\ 4t - 3t &= 75 + 3t - 3t \\ t &= 75 \end{aligned}$$

The cost will be equal when both companies buy 75 shirts. I need to put this number back into the original equations, and solve for the cost at this number of T-shirts. For One Size Fits All: $C = 4(75)$ and the cost will therefore be \$300. For You Draw It/We Print It: $C = 75 + 3(75)$ and the cost will therefore also be \$300.

d. To answer question d, I know from answering question c that the cost is the same for 75 T-shirts. If fewer than 75 T-shirts are ordered, from question b I know that One Size Fits all has the better offer. If more than 75 are ordered, I know from question a that You Draw It/We Print It has the better offer.