Write a SOLUTION and EXPLANATION of the following problem that will be informative AS WRITTEN to a 7th-grader.

Which is a better deal: A 10 inch diameter pizza for $8 or a 15 inch diameter pizza for $16?

(The task here is not so much to be a good problem-solver, as to be a good explainer—a good teacher.)

First let's find the areas of the pizzas. We know area of a circle = πr^2, where r is the radius. We have the diameter and we know that the radius is one half the diameter.

We can now find the areas:

Area for 10in. pizza = $\pi(5)^2 \cong 78.54$

Area for 15in. pizza = $\pi(7.5)^2 \cong 176.71$

Well lets compare the area with the prices.

We know that for $8 we can get an area of 78.54 of pizza Let's buy two 10in. pizzas, then we would get an area of $2(78.54) = 157.08$ that would cost us $16. However, for $16 we can get a 15 in. diameter pizza with the area of 176.71.

So the larger pizza is the better deal.

$2(78.54) < 176.71$

1

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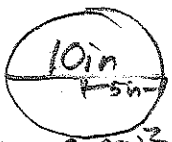
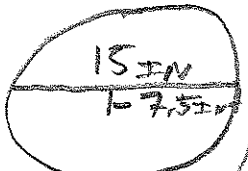
FIRST CONSIDER THE PRICES.

$8 VS. $16

THE LARGER IS TWICE THE AMOUNT OF THE SMALLER. IF THE AMOUNT OF PIZZA WE RECIEVE IS IN THE SAME RATIO, 1 TO 2, THEN IT WOULD NOT MATTER WHICH PIZZA WE CHOOSE, BUT IF ONE IS BETTER THAN THE OTHER WE WILL HAVE OUR ANSWER. CONSIDER THE SAUCE ONLY. HOW MUCH SAUCE NEEDS TO BE SPREAD ON EACH PIZZA? THIS IS AN AREA PROBLEM AND AREA OF A CIRCULAR PIZZA IS GIVEN BY PI TIMES THE RADIUS SQUARED, $A=\pi r^2$



$A=\pi(5)^2$
$A=25\pi in^2$
$A\approx 78.5 in^2$



$A=\pi(7.5)^2$
$A=56.25\pi in^2$
$A\approx 176.7 in^2$

SO WE SEE THE 15 IN PIZZA IS A BETTER CHOICE BECAUSE IT'S AREA IS MORE AND RATIO IS GREATER 2/1.

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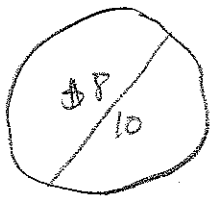
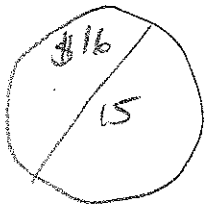


Pizza 1



Pizza 2

$A = \pi r^2$

$2r = D$

$\frac{2r = 10}{2}, \frac{2r = 15}{2}$

$r = 5 \quad r = 7.5$

$A_1 = \pi(5)^2$ $A_2 = \pi(7.5)^2$

$A_1 = 78.53$ $A_2 = 176.71$

$\frac{78.53}{\$8}$ $\frac{176.71}{15}$

Pizza 2

9.8 inches / Dollar

11.04 inches / Dollar

This would be the work on the board ↑

- First let's draw out our pizzas.
- Now to see what is a better deal we want to know which one will give us more pizza per dollar.
- To do this let's find the area of each pizza. $A = \pi r^2$ we are given the diameter which is twice the radius, so let's divide the diameter by 2 to get our radius.
- The radius of the first pizza is 5. The second 7.5
- Plug into our Area formula $A = \pi r^2$ $A_1 = 78.53$, $A_2 = 176.71$
- Now let's divide by our price so we can get how many inches of pizza for each dollar we are getting. The 15 inches pizza is more pizza for your money.

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Pizza 1

$A = \pi r^2$

$2r = 10$

$r = 5$

A of $P_1 = \pi 25$

$= 78.54$

Pizza 2

$2r = 15$

$r = \frac{15}{2}$

A of $P_2 = \pi(\frac{15}{2})^2$

$= 176.71$ for $16.00

78.54
+ 78.54
157.8 for $16.00

For $16 you could get 1 - 15in pizza w/ an area of 176.71 or 2 10in pizzas with an area of 78.54 EACH. If you add the area of the 2 - 10in pizza's you get a total area of 157.80 which is LESS then the one 15in pizza w/ and area of 176.71. Therefore you get MORE Pizza for $16.00 with the one 15in Pizza

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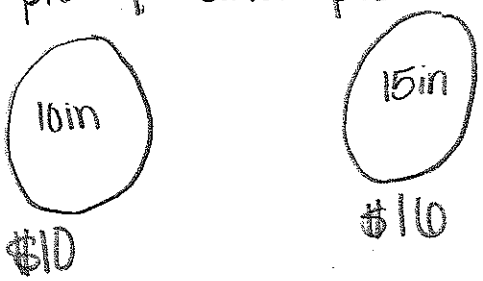
We have pie #1 and pie #2 shown below and for the given prices. Lets find the area of both pies.



Pie #1 has a radius of $\frac{10}{2}=5$in so Area $=\pi(5)^2$ (use 3.14 as π) So area $\approx 78.5 in^2$ for $10. Pie #2 has a radius of $\frac{15}{2}=7.5$in so area $=\pi(7.5)^2$ so area ≈ 176.625 for $16. The area of pie #2 is more than twice the area of pie #1 but not double the price. Therefore pie #2 is the better deal. We could check our idea by finding the price per square in. For pie #1 we would have $\frac{78.5}{\$10}$ so $1 for $7.85 in^2$, For pie #2 we would have $\frac{176.625}{\$16}$ so $1 for $11.039 in^2$ Therefore my $1 would buy more of pie #2 making it a better deal.

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Let's compare the pizza's on level ground.
The slices of pizza will not be the same size, so lets compare the areas,
The area of the 10in pizza is found using the $A = \pi r^2$ equation. Remember, diameter is 2× radius.

$A_{10} = (3.14)(5)^2 = 3.14 \times 25 = 78.5$ in sq.

and the 15in pizza would have an area of

$A_{15} = (3.14)(7.5)^2 = 176.63$ in sq.

Since each pizza contains square inches, we can compare the cost of each square inch in the pizzas.

For the 10" pizza we have $\frac{\text{COST}}{\text{area}} = \frac{\$8}{78.5 \text{ in sq}} \approx \$.10$ per square inch.

and the 15" pizza is $\frac{\$16}{176.63} = \$.09$ per square inch.

Because the cost of the 15" pizza is lower per square inch, the 15" pizza is a better deal.

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Compare the unit costs ("compare apple to apple"

i.e. Find the unit cost for each pizza

define ⇒ Unit cost (cost per square inch) = (total cost in $) / (Area in square inch)

10 inch pizza (recall that the area of a circle is πR^2 where R is the radius)

$$\text{Unit cost}_{I} = \frac{\$8}{\pi r^2} = \frac{8}{\pi(5)^2}$$

$$= \boxed{0.1018} \left(\$/\text{inch}^2\right)$$

15 inch pizza

$$\text{unit cost}_{II} = \frac{16}{\pi(7.5)^2}$$

$$= \boxed{0.0905} \ \$/\text{inch}^2$$

It is clear the 15 inch is a better deal because its unit cost is smaller.

7

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A BETTER DEAL WOULD BE TO GET MORE PIZZA PER DOLLAR. WE MEASURE THE AMOUNT OF SOMETHING IN AREA, SO WE KNOW THE AREA OF A CIRCLE = πr^2, WITH r = radius. RADIUS = $\frac{1}{2}$ DIAMETER, SO RADIUS OF THE $8 PIZZA = $10 \cdot \frac{1}{2} = 5$ in. RADIUS OF $16 PIZZA = $15 \cdot \frac{1}{2} = 7.5$ in.

Area of $8 pizza = $\pi \cdot 5^2 = 25\pi \approx 78.5398 in.^2$

Area of $16 pizza = $\pi \cdot 7.5^2 = 56.25\pi \approx 176.7146 in.^2$

We want the most in^2 per dollar so set up the ratios of AREA to $.

$$\frac{78.5398 in^2}{\$8} \approx 9.82 \frac{in^2}{\$}$$

$$\frac{176.7146 in^2}{\$16} \approx 11.04 \frac{in^2}{\$}$$

So with the $16 pizza, you get over an inch more pizza per dollar than the $8 pizza, so the $16 pizza is the better deal.

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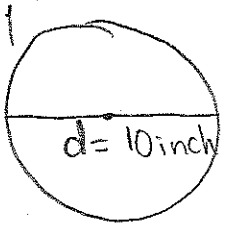
Let's define better deal as more pizza for less money. We have:

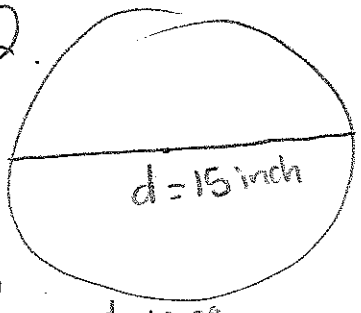
Pizza 1



$8.00

Area of a circle
$A = \pi r^2$
Where $r = d/2$
radius = diameter/2

Pizza 2.



$16.00

Area of pizza 1 $= \pi(5)^2$

$= 25\pi$

Area of pizza 2 $= \pi(7.5)^2$

$= 56.25\pi$

Now pizza 1 costs $8.00 and pizza 2 costs 16.00

So we have

$9.817 = \frac{25\pi \text{ of pizza 1}}{\$8.00}$ and $11.045 = \frac{56.25\pi \text{ pizza 2}}{\$16.00}$

So with 1 dollar we get 9.817 of pizza 1 and 11.045 of pizza 2. Therefore we get more of pizza 2 for the same amount of money.

Better deal 15inch diameter pizza for $16.

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THE GOAL IS TO COMPARE, + EVALUATE, W/C DEAL PRODUCES MORE PIZZA PER DOLLAR, i.e., ~ $\frac{\text{pizza}}{\$}$

PIZZA 1	PIZZA 2
$\frac{\text{pizza}}{\$} = \frac{\text{CIRCLE}_{\text{AREA}}}{\$}$ (Be reminded $r = \frac{d}{2}$)	
$= \frac{\pi 5^2}{8}$	$= \frac{\pi 7.5^2}{16}$
$= 9.81 \text{ in}^2/\text{dollar}$	$= 11.04 \text{ in}^2/\text{dollar}$

Referring to the table, clearly Pizza 2 (deal 2) is the better deal since more pizza ($11.04 \text{ in}^2 > 9.81 \text{ in}^2$) is served per dollar.

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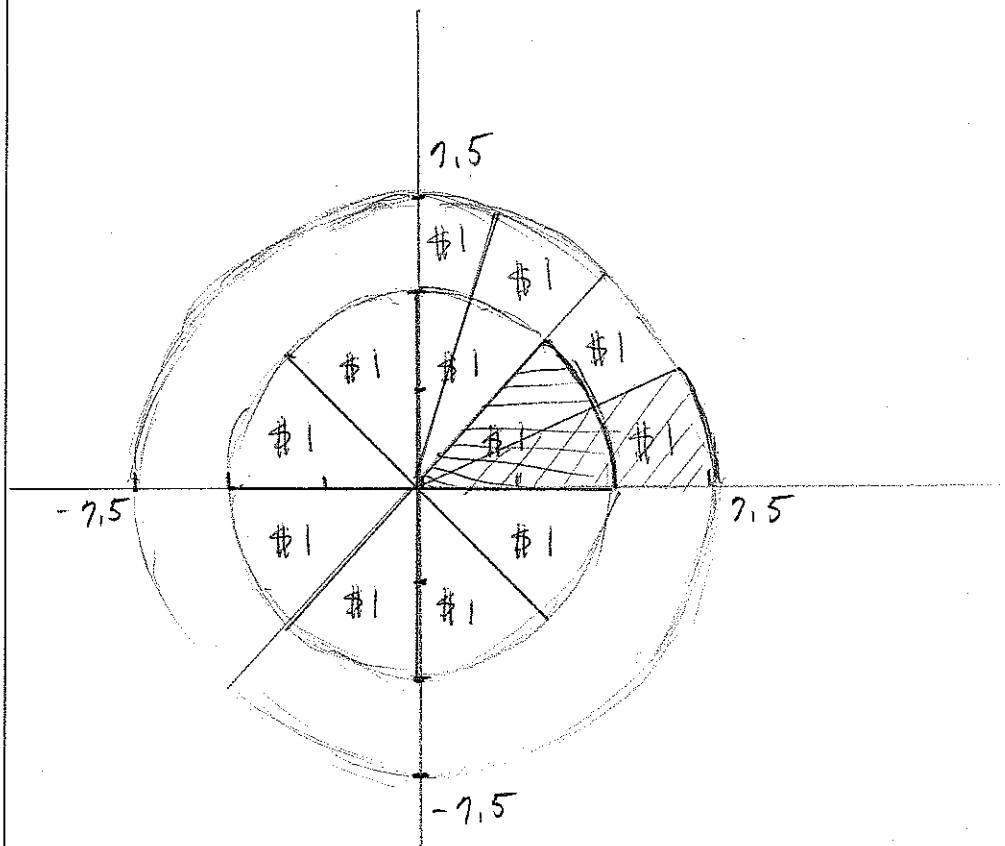

Area of Smaller Pizza:
$A = 25\pi \approx 78.5 (in)^2$
about $9.8 (in)^2$/dollar

Area of Bigger Pizza:
$A = (7.5)^2\pi \approx 176.7 (in)^2$
about $11.0 (in)^2$/dollar

Conclusion: A 15 in diameter pizza for $16 is a better deal b/c you will get about $11.0 (in)^2$ for a dollar compare to about $9.8 (in)^2$ for a dollar with a 10 in diameter pizza.

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(1) Find the area of each pizza.

10 in pizza

$\pi \approx 3.14$

$r = 5$ in

$A = (3.14)(25)$

$= 78.5$ in^2

15 in pizza

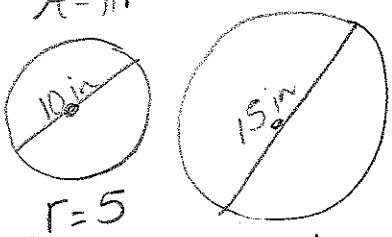
$\pi \approx 3.14$

$r = 7.5$

$A = (3.14)(7.5$ in$)$

$= 176.63$ in^2

$A = \pi r^2$



$r = 5$

$d = 10$

$r = 7.5$

$d = 15$

(2) Total square inches for each dollar spent

10 in: 78.5 in$^2 \div 8$

$= 9.8125$ sq in

15 in: 176.63 in$^2 \div 16$

$= 11.0394$ sq in

(1) First determine the Area of each pizza. Remember the area of a circle can be found using the formula $A = \pi r^2$. π is approximately 3.14 and the radius is half of the diameter. Area is also measured in square units.

(2) Determine the total square inches for each dollar spent.

The 15 in pizza gives more square inches per dollar spent.

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In order to determine which pizza is a better deal, we must find out how much we are being charged for each part of the pizza. This amount is called a unit cost. (how much am I being charged per unit). In this example, we must calculate the area of each pizza since we will be eating the whole pizza.

STEP 1: Area of Smaller Pizza: $A = \pi r^2$ $(\pi = 3.14)$

$d = 10$ in

$r = \frac{1}{2}(10) = 5$ in

$A = \pi r^2$

$= (3.14)(5^2)$

$= 3.14(25)$

$A = 78.5 \text{ in}^2$

For $8, we are receiving 78.5 square inches of pizza.

STEP 2: Unit Price/Cost

$$\text{Unit Cost} = \frac{\text{how much I pay}}{\text{how much I receive}} = \frac{\$8}{78.5 \text{ in}^2} \approx \$0.10/\text{in}^2$$

We are paying $0.10 per square inch of pizza we receive.

(Back) →

d=15 $r = 7.5\text{in}$ $= 3.14(7.5^2)$

$= 3.14(56.25)$

$= 176.625\text{in}^2$

For $16, we are receiving 176.625 square inches of pizza.

Step 4: Unit Price/Cost

$$UP = \frac{\text{how much I pay}}{\text{how much I receive}} = \frac{\$16}{176.625\text{in}^2} \approx \$0.09/\text{in}^2$$

We are payin $0.09 per square inch of pizza.

Step 5: Compare Unit Prices

10-inch Pizza = $0.10/square inch

15-inch Pizza = $0.09/square inch

Which is cheaper? The 15-inch pizza cost less per square inch, so we consider it as the better deal.

13(b)

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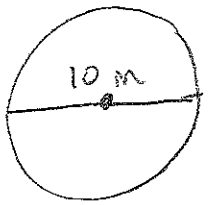
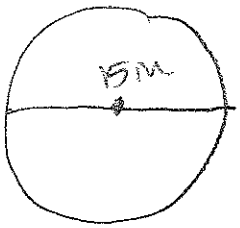
I would use the concept of unit rates to explain to a 7th grader how to solve the problem. We would review that a unit rate is the price per one of an object, in this case it's the price per square inch of pizza. Students would ① draw pictures that represent the two pizzas ② calculate the total square inches of each pizza ③ find the unit rate of each pizza ④ compare the unit rates and determine which one is the best expensive, meaning the best deal.

① 



→ Drawings

② $A = \pi r^2$
$A = 3.14(5)^2$
$A = 78.5\ in^2$

$A = \pi r^2$
$A = 3.14(7.5)^2$
$A = 176.625\ in^2$

→ Calculate Area

③ $\frac{\$8}{78.5\ in^2} = \$0.10/in^2$ $\frac{\$16}{176.625\ in^2} = \$0.09/in^2$ → find unit rates

④ compare the unit rates. The unit rate of the 15" pizza is less than that of the 10" pizza, thus the 15" pizza is a better deal. → Compare

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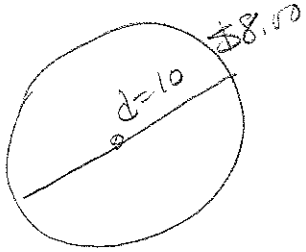
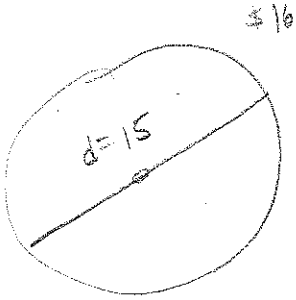


$A = \pi r^2$
$A = \pi \cdot 5^2$
$A = 25\pi$
$A = 78.54$
$\div 8 = 9.818$ per dollar



$A = \pi r^2$
$A = \pi \cdot (7.5)^2$
$A = 56.25\pi$
$A = 176.715$
$\div 16 = 11.045$ per Dollar

You will have a better deal if you purchase the 15 inch diameter pizza for $16.00.

1. Find the area of both pizzas.
2. Find the unit rate of both pizzas. How much square units of pizza could you receive for a $1.00.

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Explore - What is a better deal: A 10 inch diameter pizza for $8 or 15 inch diameter pizza for 16?
What do we need to know? ... the better deal.
What are we comparing?
- the size of the pizzas verses the amts of money you pay for each one.

What do we need to find?
- the area of each pizza
- already have the prices.

How much larger does the Area of the 15 inch pizza need to be for it to be a better deal?
— more than Double because the price is double.

Plan - find the Area of each pizza.
compare each area.
- if the area of the larger is more than 2 times the area of the smaller then it is the better deal, if not is not then the smaller is the better deal. or if they are exactly double then their is no better deal.

Solve - $A(10) = \pi r^2$
$= \pi 5^2$
$= 3.14(25)$
$= 78.54 in^2$

$A(15) = \pi r^2$
$A(15) = \pi (7.5)^2$
$A(15) = \pi 56.25$
$= 176.71 in^2$

since $2(78.54) = 157.08 < 176.71$ the larger pizza is the better deal

examine - check Area $\pi 5^2 = 78.54$
$\pi 7.5^2 = 176.7$
all me this right & answer is correct 16

Check the double of the smaller
$2(78.54) = 157.08 \leq$
$157.08 < 176.71$

Discuss - (What did we just do? / Why did we multiply the bases Abs?)
Give a similar problem after discussion.

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$A = \pi r^2$
$= \pi 5^2$
$= 25\pi$
$= 78.5 in^2$
} Area of pizza in 10 in. pizza

$A = \pi r^2$
$= \pi (7.5)^2$
$= 56.25\pi$
$= 176.7 in^2$
} Area of 15 in. pizza

$\frac{\$8}{78.5 in^2} = \frac{\$0.10}{1 in^2}$ } cost per sq. in.

$\frac{\$16}{176.7 in^2} = \frac{\$0.09}{1 in^2}$

① Take each pizza - find the area of each.

② The area of the 10" pizza is 78.5 sq. inches while the area of the 15" pizza is 176.7 sq. inches.

③ The 10" pizza, with $78.5 in^2$, is $8. Find the price per square inch of pizza $\approx \$0.10/in^2$
The 15" pizza, with $176.7 in^2$, is $16. Find the price per square inch of pizza $\approx \$0.09/in^2$

④ The cheaper the unit rate, the better the deal. The 15" pizza for $16 is the better deal (by about $0.01).

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Solution:

Pizza A - 10 inch $8

$A = \pi r^2$

$A = \pi \cdot 5^2$

$A = \pi \cdot 25$

$A = 75.54 \text{ in}^2$

Unit Rate:

$75.54 \div 8$

9.82 inches per dollar

Pizza B - 15 inch $16

$A = \pi r^2$

$A = \pi \cdot (7.5)^2$

$A = \pi \cdot 56.25$

$A = 176.71 \text{ in}^2$

Unit Rate

$176.71 \div 1$

11.04 inches per dollar

Pizza B is better deal!! ☺

Let the 10 inch pizza be labeled as Pizza A and the 15 inch pizza Pizza B. First we need to find the area of both Pizza's. Assume the pizza's are round and not square in shape. The area of a circle can be found by the equation $A = \pi r^2$. In order to find the area we first need to find our radi (radius plural) by dividing both diameters by 2. You will get that Pizza A's radius is $\frac{10}{2} = 5$in, and Pizza B's radius is $\frac{15}{2} = 7.5$in. Now that we have our radi, we can substitute our variable r with the correct values. Do Pizza A first and you will get $A = \pi(5)^2 = 75.54 \text{ in}^2$ (rounded to nearest hundredth)

Now we need to find Pizza B and you will get $A = \pi(7.5)^2 = 176.71 \text{ in}^2$ (rounded to nearest hundredth) →

figure out how much each inch of pizza will cost us

To do that we need to divide our area by how much each pizza cost. Again do Pizza A first. We take $\frac{75.54}{\$8}$ and you will get that we can get 9.82 in (rounded to nearest hundredth) of pizza per $1 spent. Now we do Pizza B. We take $\frac{176.71}{\$16}$ and you will get that we can get 11.04 in (rounded to nearest hundredth) of pizza per $1 spent. Finally, we can compare the 2!!

Looking back we can see that with Pizza B we can get more pizza per dollar spent so Pizza B is the better deal!

18(b)