

5th/6th grade Math Meet '12 Problem Explanations

**Event 1: Problem Solving (no calculators)**

**Part 1: Computations. (2 pts. each)**

1)  $x / 3 = 8/12$   $x = 2$   
**equivalent fractions 8/12 reduced is  $\frac{2}{3}$  by GCF of 4**

2)  $80 / x = 5$   $x = 16$   
**5/1 when multiply numerator and denominator by 16, becomes 80/16,  $x=16$   
or  $5/1 = 80/x$  and cross multiply to solve**

3)  $6(12 - x) = 42$   $x = 5$   
**Divide both sides by 6**  
 **$12 - x = 7$ , so  $x = 5$**

4)  $18 + 3x = 54$   $x = 12$   
**Subtract 18,  $3x = 36$ ,  $x = 12$**

5)  $0.12 \div x = 3$   $x = 0.04$   
 **$12 / 4 = 3$  so  $.12 / .04 = 3$**

**Part 2: Problem solving involving the order of operations. (2 pts. each)**

Use the order of operations to evaluate each problem. If your answer is a fraction, write it in simplest form. No decimal answers.

1)  $4(3) - 9 \div 3$  9  
 **$12 - 3 = 9$**

2)  $124 - 8 \cdot 7 + 12$  80  
 **$124 - 56 + 12 = 68 + 12 = 80$**

3)  $5^2 + 4 - 3$  26  
 **$25 + 4 - 3 = 29 - 3 = 26$**

4)  $15 + 2 \cdot 3$  21  
 **$15 + 6 = 21$**

5)  $(2)(3) - 1 + 4$  9  
 **$6 - 1 + 4 = 5 + 4 = 9$**



- 5) The length of a screw is 2.375 inches. Represent this length as a mixed number in simplest form.
- $$2 \frac{3}{8}$$
- 2 375/1000 GCF is 125, so 2 3/8

**Event 3: Logic and Reasoning (with calculators)**

**Part 1:** Application problems involving addition and subtraction of fractions.

(20 points)

Answer the following questions. (4 points each)

- 1) What is the thickness of a countertop made of  $\frac{7}{8}$  inch plywood and  $\frac{1}{16}$  inch Formica?
- $$\frac{7}{8} + \frac{1}{16} = \frac{14}{16} + \frac{1}{16} = \frac{15}{16} \text{ inch}$$

- 2) A length of bar stock  $16 \frac{3}{8}$  in. long is cut so that a piece only  $7 \frac{9}{16}$  in. long remains. What is the length of the cutoff piece? Disregard waste.
- $$16 \frac{3}{8} - 7 \frac{9}{16} = 16 \frac{6}{16} - 7 \frac{9}{16} = 15 \frac{22}{16} - 7 \frac{9}{16} = 8 \frac{13}{16} \text{ inches}$$

- 3) Three pieces of steel are joined together. What is the total thickness if the pieces are  $\frac{29}{32}$  in.,  $\frac{1}{2}$  in., and  $\frac{7}{16}$  in.?
- $$29/32 + 1/2 + 7/16 = 29/32 + 16/32 + 14/32 = 59/32 = 1 \frac{27}{32} \text{ inches}$$

- 4) If  $5 \frac{1}{8}$  cups of water are mixed with  $\frac{3}{4}$  cup of Kool Aid, how many cups are in the mixture?
- $$5 \frac{1}{8} + \frac{3}{4} = 5 \frac{1}{8} + \frac{6}{8} = 5 \frac{7}{8} \text{ cups}$$

- 5) A flower bed includes  $7 \frac{7}{8}$  in. of base fill. If the bed is to be 18 in. thick, how thick must the topsoil be?
- $$18 - 7 \frac{7}{8} = 17 \frac{8}{8} - 7 \frac{7}{8} = 10 \frac{1}{8} \text{ inches}$$

**Event 3:** Logic and Reasoning (with calculators) **Part 2:** Application Problems involving multiplication and division of fractions. (15 points)

Answer the following questions. Answer can be written as fraction or decimal (3 points each)

1) A fuel tank that holds 75 liters (L) of fuel is  $\frac{1}{4}$  full. How many liters of fuel are in the tank?

**75 ( $\frac{1}{4}$ ) or 75 (.25) =**  
18.75 liters or  $18\frac{3}{4}$  liters

2) If steps are 12 risers high and each riser is  $7\frac{1}{2}$  in. high, what is the total rise of the steps?

**12 ( $7\frac{1}{2}$ ) = 12 (7.5) =**

90 inches

3) A company is making drinking straws. Answer the questions that follow:

a. How many  $9\frac{1}{4}$  in. drinking straws can be cut from a  $216\frac{1}{2}$  in. length of stock?

**(216.5) / (9.25) = rounding to the nearest whole straw =**  
23 straws

b. How much stock is left over?

**23 straws (9.25) = 212.75 in. used, so  $216.5 - 212.75 = 3.75$  in. left or  $3\frac{3}{4}$  in. left.**

3.75 in. or  $3\frac{3}{4}$  in.

4) Three shelves of equal length are cut from a 72-in. board. if  $\frac{1}{8}$  in. is wasted on each cut, what is the maximum length of each shelf? (Two cuts are made to divide the entire board into three equal lengths.)

**waste =  $\frac{1}{8} + \frac{1}{8} = \frac{2}{8} = \frac{1}{4}$**

**$72 - \frac{1}{4} = 71\frac{3}{4}$  divide it into 3 pieces  $\frac{287}{4}$  divided by 3 or multiplied by  $\frac{1}{3}$**   
 **$(\frac{287}{4})(\frac{1}{3}) = \frac{287}{12} = 23\frac{11}{12}$**

$23.\overline{916}$  or 23.92 (rounded) or  $23\frac{11}{12}$  inches

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**Event 4: Mental Math** (no calculators)  
Each answer is worth 2 points.

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1) \_\_\_\_\_ 80 \_\_\_\_\_  
(5)(16)

6) \_\_\_\_\_ 80 \_\_\_\_\_  
(4)(4 + 16) = 4(20)

2) \_\_\_\_\_ 12 \_\_\_\_\_  
 $20 + 20 + 20 = 60/5 =$

7) \_\_\_\_\_ -40 \_\_\_\_\_  
 $(-20) + (-8) + (-12) = (-20 + -20)$

3) \_\_\_\_\_ 33 \_\_\_\_\_  
 $(19 + 1) + (6 + 4) + 3 = 20 + 10 + 3$

8) \_\_\_\_\_ 10 \_\_\_\_\_  
 $4 + 16 = 20 / 2 =$

4) \_\_\_\_\_ 190 \_\_\_\_\_  
 $(97-7) + (83 - 3) + (24 - 4) =$   
 $90 + 80 + 20 =$

9) \_\_\_\_\_ 110 \_\_\_\_\_  
 $(28 + 12) + (46 + 14) + 10 =$   
 $40 + 60 + 10 =$

5) \_\_\_\_\_ 6 \_\_\_\_\_  
 $3 + 4 - 1 = 7 - 1 =$

10) \_\_\_\_\_ 76 \_\_\_\_\_  
 $(25 - 9) + (64 - 4) = 16 + 64$

**Event 5: Team Problems** (with calculators)

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**Problem 1: Conversions with U.S. Customary Units.** (25 points)  
(5 pts each, no partial credit)

Unit ratios that you may use:

- 12 inches = 1 foot
- 3 feet = 1 yard
- 1 mile = 5280 feet
- 3 teaspoons (t) = 1 Tablespoon (T)
- 8 ounces (oz) = 1 cup (c)
- 2 cups (c) = 1 pint (pt)
- 2 pints = 1 quart (qt)
- 2 tablespoons (T) = 1 ounce (oz)
- 4 quarts (qt) = 1 gallon (gal)

Add or subtract the following using unit ratios:

1)  $3 \text{ ft} + 2 \text{ in} =$  \_\_\_\_\_ **38** \_\_\_\_\_ in  
**12 inches = 1 foot, so  $3(12) = 36 + 2 =$**

2)  $2 \text{ t} + 3 \text{ T} =$  \_\_\_\_\_ **11** \_\_\_\_\_ t  
**3 teaspoons in 1 Tablespoon, so  $2 + 3(3) =$**

3)  $5 \text{ yds} + 15 \text{ inches} =$  \_\_\_\_\_ **195** \_\_\_\_\_ in  
**3 feet in 1 yard so  $5(3) = 15$  feet, 12 inches in 1 foot, so  $(15)(12) = 180 + 15 =$**

4) Subtract 2 ft from 68 inches. \_\_\_\_\_ **44** \_\_\_\_\_ in  
**12 inches in 1 foot, so  $(2)(12) = 24$ ,  $68 - 24 =$**

5) Subtract 3 cups from 2 quarts. \_\_\_\_\_ **5** \_\_\_\_\_ cups  
**2 cups = 1 pint, 4 cups = 1 quart, so  $4(2) = 8$  cups - 3 =**

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Event 5: Team Problems (with calculators)

**Problem 2:** What percent is that? (20 points)  
(4 points each, no partial credit) LABEL YOUR ANSWERS!

1) A 5% sales tax is levied on an order of building supplies costing \$127.32. What is the amount of sales tax to be paid? Round to the nearest cent.

$$5/100 = x / 127.32 \text{ and cross multiply} \quad \text{or} \quad 0.05 ( 127.32) =$$

\$6.37

2) A certain ore yields an average of 67% iron. How much ore is needed to obtain 804 pounds of iron?

$$67/100 = 804/x \text{ and cross multiply} \quad \text{or} \quad 804/.67 =$$

1200 pounds

3) In a welding shop, 104,000 welds are made. If 97% of them are acceptable, how many are acceptable?

$$97/100 = x/104000 \text{ and cross multiply} \quad \text{or} \quad .97(104000) =$$

100,880 welds

4) A landscape contractor figures it costs  $\frac{1}{2}$  % of the total cost of a job to make a bid. What would be the cost of making a bid on a \$115,000 job?

$$\frac{1}{2} \% = 0.005 \quad .5/100 = x/115000 \text{ and cross multiply} \quad \text{or} \quad .005(115,000) =$$

\$575.00

5) Estimate to the nearest cent a 15% tip on a restaurant bill of \$31.15.

$$15/100 = x/31.15 \text{ and cross multiply} \quad \text{or} \quad .15(31.15) =$$

\$4.67

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Event 5: Team Problems (with calculators)

**Problem 3: Percents, what is left?** (25 points)

(5 points each, no partial credit) LABEL YOUR ANSWERS!

1) A chicken farmer bought 2,575 baby chicks. Of this number, 2060 lived to maturity. What percent loss was experienced by the chicken farmer?  
 $x/100 = 2060/2575$ ,  $x = 80$  so 80% lived, resulting in a 20% loss

20%

2) Ciara Walker was earning \$49,860 and received a 7% raise. Find her new annual earnings.

$7/100 = x/49860$   $x = 3490.20$  is the raise +  $49,860 = 53,350.20$   
or  $107/100 = x/49860$  resulting in the answer =

\$53,350.20

3) When making an estimate on a job, a contractor wants to make a 10% profit. If all the estimated costs are \$15,275, what is the total bid of cost and profit for the job?

$10/100 = x/15275$ ,  $x=1527.50$  is the profit +  $15275 = 16,802.50$  or  
 $110/100 = x/15275$  ,  $x =$

\$16,802.50

4) If 17% extra flooring is needed to allow for waste when boards are laid diagonally, how much flooring should be ordered to cover 2,045 board feet of floor? Answer to the nearest whole board foot.

$17/100 = x/2045$ ,  $x = 347.65 + 2045 = 2393$  boards

2393 boards

5) Julio made \$15.25 an hour but took a 20% pay cut. What was the new hourly pay?

$20/100 = x/15.25$ ,  $x=3.05$  pay cut, so  $15.25 - 3.05 = 12.20$  or  
He lost 20%, kept 80% of his pay, so  $80/100 = x/15.25$ ,  $x=$

\$12.20

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Event 5: Team Problems (with calculators)

**Problem 4: Function Machines (30 points)**

Part 1: Function Machine #1 (2 pts. each)

Here is a function machine. You need to determine what they do so that you can fill in the missing input or output.

The function follows the rule  $y = 12 - 8x$

So when  $x = 5$ ,  $12 - 8(5) = 12 - 40 = -28$

when  $x = 9$ ,  $12 - 8(9) = 12 - 72 = -60$

when  $y = -100$ ,  $-100 = 12 - 8x$ , subtract 12 from each side,  $-112 = -8x$ ,  $x=14$

when  $y = 20$ ,  $20 = 12 - 8x$ , subtract 12 from each side,  $8 = -8x$ ,  $x = -1$

Function Machine 1

<u>  1  </u>	=====→	<u>  4  </u>
<u>  2  </u>	=====→	<u> -4  </u>
<u>  3  </u>	=====→	<u> -12  </u>
1) <u>  5  </u>	=====→	<u>  ? = -28  </u>
2) <u>  9  </u>	=====→	<u>  ? = -60  </u>
3) <u>  ? = 14  </u>	=====→	<u> -100  </u>
4) <u>  ? = -1  </u>	=====→	<u>  20  </u>

**Problem 4: Function Machine**

**Part 2: Function Machine #2 (2 points each)**

The function follows the rule that you flip the digits. If there is one digit, then place a zero in front of the number and flip it.

For example, input 41, output is 14.

input is 05, output is 50

so input is 45, output is 54

input is 78, output is 87

output is 672, so the input is 276

output is 1, it becomes 01, so the output is 10

Function Machine 2

<u>  0  </u>	⇒	<u>  0  </u>
<u>  5  </u>	⇒	<u> 50 </u>
<u> 15 </u>	⇒	<u> 51 </u>
<u> 253 </u>	⇒	<u> 352 </u>
1) <u>  45  </u>	⇒	<u> ? = 54 </u>
2) <u>  78  </u>	⇒	<u> ? = 87 </u>
3) <u> ? = 276 </u>	⇒	<u> 672 </u>
4) <u> ? = 10 </u>	⇒	<u>  1  </u>

**Event 5: Team Problems (with calculators)**

**Problem 4: Function Machine**

Part 3: Function Machine #3

The function follows the rule:  $(n)(n) - 1$

So, when  $n = 1$ ,  $(1)(1) - 1 = 0$

$n = 2$ ,  $(2)(2) - 1 = 3$

when  $n = 5$ ,  $(5)(5) - 1 = 24$

$n = 10$ ,  $(10)(10) - 1 = 99$

the output is 399,  $(n)(n) - 1 = 399$ , so  $(n)(n) = 400$ ,  $n = 20$

the output is 2499,  $(n)(n) - 1 = 2499$ , so  $(n)(n) = 2500$ ,  $n = 50$

Function Machine 3

- |                                    |   |                   |
|------------------------------------|---|-------------------|
| <u>  1  </u>                       | ⇒ | <u>    0    </u>  |
| <u>  2  </u>                       | ⇒ | <u>    3    </u>  |
| <u>  3  </u>                       | ⇒ | <u>    8    </u>  |
| <u>  4  </u>                       | ⇒ | <u>   15   </u>   |
| 1) <u>  5  </u><br>(3 points)      | ⇒ | <u>  ? = 24  </u> |
| 2) <u> 10  </u><br>(3 points)      | ⇒ | <u>  ? = 99  </u> |
| 3) <u>  ? = 20  </u><br>(4 points) | ⇒ | <u>   399   </u>  |
| 4) <u>  ? = 50  </u><br>(4 points) | ⇒ | <u> 2499  </u>    |