$$\overline{\text{correct}}$$
$$\downarrow$$
correct
Answer

1) $(4)(5)(12) - 18 + 12 = 4000 - x$

$\underbrace{20 \cdot 12}$

$240 - 18 + 12 = 4000 - x$

$222 + 12 = 4000 - x$

$234 = 4000 - x$
$_{+x} _{+x}$

$234 + x = 4000$
$-234 -234$

$\boxed{x = 3,766}$

2) $\frac{2}{5} + \frac{1}{10} + \frac{3}{4} + \frac{1}{x} = 1$

$\frac{8}{20} + \frac{2}{20} + \frac{15}{20} + \frac{1}{x} = \frac{20}{20}$

$\frac{25}{20} + \frac{1}{x} = \frac{20}{20}$

$\frac{1}{x} = \frac{-5}{20}$ or $-\frac{1}{4}$

$\boxed{x = -4}$

3) $\underbrace{\frac{3x}{4} = \frac{2}{7}}$

$21x = 8$

$x = \frac{8}{21}$

$\boxed{x = \frac{8}{21}}$

4) $0.24 \div x = 3$

$0.24 \div 3 = x$

$3\overline{)0.24} \quad 0.08$

$\boxed{x = 0.08}$

5) $\frac{x}{2} - \frac{5x}{6} = \frac{1}{9}$

$\frac{18}{1}\left(\frac{x}{2} - \frac{5x}{6}\right)\left(\frac{1}{9}\right)\frac{18}{1}$

$\frac{18x}{2} - \frac{90x}{6} = \frac{18}{9}$

$9x - 15x = 2$

$-6x = 2$

$x = -\frac{2}{6}$

$\boxed{x = -\frac{1}{3}}$

↓
Correct
Answer

1) $7 \times 9 - 8 + 11 - 6(5 - 2(-3))$

$= 63 - 8 + 11 - 6(5 + 6)$

$= 63 - 8 + 11 - 6(11)$

$= 63 - 8 + 11 - 66$

$= 55 + 11 - 66$

$= 66 - 66$

(0)

2) $\frac{6 - (3^3 + 6)}{5 - 4^0} \times 2$

$= \frac{6 - (27 + 6)}{5 - 1} \times 2$

$= \frac{6 - \frac{33}{4}}{} \times 2$

$= \frac{-27}{4} \times 2$

$= \frac{-27}{2}$

$= \left(-13\frac{1}{2}\right)$

or

$\left(-\frac{27}{2}\right)$

3) $19 + (10 + (10 - 3)^2) + 2$

$= 19 + (10 + (7)^2) + 2$

$= 19 + (10 + 49) + 2$

$= 19 + 59 + 2$

$= 80$

(80)

4) $m - n \div 4$ if $m = 5, \ n = -8$

$= 5 - (-8) \div 4$

$= 5 - -2$

$= 5 + 2$

$= 7$

(7)

5) $-y(x - (9 - 4y)) + 5$ if $x = 4, \ y = -2$

$= -(-2)(4 - (9 - 4(-2))) + 5$

$= 2(4 - (9 + 8)) + 5$

$= 2(4 - 17) + 5$

$= 2(-13) + 5$

$= -26 + 5$

$= -21$

(-21)

Event 2: Problem Solving with a Calculator   *Part 1: Consumer Word Problems (5 pts. each)*
Include labels when needed!

1) Erin's boss promised her a 45% increase after two years. If Erin is currently making $683 per month, what is her new monthly payment? ~~If 14% of her paycheck is taken for taxes and other payments?~~

$683 \cdot 1.45 =$ $\boxed{\$990.35}$ $=$ $\boxed{\$851.701}$

$-$ $990.35 \cdot 0.14 = 138.649$

2) Jimmy went shopping for jeans and saw that there was a great sale! Jeans that normally cost $53 were only $18. What was the percent mark-down for the jeans? Round your answer to the nearest whole percent.

$\frac{18}{53} \approx 34\%$ $100\% - 34\% = \boxed{66\%}$

3) Your teachers says that his wife has put an 18 × 51 foot garden in along the whole back end of their back yard. He says that this has reduced the back-yard lawn area by 24%. What is the total area of his backyard, including the new garden?

$A = 18 \times 51$
$= 918 \, ft^2$

$\frac{918}{x} = \frac{24}{100}$

$\frac{24x}{24} = \frac{91,800}{24}$

$x = 3,825$

$\boxed{3,825 \, ft^2}$

4) Ronald served 18 customers while working 4 hours. Assuming the relationship is directly proportional, how many hours did Ronald work if he served 32 customers? Round to the nearest quarter of an hour.

$\frac{18 \, cust.}{4 \, hrs} = \frac{32 \, cust.}{x}$

$128 = 18x$
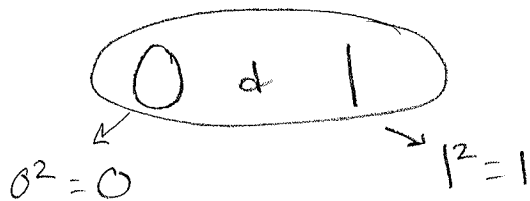$\frac{}{18} \quad \frac{18x}{18}$
$7.1 = x$

$\boxed{7 \, hours}$

5) Regina at the store to buy soda. Which is the best deal? 8 cans for $4.88, 10 cans for $5.80, 3 cans for $1.68 or 12 cans for $7.20?

$\frac{\$4.88}{8} = \$0.61/c$ $\frac{\$5.80}{10} = \$0.58/c$ $\frac{\$1.68}{3} = \$0.56/c$ $\frac{\$7.20}{12} = \$0.60/can$

$\boxed{\$1.68 \text{ for } 3 \text{ cans}}$

1) Which number(s) is (are) equal to its (their) square?

0 d 1

$0^2 = 0$ $1^2 = 1$

2 pts each

2) Which number(s) is(are) equal to half its (their) square?

0 d 2

$0^2 = \frac{0}{2} = 0$ $2^2 = \frac{4}{2} = 2$
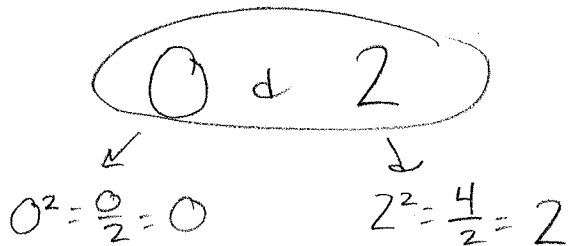
2 pts each

3) The numbers 4 , 12 , 17 and x have an average equal to 14. What is x?

$$\frac{4+12+17+x}{4} = 14$$

$33 + x = 56$

$x = 23$

$X = 23$

4) Your brother Jack is 2 years from being twice as old as your sister Jenny. The sum of Jack's age and three times Jenny's age is 68. How old is Jenny?

$X = $ Jack

$y = $ Jenny
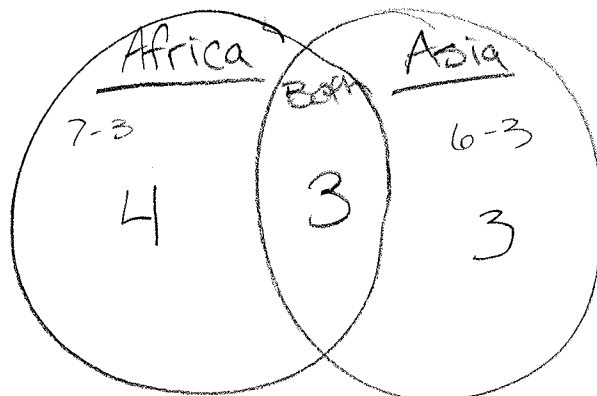
$X = 2y - 2$

$x + 3y = 68$

$2y - 2 + 3y = 68$

$5y = 70$

$y = 14$

Jenny is 14

5) Of the people in Paul's apartment building, 7 have been to Africa, 6 have been to Asia, and 3 people have been to both Africa and Asia. How many people have been to Africa but not Asia? How many people have been to at least Asia or Africa?

Africa   Both   Asia

$7 - 3$ $6 - 3$

4 3 3

Africa – 4 people

Either/Both – 10 people

2 pts each

Event 3: Mathematical Reasoning with a Calculator

		Part 2: Conversions (3 pts. each)
1 foot = 12 inches	1 hour = 60 minutes	1 quart = 2 pints
1 yard = 3 feet	1 tablespoon = 3 teaspoons	1 gallon = 4 quarts
1 mile = 5,280 feet	1 cup = 16 tablespoons	1 pound = 16 ounces
1 minute = 60 seconds	1 pint = 2 cups	1 ton = 2000 pounds

Find the following conversions. Round to the nearest hundredth when necessary.

1) Which ~~weighs~~ more, 324 teaspoons or 7 cups?

$$\frac{324 \text{ tsp}}{1} \times \frac{1 \text{ tblsp}}{3 \text{ tsp}} \times \frac{1 \text{ cup}}{16 \text{ tblsp}} = \frac{324}{48} = 6.75 \text{ cups}$$

7 cups

2) How many more cups of milk would you be drinking if you drank 3 gallons of milk rather than 43 cups of milk?

$$\frac{3 \text{ gal}}{1} \times \frac{4 \text{ qt}}{1 \text{ gal}} \times \frac{2 \text{ pt}}{1 \text{ qt}} \times \frac{2 \text{ cups}}{1 \text{ pt}} = 48 \text{ cups}$$

5 more cups

3) Which weighs more, 9 tons or 300,000 ounces?

$$\frac{9 \text{ tons}}{1} \times \frac{2000 \text{ lb}}{1 \text{ t}} \times \frac{16 \text{ oz}}{1 \text{ lb}} = 288,000 \text{ oz}$$

300,000 oz

4) If a pipe leaks 3 pints of water in 12 hours, how many gallons would it leak in a week?

$$\frac{3 \text{ pints}}{12 \text{ hrs}} \times \frac{168 \text{ hrs}}{1 \text{ week}} \times \frac{1 \text{ gal}}{8 \text{ pts}} = \frac{504 \text{ gal}}{96 \text{ weeks}} = 5.25 \text{ gal/week}$$

5) If Tara ran 7 feet per second, how many miles per hour is she running?

$$\frac{7 \text{ ft}}{1 \text{ sec}} \times \frac{1 \text{ mile}}{5280 \text{ ft}} \times \frac{3600 \text{ s}}{1 \text{ hr}} = \frac{25,200 \text{ mi}}{5280 \text{ hr}} \approx 4.77 \text{ mi/hr}$$

Event 4: Mental Math

1) 6040

2) 44

3) 20
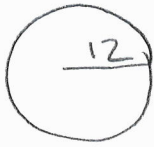
4) 257

5) 60%

6) 36

7) -8

8) 85

9) 64

10) 4

Event 5: Team Problems (with calculators)   *Problem 1: Area and Perimeter (5 pts each)*
Use 3.14 for π. Round all answers to the nearest hundredth. Include labels!

1) A water sprinkler can spray water at a maximum distance of 12 m in all directions. What area of the garden can this sprinkler irrigate?

$$A = \pi \cdot 12^2$$
$$= 144\pi$$
$$\approx 452.16$$

$\boxed{452.16 \, m^2}$

* 1 pt label
* 1 pt rounding
* 3 pts answer

2) Mrs. Rodger's garden is made up of 4 squares and 2 semicircles as shown below. Each small square has an area of 4 square meters. What is the total area of the garden? The perimeter?

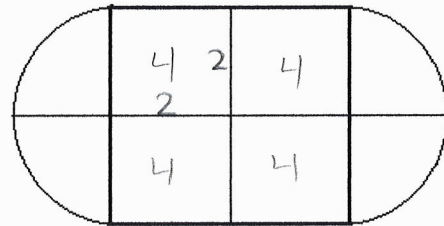$$A = 4(4) + \pi \cdot 2^2$$
$$= 16 + 4\pi$$
$$= 16 + 12.56$$
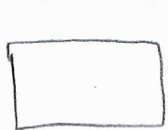$$\approx \boxed{28.56 \, m^2}$$

$$P = 4(2) + 4\pi$$
$$= 8 + 12.56$$
$$\approx \boxed{20.56 \, m}$$

* Each answer - 2 pts
* Labels/Rounding - 1pt

(figure showing garden with squares labeled 4, 2, 4 / 2 / 4, 4)

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3) A rectangle field has an area of 300 square meters and a perimeter of 80 meters. What are the length and width of the field?

$$A = 300 \, m^2$$
$$P = 80 \, m$$

* Add to 40
\+ Multiply to 300

$\boxed{30 \text{ meters} \atop + \atop 10 \text{ meters}}$

* 2 pts per answer
* 1 pt for label

$$lw = 300$$
$$2(l+w) = 80 \qquad l+w = 40$$
OR

4) Find the circumference of a circle whose area is 100π square centimeters.

$$A = \pi r^2$$
$$100\pi = \pi r^2$$
$$10 = r$$

$$C = 2\pi r$$
$$= 2 \cdot \pi \cdot 10$$
$$\approx \boxed{62.8 \, cm}$$

* 4 pts answer
* 1 pt label

5) In the figure below the square has all its vertices on the circle. The area of the square is equal to 400 square cm. What is the area and perimeter of the outer circle?

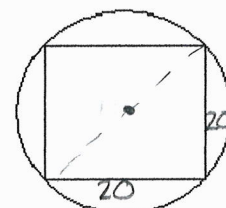$$20^2 + 20^2 = C^2$$
$$800 = C^2$$
$$28.28 cm \approx C$$

$C \rightarrow$ Diameter
$$C = 28.28\pi$$
$$\approx \boxed{88.80 \, cm}$$

$$A = 14.14^2 \cdot \pi$$
$$\boxed{\approx 627.81 cm^2}$$

(figure showing square inscribed in circle with sides labeled 20, 20)

* 2 pts - Each Answer
* 1 pt - Label + Rounding

**Use the figure at right to answer questions 1 and 2. (11 points)**

ABC is an equilateral triangle with side length equal to 50 cm. BH is a perpendicular bisector of AC.

1) What is the length of BH? If necessary, leave your answer as a *simplified* square root.

$25^2 + BH^2 = 50^2$

$625 + BH^2 = 2500$

$BH^2 = 1875$

$BH = \sqrt{1875}$

$BH = 25\sqrt{3} \text{ cm}$

$\approx 43.3 \text{ cm}$

* 6 pts - Simplified Answ. w/ label
* 5 pts - Simp. Ans. w/o label
* 4 pts - Unsimp. Ans.
* 3 pts - Unsimp. Ans. w/o label 50cm
* 2 pts - Approx. answer w/ label
* 1 pt - Approx. Ans w/o label
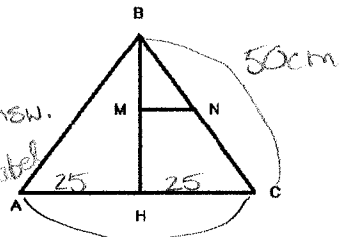
2) What is the area of triangle ABC? Do NOT approximate your answer. Leave it in ~~simplified fraction form.~~ sq. root form.

$A = \frac{1}{2}(50 \cdot 25\sqrt{3}) = 625\sqrt{3} \text{ cm}^2$

$= \frac{1250\sqrt{3}}{2}$

$\approx 1082.53 \text{ cm}^2$

*Same scale as above, but start w/ 5 pts max.

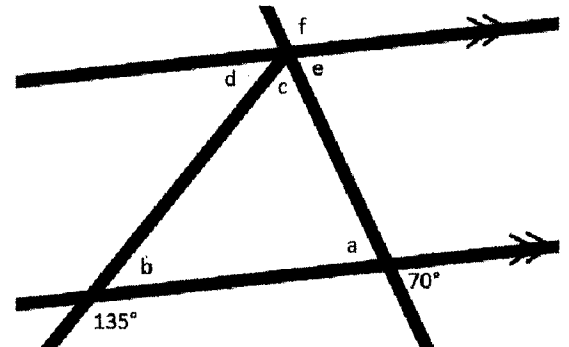3) Find the missing angles: (6 points) — 1 pt each

a: $70°$

b: $45°$ $180 - 35 = 45$

c: $65°$ $180 - 70 - 45$

d: $45°$

e: $70°$

f: $110°$ $65 + 45$

5) Find the unknown sides x, y, z and w if all 3 triangles are similar. (8 points) — 2 pts each

$\frac{36}{12} = \frac{3}{1}$ $\frac{204}{51} = \frac{4}{1}$

$x = 3 \cdot 3$ $z = 36 \cdot 4$

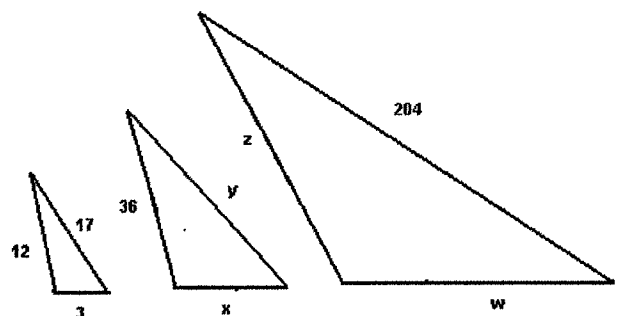$x = 9$ $z = 144$

$y = 17 \cdot 3$ $w = 9 \cdot 4$

$y = 51$ $w = 36$

Excavation for a rectangular pool is being done in your backyard. The pool will be 42 feet long, 29 feet wide, and 8 feet into the ground. Round all answers to the nearest hundredth and include labels.

1) If dirt will be taken away in a truck that can hold 120ft³ of dirt at a time, how many loads will it take to clear the dirt from the hole for the pool? Assume that the concrete will take up an additional 2 feet for each dimension.
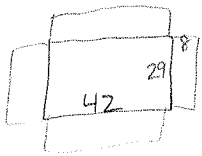
$$V = 44 \times 31 \times 10$$
$$= 13,640 \text{ ft}^3$$

$$\frac{13,640}{120} = 113.\overline{6}$$

$$\boxed{114 \text{ loads}}$$

4 pts - Answer
1 pt - Label

2) Once the pool construction is finished, you will need to paint the concrete inside. Paint typically comes according to square yards. How many *square yards* will you need to cover? Round to the nearest hundredth.

$$SA = 2(29 \cdot 8) + 2(42 \cdot 8) + 42(29)$$
$$= 464 + 672 + 1218$$
$$= 2,344 \text{ ft}^2$$

$$2,344 \div 9 = \boxed{260.44 \text{ yd}^2}$$

4 pts - Answer
1 pt - Rounding & Label

3) If each can of paint costs $15 including tax and covers 36 square yards, how much money should you expect to spend on paint?

$$260.44 \div 36 = 7.23 \text{ cans}$$

$$8 \text{ cans} \times 15 = \boxed{\$120}$$

$$7 \text{ cans} \times 15 = \$105$$

4 pts - Answer
2 pts - Rounded to 7 cans
1 pt - label

4) You have a coupon for 25% off or $15 off every $50 spent. Which is a better deal?

$$120 \cdot 0.25 = \$30 \rightarrow \boxed{\text{Same! Both save \$30}}$$

5 pts

$$105 \cdot 0.25 = \$26.25 \rightarrow \$15 \text{ off } \$50 \quad \text{*If answered above w/ \$105}$$

5) A neighbor sees your project and comes to brag about her circular pool. If her pool is 35 feet in diameter and 8 feet deep, does her pool hold more water than yours? What is the difference? Use 3.14 for pi.

Circle
$$V = \pi r^2 \cdot h$$
$$= \pi \cdot 17.5^2 \cdot 8$$
$$= 7,693 \text{ ft}^3$$

$$V = 42 \cdot 29 \cdot 8$$
$$= 9,744 \text{ ft}^3$$

$$9,744 - 7,693 = 2,051 \text{ ft}^3$$

$$\boxed{\text{No - Yours holds 2,051 more ft}^3 \text{ of water}}$$

No - 2 pts
Difference - 2 pts
Label - 1 pt

Mary is building a colorful picket fence. She needs 300 pickets and only wants to use the colors red, blue, yellow, and orange. She is trying to figure out how many of each color she has so she can create a pattern. There is one more red picket than twice the yellow pickets. For yellow pickets, Mary has 2 more than 1/3 of the amount of ~~orange~~ green pickets. Finally, she sees that the number of blue pickets is 1 less than 2.5 times the number of yellow tiles.

1. Write distinct equations for each of the following relationships. Use r – red, o – orange, y – yellow, b – blue. (3 points per equation)

   a. Relate the number of red pickets to yellow pickets:

$$r = 2y + 1$$

   b. Relate the number of yellow pickets to ~~orange~~ green pickets:

$$y = \tfrac{1}{3}g + 2 \quad \rightarrow \quad o = 3y - 6$$

   c. Relate the number of yellow pickets to blue pickets:

$$b = 2.5y - 1$$

   d. Relate the total number of pickets to each color in one equation:

$$r + g + y + b = 300$$

2. Substitute all equations into the equation from d. Make sure you are left with only one variable to solve. Write this equation below. **(5 points)**

$$2y + 1 + 3y - 6 + y + 2.5y - 1 = 300$$

OR

$$8.5y - 6 = 300$$

✱5 pts simplified or unsimplified w/one variable

3. How many of each color does Mary have? **(8 points)**

$$2y + 1 + 3y - 6 + y + 2.5y - 1 = 300$$
$$8.5y - 6 = 300$$

✱Two pts per color

$$8.5y = 306$$
$$\boxed{y = 36}$$

$$r = 2(36) + 1$$
$$= 72 + 1$$
$$\boxed{r = 73}$$

$$g = 3(36) - 6$$
$$= 108 - 6$$
$$\boxed{g = 102}$$

$$b = 2.5(36) - 1$$
$$\boxed{b = 89}$$

$$36 + 73 + 102 + 89 \stackrel{?}{=} 300$$
$$300 = 300 \checkmark$$

Name: _____   School Team:_____

Tie Breaker

Circle your final answer!

Rationalize each the denominator. That is, ensure that no irrational numbers are left in the bottom of the fraction.

1. $\frac{1}{\sqrt{2}} =$ $\quad \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{(\sqrt{2})^2} = \boxed{\frac{\sqrt{2}}{2}}$

* 1 pt - correct answer

2. $\frac{2}{3+\sqrt{5}} =$ $\quad \frac{2}{3+\sqrt{5}} \cdot \frac{3-\sqrt{5}}{3-\sqrt{5}} = \frac{6-2\sqrt{5}}{9+3\sqrt{5}-3\sqrt{5}-(\sqrt{5})^2} = \frac{6-2\sqrt{5}}{9-5} = \boxed{\frac{6-2\sqrt{5}}{4}}$

OR

$\boxed{\frac{3-\sqrt{5}}{2}}$

*2 pts - Correct Answer

3. $\frac{3}{\sqrt{3}-\sqrt{2}} =$ $\quad \frac{3}{\sqrt{3}-\sqrt{2}} \cdot \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}+\sqrt{2}} = \frac{3\sqrt{3}+3\sqrt{2}}{(\sqrt{3})^2+\sqrt{3}\sqrt{2}-\sqrt{3}\sqrt{2}-(\sqrt{2})^2}$

$= \frac{3\sqrt{3}+3\sqrt{2}}{3-2} = \boxed{3\sqrt{3}+3\sqrt{2}}$

OR

$\boxed{3(\sqrt{3}+\sqrt{2})}$

*3 pts - Correct Answer