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MTH/SLS 218–6816 Exam 2

March 28, 2011 Professor Ilya Kofman

NAME: Key

1 in = 2.54 cm, 1 kg = 2.2 lbs 1 gal = 3.79 ℓ

20 **Problem 1.** A recipe that serves 6 calls for 2 Tbsp vegetable oil, 4 pints of stock, $\frac{2}{3}$ lbs of peas, and 5 eggs. Note that 16 Tbsp = 1 cup. If the cafeteria needs to serve 1000, it must buy:

(a) How many gallons of vegetable oil? $\boxed{1.3 \text{ gal}}$

$$\frac{1000}{6} \cdot 2\,\text{Tbs} \cdot \frac{1\,\text{cup}}{16\,\text{Tbsp}} \cdot \frac{1\,\text{gallon}}{16\,\text{cups}} = \frac{2000}{1536}\,\text{gal}$$

(b) How many liters of stock? 315.8 ℓ

$$\frac{1000}{6} \cdot 4\,\text{pts} \cdot \frac{1\,\text{gal}}{8\,\text{pts.}} \cdot \frac{3.79\,\ell}{\text{gal}} = \frac{(4000)(3.79)}{48}\,\ell = \boxed{315.8\,\ell}$$

(c) How many kilograms of peas?

$$\frac{1000}{6} \cdot \frac{2}{3}\,\text{lbs} \cdot \frac{1\,\text{kg}}{2.2\,\text{lbs}} = \boxed{50.5\,\text{kg}}$$

(d) How many dozens of eggs?

$$\frac{1000}{6} \cdot 5\,\text{eggs} \cdot \frac{1\,\text{dozen}}{12\,\text{eggs}} = 69.4 \Rightarrow \boxed{70 \text{ dozen eggs}}$$

10 **Problem 2.** Standard copy paper is 8.5 inches by 11 inches.

(a) How many square millimeters (mm^2) is one sheet of copy paper?

$$(8.5)(11)\,\text{in}^2 \times \left(\frac{2.54\,\text{cm}}{1\,\text{in}}\right)^2 \times \left(\frac{10\,\text{mm}}{1\,\text{cm}}\right)^2 = 60{,}322\,\text{mm}^2$$

(b) One acre is 43,560 sq ft. How many pieces of copy paper will cover one acre?

$$43{,}560\,\text{ft}^2 \times \left(\frac{12\,\text{in}}{1\,\text{ft.}}\right)^2 \times \frac{1\,\text{paper}}{(8.5)(11)\,\text{in}^2} = 67{,}087\ \text{papers}$$

114 + 15

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Problem 3. (a) How many km is 72,531 mm?

0.072531 km

(b) How many km is 5.4 miles?

$$5.4\,mi \times \frac{5280\,ft.}{1\,mi} \times \frac{12\,in}{1\,ft.} \times \frac{2.54\,cm}{1\,in} \times \frac{1\,km}{100{,}000\,cm} = 8.7\,km$$

(c) How fast is 3 cm/sec in miles per hour?

$$\frac{3\,cm}{sec} \times \frac{1\,in}{2.54\,cm} \times \frac{1\,ft}{12\,in} \times \frac{1\,mile}{5280\,ft.} \times \frac{60\,sec}{1\,min} \times \frac{60\,min}{1\,hr.} = 0.067\,\frac{miles}{hr.}$$

(d) The current price of gasoline in France is 1.58 Euros per liter. Now, \$1 is 0.71 Euros. How much is gasoline in France in dollars per gallon?

$$1.58\,\frac{Euro}{l} \times \frac{\$1}{0.71\,Euro} \times \frac{3.79\,l}{1\,gal} = \$8.43/gal$$

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Problem 4. Jack reports that a pail weighs 4.7 lbs. Jill can weigh things in pounds to three decimal places. If Jill weighs the pail, what weight range could she report?

$4.650 - 4.749$

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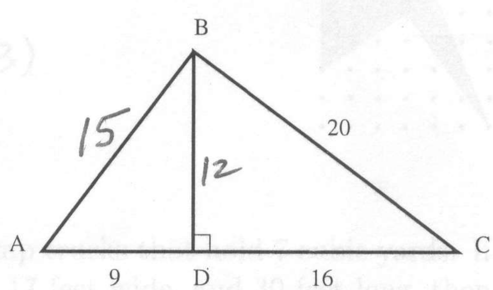
Problem 5. In $\triangle ABC$, $\angle BDC$ is a right angle, but do <u>not</u> assume that $\angle ABC$ is a right angle.

(a) Find the area of $\triangle ABC$.



$16^2 + (BD)^2 = 20^2$

$BD = \sqrt{20^2 - 16^2} = 12$

$\text{Area}(\triangle ABC) = \frac{1}{2}(12)(9+16)$

$= 150$

(b) Find the perimeter of $\triangle ABC$.

$9^2 + (BD)^2 = (AB)^2 \Rightarrow 9^2 + 12^2 = (AB)^2 \Rightarrow AB = 15$

$\text{Perimeter}(\triangle ABC) = 15 + 20 + 25 = 60$

(c) Determine whether $\angle ABC$ is a right angle. Justify.

Yes, since $(AB)^2 + (20)^2 = (25)^2$ (Pythagorean Thm.)

$15^2 + 20^2 = 25^2$

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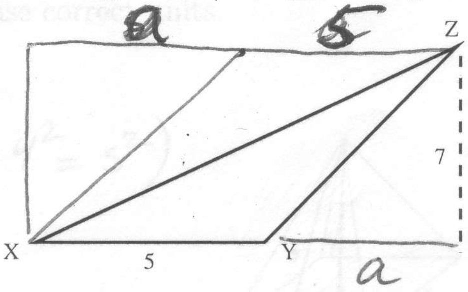
6 **Problem 6.** Justify $A = \frac{1}{2}bh$ for $\triangle XYZ$, using rectangles and/or right triangles.

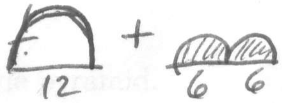
$7(a+5) = \cancel{2}(7a)(\cancel{\tfrac{1}{2}})$
$+ 2\,\text{Area}(\triangle XYZ)$



$\Rightarrow 7 \cdot 5 = 2\,\text{Area}(\triangle XYZ)$

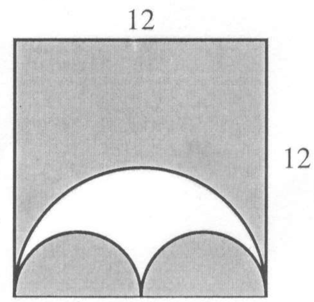
$\Rightarrow \text{Area}(\triangle XYZ) = \frac{1}{2}(7)(5)$

6 **Problem 7.** Find the area of the shaded region. (Leave π in your answer.)

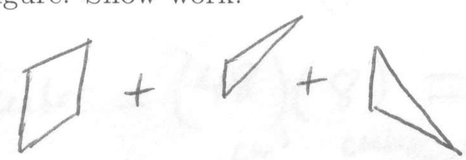
Area = $(12)(12) -$ 

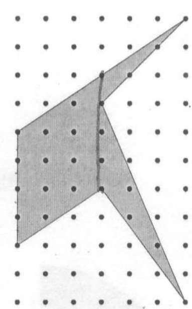
$= 144 - \frac{1}{2}\pi(6)^2 + \pi(3)^2$

$= 144 - 9\pi$



6 **Problem 8.** The dots below are spaced 1 cm apart. Determine the area of the shaded figure. Show work.

$A =$ 



$= (3)(4) + \frac{1}{2}(1)(3) + \frac{1}{2}(3)(3)$

$= 18$

6 **Problem 9.** A construction company has dump trucks that hold 7 cubic yards. If the company digs a hole that is 12 feet deep, 17 feet wide, and 30 feet long, then how many dump trucks will they need to haul away the dirt dug from this hole?

$\text{Vol (hole)} = \underbrace{12 \cdot 17 \cdot 30}_{6120}\ ft^3 \times \left(\frac{1\ yd}{3\ ft.}\right)^3 = 226.7\ yd^3$

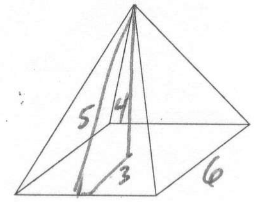
$\frac{226.7}{7} = 32.4 \Rightarrow$ 33 dump trucks

24

20 **Problem 10.** A square with side length 6 cm is the base of a square pyramid, which has height 4 cm. Show work below, and use correct units.

(a) What is the slant height of the pyramid?

$\underline{s = 5\,\text{cm}}$ $\quad (3^2 + 4^2 = s^2)$



(b) Compute the surface area of the pyramid (including the base).

$4 \cdot \frac{1}{2}(6)(5) + (6)^2 = 96\ \text{cm}^2$

(c) Compute the volume of the pyramid.

$\frac{1}{3}(36)(4) = 48\ \text{cm}^3$

(d) If a little cube with side length 5 mm is filled with water, how many such cubes will fill the pyramid?

Each cube vol $= \left(\frac{1}{2}\,\text{cm}\right)^3 = \frac{1}{8}\,\text{cm}^3$

$\# \text{cubes} = \underset{\text{cm}^3}{(48)}\underset{\text{cubes/cm}^3}{(8)} = 384$ cubes

15 **Problem 11. (BONUS)** A cone will be made from the quarter-disc shown.

(a) Find the surface area of the cone.

$SA = \frac{1}{4}\pi(8)^2 = 16\pi$

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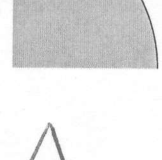

(b) Find the radius r of the cone. (Hint: Use circumference.)

$\cancel{2\pi} r = \frac{1}{4}(\cancel{2\pi} \cdot 8) \Rightarrow r = 2$

(c) Find the volume of the cone. (Hint: Find the height.)

$\left.\begin{array}{l} r^2 + h^2 = s^2 \\ 2^2 + h^2 = 8^2 \end{array}\right\}$ $\quad h = \sqrt{64-4} = \sqrt{60}$

$V = \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi(2^2)\sqrt{60} = \frac{4\pi\sqrt{60}}{3}$

$\approx 32.45\ \text{cm}^3$

20 + 15