9.

SOLUTION PAGE

DIVISION: **MU**

TEST: **Mu Applications**

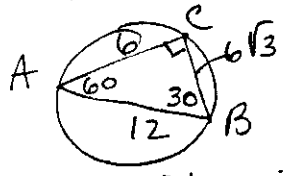
C (1.) $\pi r^2 = 2\pi r + 80\pi$

$r^2 - 2r - 80 = 0$

$(r-10)(r+8) = 0$

$r = 10, -8$

B (2.)



$\triangle ABC$ is right with $\angle C$ the right angle. $m\angle B = 30$, $m\angle A = 60$, $m\overset{\frown}{BC} = 120$

B (3.) 7 inch gear must turn twice as fast as 14 in gear.

B (4.) m

	r	t	d	
N	7	x	7x	72
m	5	x	5x	72

$12x = 72$

$x = 6$

$5 \cdot 6 = 30$ km from m.

D (5.) orig frac $\frac{3x}{4x}$, $\frac{3x-5}{4x+4} = \frac{5}{12}$

$36x - 60 = 20x + 20$

$16x = 80$

$x = 5$, orig frac $\frac{15}{20}$

$15 + 20 = 35$

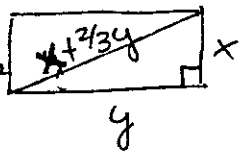
D (6.)

	r	t	d
up	5	$\frac{x}{5}$	x
	25	$\frac{x}{25}$	x

avg speed $= \frac{2x}{\frac{x}{5} + \frac{x}{25}}$

$= \frac{2x}{\frac{6x}{25}} = \frac{25}{3}$ or $8\frac{1}{3}$

B (7.) $x^2 + y^2 =$



$x^2 + y^2 = x^2 + \frac{4}{3}xy + \frac{4}{9}y^2$

$\frac{5}{9}y^2 - \frac{4}{3}xy = 0$

$y(\frac{5}{9}y - \frac{4}{3}x) = 0$

$\frac{5}{9}y = \frac{4}{3}x$

$\frac{5}{12} = \frac{x}{y}$

A (8.) x = Sam helping

$\frac{x+10}{20} + \frac{x}{30} = 1$

$x = 6$, $\frac{6}{60} = \frac{1}{10}$ hr.

A (9.) $84 < 40x + 32 < 124$

$52 < 40x < 92$

$\frac{13}{10} < x < \frac{23}{10}$

D (10.) 2^n = # total subsets when n is element

$2^5 = 32$ & gives 31 non-empty subsets

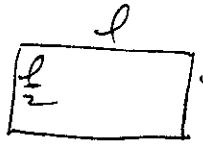
C (11.) 5 pts → 1 polygon

4 pts → 4 polygons

3 pts → 10 polygons

16

D (12.)

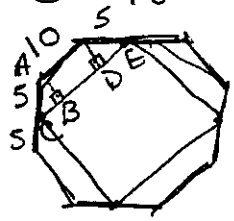


$x = 3l$

$\frac{x}{3} = l$

$\frac{x}{6} = w$; $\frac{x}{3} \cdot \frac{x}{6} = \frac{x^2}{18}$

D (13.) $AB = \frac{5}{2}\sqrt{5}$



$CB = \frac{5}{2}\sqrt{2}$

$BD = 10$

$DE = \frac{5}{2}\sqrt{2}$

CE (side of □) $= \frac{10 + 5\sqrt{2}}{2}$

area $= (10 + 5\sqrt{2})^2$

$= 150 + 100\sqrt{2}$

B (14.) $\begin{cases} x^2 + y^2 = 34 \\ (x+y)^2 = 64 \end{cases}$

$x^2 + 2xy + y^2 = 64$

$34 + 2xy = 64$

$2xy = 30$

$xy = 15$

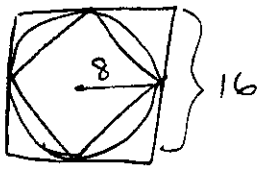
MAO 1996

SOLUTION PAGE

DIVISION: **MU**

TEST: **Mu Applications**

A (15) Let side of $\square = 16$.



$r_{\odot} = 8$

largest possible $\square$ joins tangents of $\odot$'s

orig $\square$, diag of square is 16 so side is $8\sqrt{2}$.

area original is 256 compared to area 2nd $\square = 128$. $\frac{128}{256} = \frac{1}{2}$ Sheet left.

E (16) V of orig $= Bh$ new tank

$= 25 \cdot 20$ $r = 10$

$= 500$ $V = Bh$

$500 = 100 \cdot h$

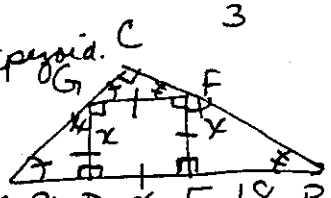
$5 = h$

A (17) $2x - 3y = 6$, $5x - ay = 4$

$m = \frac{+2}{+3}$ $m = \frac{+5}{+a}$

Since $+$, $\frac{2}{3} = -\frac{a}{5}$, $10 = -3a$, $-\frac{10}{3} = a$

C (18) ABEG is a trapezoid.



Let sides of $\square = x$

Since $\overline{GF} \parallel \overline{AB}$, $\angle A \cong \angle CGF$ & $\angle B \cong \angle CFG$.

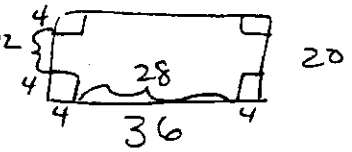
$\triangle$s are $\sim$, so $\frac{x}{8} = \frac{18}{x}$, $x^2 = 8 \cdot 18$, $x = 12$

$A = \frac{1}{2} \cdot 12(12 + 38)$

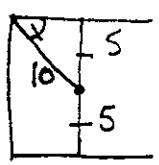
$= 300$

B (19) $V = 4 \cdot 12 \cdot 28$

$= 1344$



A (20)

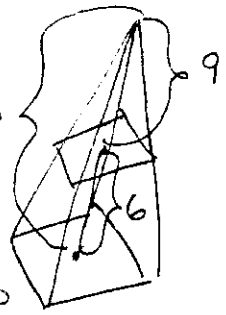


Side opp $\angle$ is $\frac{1}{2}$ hypp

so $\angle = 30$.

E C (21) Ratio alt is $\frac{3}{5}$

Ratio Vs $= \frac{27}{125}$



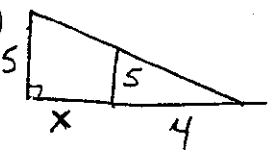
$\frac{27}{125} = \frac{x}{250}$

$\frac{250}{-54}$

196

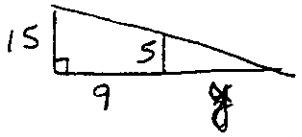
$x = 54$

A (22)



$\frac{5}{15} = \frac{4}{4+x}$

$x = 8$



$\frac{1}{3} = \frac{y}{y+9}$

$y = 4\frac{1}{2}$

Shadow is $\frac{1}{2}$ ft longer

D (23)

	r	t	d
going	2x	$\frac{150}{2x}$	150
returning	x	$\frac{150}{x}$	150

$\frac{150}{2x} + \frac{150}{x} = \frac{9}{2}$

$150 + 300 = 9x$

$50 = x$

$2x = 100$

D (24) $x + y = 60$, $\frac{x}{y} = \frac{1}{6}$

$y = 6x$

$60 - x = 6x$

$\frac{60}{7} = x$, $y = \frac{360}{7}$

$xy = 440\frac{40}{49}$

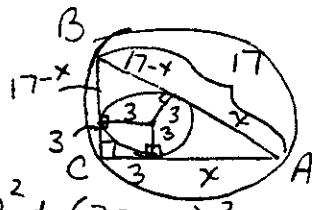
MAO 1996

SOLUTION PAGE

DIVISION: **MU**

TEST: **Mu Applications**

C (25)



$17^2 = (x+3)^2 + (20-x)^2$

$289 = x^2+6x+9+400-40x+x^2$

$0 = 2x^2-34x+120$

$0 = 2(x^2-17x+60)$

$0 = (x-12)(x-5)$

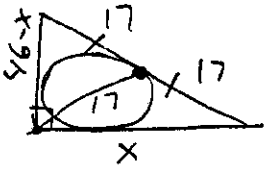
$x = 5, 12$

$AC = 8,\ BC = 15,\ AB = 17$

$p\triangle ABC = 40$

B (26) $p = 80$

midpt of hypp is equidistant from vertices.



$(46-x)^2 + x^2 = 34^2$

$2116 - 92x + x^2 + x^2 = 1156$

$2x^2 - 92x + 960 = 0$

$2(x^2-46x+480) = 0$

$2(x-16)(x-30) = 0$

$x = 16, 30$

sides are 16, 30, 34

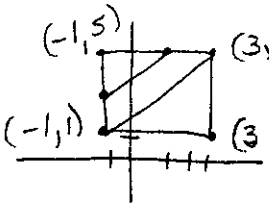
$a\triangle = \frac{1}{2}\cdot 16\cdot 30$

$= 240$

$\text{radius } \odot = \frac{A\triangle}{S\triangle} = \frac{240}{40}$

$= 6$

B (27) $240 - 36\pi$



side of $\square = 4$

diag of $\square = 4\sqrt{2}$

side of new $\square = 2\sqrt{2}$

A (28) $r^2 = 27,\ r = 3\sqrt{3}$

$V = \frac{4}{3}\pi \cdot 3\sqrt{3}\cdot 3\sqrt{3}\cdot 3\sqrt{3}$

$= \frac{4\cdot 3\cdot 3\cdot 3\cdot \sqrt{3}\,\pi}{\pi}$

$= 108\sqrt{3}\pi$

B (29) orig change $= 10a+b$

actual change $= 10b+a$

$(10b+a) - (10a+b) = 27$

$9b - 9a = 27$

$b - a = 3$ & $a+b = 9$

$b = 6,\ a = 3$

$10a+b = 36$ (change)

price is 64

A (30) m $A+3$

A $A+2$

ℓ $A+1$

g A

$A^2 + (A+1)^2 + (A+2)^2 + (A+3)^2 = 534$

$4A^2 + 12A + 14 = 534$

$4(A^2+3A-130) = 0$

$(A+13)(A-10) = 0$

$A = 10$

$10+11+12+13 = 46$

MAO 1996