(33) POPULATION GROWTH, r% per year

ACT Practice 2007-2008 Sample Test

CONTINUED

$$P(t) = P_0\left(1 + \frac{r}{100}\right)^t$$

t years

P_0 initial population

SAN JOSE = 782,000 IN 1990

$r = 5\%$ per year $\Rightarrow \frac{5}{100} = .05$

Find expression of $P(t)$ in 2000 $\Rightarrow$ 10 years later

$$\boxed{P(t) = 782{,}000(1.05)^{10}}$$ (C) ✓

(34) .10 per min 7pm - 7am M-F, ALL DAY SATURDAY, ALL DAY HOLIDAYS $\Rightarrow \frac{1}{10}$

.05 per min ALL DAY SUNDAY $\Rightarrow \frac{1}{20}$

.25 per min all other $\Rightarrow \frac{1}{4}$

TOTAL of Calls: 8 min @ 5pm TUES $\Rightarrow 8\left(\frac{1}{4}\right) = \$2$

10 min @ 10:30 AM WED $\Rightarrow 10\left(\frac{1}{4}\right) = \$2.50$

THANKSGIVING 15 min $\Rightarrow 15\left(\frac{1}{10}\right) = \$1.50$

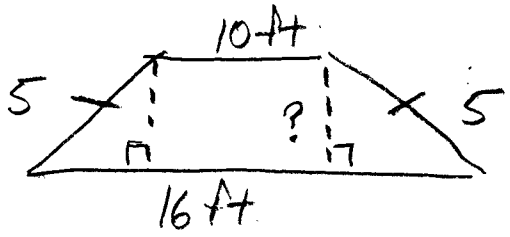
17 min SATURDAY $\Rightarrow 17\left(\frac{1}{10}\right) = \$1.70$

22 min SUNDAY $\Rightarrow 22\left(\frac{1}{20}\right)$

$\Rightarrow 11\left(\frac{1}{10}\right) = \$1.10$

$\boxed{\$8.80}$ (J) ✓

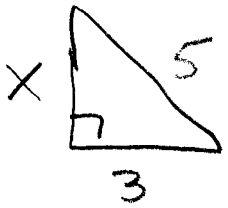
(35)



Isosceles Trapezoid

Find distance between the two sides

3 | 10 | 3



Since $5^2 - 3^2 = x^2$

$25 - 9 = x^2$

$16 = x^2$

$\boxed{4 = x}$ (B) ✓

(36) $3(x+2) > 4(x-3)$

$3x + 6 > 4x - 12$

$-3x \quad -3x$

$6 > x - 12$

$18 > x$

$\therefore \boxed{x < 18}$ (K) ✓

(37)

(1, -5) (4, -3) (?, ?)

MIDPOINT (x, y)

What is $x + y$?

$\frac{1+x}{2} = 4$ $\quad$ $\frac{-5+y}{2} = -3$

$1 + x = 8$ $\quad$ $-5 + y = -6$

$x = 7$ $\quad$ $y = -1$

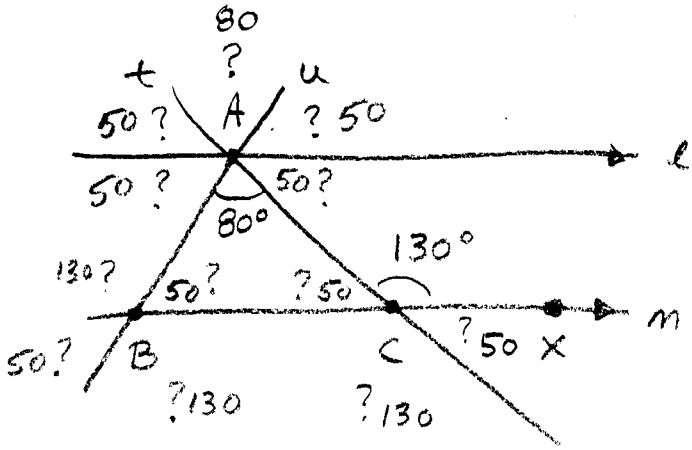
$\therefore \boxed{x + y = 6}$ (C) ✓

(38) $\dfrac{x+1}{x^3-x} = \dfrac{x+1}{x(x^2-1)} = \dfrac{(x+1)}{x(x-1)(x+1)}$

$(x-1)(x+1)$

$= \dfrac{1}{x(x-1)}$ or $\dfrac{1}{x^2-x}$ ✓ (J)

(39)



How many 50° Angles

ℓ } 4@50°

m } 4@50°

8 at 50° (C) ✓

(8 Angles)

(40) Tickets ⇒ $3 for adults ⇒ x axis

$2 for students ⇒ y axis.

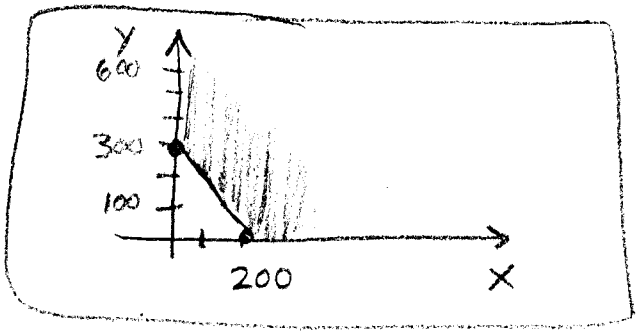
$3x + 2y \geq 600$

$2y \geq -3x + 600$

$y \geq -\frac{3}{2}x + 300$

NOTE

$m = \frac{-300}{200}$ $b = 300$



(H) ✓

(41) MEDIAN ⇒ MIDDLE ⇒ PUT IN ORDER

$N = 7$ ✓

21, 33, 33, **42**, 67, 79, 89

✓ ✓ ✓ ↑ MEDIAN (A) ✓ — — —

☹ (42) $|x|^2 + 2|x| - 3 = 0$

$x^2 + 2x - 3 = 0$

Sum ⇒ 2

prod ⇒ −3

−1 +3

$(x-1)(x+3) = 0 \Rightarrow x = 1, -3$

* $x=1$ $|x|$ is always 1 BUT $|-3|$ is +3 WHICH IS NOT A SOLUTION

∴ ONLY $x = 1$ or $x = |-1|$ will check

∴ $\boxed{x = \pm 1}$ (F)

(43) LINE THROUGH (2,5), $m = -\frac{2}{3}$

$y = mx + b$

$5 = -\frac{2}{3} \cdot 2 + b$

$\frac{15}{3} = 5 = -\frac{4}{3} + b$

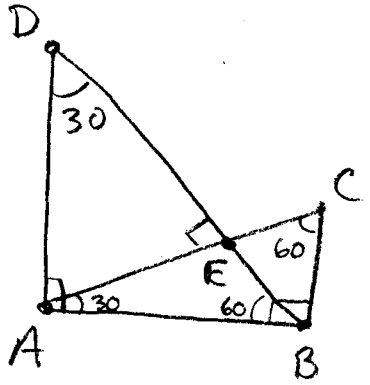
$\frac{19}{3} = 6\frac{1}{3} = b$

$y = -\frac{2}{3}x + 6\frac{1}{3}$

ONLY POINT D IS ON GRAPH OF THIS LINE (5,3) (D) ✓

CK: $3 \stackrel{?}{=} -\frac{2}{3}(5) + \frac{19}{3}$ ✓

(44)

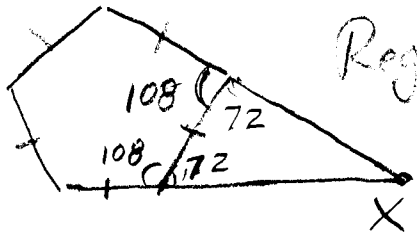


Which ratio of side lengths is equivalent to the ratio of the perimeter of $\triangle ABC$ to the perimeter of $\triangle DAB$

$$\frac{P_{\triangle ABC}}{P_{\triangle DAB}} = \boxed{\frac{\overline{AB}}{\overline{AD}}} = \frac{\overline{BC}}{\overline{AB}} = \frac{\overline{CA}}{\overline{BD}}$$

(F) ✓

(45)



Regular Pentagon

$m\angle X = ?$

Interior Angles $\Rightarrow 180(N-2)$

$* 180(3) = 540^\circ$

Each $\angle \Rightarrow \frac{540}{5} = 108^\circ$

$\therefore m\angle X \Rightarrow 180 - 144 = \boxed{36^\circ}$ (C) ✓

* CK $\triangle = 180$

$\square = 360$

$\pentagon = 540$ ✓

(46) 

6 SIDES @ $3 \cdot 3 = 9 in^2$ per side

$\Rightarrow$ **$54 in^2$** (K) ✓

(47) $(X + .25X) - (X + .25x) .2$

$1.25X - .2X - .050X = 1X$

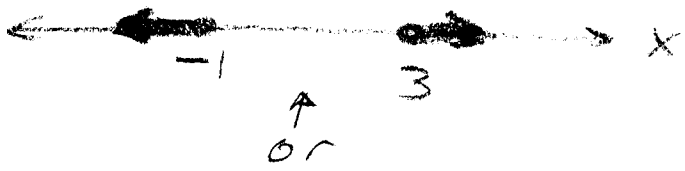
$\therefore$ **FINAL $\Rightarrow$ 100% of original** (C) ✓

(48) $X \cdot Y = 1 \qquad X > 1$ if y is reciprocals

$\therefore$ y MUST BE positive $\Rightarrow y > 0$

AND, y MUST be < 1

$\Rightarrow$ **$0 < y < 1$** (I) ✓

(49) 

or

$X \leq -1$ or $X \geq 3$ (D) ✓

$-1 \geq X \qquad 3 \leq X$

(50) $y = x^2 - 1$

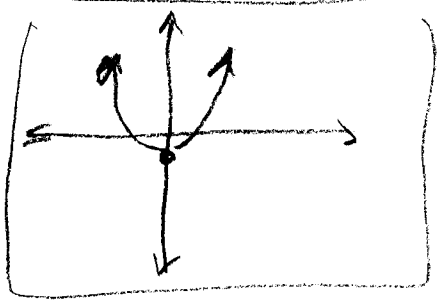
$y = ax^2 + bx + c$

$a = 1 \quad b = 0 \quad c = -1$

Vertex $\Rightarrow x = \frac{-b}{2a} = 0$

x	y
0	-1

Smiley $a = 1$

$\therefore$  (I) ✓

(51) $\left(\frac{2}{3}x\right)^4 = ?$

$\frac{16}{81}x = ?$

1. START WITH 81 $\Rightarrow \quad 81 \cdot \frac{2}{3} = 54$

2. $\quad 54 \cdot \frac{2}{3} = 36$

3 $\quad 36 \cdot \frac{2}{3} = 24$

4 $\quad 12 \cdot \frac{2}{3} = 8$

$\therefore$ MUST START WITH 81 (E) ✓

(52) Consecutive integers m, N where $m < N$

$\text{EVEN}^2 \Rightarrow \text{EVEN}$

$\text{ODD}^2 \Rightarrow \text{ODD}$

$\Rightarrow$ Difference of even/odd always ODD

$\therefore$ $N^2 - m^2$ is ODD (I) ✓

(53) $x > 0 \quad P(x) = x^5 + x^4 - 36x - 36$

$x < 0 \quad P(x) = -x^5 + x^4 + 36x - 36$

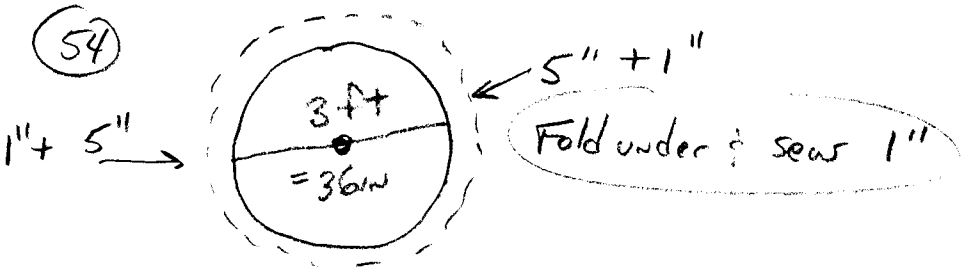
$P(-1) = = -(-1)^5 + (-1)^4 + 36(-1) - 36$

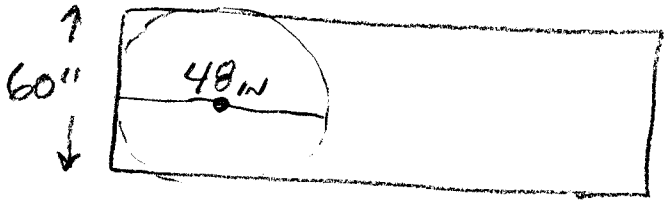
< 0

$+1 + 1 - 36 - 36$

$= \boxed{-70}$ (A) ✓

(54)



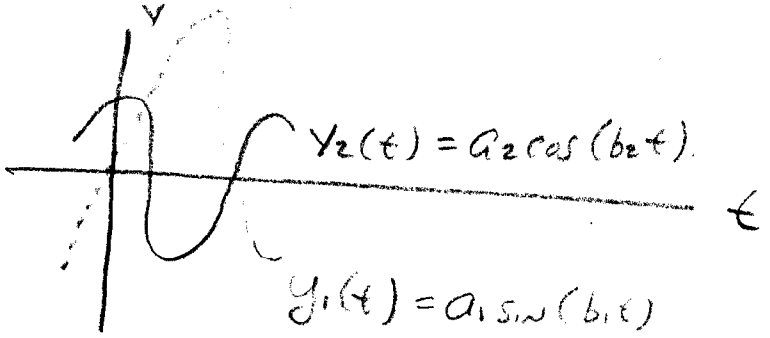


SHORTEST LENGTH OF FABRIC?

$\boxed{48 \text{ in}}$ (K) ✓

(55.) $y_1(t) = a_1 \sin(b_1 t)$ $\quad b_1, b_2$ positive, real numbers

$y_2(t) = a_2 \cos(b_2 t)$



a_1 AND a_2 ARE the AMPLITUDES, $\therefore a_1 > a_2$

$\therefore$

SINCE SIN $\Rightarrow$  AND COS $\Rightarrow$ 

then a_1, a_2 ARE both > 0

$\therefore$ $\boxed{0 < a_2 < a_1}$ (b) ✓

(56) $0 < x < \frac{\pi}{2}$

SINCE $\sin^2 x + \cos^2 x = 1$

$\sin^2 x = 1 - \cos^2 x$

$\cos^2 x = 1 - \sin^2 x$

$$\frac{\sqrt{1-\cos^2 x}}{\sin x} + \frac{\sqrt{1-\sin^2 x}}{\cos x}$$

$$\Rightarrow \frac{\sqrt{\sin^2 x}}{\sin x} + \frac{\sqrt{\cos^2 x}}{\cos x} = 1 + 1 = \boxed{2}$$ (H) ✓

(57) $f(x) = \sqrt{x}$

$g(x) = 7x + b$

$f(g(x)) = \sqrt{7x+b} = y$ THROUGH (4, 6) x, y

$\therefore \sqrt{7(4)+b} = 6$

$\sqrt{28+b} = 6$

SINCE

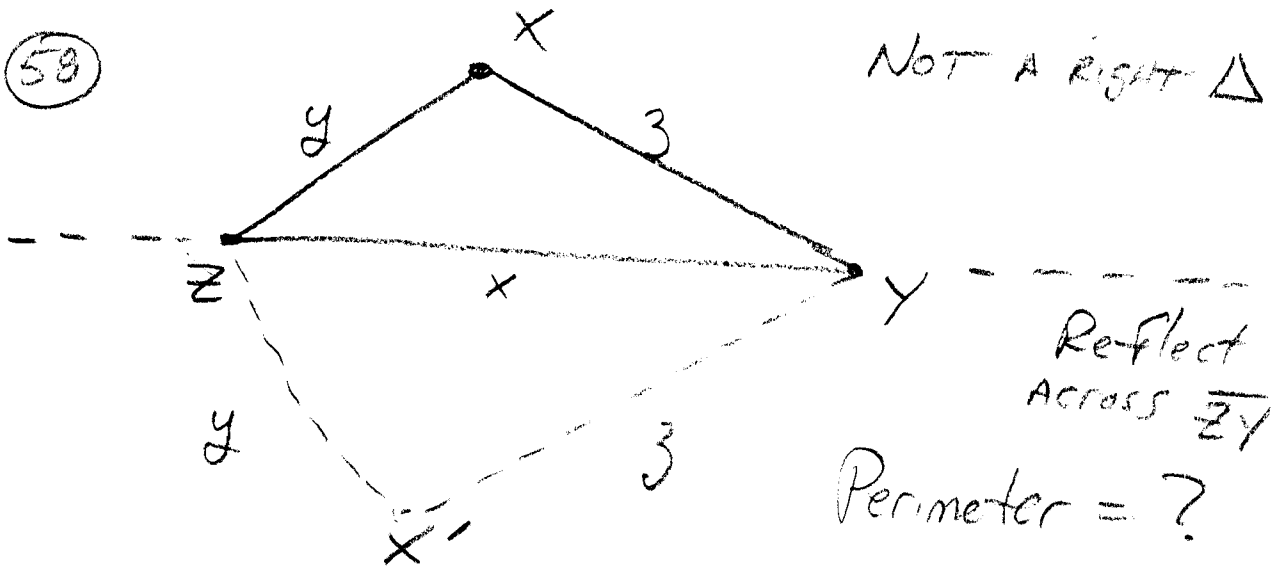
$28+b = 36$

$b = 36-28$

$b = 8$

$\therefore \boxed{b = 8}$ (A) ✓

(58)



NOT A RIGHT △

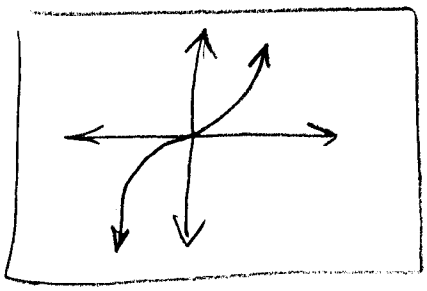
Reflect across $\overline{zy}$

Perimeter = ?

$P = 2y + 2z$ or $\boxed{2(y+3)}$ (K) ✓

(59) Which is odd function ⇒ ↙↗ or ↖↘

and symmetric to origin?



(E) ✓

(60) $\log_2 24 - \log_2 3 = \log_5 x$

$\log_2\left(\frac{24}{3}\right) = \log_5 x$

$\log_2(8) = \log_5 x$

$\log_2(2^3) = 3 = \log_5 x$

$\therefore 5^3 = x$

$\boxed{125 = x}$ (I) ✓