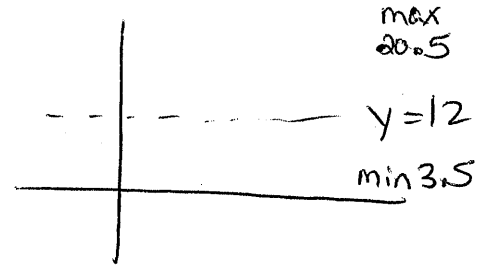**1** Suppose the function $H(t) = 8.5\sin(0.017t - 1.35) + 12$ models the hours of sunlight for a town in Alaska, where $t = 1$ is the first day of the year. Based on the function, what is the **approximate** range of daylight hours for the town?

(A) 3.5 to 20.5

B 4 to 20

C 4.5 to 19.5

D 5 to 19

Amplitude = 8.5

Midline = 12

max 20.5

y = 12

min 3.5

2 A piecewise function is shown below.

$$h(x) = \begin{cases} -2x^2 + 5x + 10 & \text{for } -4 \le x < 3 \\ 2x + 3p & \text{for } 3 \le x \le 5 \end{cases}$$

For what value of p will the function be continuous?

A $\frac{10}{3}$

(B) $\frac{1}{3}$

C $\frac{-25}{3}$

D $\frac{-34}{3}$

X = 3 is a potential problem

X = 3 is where the function might "jump"

Top X = 3
$-2(3)^2 + 5(3) + 10 = 7$

Bottom
$2(3) + 3p = 7$
$3p = 1$
$\boxed{p = \frac{1}{3}}$

3 The third term of a geometric sequence is 96, and the fifth term is 1,536. What is the sum of the first ten terms of this sequence?

A 4,092

B 1,572,864

(C) 2,097,150

D 33,554,400

$a_3 \qquad a_5$

$96, \underline{\quad}, 1536$

$96 \cdot r \cdot r = 1536$

$r^2 = 16$

$r = 4$ (multiply 4 going forward in pattern
Divide 4 if going backward)

$6, 24, 96, \ldots$ now use the S_n formula

$S_{10} = \frac{6(1 - 4^{10})}{(1-4)}$

Try graphing the original, then try $4.7x^{1/9}$, Use the
TABLE !

(4) The equation $y = 4.7x^{\frac{1}{6}}$ is graphed on the coordinate plane. How does increasing the denominator of the exponent transform the graph?

A   The transformed graph will approach a horizontal asymptote while the original graph will not.

B   The transformed graph will not approach a horizontal asymptote while the original graph will.

(C)   The transformed graph will go to ∞ slower than the original graph as the value of x gets larger.

D   The transformed graph will go to ∞ faster than the original graph as the value of x gets larger.

(5) Which function has an amplitude that is twice the size and a period that is three times the size of the function $y = 3\cos\left(\frac{x}{4} - 1\right) + 2$?

*Be careful, if the period is 3 times bigger, that doesn't mean B is! *

(A) $y = 6\sin\left(\frac{x}{12} - 3\right) + 1$

twice the amplitude $= 6$

B $y = \frac{3}{2}\cos\left(\frac{3x}{4} + 1\right) - 3$

$B = \frac{1}{4}$ Period $= \frac{2\pi}{\left(\frac{1}{4}\right)} = 8\pi$

C $y = 6\cos\left(\frac{3x}{4} - 1\right) + 3$

three times bigger $= 24\pi$

D $y = \frac{3}{2}\sin\left(\frac{x}{12} + 3\right) - 1$

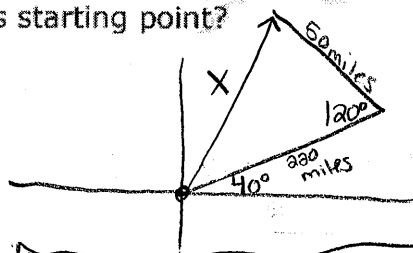$\frac{2\pi}{B} = 24\pi$ $\boxed{B = \frac{1}{12}}$

(6) A plane takes off and travels at an angle of 40° north of east at 110 mph for 2 hours. It then adjusts its path to head 10° west of north and travels in that direction for half an hour at a speed of 100 mph. **Approximately** how far away is the plane from its starting point?

(220 miles)

label the graph in DISTANCE

A   182 miles

B   200 miles

$X^2 = 220^2 + 50^2 - 2(220)(50)\cos(120)$
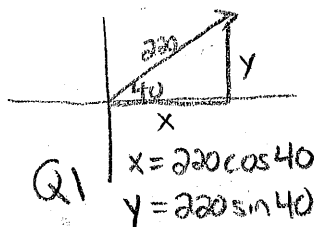
$\boxed{X = 248.79}$

C   238 miles

D   249 miles
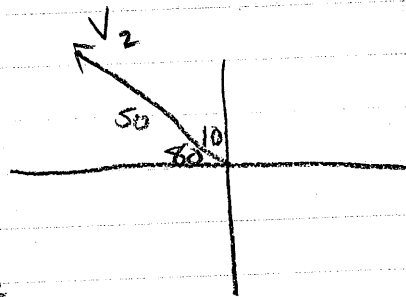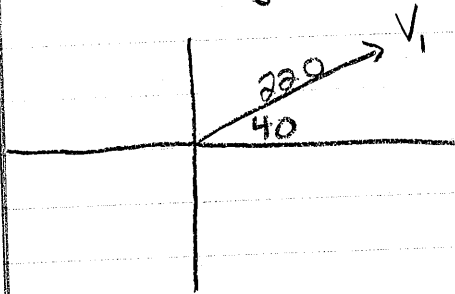
50 miles
X
120°
40°   220 miles

Alternate Solution

Resultant Vector = Vector + Vector

$\langle 168.53, 141.41 \rangle + \langle -8.68, 49.24 \rangle$

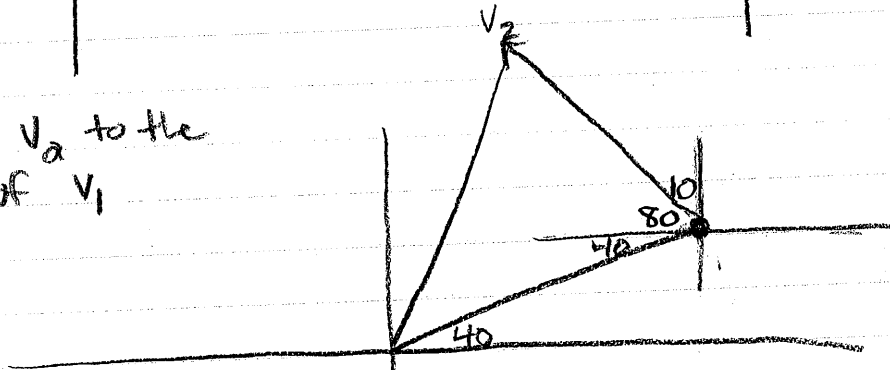$R = \langle 159.85, 190.65 \rangle \rightarrow$ magnitude $= 248.79$

Q1 $x = 220\cos 40$
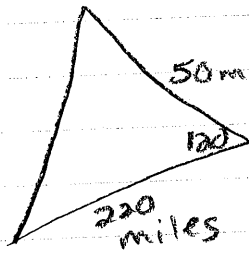$y = 220\sin 40$
220
40
x   y

Q2 $X = 50\sin(10)$
$Y = 50\cos(10)$
50   10
x   Y

#6 Diagram

V_1

220
40

V_2

50
80 10

V_2

10
80
40
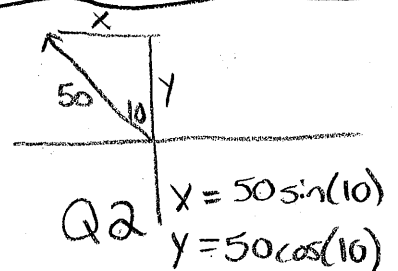
move V_2 to the
end of V_1

40

40=40 alternate interior

50 miles

120

220 miles

SAS
Law of Cosines

7 Which function correctly represents the graph below?

Handwritten: y = 4

Handwritten: Phase Shift "2 boxes" $\frac{\pi}{3}$ right

Handwritten: Since there are 6 boxes, each box is $\frac{\pi}{6}$
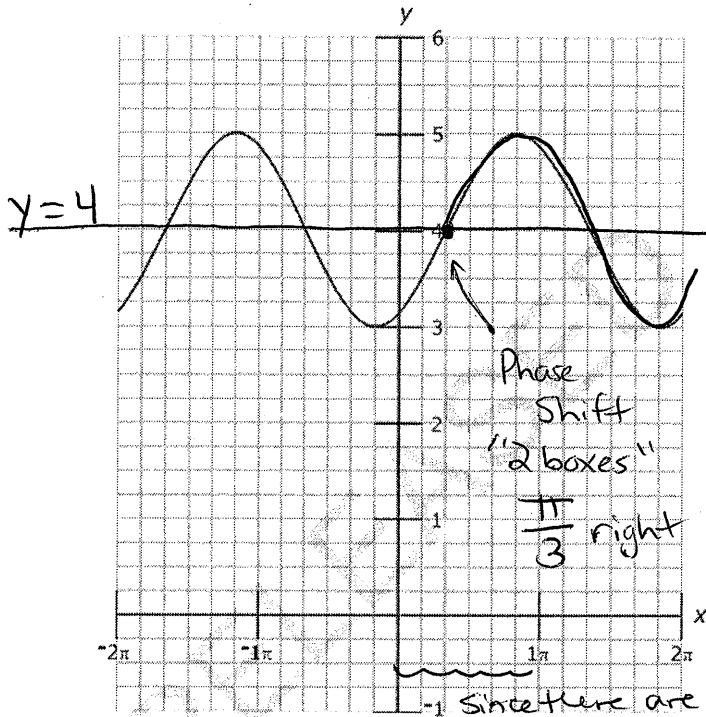
Handwritten: Notice, answer choices are Positive sine and Positive Cosine (midline (maximum)

A $y = \sin\left(x - \frac{\pi}{3}\right) + 4$

B $y = \sin\left(x + \frac{\pi}{3}\right) + 4$

C $y = \cos\left(x - \frac{\pi}{3}\right) + 4$

D $y = \cos\left(x + \frac{\pi}{3}\right) + 4$

8 A Ferris wheel is designed in such a way that the height (h), in feet, of the seat above the ground at any time, t, is modeled by the function

$$h(t) = 60 - 55\sin\left(\frac{\pi}{10}t + \frac{\pi}{2}\right).$$

Handwritten: midline   Amplitude

Handwritten: max 115   y = 60   min 5
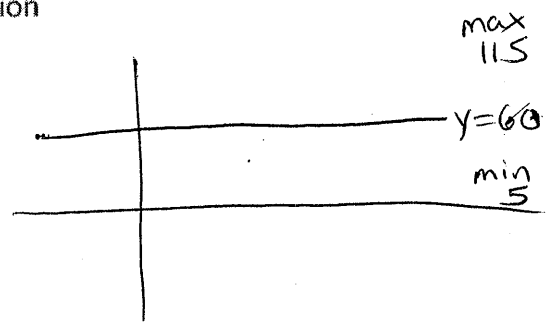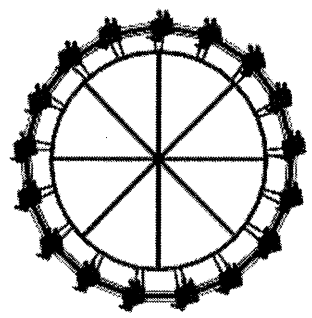
What is the **maximum** height a seat reaches?

A 55 feet

B 60 feet

C 110 feet

D 115 feet

(9) Which statement is true about the fifth terms of the two sequences below?

Explicit $\quad a_n = 3n^2 - 6 \quad$ $\underline{-3} \quad \underline{6} \quad \underline{21} \quad \underline{42} \quad \underline{69}$ (Plug in 1, 2, 3, ...)

Recursive $\quad b_n = 3(b_{n-1} - 6); \; b_1 = 10 \quad$ $\dfrac{10}{} \quad \dfrac{12}{3(10-6)} \quad \dfrac{18}{3(12-6)} \quad \dfrac{36}{3(18-6)} \quad \dfrac{90}{3(36-6)}$

previous term

~~A~~ The fifth term of the recursive sequence exceeds the fifth term of the explicit sequence by 63.

~~B~~ The fifth term of the explicit sequence exceeds the fifth term of the recursive sequence by 63.

(C) The fifth term of the recursive sequence exceeds the fifth term of the explicit sequence by 21. $\quad 90 - 69 = 21 \checkmark$

D The fifth term of the explicit sequence exceeds the fifth term of the recursive sequence by 21.

(10) Which statement is true about the series shown below?

$$^-4 + {}^-2 + {}^-1 + \dfrac{^-1}{2} + \dfrac{^-1}{4} + \ldots$$

$r = \frac{1}{2}$

(A) The series converges because $|r| < 1$.

B The series diverges because $|r| < 1$.

C The series converges because $|r| > 1$.

D The series diverges because $|r| > 1$.

(11) What is the explicit form of the equation $a_n = a_{n-1} + 2(n-1); \; a_1 = 1$?

~~A~~ $a_n = 2n - 1$

(B) $a_n = n^2 - n + 1$

C $a_n = n^2 - 2n + 2$

D $a_n = 2n^2 - 2n - 1$

$\underline{1}, \; \dfrac{3}{1+2(2-1)}, \; \dfrac{7}{3+2(3-1)}, \; \dfrac{13}{7+2(4-1)}$

previous term | 2nd term a_2 | 3rd term a_3 | 4th term a_4

Now, find an answer choice where
n=2 gives you 3, n=3 gives you 7, etc
n=4 gives you 13