

Selected Response

- | | | | | |
|------|-------|-------|-------|-------|
| 1) C | 6) C | 11) C | 16) A | 21) C |
| 2) A | 7) C | 12) B | 17) D | 22) B |
| 3) C | 8) D | 13) D | 18) C | 23) D |
| 4) A | 9) D | 14) D | 19) B | 24) B |
| 5) D | 10) C | 15) A | 20) D | 25) B |

Constructed Response

1)	$(2n+1)^2 - 5$	or	$(2n-1)^2 - 5$
	$4n^2 + 4n + 1 - 5$		$4n^2 - 4n + 1 - 5$
	$4n^2 + 4n - 4$		$4n^2 - 4n - 4$
	$4(n^2 + n - 1)$		$4(n^2 - n - 1)$

∴ divisible by 4 since 4 can be factored out

∴ When 5 is subtracted from the square of an odd number

the result is divisible by 4

Marking Guide:

1pt - initial expression of $(2n+1)^2 - 5$ or $(2n-1)^2 - 5$ or some other correct expression

1pt - expanding and combining like terms

1pt - factoring out 4

1pt - conclusion

2a)	$n=1$	$n=6$	$n=-5$
	$(1)(2) = 2$	$(6)(2) = 12$	$(-5)(2) = -10$
	$(2)+5 = 7$	$(12)+5 = 17$	$(-10)+5 = -5$
	$(7) \times 4 = 28$	$(17) \times 4 = 68$	$(-5) \times 4 = -20$
	$(28)+30 = 58$	$(68)+30 = 98$	$-20+30 = 10$
	$(58)-18 = 40$	$(98)-18 = 80$	$10-18 = -8$
	$(40) \div 4 = 10$	$(80) \div 4 = 20$	$-8 \div 4 = -2$
	$(10)-8 = 2$	$(20)-8 = 12$	$-2-8 = -10$

Conclusion: Answer is 2n.

Marking Guide

1pt - testing number trick

1pt - drawing accurate conclusion.

$$b) \frac{(2n+5)(4) + 30 - 18}{4} - 8 = \frac{8n+20+12}{4} - 8 = 2n+5+3-8 = 2n$$

Marking Guide:

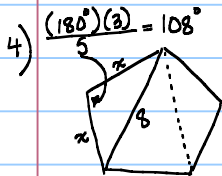
1pt - setting up algebra correctly

1pt - simplification to 2n

3) $m\angle 1 = 90^\circ$ $m\angle 5 = 28^\circ$
 $m\angle 2 = 118^\circ$ $m\angle 6 = 118^\circ$
 $m\angle 3 = 90^\circ$ $m\angle 7 = 128^\circ$
 $m\angle 4 = 98^\circ$ $m\angle 8 = 52^\circ$

Marking Guide

$\frac{1}{2}$ pt - each angle measure



$$8^2 = x^2 + x^2 - 2(x)(x) \cos 108^\circ$$

$$64 = 2x^2 - 2x^2(\cos 108^\circ)$$

$$64 = 2x^2 + 0.618x^2$$

$$64 \doteq 2.618x^2$$

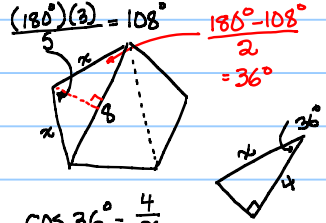
$$24.446 \doteq x^2$$

$$x \doteq 4.9443$$

\therefore Perimeter $\doteq 5(4.9443) = 24.72$ cm

Marking Guide

- $\frac{1}{2}$ pt determining angle for pentagon
- $\frac{1}{2}$ pt setting up equation to find length of side
- $\frac{1}{2}$ pt Solving for length of one side
- $\frac{1}{2}$ pt adding to obtain perimeter



$(180^\circ)(3) = 108^\circ$ $\frac{180^\circ - 108^\circ}{2} = 36^\circ$

$\cos 36^\circ = \frac{4}{x}$

$x = \frac{4}{\cos 36^\circ}$

$x = 4.9443$

OR

\therefore Perimeter $\doteq 5(4.9443) = 24.72$ cm

Marking Guide

- $\frac{1}{2}$ pt determining angle for pentagon
- $\frac{1}{2}$ pt determining base angle of isosceles Δ
- $\frac{1}{2}$ pt setting up equation to find length of side
- $\frac{1}{2}$ pt solving for length of one side
- $\frac{1}{2}$ pt adding to obtain perimeter

5) Statements

Reasons

$m\angle 1 + m\angle 2 + m\angle 3 = 180^\circ$

Angles in Δ add to 180°

$m\angle 3 + m\angle 4 = 180^\circ$

Supplementary Angles/Straight line

$m\angle 1 + m\angle 2 + m\angle 3 = m\angle 3 + m\angle 4$

Both = 180° ; Transitive Property of =

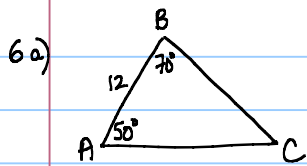
$m\angle 1 + m\angle 2 = m\angle 4$

Subtraction of $m\angle 3$ from both sides

Marking Guide

$\frac{1}{2}$ point - each reason

Note: student's wording should indicate understanding



Yes. Sufficient information. ASA

Marking Guide

1pt - Yes and Reason

b) $\angle C = 180^\circ - (70^\circ + 50^\circ) = 60^\circ$

$$\frac{12}{\sin 60^\circ} = \frac{BC}{\sin 50^\circ} = \frac{AC}{\sin 70^\circ}$$

$$BC = \frac{12 \sin 50^\circ}{\sin 60^\circ} = 10.615$$

$$AC = \frac{12 \sin 70^\circ}{\sin 60^\circ} = 13.021$$

\therefore Perimeter: $12 + 11 + 13 = 36 \text{ cm}$

Marking Guide

1/2 pt - obtaining mLC

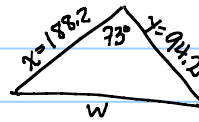
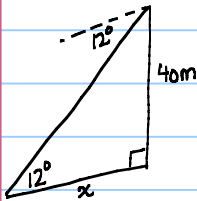
1 pt - setting up law of sines

1 pt - solving BC

1 pt - solving AC

1/2 pt - adding to obtain perimeter

7)



$$\tan 12^\circ = \frac{40}{x}$$

$$x = \frac{40}{\tan 12^\circ} = 188.2$$

$$\tan 23^\circ = \frac{40}{y}$$

$$y = \frac{40}{\tan 23^\circ} = 94.23$$

$$w^2 = 188.2^2 + 94.2^2 - 2(188.2)(94.2)\cos 73^\circ$$

$$w^2 = 33926.3$$

$$w = 184.2 \text{ m}$$

\therefore 184 m apart

Marking Guide:

1/2 pts - setting up and solving for x

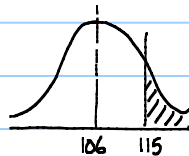
1/2 pts - setting up and solving for y

1/2 pt - obtaining angle of 73°

1 pt - using law of cosines

1/2 pt - obtaining answer

8a)



$$z = \frac{115 - 106}{10.5} = 0.857$$

ANS.

Using chart: 19.5% (2487)

Using calculator: 19.6% (2500)

Marking Guide

1 pt - finding z-score or showing script if z-score on calc. used

1 pt - for % related to z-score (shaded region)

1 pt - mult to find solution



$$z = 1.28 \quad 1.28 = \frac{100 - 85}{\sigma}$$

$$1.28\sigma = 15$$

$$\sigma = \frac{15}{1.28}$$

$$\sigma = 11.72$$

Marking Guide

1pt - for z-score associated with 10% (90%)

1pt - using z-score formula

1pt - determining standard deviation

9a) margin of error

$$\frac{47.2 - 34.5}{2} = \frac{12.7}{2} = 6.35$$

Marking Guide

1pt - margin of error calculation

b) Sample mean

$$34.5 + 6.35 = 40.85$$

$$\text{or } 47.2 - 6.35 = 40.85$$

$$\text{or } \frac{34.5 + 47.2}{2} = 40.85$$

1pt - Sample mean calculation

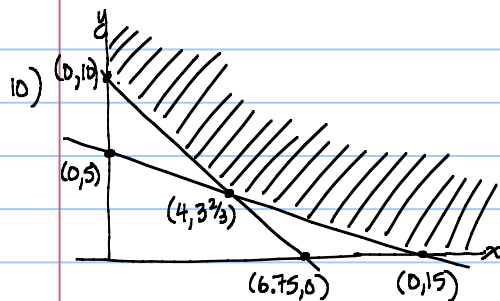
c) (i) no change

(ii) larger

$\frac{1}{2}$ pt - each answer

d) Margin of error reduces so confidence interval is narrower

1pt - correct answer



Marking Guide

2pts - obtaining region with shading

1pt - cost function

$\frac{1}{2}$ pts - determining pt of intersection $(4, 3\frac{2}{3})$

$$C = 12x + 8y$$

$$\text{Vertices: } (0, 9) \quad C = 12(0) + 8(9) = \$72$$

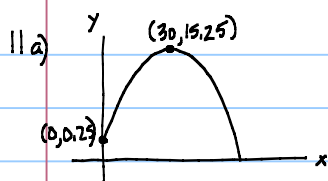
$$(4, 3\frac{2}{3}) \quad C = 12(4) + 8(3\frac{2}{3}) = \$77.33$$

$$(15, 0) \quad C = 12(15) + 8(0) = \$180.$$

1pt - plugging in appropriate vertices

$\frac{1}{2}$ pt - answer

\therefore Use all type Y to minimize cost.



$$y = k(x-30)^2 + 15.25$$

$$(0, 0.25): 0.25 = k(-30)^2 + 15.25$$

$$-15 = 900k$$

$$-\frac{1}{60} = k$$

$$\therefore y = -\frac{1}{60}(x-30)^2 + 15.25$$

Marking Guide

1 pt - for vertex in equation

$\frac{1}{2}$ pt - subbing in $(0, 0.25)$

$\frac{1}{2}$ pt - solving for k

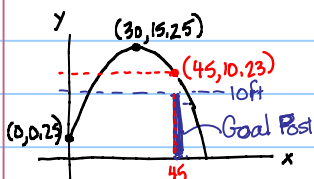
1 pt - equation

b) $x = 45$ find y

$$y = -\frac{1}{60}(45-30)^2 + 15.25$$

$$y = 10.25$$

\therefore It does clear
the goal post.



OR $y = 10$ find x

$$10 = -\frac{1}{60}(x-30)^2 + 15.25$$

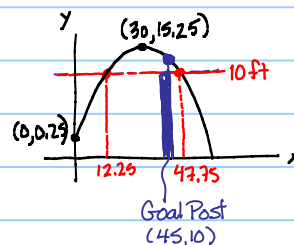
$$-5.25 = -\frac{1}{60}(x-30)^2$$

$$315 = (x-30)^2$$

$$\pm 17.75 = x-30$$

$$x = 30 \pm 17.75$$

$$x = 12.25 \text{ or } x = 47.75$$



Marking Guide

1 pt - letting $x=45$ to solve for y
or letting $y=10$ to solve for x

1 pt - plugging into equation and
solving

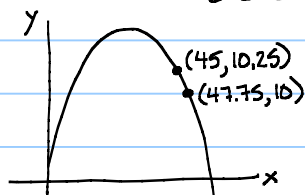
1 pt - answer based on result

Marking Guide

2 pts - Indicating one of either
 $(45, 10.25)$ or $(47.75, 10)$
on graph

1 pt - answer based on result

OR Graphically:



$$12) \quad y = a(x-r)(x-s)$$

$$y = a(x+1)(x-6)$$

$$-12 = a(5+1)(-12-6)$$

$$-12 = a(6)(-18)$$

$$-12 = a(-108)$$

$$\frac{1}{9} = a$$

$$\therefore \text{Eqn is: } y = \frac{1}{9}(x+1)(x-6)$$

Marking Guide

1pt: $y = a(x+1)(x-6)$

$\frac{1}{2}$ pt: substituting $x=5; y=-12$

$\frac{1}{2}$ pt: $a = \frac{1}{9}$

1pt: final answer

$$13) \quad y = a(x-r)(x-s)$$

$$y = a(x)(x-6); a=1$$

$$y = (x)(x-6)$$

$$y = a(x-h)^2 + k$$

$$y = a(x-3)^2 - 9; a=1$$

$$y = (x-3)^2 - 9$$

$$y = ax^2 + bx + c$$

$$a=1$$

$$b=-6$$

$$c=0$$

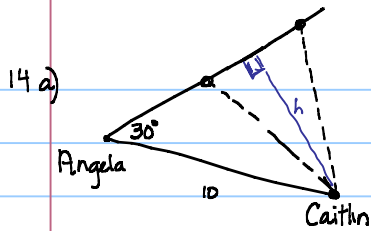
$$\therefore y = x^2 - 6x$$

Marking Guide

1pt: factored form

1pt: vertex form

1pt: standard form



$$\sin 30^\circ = \frac{h}{10}$$

$$h = 10 \sin 30^\circ$$

$$h = 5 \text{ km}$$

Leticia's house is 5 km
or more from Caitlin's house

Marking Guide

1 pt - setting up to
find minimum distance

1 pt - answer

b)

$$0 = x^2 - 17.3x + 51$$

$$x = \frac{17.3 \pm \sqrt{(-17.3)^2 - 4(1)(51)}}{2(1)}$$

$$= \frac{17.3 \pm \sqrt{95.29}}{2}$$

$$= \frac{17.3 \pm 9.76}{2} \begin{matrix} \nearrow 3.77 \\ \searrow 13.53 \end{matrix}$$

\therefore Leticia lives 3.77 km or 13.53 km
from Angela's house.

Marking Guide

1 pt - using quadratic
formula

$\frac{1}{2}$ pt - solving correctly

$\frac{1}{2}$ pt - conclusion

15 a) y-intercept is (0, 1470)
this means at $t=0$ sec
the height of the spider is 1470 cm
or 1.47 m.

Marking Guide

$\frac{1}{2}$ pt - y-intercept

$\frac{1}{2}$ pt - description

b)

$$h(t) = 0$$

$$-490t^2 + 980t + 1470 = 0$$

$$t^2 - 2t - 3 = 0$$

$$(t-3)(t+1) = 0$$

$$t-3=0 \quad t+1=0$$

$$t=3 \quad t=-1$$

$$t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$t = \frac{-980 \pm \sqrt{3841600}}{-980}$$

$$t = \frac{-980 \pm 1960}{-980}$$

$$t = -1 \text{ or } t = 3$$

Marking Guide

$\frac{1}{2}$ pt - $h(t) = 0$

1 pt - factor or
quadratic
formula

$\frac{1}{2}$ pt - answer

\therefore frog hits water after 3 sec.

c)

$$t = \frac{-b}{2a} = \frac{-980}{-980} = 1$$

$$\frac{3+1}{2} = \frac{2}{2} = 1$$

$$h(1) = -490(1)^2 + 980(1) + 1470$$

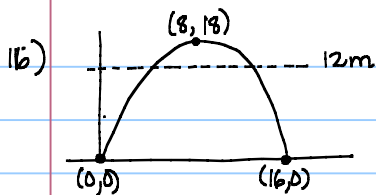
$$h(1) = 1960 \text{ cm or } 1.96 \text{ m}$$

$$h(1) = 1960 \text{ cm} = 1.96 \text{ m}$$

Marking Guide

1 pt - using $x = -\frac{b}{2a}$
or average x-int
to find $x = 1$

1 pt - subbing in to
find $h(1)$



$$y = k(x)(x-16)$$

$$(8, 18): 18 = k(8)(8-16)$$

$$18 = k(8)(-8)$$

$$18 = -64k$$

$$-\frac{9}{32} = k$$

$$\therefore y = -\frac{9}{32}(x)(x-16)$$

$$y=12: 12 = -\frac{9}{32}(x)(x-16)$$

$$384 = -9(x^2 - 16x)$$

$$384 = -9x^2 + 144x$$

$$9x^2 - 144x + 384 = 0$$

$$x = \frac{144 \pm \sqrt{6912}}{18}$$

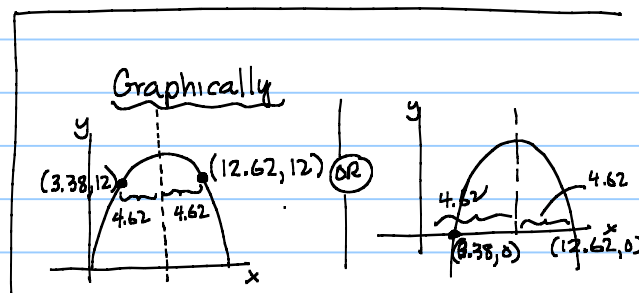
$$x = \frac{144 \pm 83.14}{18}$$

12.62m
3.38m

$$12.62 - 8 = 4.62 \text{ m}$$

$$\text{or } 8 - 3.38 = 4.62 \text{ m}$$

\therefore Lights are approx
4.62 m from center
of tunnel.



Marking Guide

1 pt - for factored form of equation

$\frac{1}{2}$ pt - for subbing in vertex

$\frac{1}{2}$ pt - solving for k

1 pt - for equation

$\frac{1}{2}$ pt - letting $y=12$

$\frac{1}{2}$ pt - setting equation to zero

1 pt - using quadratic formula and solving for x

$\frac{1}{2}$ pts

Either graph $y = -\frac{9}{32}(x)(x-16)$

and $y_2 = 12$ to find

intersection points

OR graph $y = -\frac{9}{32}(x)(x-16) - 12$

to find x-intercepts

1 pt - subtracting to find distance from center of tunnel

17) $1500 + 80(16) = 2780$ altitude

$$2780 - 2000 = 780 \text{ ft to go down}$$

$$\frac{780}{90} = 8\frac{2}{3} \text{ min}$$

$$7 \text{ am} + \underbrace{16 \text{ min} + 35 \text{ min}}_{59\frac{2}{3} \text{ min}} + 8\frac{2}{3} \text{ min}$$

$$7:59:40 \text{ am}$$

Marking Guide

$\frac{1}{2}$ pt - $(80)(16)$

$\frac{1}{2}$ pt - cruising altitude

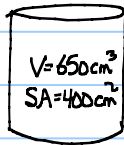
$\frac{1}{2}$ pt - obtaining necessary distance to go down

$\frac{1}{2}$ pt - dividing by 90

$\frac{1}{2}$ pt - adding times

$\frac{1}{2}$ pt - final answer

18)



$$\frac{520}{650} = 0.8$$

New can is 80% volume

Scale factor:

$$k^3 = 0.8$$

$$k = \sqrt[3]{0.8}$$

$$k = 0.9283$$

$$SA = k^2(400)$$

$$= 344.71 \text{ cm}^2$$

Marking Guide

1 pt - dividing to obtain 0.8

1 pt - scale factor, k

1 pt - mult SA by k^2 19) $1.2 - 2(0.3) = 0.6$ ← diameter of center

$$V_{\text{scale}} = \pi R^2 h - \pi r^2 h$$

$$= \pi (0.6)^2 (5.4) - \pi (0.3)^2 (5.4)$$

$$= 4.58 \text{ m}^3$$

$$V_{\text{Actual}} = (3)^3 (4.58)$$

$$= 123.66 \text{ m}^3$$

$$(5.4)(3) = 16.2 \text{ m}$$

$$(0.6)(3) = 1.8 \text{ m}$$

$$\text{OR } (0.3)(3) = 0.9 \text{ m}$$

$$V_{\text{ACTUAL}} = \pi R^2 h - \pi r^2 h$$

$$= \pi (1.8)^2 (16.2) - \pi (0.9)^2 (16.2)$$

$$= 123.66 \text{ m}^3$$

Marking Guide

½ pt for radius of center

1½ pts calculation of volume of scale model

1 pt mult by $(3)^3$ Marking Guide

½ pt for radius of center

1 pt for mult dimensions by 3

1½ pts calculation of volume actual pipe

20a) $14'' \times \frac{3}{4} = 10\frac{1}{2}''$

$$9'' \times \frac{3}{4} = 6\frac{3}{4}''$$

Marking Guide½ pt each $10\frac{1}{2}''$ and $6\frac{3}{4}''$

1 pt squaring scale factor

b) $(\frac{3}{4})^2 = \frac{9}{16} \approx 0.56$