Mathematics 11 - Sample Exam Marking Guide

Note Title 1/1/2015

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	
4) A	9) D	14) D	19) B	
5) D	10) C	15) A	20) D	

Constructed Response

1) $(2n+1)^2 - 5$ OR $(2n-1)^2 - 5$

$4n^2 + 4n + 1 - 5$ $4n^2 - 4n + 1 - 5$

$4n^2 + 4n - 4$ $4n^2 - 4n - 4$

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

$\therefore$ divisible by 4 since 4 can be factored out

$\therefore$ 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)x4=28	(17)x4=68	(-5)x4=-20
(28)+30=58	(68)+30=98	-20+30=10
(58)-18=40	(98)-18=80	10-18=-8
(40)÷4=10	(80)÷4=20	-8÷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) $\frac{(2n+5)(4)+30-18}{4} - 8 = \frac{8n+20+12}{4} - 8 = 2n+5+3-8 = \boxed{2n}$

Marking Guide:

(1pt) - setting up algebra correctly

(1pt) - simplification to 2n

3) $m\angle 1 = 90^\circ$ $m\angle 5 = 28^\circ$

$m\angle 2 = 118^\circ$ $m\angle 6 = 118^\circ$

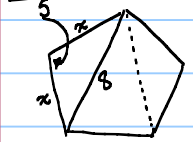
$m\angle 3 = 90^\circ$ $m\angle 7 = 128^\circ$

$m\angle 4 = 98^\circ$ $m\angle 8 = 52^\circ$

Marking Guide

½ pt - each angle measure

4) $\frac{(180^\circ)(3)}{5} = 108^\circ$



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

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

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

$64 \div 2.618x^2$

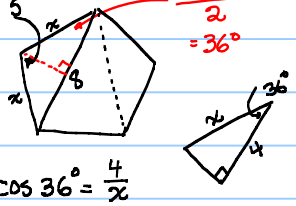
$24.446 \div x^2$

$x \div 4.9443$

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

OR

$\frac{(180^\circ)(3)}{5} = 108^\circ$ $\frac{180^\circ - 108^\circ}{2} = 36^\circ$



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

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

$x = 4.9443$

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

Marking Guide

- 1 pt determining angle for pentagon
- 1 pt setting up equation to find length of side
- 1½ pt solving for length of one side
- ½ pt adding to obtain perimeter

Marking Guide

- 1 pt determining angle for pentagon
- ½ pt determining base angle of isosceles Δ
- 1 pt setting up equation to find length of side
- 1 pt solving for length of one side
- ½ pt adding to obtain perimeter

5)

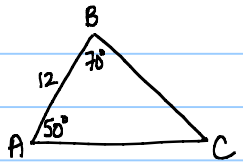
Statements	Reasons
$m\angle 1 + m\angle 2 + m\angle 3 = 180^\circ$	Angles in Δ add to 180°
$m\angle 3 + m\angle 4 = 180^\circ$	Supplementary Angles/Straight line
$m\angle 1 + m\angle 2 + m\angle 3 = m\angle 3 + m\angle 4$	Both = 180°; Transitive Property of =
$m\angle 1 + m\angle 2 = m\angle 4$	Subtraction of $m\angle 3$ from both sides

Marking Guide

1 point - each reason

Note: student's wording should indicate understanding

6a)



Yes. Sufficient information. ASA

Marking Guide

(1pt) - Yes and Reason

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

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

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

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

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

Marking Guide

(½pt) - obtaining m∠C

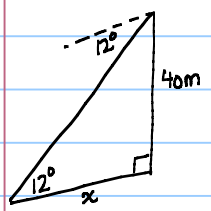
(1pt) - setting up law of sines

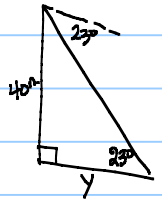
(1pt) - solving BC

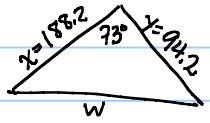
(1pt) - solving AC

(½pt) - adding to obtain perimeter

7)







$$\tan 12° = \frac{40}{x}$$

$$x = \frac{40}{\tan 12°} = 188.2$$

$$\tan 23° = \frac{40}{y}$$

$$y = \frac{40}{\tan 23°} = 94.23$$

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

$$w^2 = 33926.3$$

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

$\therefore$ 184 m apart

Marking Guide:

(1½pts) - Setting up and solving for x

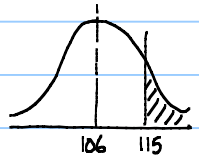
(1½pts) - setting up and solving for y

(½pt) - obtaining angle of 73°

(1pt) - using law of cosines

(½pt) - obtaining answer

8a)



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

ANS.

Using chart : 19.5% (2487)

Using calculator : 19.6% (2500)

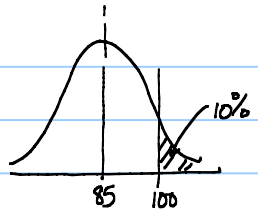
Marking Guide

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

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

(1pt) - mult to find solution

8b)



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

$1.28\sigma = 15$

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

$\sigma = 11.72$

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

$34.5 + 6.35 = 40.85$

or $47.2 - 6.35 = 40.85$

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

(1pt) - sample mean calculation

c) (i) no change

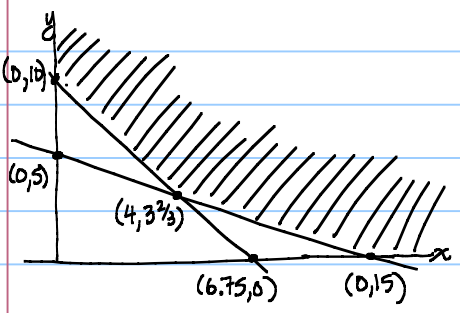
(ii) larger

(½ pt) - each answer

d) Margin of error reduces so confidence interval is narrower

(1pt) - correct answer

10)



Marking Guide

(2pts) - obtaining region with shading

(1pt) - cost function

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

(1pt) - plugging in appropriate vertices

(½pt) - answer

$C = 12x + 8y$

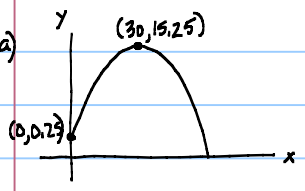
Vertices: $(0,9)$ $\quad C = 12(0) + 8(9) = \$72$

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

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

∴ Use all type Y to minimize cost.

11 a)



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

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

$-15 = 900k$

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

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

Marking Guide

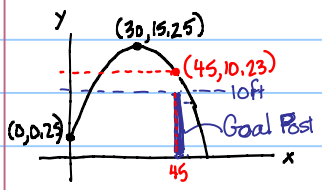
- (1 pt) - for vertex in equation
- ($\frac{1}{2}$ pt) - subbing in $(0, 0.25)$
- ($\frac{1}{2}$ pt) - solving for k
- (1 pt) - equation

b) $x = 45$ find y

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

$y = 10.23$

$\therefore$ It does clear the goal post.



OR

$y = 10$ find x

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

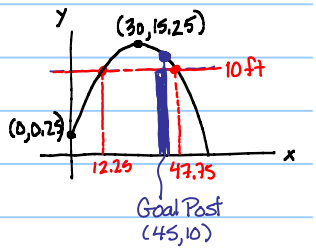
$-5.25 = -\frac{1}{60}(x-30)^2$

$315 = (x-30)^2$

$\pm 17.75 = x - 30$

$x = 30 \pm 17.75$

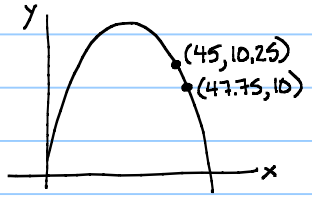
$x = 12.25$ or $x = 47.75$



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

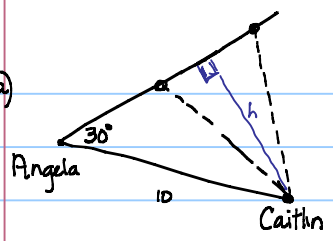
OR Graphically:



Marking Guide

- (2 pts) - Indicating one of either (45, 10.25) or (47.75, 10) on graph
- (1 pt) - answer based on result

12a)



Marking Guide

(1 pt) - setting up to find minimum distance

(1 pt) - answer

$\sin 30° = \frac{h}{10}$

$h = 10 \sin 30°$

$h = 5$ km

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

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

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

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

$= \frac{17.3 \pm 9.76}{2}$ → 3.77, 13.53

Marking Guide

(1 pt) - using quadratic formula

(½ pt) - solving correctly

(½ pt) conclusion

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

13a) y-intercept is (0, 1470)

this means at t=0sec the height of the spider is 1470cm or 1.47 m.

Marking Guide

(½ pt) - y-intercept

(½ pt) - description

b) $h(t) = 0$

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

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

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

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

$t = 3 \quad t = -1$

OR

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

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

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

$t = -1$ or $t = 3$

∴ frog hits water after 3 sec.

Marking Guide

(½ pt) - $h(t) = 0$

(1 pt) - factor or quadratic formula

(½ pt) - answer

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

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

$h(1) = 1960$ cm or 1.96m

OR

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

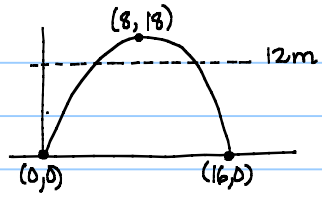
$h(1) = 1960$cm $= 1.96$m

Marking Guide

(1 pt) - using $x = -b/2a$ or average x-int to find $x = 1$

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

13)



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

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

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

$18 = -64k$

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

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

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

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

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

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

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

$x = \frac{144 \pm 83.14}{18}$ → 12.62m, → 3.38m

$12.62 - 8 = 4.62$ m

or $8 - 3.38 = 4.62$ m

∴ Lights are approx 4.62 m from center of tunnel.

Marking Guide

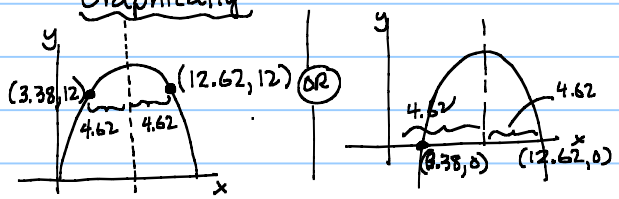
- (1 pt) - for factored form of equation
- (½ pt) - for subbing in vertex
- (½ pt) - solving for k
- (1 pt) - for equation
- (½ pt) - letting $y = 12$
- (½ pt) - setting equation to zero
- (1 pt) - using quadratic formula and solving for x

(solved with quadratic formula)

- (1½ pts) - Either graph $y_1 = \frac{-9}{32}(x)(x-16)$ 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

(solving by graphing)

Graphically



14) $1500 + 80(16) = 2780$ altitude

$2780 - 2000 = 780$ ft to go down

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

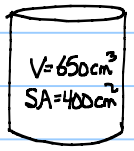
$7\text{am} + \underbrace{16\text{min} + 35\text{min} + 8\frac{2}{3}\text{min}}_{59\frac{2}{3}\text{min}}$

7:59:40 am

Marking Guide

- (½ pt) - (80)(16)
- (½ pt) - cruising altitude
- (½ pt) - obtaining necessary distance to go down
- (½ pt) - dividing by 90
- (½ pt) - adding times
- (½ pt) - final answer

15)



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

Marking Guide
- (1 pt) - dividing to obtain 0.8
- (1 pt) - scale factor, k
- (1 pt) mult SA by k^2

New can is 80% volume

Scale factor:

$k^3 = 0.8$

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

$k = 0.9283$

$SA = k^2(400)$

$= 344.71\ cm^2$

16) $1.2 - 2(0.3) = 0.6$ ← diameter of center

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

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

$= 4.58\ m^3$

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

$= 123.66\ m^3$

Marking Guide
- (½ pt) for radius of center
- (1½ pts) calculation of volume of scale model
- (1 pt) mult by $(3)^3$

$(5.4)(3) = 16.2\ m$

$(0.6)(3) = 1.8\ m$

OR $(0.3)(3) = 0.9\ m$

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

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

$= 123.66\ m^3$

Marking Guide
- (½ pt) for radius of center
- (1 pt) for mult dimensions by 3
- (1½ pts) calculation of volume actual pipe