MOCK EXAM 1 - PAPER 2 SOLUTIONS

Given during Review Sessions

(from May 2016)

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1 (a) $a = 4.2$ $b = 74$ A1 A1

(b) i $\bar{x} = 5.91$ (km) A1

ii $\bar{y} = 88$ (micrograms per m^3) A1

iii $r = -0.956$ G2

↖ From GDC

c) from GDC → $y = (-5.3945...)x + 119.852...$

$y = -5.39x + 120$ A1 A1

d) i $y = (-5.38955...)(14) + 119.852$

$= 44.4$ (44.3984) A1 G2

ii Ernesto's estimate is not reliable because 14 km is an extrapolation A1 R1

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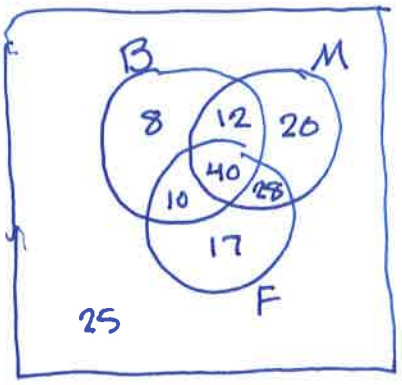
12 total

2 (a.)



Marks

A1 for labeled sets B, M, F inside universal set

A1 for 40 in central area

A1 Correct 10, 12, 28

A1 for 8, 20, 17

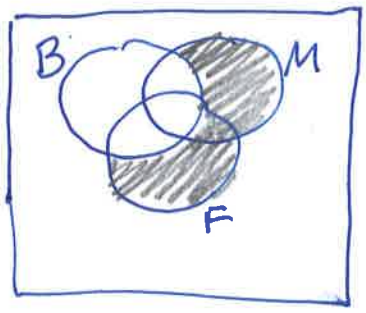
A1 for 25

(b) $8 + 12 + 20 + 10 + 40 + 28 + 17 + 25$

$= 160$

M1 A1 (FT) or G2

(c) i.



A1

ii $n((F \cup M) \cap B') = 20 + 28 + 17 = 65$

or $(100 + 95 - 68) - (10 + 40 + 12) = 65$

M1 A1 (G2)

(d) i $P(\text{student downloaded music}) = \frac{100}{160}$ (or $\frac{5}{8}$ or .625 or 62.5%) A1A1

ii $P(\text{downloaded books} / \text{given that they had not downloaded films}) = \frac{20}{65}$ or equivalent A1A1

iii $P(\text{student downloaded at least two}) = \frac{90}{160}$ or equivalent A1 A1

e) Expected number downloading music $= \frac{100}{160} \times 850 = 531.25$

$= 531$

TOTAL 18

3 $h(t) = -0.2t^2 + 16t + 12$ for $t \geq 0$

(a) initial height at firing $h(0) = 12$ **12 m** A1

(b) $h(15) = -0.2(15)^2 + 16(15) + 12$ M1 A1

$= \boxed{207 \text{ m}}$

(c) Find value of k (#seconds till it landed in water)

$0 = -.2t^2 + 16t + 12$ M1

solve by graphing or other methods

$t =$ **80.7 seconds** (80.7430) A1 G2

← Answer

(d) Find $h'(t) = -0.4t + 16$ A1 A1

(e) i maximum height when tangent is flat (when gradient is 0)

Set $h'(t) = 0$ $0 = -.4t + 16$ M1

solve

$t =$ **40 sec**

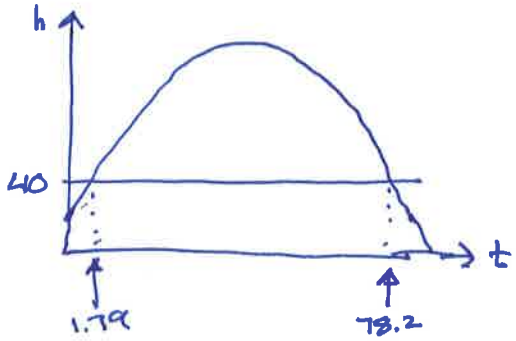
ii $f(40) = -.2(40)^2 + 16(40) + 2$ M1

$= \boxed{332 \text{ meters}}$ A1

↓

3 CONTINUED

(f)



Set $h(t) = 40$

$-.2t^2 + 16t + 12 = 40$ M1

solve

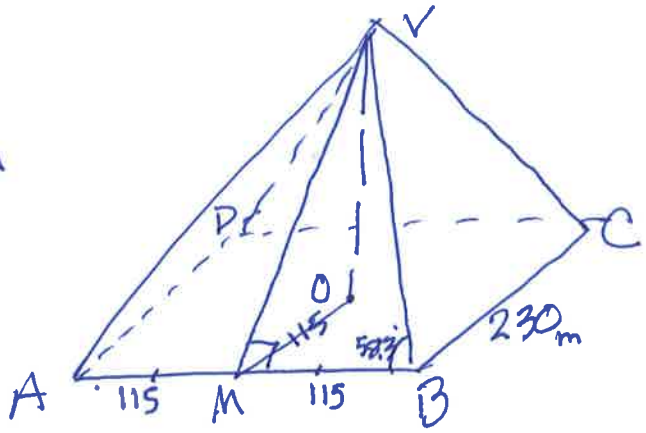
$t = 1.79$ sec (1.79005....)

$t = 78.2$ sec (78.2099.....)

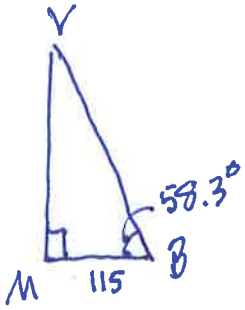
Time for visibility $78.2 - 1.79 = 76.4$ (76.4195) A1 A1 or GR

13 total

4



(a)



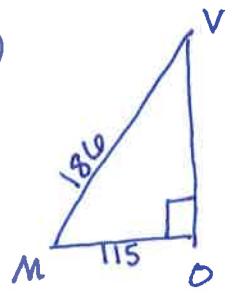
$\tan 58.3^\circ = \frac{VM}{115}$ A1M1

$VM = 115 \tan 58.3^\circ$

$= 186.200 = 186$ A1

3 s.f.

(b)



Pythag. Theorem

$VO^2 = 186^2 + 115^2$ M1 A1

$VO = 146\text{ m}$ $(146.188\ldots)$

(c) Volume $= \frac{1}{3}(230 \times 230)(146.188\ldots)$ M1

height

$= 2,580,000\text{ m}^3$ $(2577785\ldots)$ A1

(d) 2.58×10^6 (m^3) A1 A1

(e)

$V = 1 \times 5 \times 430000$ M1

$= 2,150,000\text{ m}^3$ A1

which is less than volume of pyramid R1

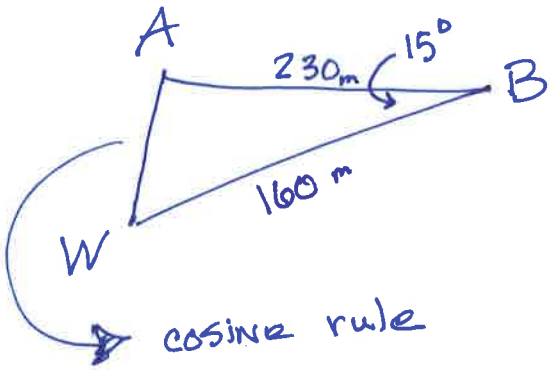
so Ahmad is correct. A1

↓

4 continued

(f)

(i)



cosine rule

$AW^2 = 160^2 + 230^2 - 2(160)(230)(\cos 15^\circ)$ M1 A1

$AW^2 = 7407.8591.....$

$AW = \boxed{86.1\text{ m}}$ $(86.0689.....)$ A1 or C2

(ii) Area of Shadow

$A = \frac{1}{2}ab\sin C = \frac{1}{2}(230)(160)(\sin 15^\circ)$ M1 A1

$= \boxed{4760\text{ m}^2}$ $(4762.27.....\text{m}^2)$ A1 C2

to 3 s.f.

19 marks total

5

(a) (i) Antonio $8000 + 450 = 8450$ (euro) A1

(ii) Barbara $8000(1.05) = 8400$ (euro) M1 A1 G3

(b) (i) ANTONIO $8000 + 450(n-1)$ M1 A1

(ii) $8000(1.05)^{n-1}$ M1 A1

(c) $8000 + 450(n-1) \geq 8000(1.05)^{n-1}$ M1

$n = 16$ years A1

(d) (i) Barbaras total (sum) for 15 years

$$S_{15} = \frac{u_1(r^n - 1)}{r - 1} = \frac{8000(1.05^{15} - 1)}{1.05 - 1}$$ M1 A1

$$= \boxed{173000 \text{ (euro)}} \quad (172629.....)$$ A1 G2 only

(ii) ANTONIO $S_{15} = \frac{n}{2}[2u_1 + d(n-1)] = \frac{15}{2}[2(8000) + 450(15-1)]$ M1 A1

$= \boxed{167000 \text{ (euro)}}$ (167250) A1

Antonio does not earn more than Barbara A1

16 total

6 $f(x) = 4 \times 2^{-x} + 1.5x - 5$

which is equal to $\frac{4}{2^x} + 1.5x - 5$

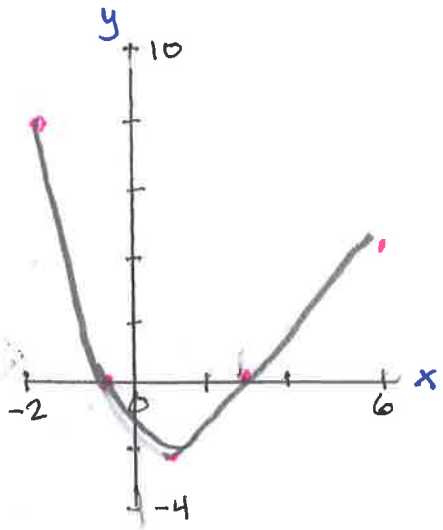
a) $f(0) = \frac{4}{2^0} + 1.5(0) - 5 = -1$ M1 A1 or G2

b) Using GDC Solve $\frac{4}{2^x} + 1.5x - 5 = 0$

$x = -0.538$ and $x = 3$ A1 A1

$(-.537670\ldots)$

c)



A1 for labels and some indication of scale

A1 for smooth curve with correct general shape with $f(-2) > f(6)$ and minimum to right of y-axis

A1 for correct y-intercept of -1

A1 for approx. correct x-intercepts consistent with part b

6 continued

$f(x) = \frac{4}{2^x} + 1.5x - 5$

If function f is the derivative of function g, then function f produces all of the gradients of function g

So $f(x) = g'(x)$

a) $g'(1) = f(1) = \frac{4}{2^1} + 1.5(1) - 5$ M1

$= -1.5$ A1 or 62

b) $g(1) = 3$ so a Point given on $g(x)$ is $(1, 3)$

gradient when $x = 1$ is -1.5

so in point-slope-format

$(y - 3) = -1.5(x - 1)$ M1 A1

OR

$y = mx + c$

$3 = -1.5(1) + c$

$c = 4.5$

$\hookrightarrow y = -1.5x + 4.5$