Assignment 2

Q1) A

Q2) D

Q3) D

Q4) C

Q5) C

Q6) D

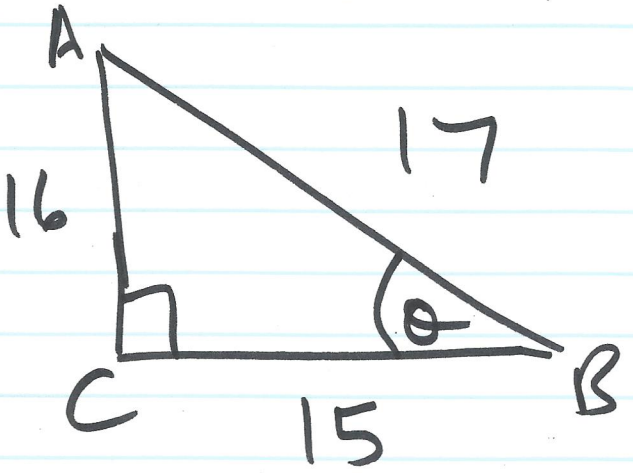
Q7) C

Q8) D

Q9) D

Q10) B

(Q11) As my answer to Q10 was 60°, which I found by using the following equation



$$\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$= \frac{15}{17}$$

$$= 0.999881422\dot{9}$$

$$= 59°59'59.57$$

$$= 60°$$

To calculate the area of the triangle, I will use the following measurements:

$$a = 15$$
$$b = 17$$

Q11) (Continued)

$$A = \frac{1}{2}ab\sin C$$

$$A = \frac{1}{2}(15)(17)\sin 60^\circ$$

$$A = 110.418239$$

$$A = 110.42 \text{ units}^2$$

N.B. units^2 used as units (cm or m) wasn't made clear in Q10 or Q11.

Q12) π radians $= 180^\circ$

$$\text{radians to degrees} = \frac{180}{\pi}$$

$$\pi = 180^\circ$$

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

$$= 108^\circ$$

Q13)

a) $I = 157N$

b) $C = 5000 - 43N$

c) At the break-even point:

Income = overhead costs

$I = 157N$
$C = 5000 - 43N$

$157N = 5000 - 43N$
$+43N \qquad +43N$

$\frac{200N}{200} = \frac{5000}{200}$

$N = \frac{5000}{200}$

∴ The break-even point is where the electronics manufacturer sells 25 headphones.

Q13)

d) Based on the break-even point calculated in part (C) of this question, the equation linking the manufacturer's profit and the number of headphones sold (N) is as follows:

$$P = 200N - 5000$$

Where 200N is 157N (income) + 43N (variable cost) and 5000 is (fixed cost).

e) $P = 200N - 5000$

$20,000 = 200N - 5000$

$+5000 \qquad +5000$

$$\frac{25,000}{200} = \frac{200N}{200}$$

$N = 125$

∴ 125 headphones must be sold to make a profit of $20,000.

Proof: $P = 200N - 5000$

$P = (200 \times 125) - 5000$

$P = 25,000 - 5,000$

$P = \$20,000$

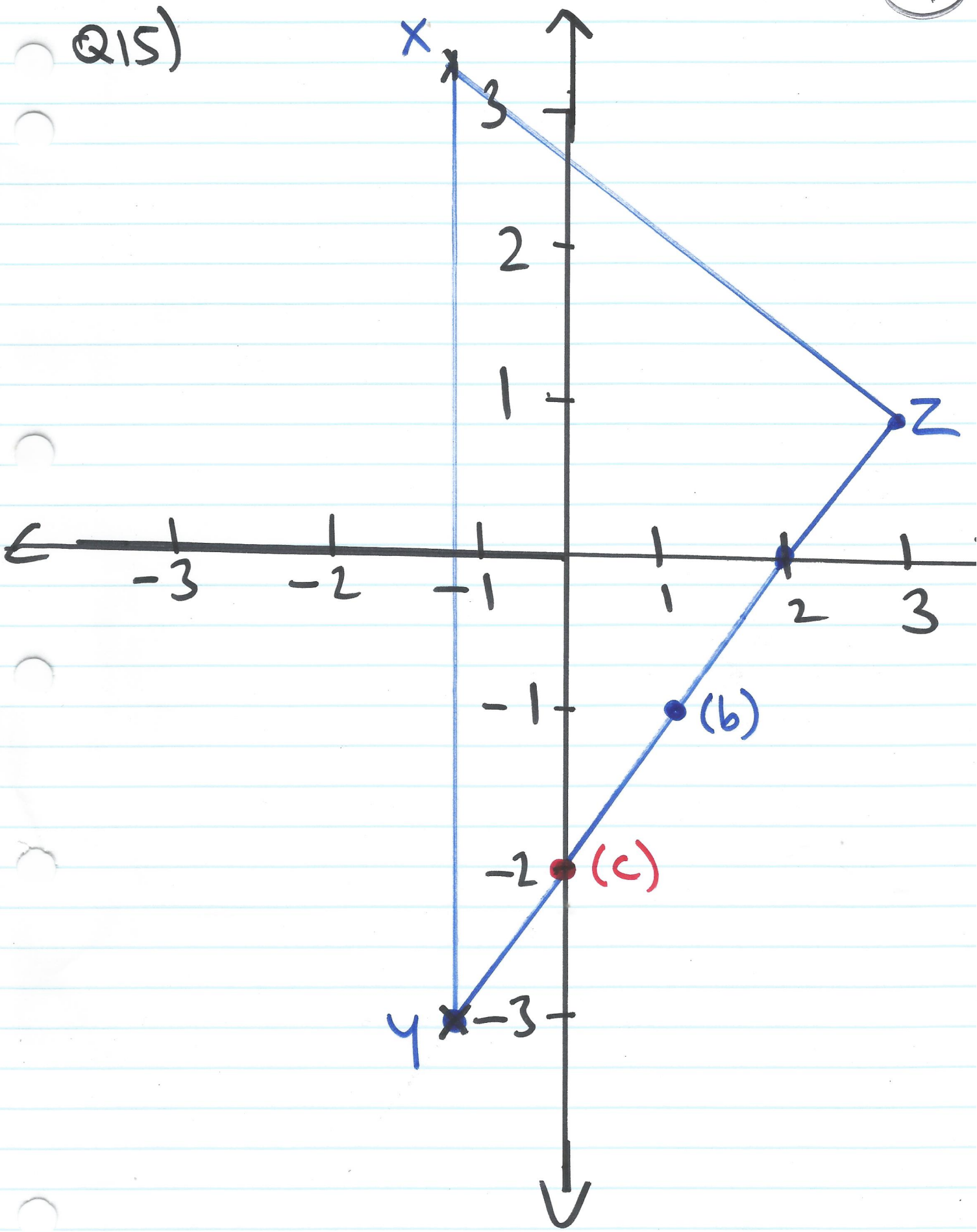
(Q14) $f(x) = ax^2 + b$

$f(2) = 5$
$f(3) = 20$

$f(2) = a(2)^2 + b$
$f(2) = 4a + b$
$5 - 4 = 1$
$a = 1, \quad b = 1$
$(4 \times 1) + 1 = 5$

$f(3) = a(3)^2 + b$
$f(3) = 9a + b$
$20 - 9 = 11$
$a = 1, \quad b = 11$
$(9 \times 1) + 11 = 20$

Q15)



Q15)

a) $d = \sqrt{(x^2 - x^1)^2 + (y^2 - y^1)^2}$

x^1 y^1

4 $(-1, -3)$

x^2 y^2

2 $(3, 1)$

$d = \sqrt{(3 - -1)^2 + (1 - -3)^2}$

$d = \sqrt{(4)^2 + (4)^2}$

$d = \sqrt{32}$

$d = 5.656854249$

$d = 5.66$

$\therefore 4z = 5.66$

b)

x	-1	0	1	2	3	4
y	-3	-2	-1	0	1	2

$y = x - 2$

Q15) (Continued)

c) gradient

$$m = \frac{y^2 - y^1}{x^2 - x^1}$$

$$m = \frac{1 - 3}{3 - -1} \#$$

$$= \frac{-2}{4}$$

$$m = -\frac{1}{2}$$

y-Intercept

$$y = -2$$

or $(0, -2)$

Q15) (Continued)

d) This part of the question was not answered as instructed in the OLS.

e) As both lines XZ and YZ converge at (3, 1), this triangle is an isosceles triangle. Therefor both lines/sides XZ and YZ are 5.66 units.

Now to find line XY

$$d = \sqrt{(x^2 - x^1)^2 + (y^2 - y^1)^2}$$

$$d = \sqrt{(-1-1)^2 + (-3-3)^2}$$

$$d = \sqrt{(2)^2 + (-6)^2}$$

$$d = \sqrt{40}$$

$$d = 6.32 \text{ units}$$

$$A = 1/2bh$$

$$A = 1/2 \times 6.32 \times 5.66$$

$$A = 17.89 \text{ units}^2$$

Q16) $(-2, -1)$ $(3, 2)$

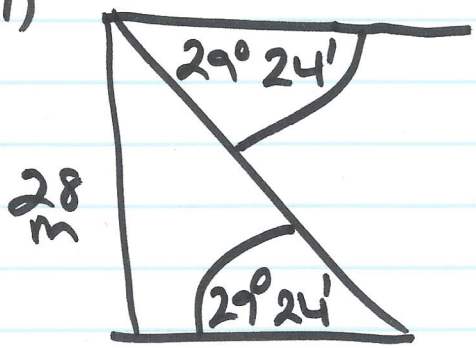
x^1 y^1 x^2 y^2

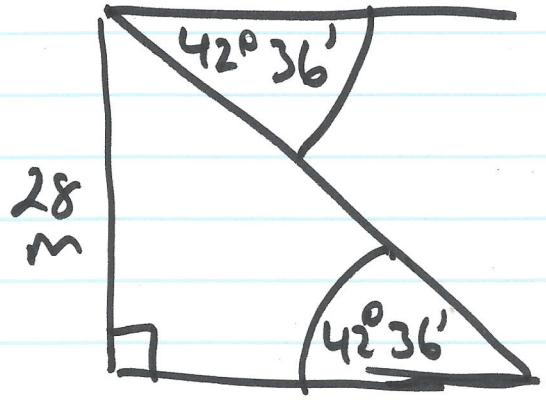
$$d = \frac{y^2 - y^1}{x^2 - x^1}$$

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

$$d = \frac{3}{5}$$

Q17)





$$x = \frac{28}{\tan 29° 24'}$$

$$x = \frac{28}{\tan 42° 36'}$$

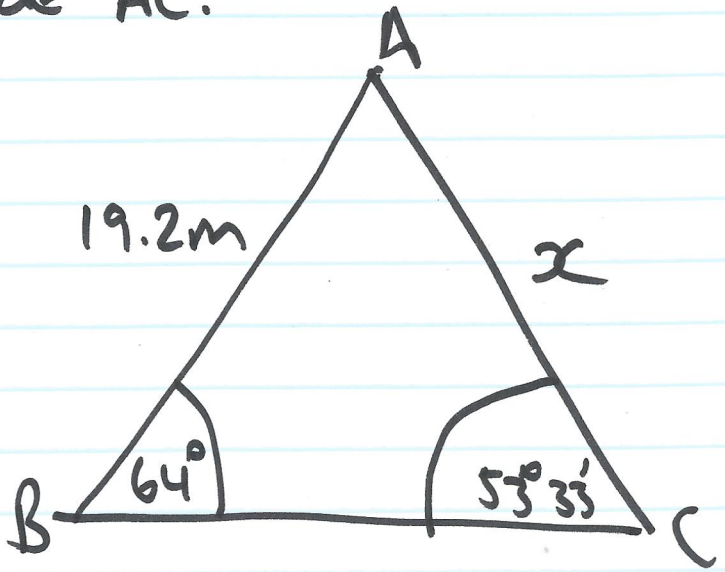
$x = 49.691994\,68\text{m}$ $x = 30.449771\,25$

[redacted] $49.691994\,68 - 30.449771\,25$
$= 19.242223\,43$

The boat has travelled 19.24m.

Q18) There is a typo in the question. The question asks to find the length of the side AC correct to the nearest centimetre (cm). However the given side is in metres (m). The question is on the final page of my submission for reference. As the given side is in (m), my answer will be in (m).

As only one side has been given, I will be using the sine rule to find the length of side AC.



$$\frac{a}{\sin A} = \frac{b}{\sin B}$$

$$\frac{x}{\sin 64^\circ} = \frac{19.2}{\sin 53^\circ 33'}$$

$$x = \frac{19.2 \sin 64^\circ}{\sin 53^\circ 33'}$$

$$x \text{ (or AC)} = 21.45371507$$
$$= 21\text{m}$$

Q19)

a) $y = 100 - (x-1)^2$

$a < 0$

$y = 100 - (0-1)^2$

$y = 99$

$\therefore$ False if x is 0, $y = 99$

b) $x = \frac{-b}{2a}$ $\qquad x = \frac{-b}{2a}$

$x = \frac{-100}{2(1)}$ $\qquad x = \frac{-1}{2(100)}$

$x = -50$ $\qquad x = \frac{1}{200}$

$\therefore$ False

Q19) (Continued)

c) $y = 100 - (x-1)^2$

$y = 100 - (11-1)^2$

$y = 0$

$y = 100 - (-9-1)^2$

$y = 0$

$\therefore$ True

d) $y = 100 - (x-1)^2$

$x = 1$

$y = 100 - (1-1)^2$

$y = 100$

$x = 1, y = 100$

$\therefore$ True

Q19) (continued)

e) $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = \frac{-1 \pm \sqrt{(1)^2 - (4 \times 1 \times 100)}}{(2 \times 1)}$

$x = \frac{-1 \pm \sqrt{1 - 400}}{2}$

$x = \frac{-1 \pm \sqrt{-399}}{2}$

$-1 + -399 = -400$
$1 + 399 = 400$

∴ True

f) This graph is Symmetrical about the y-axis. ~~This~~ This graph has line Symmetry about the y-axis. As the left and right halves are mirror-images of each other, therefore the function is even and the Statement is true.

↓

∴ True

Q20)

a) B1 - 6km/hr

6km = 6000 m

1 min = $\frac{6000}{60}$

= 100 m/min

100 x 90

= 9000 m

= 9 km

B2 - 4km/hr

4 km = 4000 m

1 min = $\frac{4000}{60}$

= 66.67 m/min

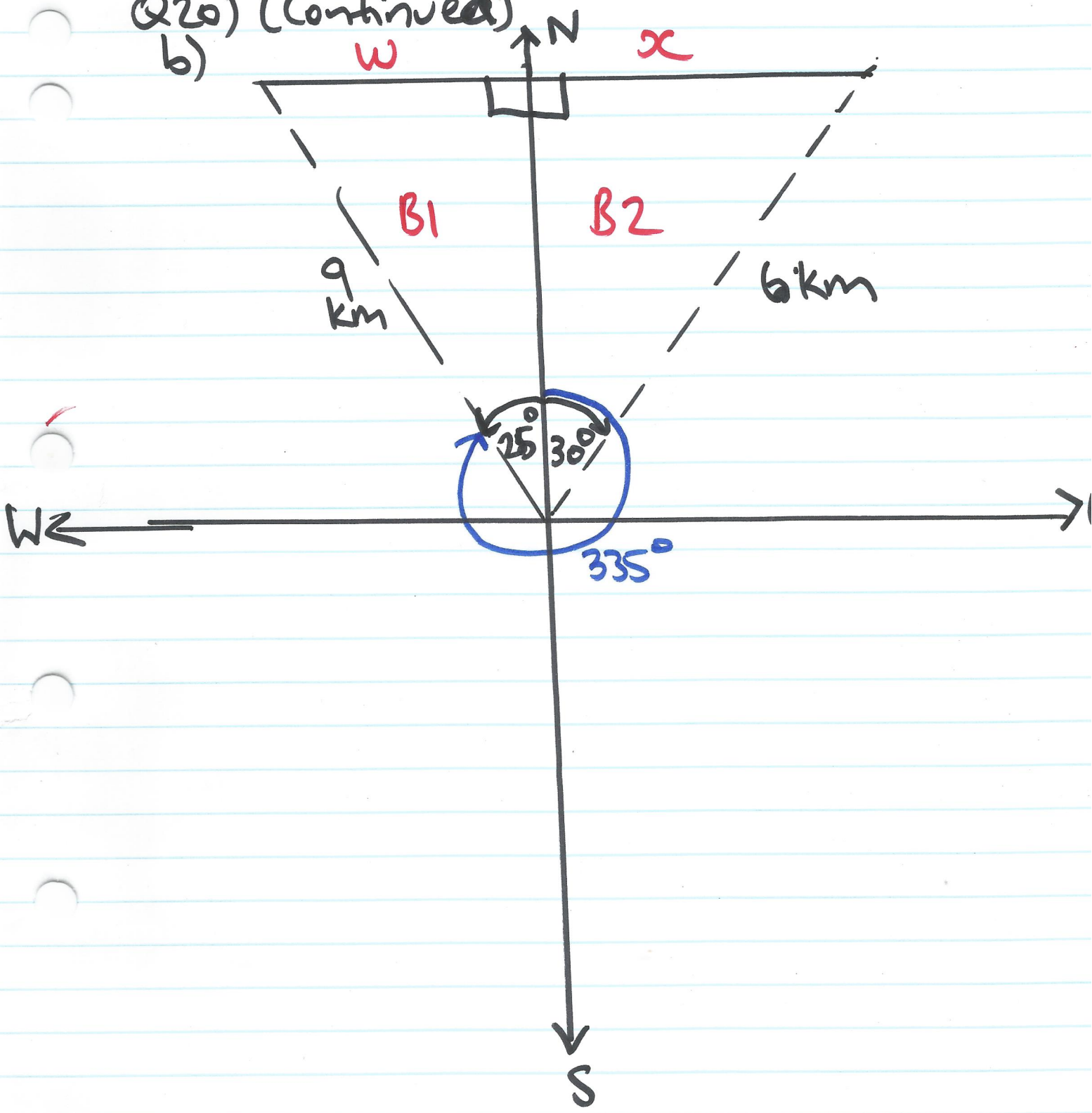
66.67 x 90

= 6000 m

= 6 km

Q20) (Continued)

b)



$360° - 335° = 25°$ or $025°$

Q20) (Continued)

c) For this part of the question I have labelled the applicable side w (for B1) and x (for B2). This can be seen on the diagram drawn for Q20(b).

Find w

$360° - 335° = 25°$

$$\sin 25° = \frac{w}{9}$$

$$w = 9\sin 25°$$

$$w = 3.803564356 \text{ km}$$

Find x

$$\sin 30° = \frac{x}{6}$$

$$x = 6\sin 30°$$

$$x = 3 \text{ km}$$

Total distance $= w + x$

$= 3.803564356 + 3$

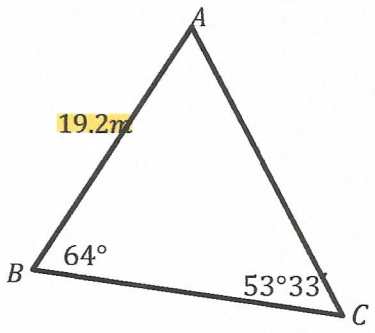
$= 6.803564356$

$= 6.8$ km

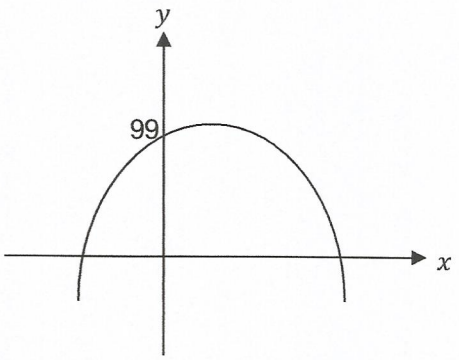
$\therefore$ B1 and B2 are 6.8km apart when the phone call occurs.

17 From the top of a vertical cliff 28 metres high, an observer finds the angle of depression of a boat at sea to be $29°24'$. Five minutes later the angle is $42°\ 36'$. How far has the boat travelled in this time?

18 In the triangle below, find the length of the side AC correct to the nearest centimetre.



19 Below is a sketch of the quadratic function $y = 100 - (x-1)^2$.



Indicate whether the following statements are true or false:

(a) The maximum value of $100 - (x-1)^2$ is 100.

(b) The axis of symmetry is $y = 1$.

(c) The zeros of the function are 11 and -9.

(d) The vertex point is $(1,100)$.

(e) The value of the discriminant is 400.

(f) The function is even.