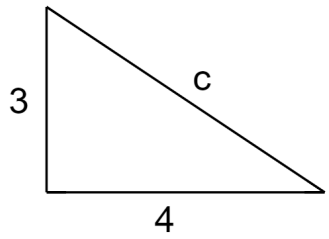
Year 9 Worksheet 3: Right-angled Triangles

Question 1: Answer the following.

(1) The length of the hypotenuse of the triangle below can be found as:



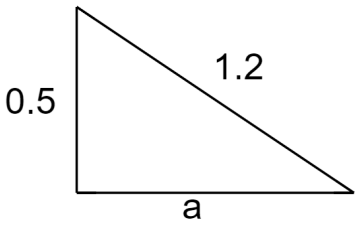
A. $c = 4^2 + 3^2$

B. $c^2 = 4^2 - 3^2$

C. $c^2 = 3^2 - 4^2$

D. $c^2 = 3^2 + 4^2$

(2) For the right-angled triangle below, find the value of a to 3 d.p:

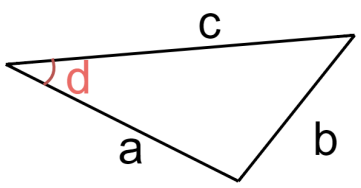


A. 1.091 B. 0.70 C. 1.103 D. 1.908 E. 0.950

(3) If a right-angled isosceles triangle has a hypotenuse of 12 cm, what is the length of its other two sides?

A. $6\sqrt{5}$ B. $5\sqrt{6}$ C. $6\sqrt{2}$ D. $2\sqrt{6}$ E. 7

(4) For the right-angled triangle shown:



A. $\cos(d) = \frac{b}{a}$

B. $\cos(d) = \frac{b}{c}$

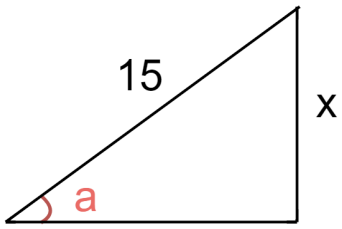
C. $\cos(d) = \frac{c}{a}$

D. $\cos(d) = \frac{a}{c}$

(5) The value of sin(45°) correct to 4 d.p is:

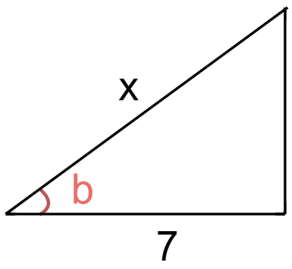
A. 0.5736 B. 0.7070 C. 0.5735 D. 0.8307 E. 0.7071

(6) If the angle a = 30°, find x:



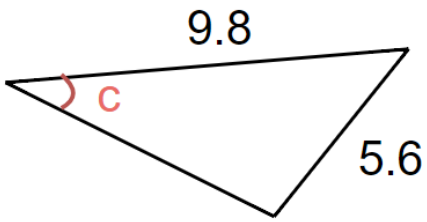
A. 7 B. 7.5 C. 8.5 D. 9 E. 12

(7) If the angle b = 50◦, find x:



A. 7.254 B. 4.499 C. 10.890 D. 6.7547 E. 8.394

(8) Find the value of c in the diagram, correct to 4 significant figures.

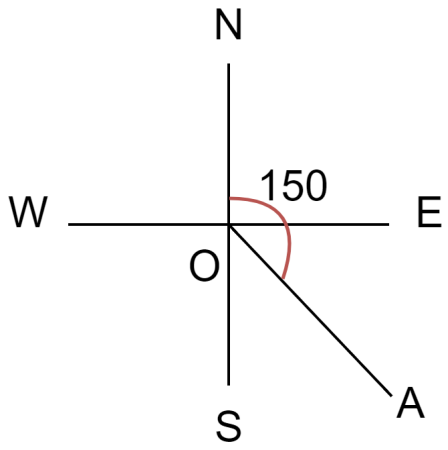


A. 34.85 B. 34.8499 C. 0.6082 D. 55.15 E. 9.973

(9) An inclined ramp has an angle of 24° to the horizontal. If this ramp extends 4.8 meters up the wall, what is the length of the ramp when rounded to the nearest meter?

A. 10 m B. 11 m C. 12 m D. 13m E. 14m

(10) The bearing of A from O is 150°. The bearing of O from A is:

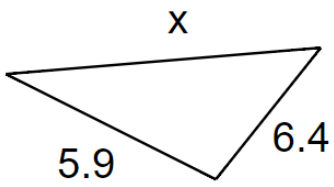


A. 30° B. 210° C. 280° D. 310° E. 330°

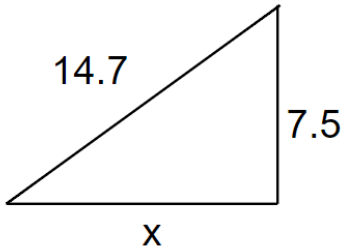
Question 2: Answer the following.

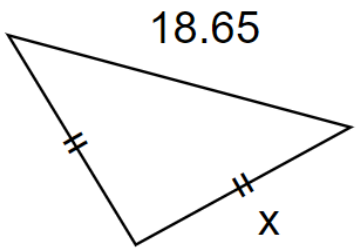
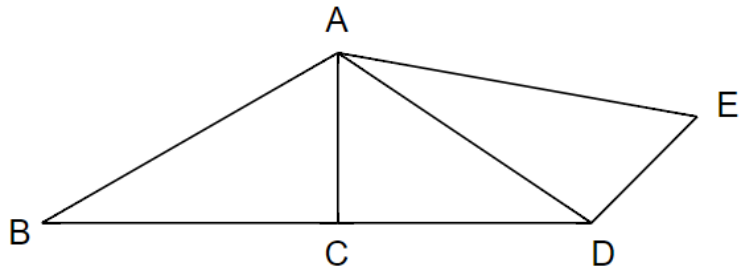
1 Find the unknown length and correct it to 2 decimal places.

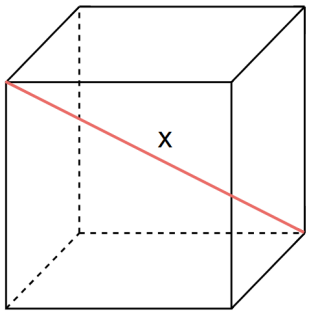
a.

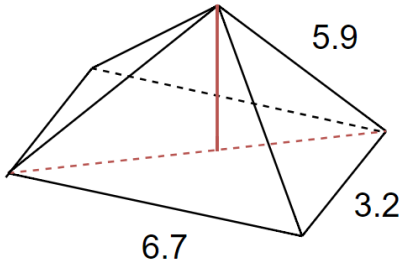
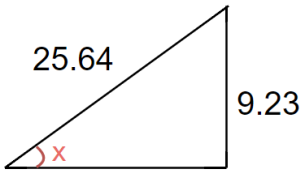
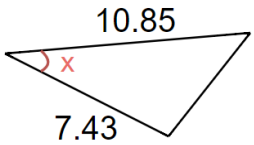
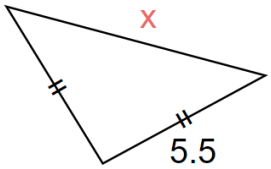


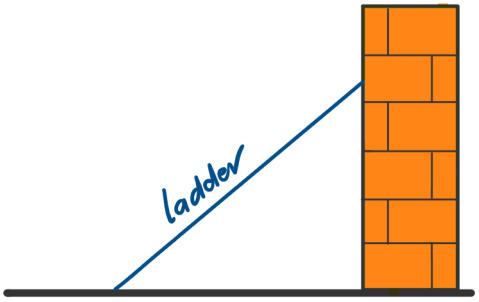
b.



	c. 
2	For the diagram below, find:  AC = 5.3 cm AB = 16.4 cm AE = 18.7 cm CD = 9.8 cm a. BC b. AD c. DE

3	Two observation decks in a skyscraper, located on opposite sides of the building, are at heights of 8 meters and 12 meters above the ground level. If these decks are connected by a 16-meter long skywalk, what is the horizontal distance (rounded to 1 decimal place) between the two observation decks?
4	Determine the length of the diagonal x in a cube with side = 8.8 cm using Pythagoras's theorem (correct to 3 d.p). 

5	Find the height of the pyramid below using Pythagoras's theorem (correct to 3 d.p). 
6	Find the value of each pronumeral, correct to two decimal places. Hint: SOH CAH TOA a.  b.  c. 

7	In a construction scenario, an extension ladder is initially set up against a building. If the ladder is initially placed so that it reaches 4 meters up the wall, and the base of the ladder is 5.5 meters away from the wall: a. What is the original length of the ladder to two decimal places?  b. If the ladder's length is extended by 1.2 meters without moving its base, what is the maximum height the ladder can reach, rounded to two decimal places? c. In a different scenario, the ladder is placed closer to the wall so that its base is only 350 centimeters away from the wall if it is not extended. i. What is the maximum height the ladder can reach in this new position, rounded to two decimal places? ii. How does this new maximum height compare to the original height from part a?"

8	A pilot departs from Tasmania and flies 657.4 km, on a bearing of 040° to reach Melbourne. The plan is to continue to fly to Sydney, but due to a severe thunderstorm between Melbourne and Sydney, the pilot deviates from the course, flying an additional 662.9 km on a 060° bearing to Canberra. From there, the pilot turns on a bearing of 20° and flies 286 km to finally reach Sydney, where more cargo is delivered. Afterward, she takes off again, covering 917.1 km at a 55° angle to reach Brisbane. a. Draw a diagram and label all the given measurements.

b. How far East of its starting point is the plane?

i. Tasmania to Melbourne.

ii. Melbourne to Canberra.

iii. Canberra to Sydney.

iv. Sydney to Brisbane.

c. How far North of its starting point is the plane?

i. Tasmania to Melbourne.

ii. Melbourne to Canberra.

iii. Canberra to Sydney.

iv. Sydney to Brisbane.

	d. Calculate the extra kilometers the pilot flew to avoid the storm.

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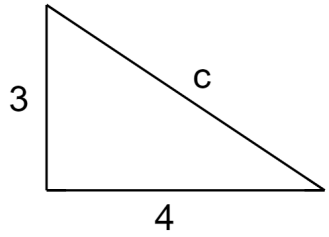
Answer Key

Question 1: Answer the following.

(1) The length of the hypotenuse of the triangle below can be found as:



A. $c = 4^2 + 3^2$

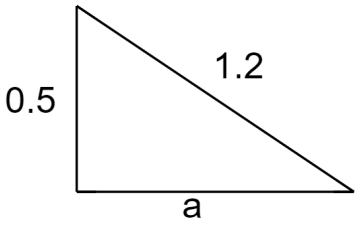
B. $c^2 = 4^2 - 3^2$

C. $c^2 = 3^2 - 4^2$

D. $c^2 = 3^2 + 4^2$

Answer: D. $c^2 = 3^2 + 4^2$

(2) For the right-angled triangle below, find the value of a to 3 d.p:



A. 1.091 B. 0.70 C. 1.103 D. 1.908 E. 0.950

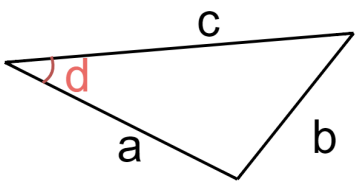
Answer: A. 1.091

(3) If a right-angled isosceles triangle has a hypotenuse of 12 cm, what is the length of its other two sides?

A. $6\sqrt{5}$ B. $5\sqrt{6}$ C. $6\sqrt{2}$ D. $2\sqrt{6}$ E. 7

Answer: C. $6\sqrt{2}$

(4) For the right-angled triangle shown:



A. cos(d) = $\frac{b}{a}$

B. cos(d) = $\frac{b}{c}$

C. cos(d) = $\frac{c}{a}$

D. cos(d) = $\frac{a}{c}$

Answer: D. cos(d) = a/c

(5) The value of sin(45°) correct to 4 d.p is:

A. 0.5736 B. 0.7070 C. 0.5735 D. 0.8307 E. 0.7071

Answer: E. 0.7071

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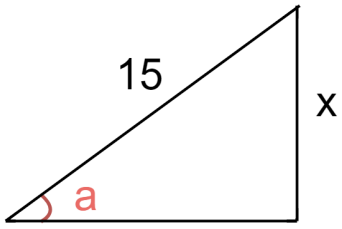
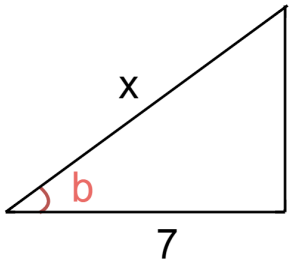


A. 7 B. 7.5 C. 8.5 D. 9 E. 12

Answer: B. 7.5

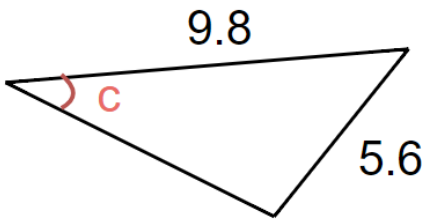
(7) If the angle b = 50◦, find x:



A. 7.254 B. 4.499 C. 10.890 D. 6.7547 E. 8.394

Answer: C. 10.890

(8) Find the value of c in the diagram, correct to 4 significant figures.



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Answer: A. 34.85

(9) An inclined ramp has an angle of 24° to the horizontal. If this ramp extends 4.8 meters up the wall, what is the length of the ramp when rounded to the nearest meter?

A. 10 m B. 11 m C. 12 m D. 13m E. 14m

Answer: C. 12 m

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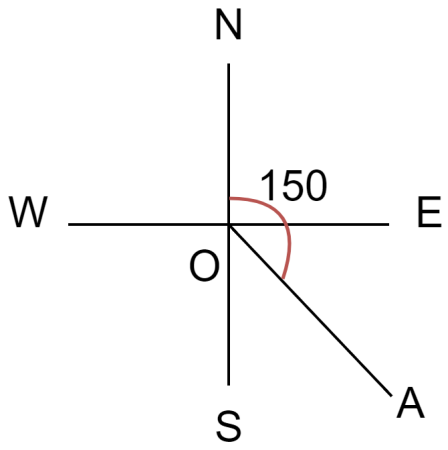


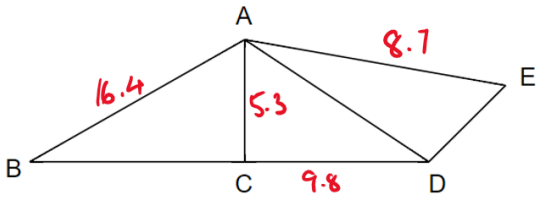
A. 30° B. 210° C. 280° D. 310° E. 330°

Answer: E. 330°

Question 2: Answer the following.

1	Find the unknown length and correct it to 2 decimal places. Answer: a. $x^2 = 5.9^2 + 6.4^2$ $\therefore x = 8.70$ (2 dp) b. $14.7^2 = x^2 + 7.5^2$ $\therefore x = 12.64$ (2 dp) c. $18.65^2 = x^2 + x^2 = 2x^2$ $\therefore x = 13.19$ (2 dp)

2



a. Δ ABC

$BC^2 = 16.4^2 - 5.3^2$

$\therefore BC = 15.52$ cm

b. Δ ACD

$AD^2 = 5.3^2 + 9.8^2$

$\therefore AD = 11.14$ cm

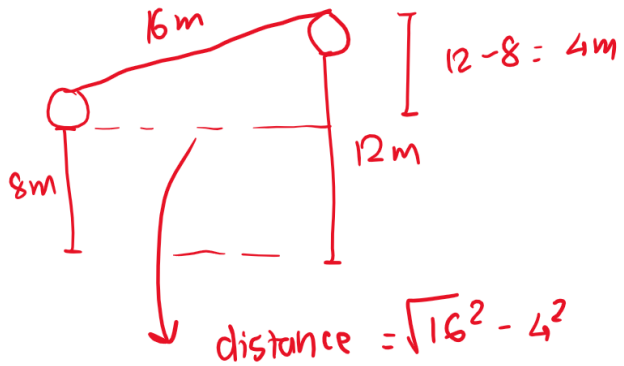
c. Δ ADE

$DE^2 = 18.7^2 - AD^2$

$= 18.7^2 - 11.14^2$ (from B)

$\therefore DE = 15.02$ cm

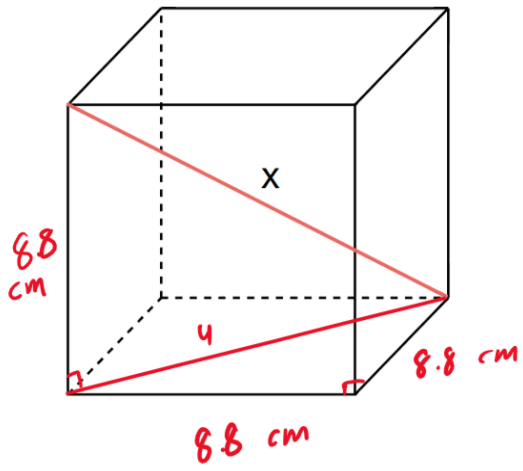
3



distance $= \sqrt{16^2 - 4^2}$

$= 15.5$ m

4



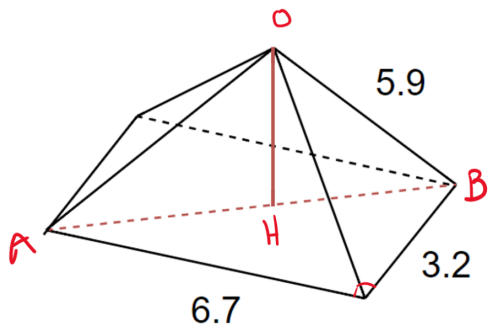
Line y: $y = \sqrt{8.8^2 + 8.8^2}$

$= 12.445$ cm

Line x: $x^2 = \sqrt{y^2 + 8.8^2}$

$= 15.242$ cm

5



Line AB: $AB = \sqrt{6.7^2 + 3.2^2}$

$= 7.425$

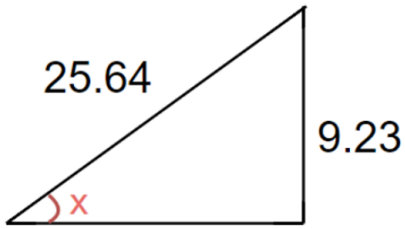
Line HB: $HB = \frac{1}{2}AB = 3.712$

Line OA: $OA = \sqrt{5.9^2 - 3.712^2}$

$= 4.586$

6

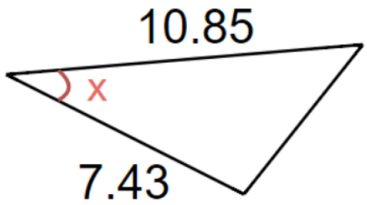
a.



$\sin x = \frac{9.23}{25.64}$

$\therefore x = 21.1^\circ$

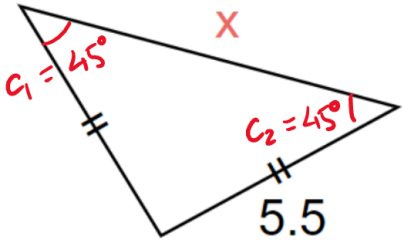
b.



$\cos x = \frac{7.43}{10.85}$

$\therefore x = 46.4^\circ$

c.



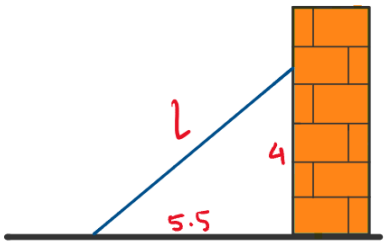
(M1) $\sin(C_1) = \sin 45^\circ = \frac{5.5}{x}$

$\therefore x = \frac{5.5}{\sin 45^\circ} = 7.78^\circ$

(M2) $\cos(C_2) = \cos 45^\circ = \frac{5.5}{x}$

$\therefore x = 7.78^\circ$

7



(a) $l = \sqrt{4^2 + 5.5^2}$

$= 6.8\ m$

(b) New length : $l = 6.8 + 1.2 = 8\ m$

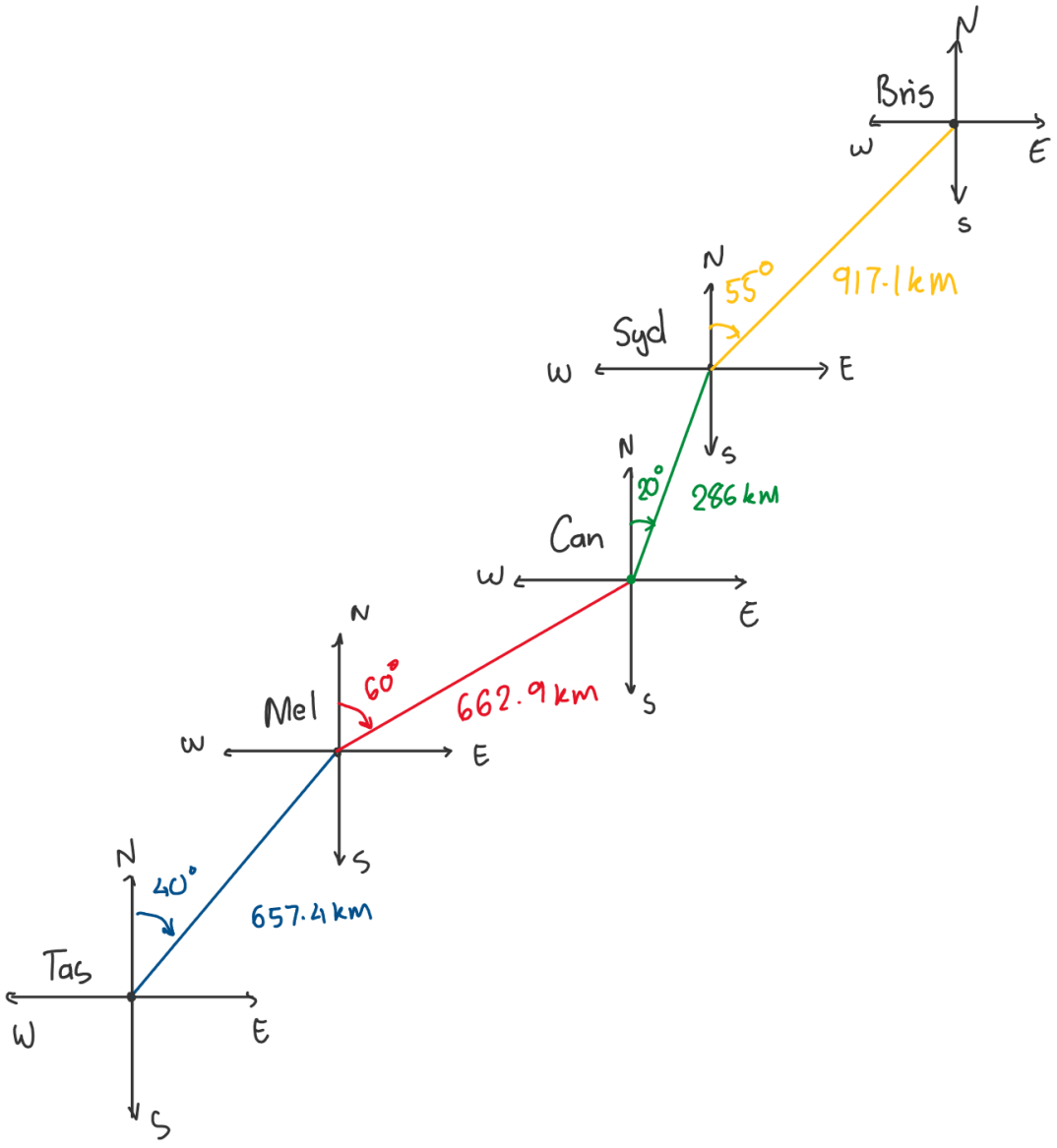
Height = $\sqrt{8^2 - 5.5^2} = 5.81\ m$

(c) i) $l = 6.8\ m$, $b = 350\ cm = 3.5\ m$

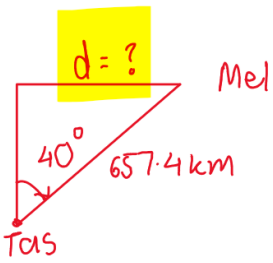
New height = $\sqrt{6.8^2 - 3.5^2} = 5.83 m$

ii) It can reach higher than part a.

8


Bris
N
W
E
S
917.1 km
55°
Syd
286 km
20°
Can
662.9 km
60°
Mel
657.4 km
40°
Tas

(b) (i) $\sin 40^\circ = \frac{d}{657.4}$



$\hookrightarrow d = \sin 40^\circ \times 657.4$

$= 422.57 \text{ km}$

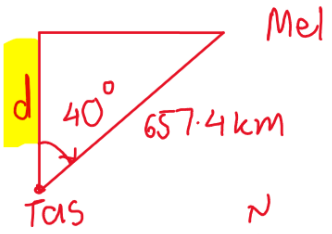
(ii) Similarly: $d = \sin 60^\circ \times 662.9$

$= 574.09 \text{ km}$

(iii) $d = \sin 20^\circ \times 286 = 97.82 \text{ km}$

(iv) $d = \sin 55^\circ \times 917.1 = 751.24 \text{ km}$

(c) (i) $\cos 40^\circ = \frac{d}{657.4}$



$\hookrightarrow d = 503.60 \text{ km}$

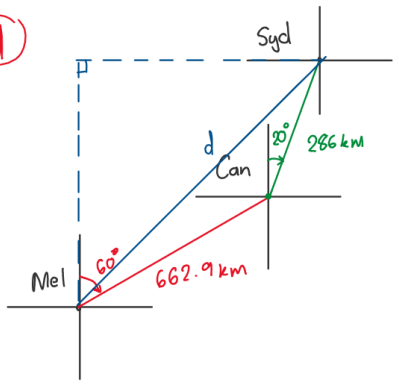
(ii) Similarly: $d = \cos 60^\circ \times 662.9$

$= 331.45 \text{ km}$

(iii) $d = \cos 20^\circ \times 286 = 268.75 \text{ km}$

(iv) $d = \cos 55^\circ \times 917.1 = 526.03 \text{ km}$

(d)



① Mel → Syd, north

331.45 + 268.75 = 600 km

① Mel → Syd, East

574.09 + 97.82 = 671.91 km

① Mel → Syd, using Pythagoras's Theorem

$d = \sqrt{599.9^2 + 760.72^2} = 900.81$ km

① Extra distance:

$\Delta d = (662.9 + 286) - 900.81$

$= 48.09$ km