

MATHEMATICS APPLICATIONS
Test 7 2018
Trigonometry
Section A-Resource Free
Marks: 27 Time Allowed: 30 minutes

Name: Solutions.

ALL working must be shown for full marks.

Name : _____

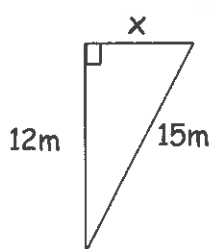
Part A Marks: / 27 =

Total: / 57 %

Question 1

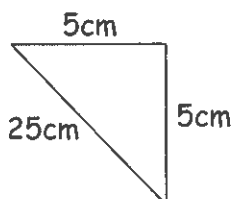
[2, 2 = 4 marks]

- a) Find the size of the missing side in the following triangle, show working out for full marks.



$$\begin{aligned} x^2 &= 15^2 - 12^2 \\ x &= \sqrt{225 - 144} \quad (\checkmark) \\ &= \sqrt{81} \\ x &= \underline{9m} \quad (\checkmark) \end{aligned}$$

- b) Decide if the following triangles are right angle triangles, for full marks explain each answer.

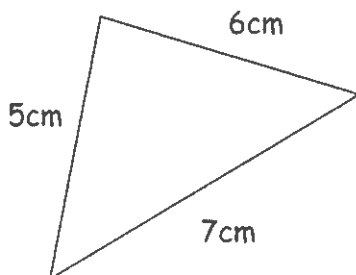


$$\begin{aligned} 5^2 + 5^2 &= 25^2 \quad \text{if right triangle} \quad (\checkmark) \\ 25 + 25 &\neq 625 \\ \therefore &\text{no not right triangle.} \quad (\checkmark) \end{aligned}$$

Question 2

[3 marks]

Find the area of the following triangle, you may leave the answer as a square root.



Herrons Rule

$$\begin{aligned} A &= \sqrt{s(s-a)(s-b)(s-c)} \\ &= \sqrt{9(9-5)(9-6)(9-7)} \\ &= \sqrt{9 \times 4 \times 3 \times 2} \\ &= \underline{\underline{\sqrt{216}}} \end{aligned}$$

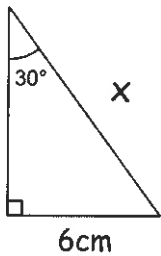
$$\begin{aligned} s &= \frac{5+6+7}{2} \\ &= 9 \end{aligned}$$

Question 3

[3 marks]

Given that $\cos 30^\circ = \frac{\sqrt{3}}{2} = \frac{A}{H}$ $\sin 30^\circ = \frac{1}{2} = \frac{O}{H}$ $\tan 30^\circ = \frac{1}{\sqrt{3}}$

Calculate the value of x



$$\sin 30^\circ = \frac{6}{x} = \frac{1}{2} \quad (\checkmark)$$

$$\therefore \underline{x = 12} \quad (\checkmark)$$

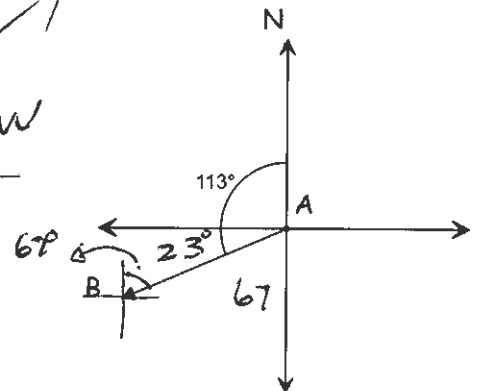
or similar,

Question 4

[2, 2 = 4 marks]

- a) Give the true bearings and compass bearing to travel from A to B for the diagram below.

True: $360 - 113$ Compass: $S 67^\circ W$
 $= \underline{247^\circ} \quad (\checkmark)$



- b) What would be the true bearing to travel from B back to A.

True: $\underline{67^\circ} \quad (\checkmark)$

Compass: $\underline{N 67^\circ E} \quad (\checkmark)$

Question 5

[3, 1 = 4 marks]

a) Calculate the z-scores for Kelly in each of her four ATAR subjects.

Biology:
Score = 53
Mean = 48
St Dev = 2.5

z-score = 2

$$\frac{53-48}{2.5}$$

$$= 2 \quad (\checkmark)$$

English:
Score = 46
Mean = 50
St Dev = 4

z-score = -1

$$\frac{46-50}{4}$$

$$= -1 \quad (\checkmark)$$

Applications:
Score = 65
Mean = 64
St Dev = 2

z-score = 0.5

$$\frac{65-64}{2}$$

$$= 0.5 \quad (\checkmark)$$

b) Rank them in order from best to worst.

Biology, Applications, English.

(✓)

Question 6

[2, 3 = 5 marks]

Daniel scored 74% for his English essay, the class mean was 66% and his z-score was 2.

a) Should Daniel be happy with his score? Explain

Yes, He is 2 st dev above the mean. (✓)
(✓)

b) What was the standard deviation for the class?

$$\frac{X - \bar{X}}{s} = z$$

$$\frac{74-66}{s} = 2 \quad (\checkmark)$$

$$\frac{8}{s} = 2 \quad (\checkmark)$$

$$s = 4 = \text{st dev} \quad (\checkmark)$$

Question 7**[1, 1, 2 = 4 marks]**

a) Calculate the following probabilities for the normally distributed data with a mean of 0 and a standard deviation of 1. Make sure you draw a diagram to help you.

i) $P(-1 < X < 1)$

68% (68.3%)

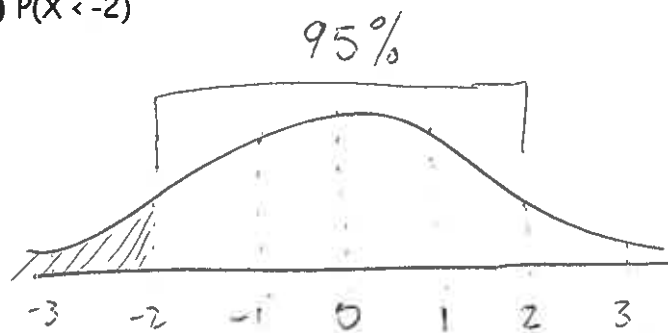
(✓)

ii) $P(X > 0)$

50%

(✓)

iii) $P(X < -2)$



$$= 100\% - 95\% = 5\% \quad (✓)$$

$$= 5\% \div 2 = \underline{2.5\%} \quad (✓)$$

Greenwood College

Test 7 2018

Trigonometry

Section B-Resource allowed

Marks: 30 Time Allowed: 30 minutes

Name: _____

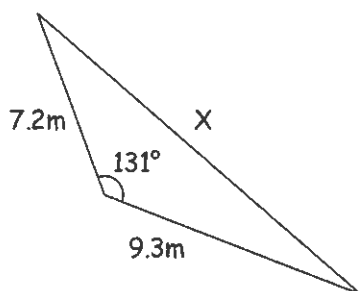
ALL working must be shown for full marks.
All answers to 2dp

Question 8

[2, 3, 4 = 9 marks]

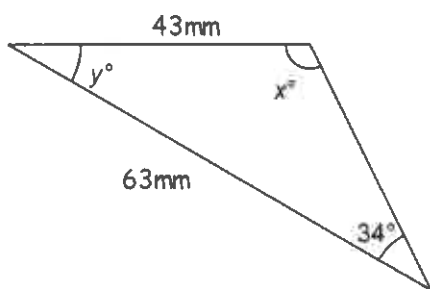
Find the value of pronumeral (letter) for the following triangles.

a)



$$\begin{aligned} a^2 &= b^2 + c^2 - 2bc \cos A \quad (\checkmark) \\ &= \sqrt{7.2^2 + 9.3^2 - 2 \times 7.2 \times 9.3 \times \cos 131^\circ} \\ &= 15.04 \text{ m} \quad (\checkmark) \end{aligned}$$

b) The value of x is between 90° and 180°.

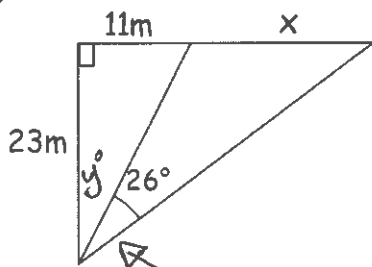


$$\frac{\sin A}{a} = \frac{\sin B}{b} \quad (\checkmark)$$

$$\frac{\sin x}{63} = \frac{\sin 34}{43}$$

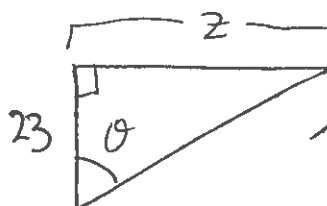
$$x = 124.99^\circ \quad (\checkmark) \quad y = 55.01^\circ \quad (\checkmark)$$

c)



$$\begin{aligned} \tan y &= \frac{11}{23} \\ y &= \tan^{-1}\left(\frac{11}{23}\right) \\ y &= 25.56^\circ \quad (\checkmark) \end{aligned}$$

$$\begin{aligned} \text{Total Angle} \\ \theta &= 25.56 + 26 = 51.56^\circ \quad (\checkmark) \end{aligned}$$



$$\tan 51.56 = \frac{z}{23}$$

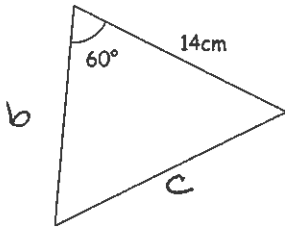
$$\begin{aligned} 23 \times \tan 51.56 &= z \\ z &= 28.98 \text{ m} \quad (\checkmark) \end{aligned}$$

$$\begin{aligned} \therefore x &= 28.98 - 11 \quad (\checkmark) \\ &= 17.98 \text{ m} \end{aligned}$$

Question 9

[4, 2 = 6 marks]

- a) Given that the area of the triangle below is 84.87cm^2 show that it is an equilateral triangle.
For full marks show all working out.



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

$$84.87 = \frac{1}{2} \times 14 \times b \times \sin 60^\circ (\checkmark)$$

$$b = 14 \text{ cm.} (\checkmark)$$

$$a^2 = b^2 + c^2 - 2bc \cos A.$$

$$c^2 = 14^2 + 14^2 - 2 \times 14 \times 14 \times \cos 60$$

$$c = 14 \text{ cm} (\checkmark)$$

\therefore All sides are 14cm
and Δ is equilateral

- b) Given that the triangle in part b) is an equilateral triangle, use herons rule to prove the area of the triangle is 84.87cm^2

$$S = \frac{14+14+14}{2}$$

$$= 21 (\checkmark)$$

$$\text{Area} = \sqrt{21 \times (21-14)(21-14)(21-14)}$$

$$= \sqrt{7203}$$

$$A = 84.87 \text{ cm}^2.$$

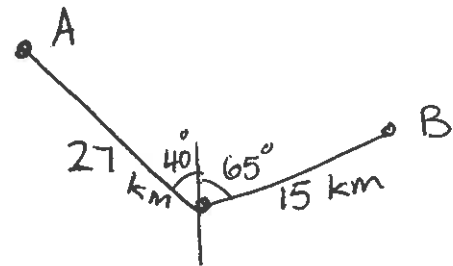
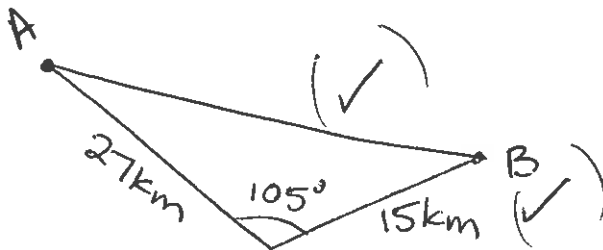
(\checkmark)

Question 10

[2, 2 = 4 marks]

Plane A is 27km away from the airport on a bearing of 320° , plane B is 15km away from the airport on a bearing of 65°

a) Draw a diagram for the situation above.



b) Calculate the distance between the two planes.

$$a^2 = b^2 + c^2 - 2bc \cos A \quad (\checkmark)$$

$$= \sqrt{27^2 + 15^2 - 2 \times 27 \times 15 \times \cos 105}$$

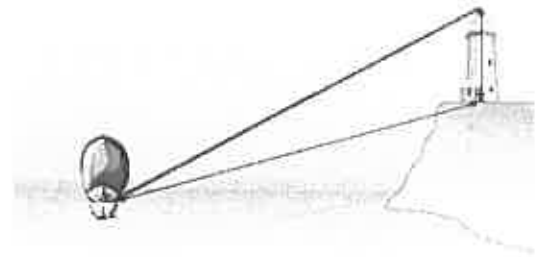
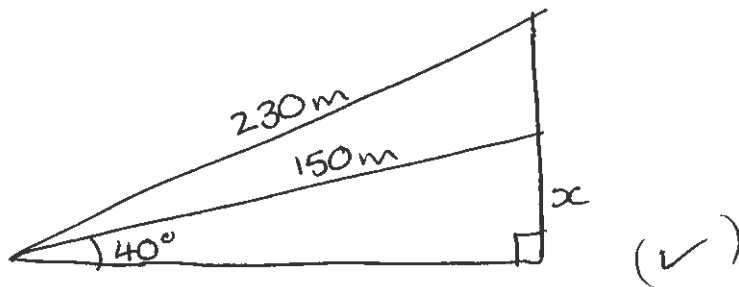
$$a = \underline{34.11 \text{ km}} \quad (\checkmark)$$

Question 11

[1, 2, 2 = 5 marks]

A sailor on a yacht sees a lighthouse on the top of a cliff. The yacht is 150m away from the top of the cliff and 230m from the top of the lighthouse. The angle of elevation from the yacht to the top of the cliff is 40° .

- a) Draw and label a triangle to represent this situation.



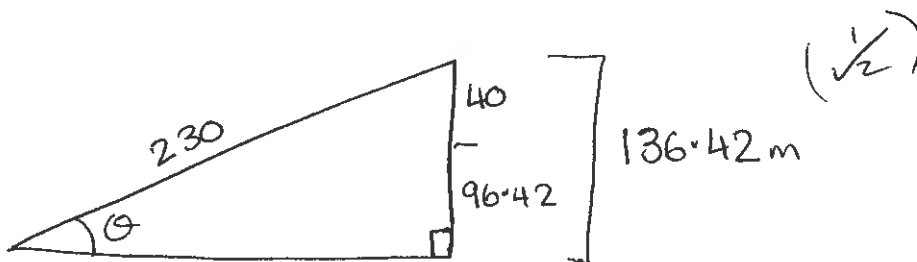
- b) Calculate the height of the cliff.

$$\sin 40^\circ = \frac{x}{150} \quad (\checkmark)$$

$$150 \times \sin 40^\circ = x$$

$$x = 96.42 \text{ m} \quad (\checkmark)$$

- c) If the height of the lighthouse is 40m, calculate the angle of depression from the top of the lighthouse to the sailor on the yacht.



$$\sin \theta = \frac{136.42}{230}$$

$$\theta = \sin^{-1} \left(\frac{136.42}{230} \right)$$

$$\theta = 36.38^\circ \quad (\checkmark)$$

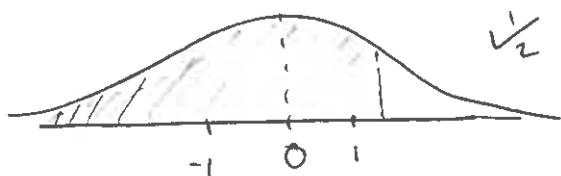
\therefore Angle of depression using alternate angles is $36.38^\circ \quad (\checkmark)$

Question 12

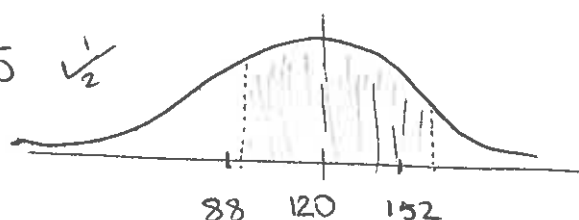
[1, 1, 1, 3 = 6 marks]

a) Calculate the following probabilities and draw the normal distribution bell curve for each.

i) $\bar{x} = 0$ $\sigma = 1$ $P(X < 1.25) = 0.8944$ \checkmark_2



ii) $\bar{x} = 120$ $\sigma = 32$ $P(90 < X < 166) = 0.7505$ \checkmark_2

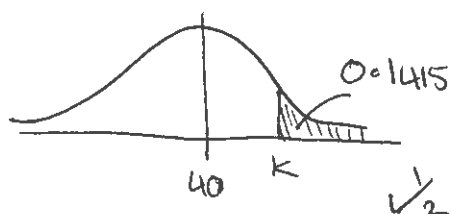


\checkmark_2

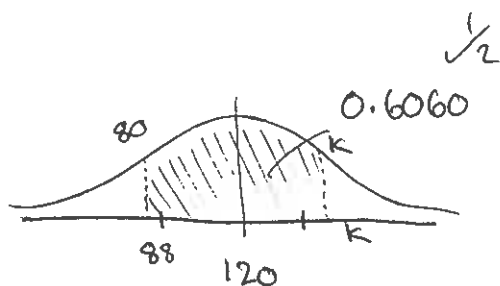
b) Find the value of k and draw the normal distribution bell curve for each.

i) $\bar{x} = 40$ $\sigma = 11$ $P(X > k) = 0.1415$

$k = 51.81$ (\checkmark_2)



ii) $\bar{x} = 120$ $\sigma = 32$ $P(80 < X < k) = 0.6060$



$P(X < 80) = 0.1056$ (\checkmark)

$P(X < k) = 0.1056 + 0.6060$

$P(X < k) = 0.7116$ (\checkmark)

$k = 137.86$ (\checkmark_2)

