# Carlingford High School

YEAR 12
STANDARD MATHEMATICS
TERM 4 Assessment Task 1
2018

Student number:..... Class 11MAS.....

- Time allowed: 50 minutes
- Answer all questions in this question booklet. Circle the correct responses to the Multiple Choice Questions on the question sheet.
- Approved calculators may be used.
- All necessary working should be shown in every question. Marks may be deducted for careless or badly arranged work.
- A reference sheet is provided

| Question/outcomes | Section A | Section B | Section C | Total |
|---|---|---|---|---|
| **Working with time** | /9 | | | /9 |
| **Rates and Ratio** | | /22 | | /22 |
| **Trigonometry** | | | /17 | /17 |
| | /9 | /22 | /17 | /48 |

## Section A: Working with time (9 marks)

Marks

1. Perth in Western Australia is 8 hours ahead of Greenwich in England. Cape Town in South Africa is 2 hours ahead of Greenwich.

   What is the time in Cape Town when it is 1 pm in Perth?

   A. 3 am  B. 7 am  C. 7 pm  D. 11 pm

2. It is 7:30 am, daylight saving time in Sydney. What is the standard time in Brisbane, which does not have daylight saving time?

   A. 6:00 am  B. 6:30 am  C. 7:00 am  D. 8:00 am

3. Wagga Wagga in NSW has coordinates $(35°S, 147°E)$. Port Moresby in Papua New Guinea is due north of Wagga Wagga

   Which of the following could be the coordinates of Port Moresby?

   A. $(10°S, 135°E)$  B. $(42°S, 147°E)$  C. $(42°S, 135°E)$  D. $(10°S, 147°E)$

4. Karin is in Athens (UTC +2) and Marco is in New York (UTC -5). 1

   i) Calculate the time difference between Athens and New York.

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   (ii) Karin is going to ring Marco at 10 pm on Tuesday, Athens time. 2
   What day and local time will it be in New York when she rings?

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   (iii) Marco is going to fly from New York to Athens. His flight will leave on 2
   Wednesday 8 October at 9 am, New York time, and will take 11 hours.
   What is the local time and date in Athens when he arrives?

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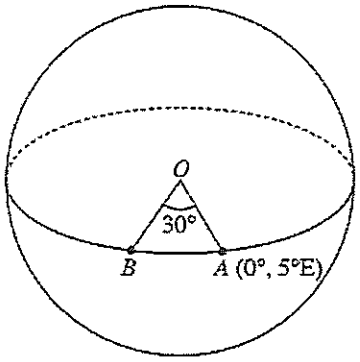
5. Island $A$ and island $B$ are both on the equator. Island $B$ is west of island $A$. The longitude of island $A$ is $5°E$ and the angle at the centre of Earth ($O$), between $A$ and $B$, is 30°.




NOT TO SCALE

What is the longitude of island $B$? 1

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**Section B: Rates and Ratio (22 marks)** **Marks**

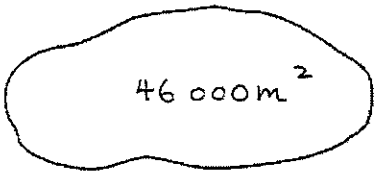
1. Amy, Brett and Coen invested \$30 000, \$25 000 and \$15 000 respectively in a new business. At the end of the first year the business made a total profit of \$42 000. The profit was divided in the same ratio as the amounts they had invested. How much of the profit did Amy receive?

A. \$9 000 B. \$14 000 C. \$18 000 D. \$30 000

2. Natural gas is charged at a rate of 1.4570 cents per MJ. What is the charge for 12 560 MJ of natural gas? Answer to the nearest cent.

A. \$86.20 B. \$183.00 C. \$8620.45 D. \$18 299.92

3. The surface area of the lake shown below is 46 000 $m^2$.




If an average of 6 $cm$ of rain falls on the lake, what will be the increase in the volume of water?

A. 2760 $L$ B. 2 760 000 $L$ C. 276 000 $L$ D. 276 000 000 $L$

4. The scale on an aerial photograph is given as $1mm = 250\ m$.
If the length of land between two points is $550\ m$, what is the map length between these points?

A. $0.20\ mm$ B. $0.36\ mm$ C. $2.20\ mm$ D. $2.75\ mm$

5. A person's maximum heart rate, MHR (in beats per minute) is given by the formula: 2

$$\text{MHR} = 220 - \text{Age} \quad \text{where Age is in years.}$$

It is estimated that a healthy person should have a heart rate of 55% of their maximum rate when beginning to exercise. Joshua is a healthy 17 years 3 months old boy.

What is an estimate of his heart rate, in beats per minute, when he begins exercising?

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6. Calculate the recovery rate number for a person whose heart rate at the end of exercising is 155 bpm and 95 bpm after one minute. Hence, state the level of fitness this indicates. 2

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7. Convert $8m/s$ to $km/h$. 2

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8. A box of 12 pens costs $7.80. These pens can also be bought in a pack of 22 pens for $9.70. Which option is the best buy? Justify your answer with appropriate mathematical calculations. 2

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9. Peta's car uses fuel at the rate of 5.9 L /100 km for country driving and 7.3 L /100 km for city driving. On a trip, she drives 170 km in the country and 25 km in the city. 2

(i) Calculate the amount of fuel she used on this trip.

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(ii) How far could the car travel on a full tank of 50 L , if Peta only did country driving? Answer correct to 2 decimal places. 2

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10. A child who weighs 14 kg needs to be given 15 mg of paracetamol for every 2 kg of body weight. Every 10 mL of a particular medicine contains 120 mg of paracetamol. What is the correct dosage, in mL of this medicine for the child? Answer to one decimal place. 2

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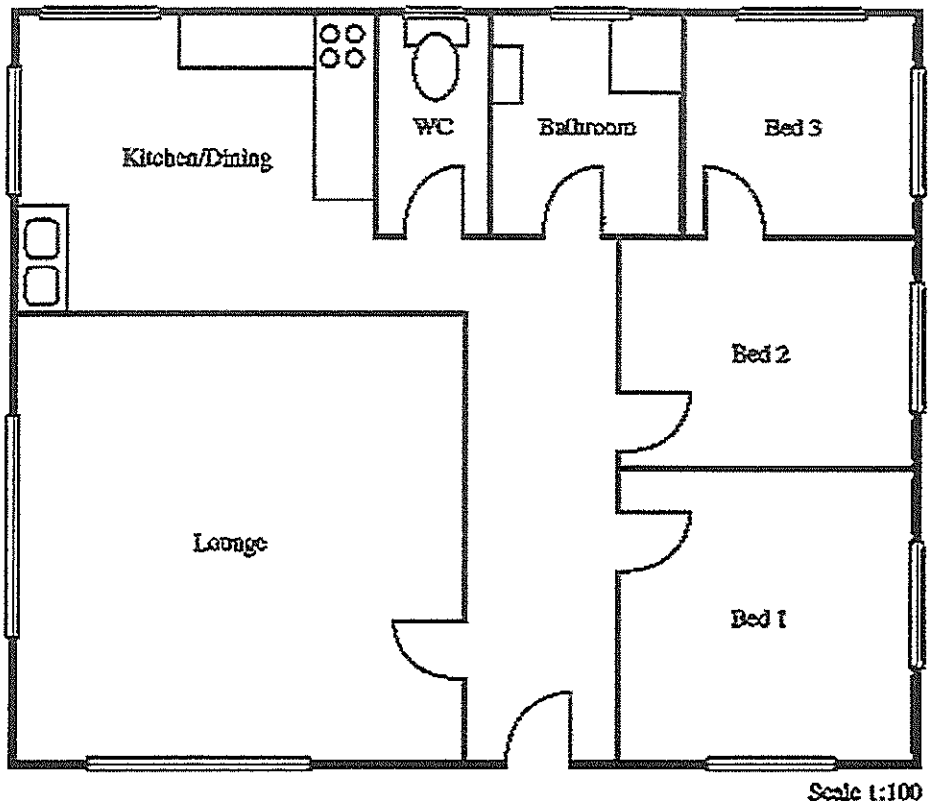
11. Below is a plan for a house.




(i) By measurement and calculation, find the dimensions of Bed 2. 2

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(ii) The owners wish to install air conditioning in Bed 2. The power output of the air conditioning unit required is based on the volume of air to be conditioned. 2

Calculate the volume of air to be air conditioned if the ceiling is 2400 mm high.

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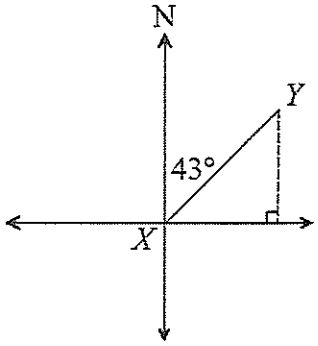
## Section C: Trigonometry (17 marks)

Marks

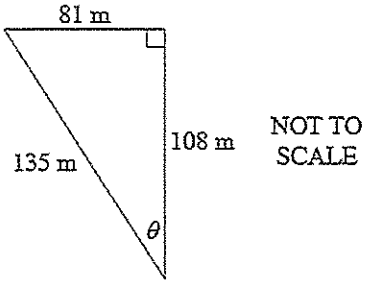
1. The compass bearing of $Y$ from $X$ is $N43°E$.




What is the compass bearing of $X$ from $Y$?

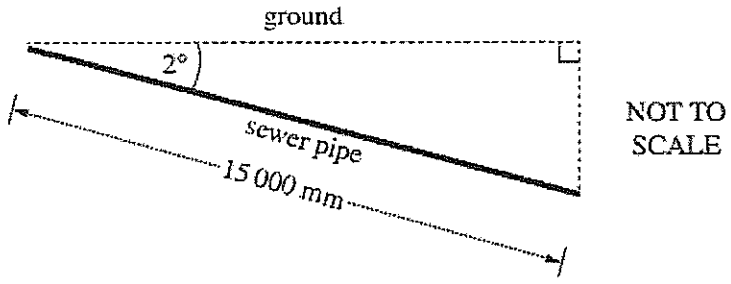
A. $S47°W$ B. $S43°W$ C. $N47°E$ D. $N43°E$

2. What is the value of $\theta$, to the nearest degree?




A. 31° B. 37° C. 49° D. 53°

3. A sewer pipe needs to be placed into the ground so that it has a 2° angle of depression. The length of the pipe is 15 000 mm. 2




How much deeper should one end of the pipe be compared to the other end? Answer to the nearest mm.

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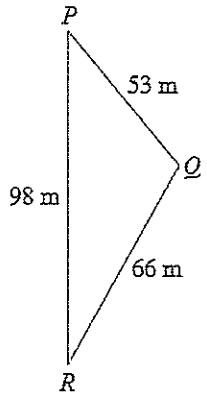
4. Triangle $PQR$ is shown below. 2




NOT TO SCALE

Find the size of angle $Q$, to the nearest minute.

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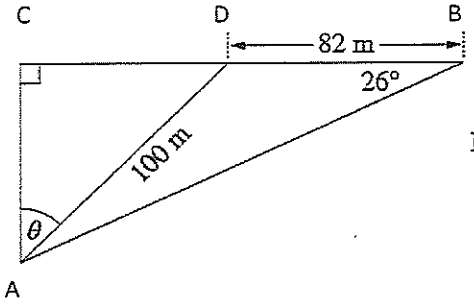
5. Triangle $ABC$ is drawn below. 2




NOT TO SCALE

(i) Find the size of angle $DAB$, to the nearest degree.

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(ii) Hence or otherwise, find the value of $\theta$, to the nearest degree. 2

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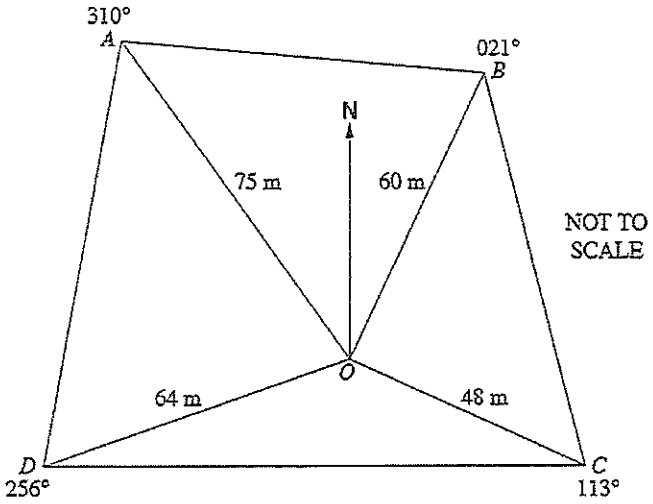
6. A compass radial survey of the field $ABCD$ has been conducted from $O$.




(i) Show that angle $AOB$ is 71° 1

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(ii) Calculate the distance $AB$, correct to 3 significant figures. 3

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(iii) Find the area of the section $OBC$, to the nearest square metre. 3

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**End of Paper**

**Carlingford High School**

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| | /9 | /22 | /17 | /48 |

Section A
Section B Q1-5 } 15 marks

Section B Q6-11 16 marks

Section C 17 marks.

## Section A: Working with time (9 marks)

Marks

1. Perth in Western Australia is 8 hours ahead of Greenwich in England. Cape Town in South Africa is 2 hours ahead of Greenwich.

   What is the time in Cape Town when it is 1 pm in Perth?

   A. 3 am  (B.) 7 am  C. 7 pm  D. 11 pm

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3. Wagga Wagga in NSW has coordinates $(35°S, 147°E)$. Port Moresby in Papua New Guinea is due north of Wagga Wagga

   Which of the following could be the coordinates of Port Moresby?

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4. Karin is in Athens (UTC +2) and Marco is in New York (UTC -5). 1

   i) Calculate the time difference between Athens and New York.

   2 + 5 = 7 hours

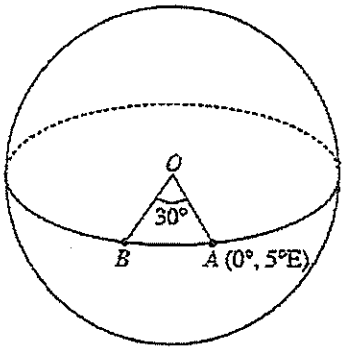
   (ii) Karin is going to ring Marco at 10 pm on Tuesday, Athens time. 2
   What day and local time will it be in New York when she rings?

   10 pm - 7 hours = 3 pm Tuesday
   (1) (1)

   (iii) Marco is going to fly from New York to Athens. His flight will leave on 2
   Wednesday 8 October at 9 am, New York time, and will take 11 hours.
   What is the local time and date in Athens when he arrives?

   9 am (8th Oct) → 4 pm (8th Oct) (1)
   + 11 hours flight
   = 3 am 9th Oct (1)
   must have both

5. Island $A$ and island $B$ are both on the equator. Island $B$ is west of island $A$. The longitude of island $A$ is $5°E$ and the angle at the centre of Earth ($O$), between $A$ and $B$, is 30°.




NOT TO SCALE

What is the longitude of island $B$? 1

25° W

do not accept (0°, 25° W)

**Section B: Rates and Ratio (22 marks)** **Marks**

1. Amy, Brett and Coen invested \$30 000, \$25 000 and \$15 000 respectively in a new business. At the end of the first year the business made a total profit of \$42 000. The profit was divided in the same ratio as the amounts they had invested. How much of the profit did Amy receive?

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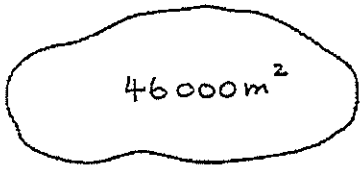


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If the length of land between two points is $550\,m$, what is the map length between these points?

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5. A person's maximum heart rate, MHR (in beats per minute) is given by the formula: 2

$$\text{MHR} = 220 - \text{Age} \qquad \text{where Age is in years.}$$

It is estimated that a healthy person should have a heart rate of 55% of their maximum rate when beginning to exercise. Joshua is a healthy 17 years 3 months old boy.

What is an estimate of his heart rate, in beats per minute, when he begins exercising?

MHR = 220 − 17·25

= 202·75 (1)

202·75 × 55% = 111·5125 bpm (1)

accept any correct rounding

6. Calculate the recovery rate number for a person whose heart rate at the end of exercising is 155 bpm and 95 bpm after one minute. Hence, state the level of fitness this indicates. 2

$\frac{155 - 95}{10} = 6$ (1)

∴ Excellent level of fitness (1)

7. Convert $8m/s$ to $km/h$. 2

8m = 1 sec

(1) 28800 m = 3600 s

28·8 h / h (1)

8. A box of 12 pens costs $7.80. These pens can also be bought in a pack of 22 pens for $9.70. Which option is the best buy? Justify your answer with appropriate mathematical calculations. 2

(1) working { 12 pens = $7.80 ; 1 pen = $0.65 } { 22 pens = $9.70 ; 1 pen = $0.4409 }

(1) ∴ 22 pens for $9.70 is the better option

9. Peta's car uses fuel at the rate of 5.9 L/100 km for country driving and 7.3 L/100 km for city driving. On a trip, she drives 170 km in the country and 25 km in the city. 2

(i) Calculate the amount of fuel she used on this trip.

$(5.9 \times 1.7) + (7.3 \times 0.25) = 11.855$ L (1)

(1)

(ii) How far could the car travel on a full tank of 50 L, if Peta only did country driving? Answer correct to 2 decimal places. 2

5.9 L = 100 km

1 L = 16.949... (1)

50 L = 847.457 .... } accept either. (1)

= 847.46 km

10. A child who weighs 14 kg needs to be given 15 mg of paracetamol for every 2 kg of body weight. Every 10 mL of a particular medicine contains 120 mg of paracetamol. What is the correct dosage, in mL of this medicine for the child? Answer to one decimal place. 2

15 mg = 2 kg

105 mg = 14 kg (1)

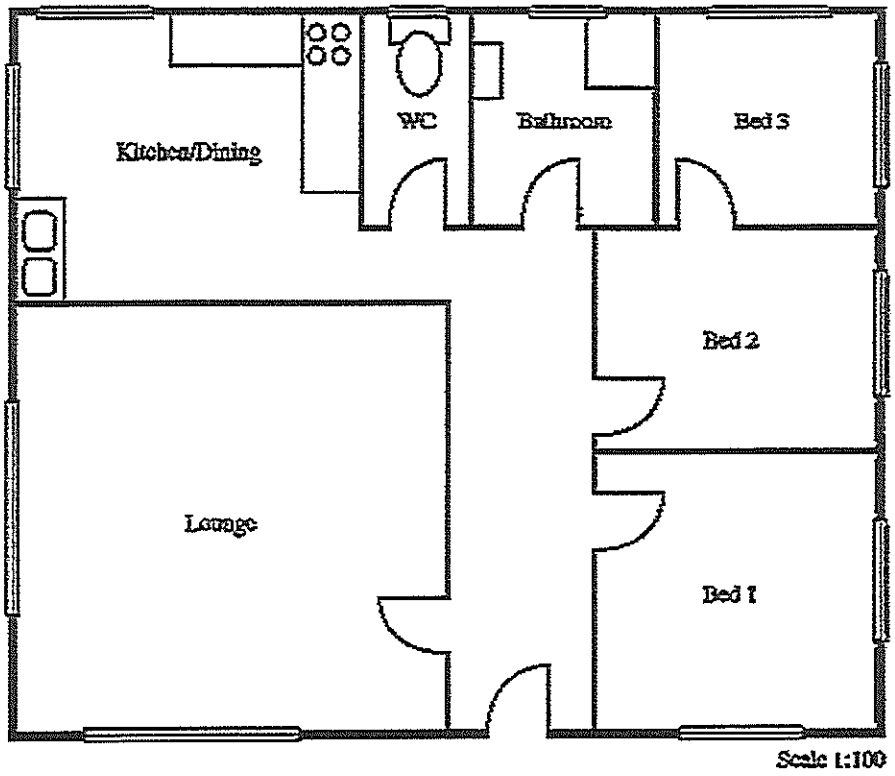
10 mL = 120 mg

0.0833 mL = 1 mg

8.75... = 105 mg

accept either (1) ∴ 8.8 mL is needed.

11. Below is a plan for a house.




(i) By measurement and calculation, find the dimensions of Bed 2. 2

length = 4 × 100 = 400 cm = 4m ①

width = 3 × 100 = 300 cm = 3m ①

∴ length = 4m, width = 3m

(ii) The owners wish to install air conditioning in Bed 2. The power output of the air conditioning unit required is based on the volume of air to be conditioned. 2

Calculate the volume of air to be air conditioned if the ceiling is 2400 mm high.

$V = 4 \times 3 \times 2.4\,m$

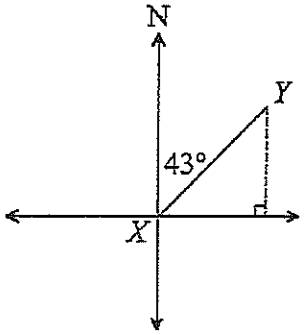
$= 28.8\,m^3$ ①

① for 2.4m.

## Section C: Trigonometry (17 marks)

Marks

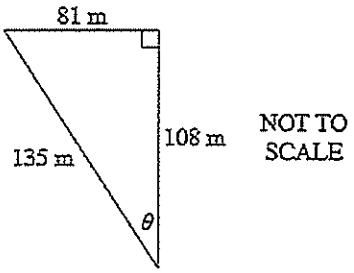
1. The compass bearing of $Y$ from $X$ is $N43°E$.




What is the compass bearing of $X$ from $Y$?

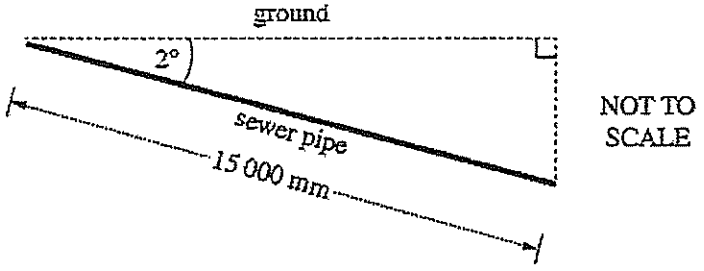
A. $S47°W$ (B.) $S43°W$ C. $N47°E$ D. $N43°E$

2. What is the value of $\theta$, to the nearest degree?




A. 31° (B.) 37° C. 49° D. 53°

3. A sewer pipe needs to be placed into the ground so that it has a 2° angle of depression. The length of the pipe is 15 000 mm. 2



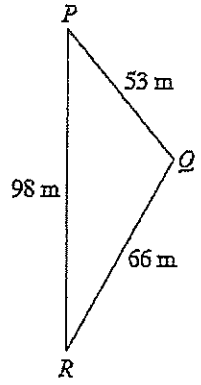

How much deeper should one end of the pipe be compared to the other end? Answer to the nearest mm.

$\sin 2° = \frac{x}{15000}$ (1)

$15000 \times \sin 2° = x$

accept either (1) $523.4924... = x$ or $523 \text{ mm} = x$

4. Triangle $PQR$ is shown below. 2



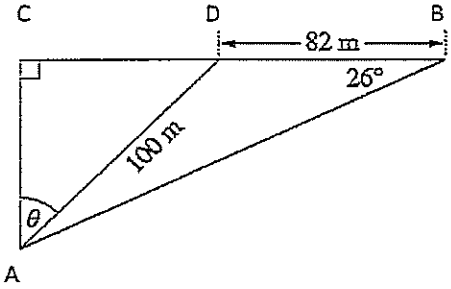

NOT TO SCALE

Find the size of angle $Q$, to the nearest minute.

$\cos \theta = \frac{66^2 + 53^2 - 98^2}{2 \times 66 \times 53}$ (1)

$\theta = 110^\circ\ 24'$ (1)

5. Triangle $ABC$ is drawn below. 2




NOT TO SCALE

(i) Find the size of angle $DAB$, to the nearest degree.

rounding Question

$\frac{\sin A}{82} = \frac{\sin 26}{100}$

$\sin A = \frac{\sin 26}{100} \times 82$

$\sin A = 0.359\ldots$ (1)

$\therefore A = 21^\circ 4'$

$= 21^\circ$ (1)

(ii) Hence or otherwise, find the value of $\theta$, to the nearest degree. 2

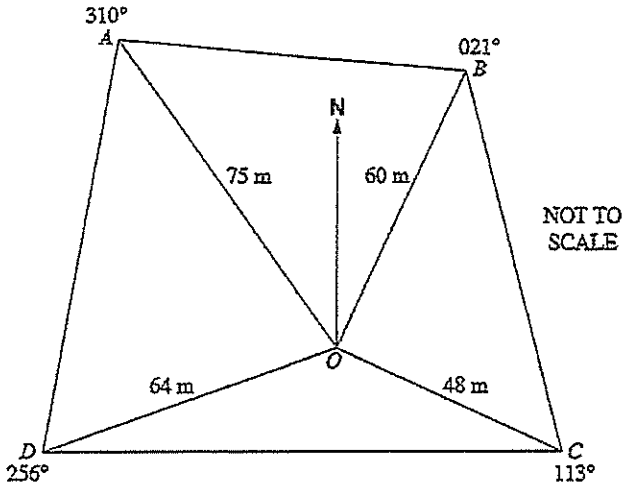
$\angle CAB = 180 - 90 - 26$

$= 64^\circ$ (1)

$\therefore \theta = 64 - 21$

$= 43^\circ$ (1)

6. A compass radial survey of the field $ABCD$ has been conducted from $O$.




(i) Show that angle $AOB$ is 71° 1

$21° + (360° - 310°)$

$= 71°$

(ii) Calculate the distance $AB$, correct to 3 significant figures. 3

$AB^2 = 60^2 + 75^2 - 2 \times 60 \times 75 \times \cos 71°$ (1)

$= 6294.8866...$

$AB = \sqrt{6294.8866}$

$= 79.340...$ (1)

$= 79.3$ m (1)

rounding Question

(iii) Find the area of the section $OBC$, to the nearest square metre. 3

$113° - 21° = 92°$ (1)

$A = \frac{1}{2} \times 60 \times 48 \times \sin 92°$ (1)

$= 1439.122...$

$= 1439\ m^2$

accept either

**End of Paper**