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NZQA

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Level 1 Mathematics and Statistics, 2018

91031 Apply geometric reasoning in solving problems

9.30 a.m. Tuesday 20 November 2018
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Apply geometric reasoning in solving problems.	Apply geometric reasoning, using relational thinking, in solving problems.	Apply geometric reasoning, using extended abstract thinking, in solving problems.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

Show ALL working.

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–12 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

TOTAL

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PLAYGROUNDS

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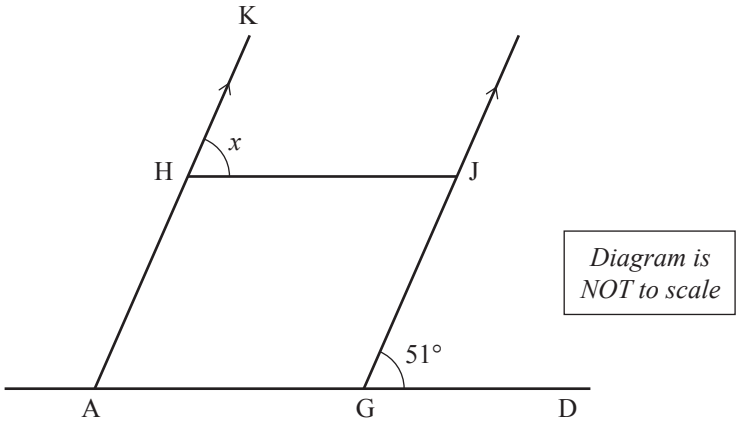
QUESTION ONE

(a) Part of a playground climbing frame is shown below.

AH and GJ are parallel.

AG and HJ are horizontal.

Angle JGD = 51°



(i) Calculate the size, x, of angle JHK.

Justify your answer with clear geometric reasoning.

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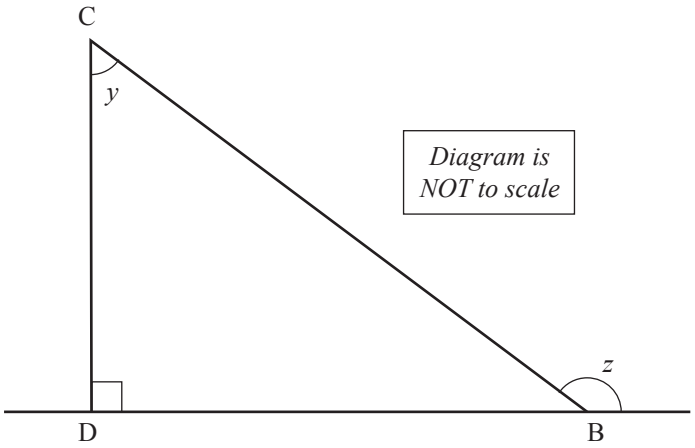
(ii) Another part of a climbing frame is shown below.



Write the angle z in terms of y.

Justify your answer with clear geometric reasoning.

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(b) A slide into a pool is made from a triangular frame with a vertical ladder.

TY is horizontal and 8 m long.

TX is 3 m long.

XU is 2.5 m high.

XU and YW are both vertical supports.

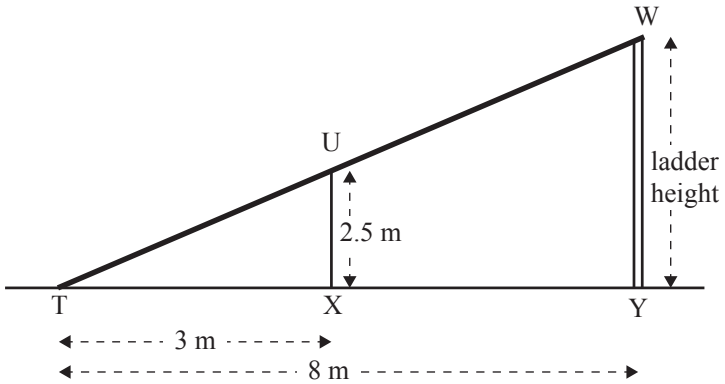

Diagram is NOT to scale

New council rules state that a slide must have:

- an angle (UTX) of less than 60° with the water AND
- a ladder height of less than 5 metres.

Find out whether or not this slide passes BOTH of these council regulations.

Show your working and state your final conclusion clearly.

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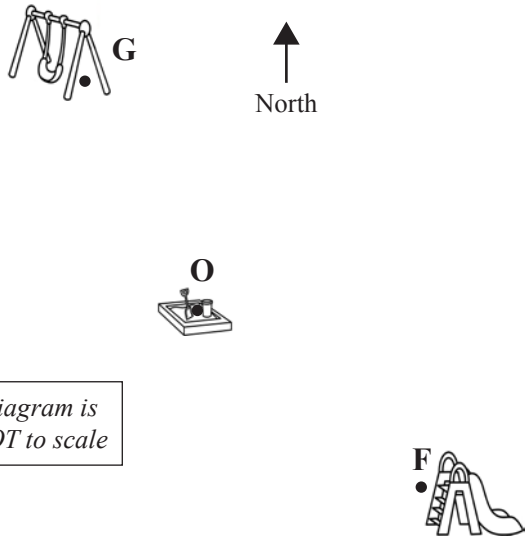
(c) Madalyn has a plan of a local playground which has a sandpit (labelled O), swing (labelled G), seesaw (labelled X), and slide (labelled F).



The swing, seesaw, and slide are all the **same distance** from the centre of the sandpit.

The slide is on a bearing of 130° from the sandpit.

The seesaw is on a bearing of 285° from the sandpit.

The swing is on a bearing of 350° from the sandpit.

Madalyn was standing at the seesaw and facing the swing.

What is the smallest angle she would turn to face the slide?

Show your working and justify your answer with clear geometric reasoning.

QUESTION TWO

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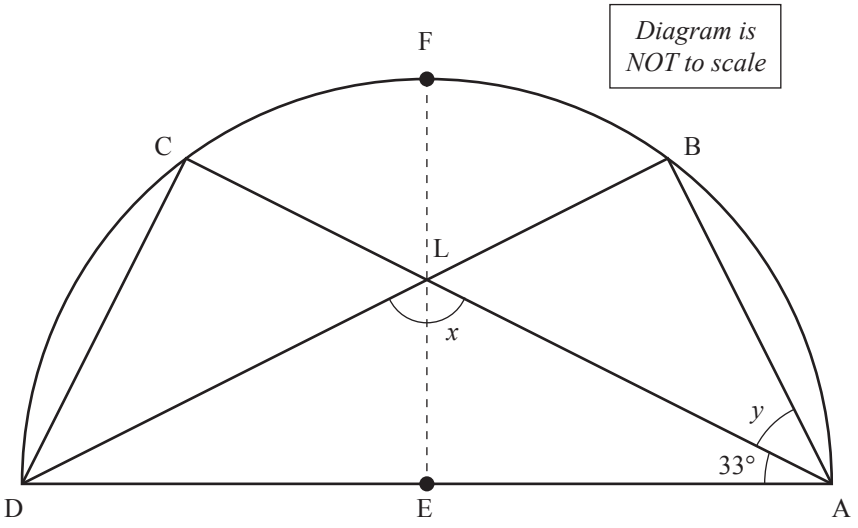
(a) A climbing frame is made from a semi-circle and triangles.

The climbing frame is symmetrical about FE.

Angle CAD = 33°

AD is the diameter of the semi-circle.



(i) Calculate the size, x, of the angle ALD.

Justify your answer with clear geometric reasoning.

(ii) Calculate the size, y, of angle BAC.

Justify your answer with clear geometric reasoning.

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(b) Another circular climbing frame is being designed.

Point O is the centre of the circle.

Lines OC and BD are parallel.

OC = BD

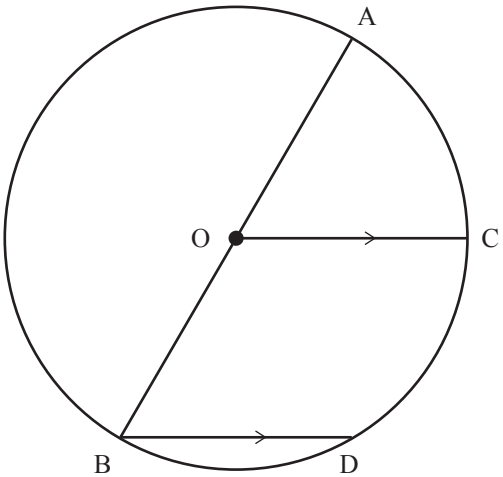

Diagram is NOT to scale

Prove that the length of the straight line AC equals the length of the straight line OD.

Justify your answer with clear geometric reasoning.

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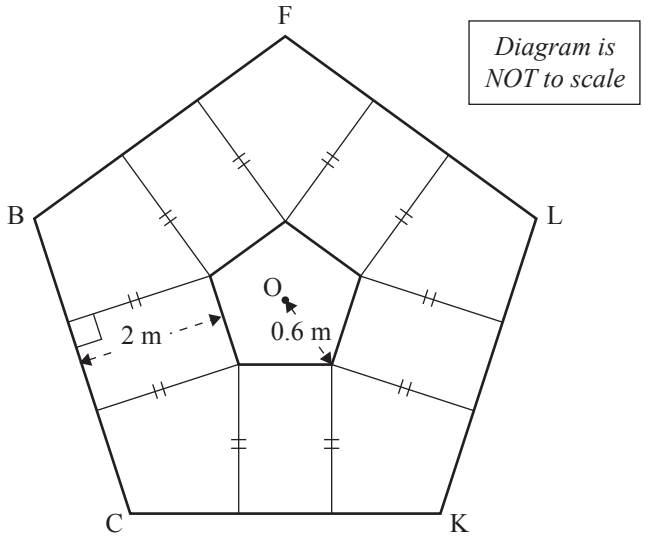
(c) A designer wants to create a frame with a small regular pentagon inside a larger regular pentagon.

Point O is:
- the centre of both pentagons
- 0.6 metres from the vertex of the smaller pentagon.

Poles from the vertices of the smaller pentagon to the side of the larger pentagon are:
- 2 metres long
- at right angles to the sides of the larger pentagon.



Calculate the length of FL, one side of the larger regular pentagon.

Show your working clearly.

QUESTION THREE

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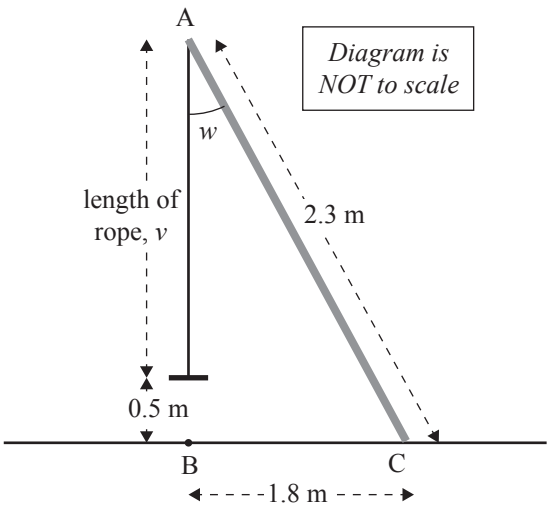
(a) A swing is made from one pole 2.3 m long, placed at an angle in the ground.
The swing seat is 0.5 m off the ground.
BC is a horizontal line of length 1.8 m.
AB is vertical.



(i) Calculate the size, w, of angle CAB.
Show your working clearly.

(ii) Calculate the length of the rope, v, holding the swing seat.
Show your working clearly.

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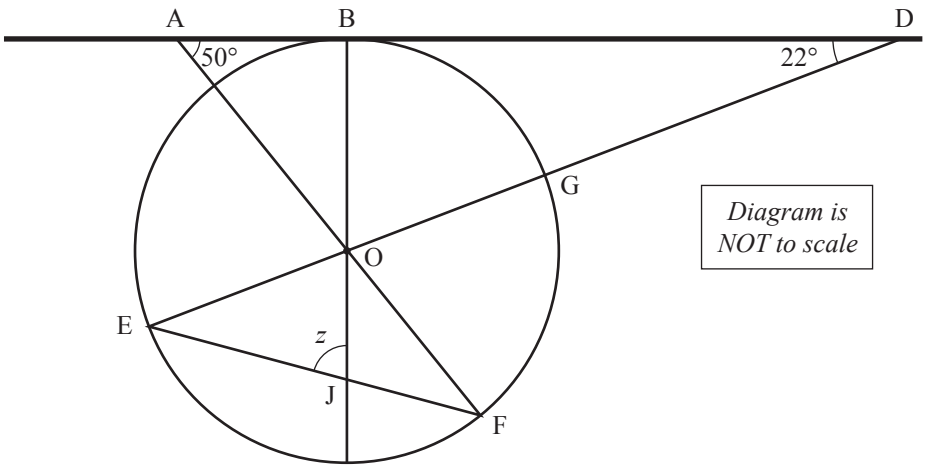
(b) A circular hoop is hung with wires running through it.

O is the centre of the circular hoop.

Angle OAB = 50°

Angle ODB = 22°



Calculate the size, z, of angle EJO.

Justify your answer with clear geometric reasoning.

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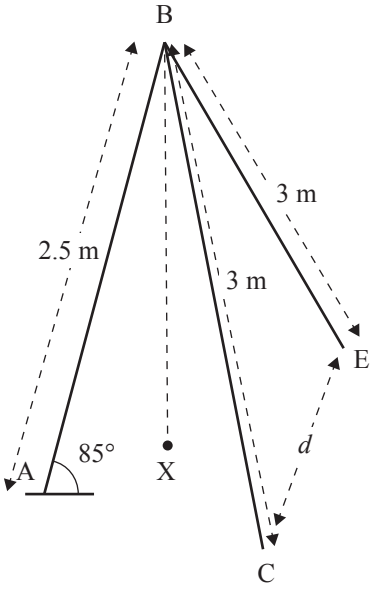
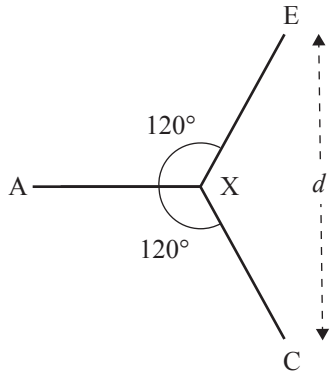
(c) ABCE is a three-sided frame and it is built as stated below:

- Pole AB is 2.5 m long above the ground and it enters the ground at 85°.
- Poles CB and EB are both 3 m long above the ground.
- The three poles are equally spaced out at 120° about the central point X (which is directly below point B).

Side view



Top view



Diagrams are NOT to scale

Calculate d, the distance between C and E at ground level.

Show your working clearly.

Extra space if required.
Write the question number(s) if applicable.

QUESTION NUMBER

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