MPM2D
Examination
Exam B, 2012
Length: 3 hours
(Exam set for 2 hrs. + 1 hr. flex time)

OTTAWA-CARLETON
DISTRICT SCHOOL BOARD

Name : _____

Teacher : _____

School : _____

Instructions to students:

1. This examination booklet is **13 pages** long.
   Please check that you have all the pages.

2. Answer all questions with complete solutions in the spaces provided on the examination paper.

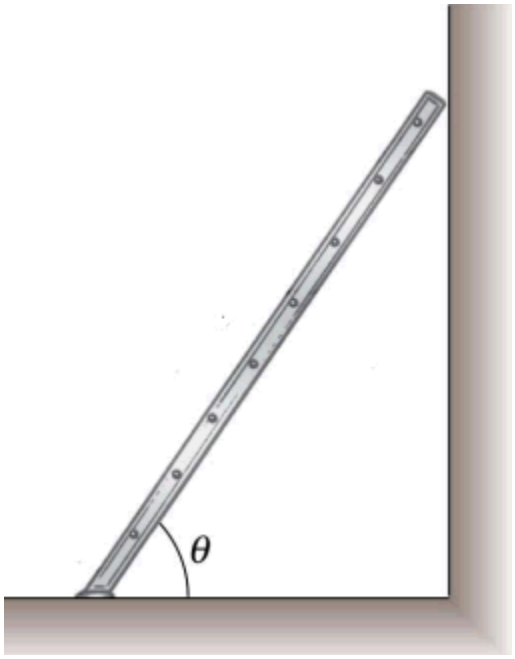
3. You may use any school-approved calculator on this examination.
   Make sure that your calculator is in **DEGREE** mode.
   Do **not** share your calculator.

4. There is a formula sheet that goes with the examination.

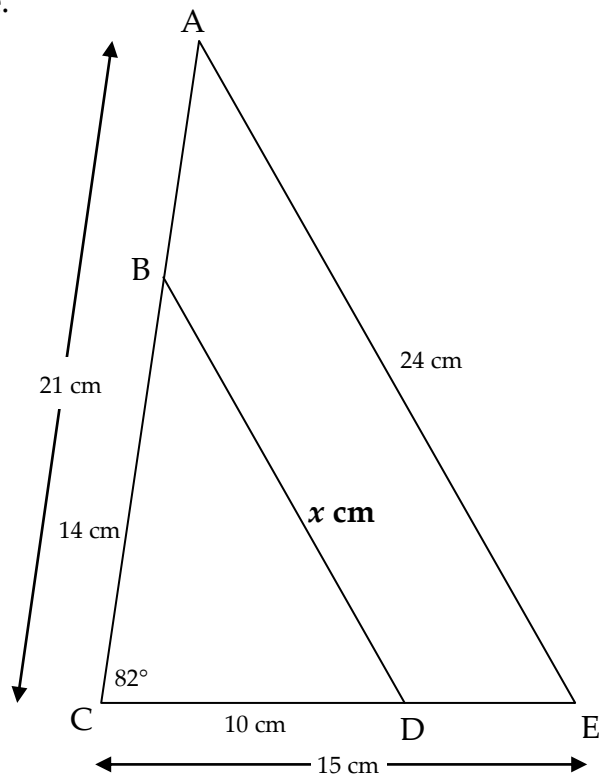
5. Diagrams are not drawn to scale.

A) Trigonometry

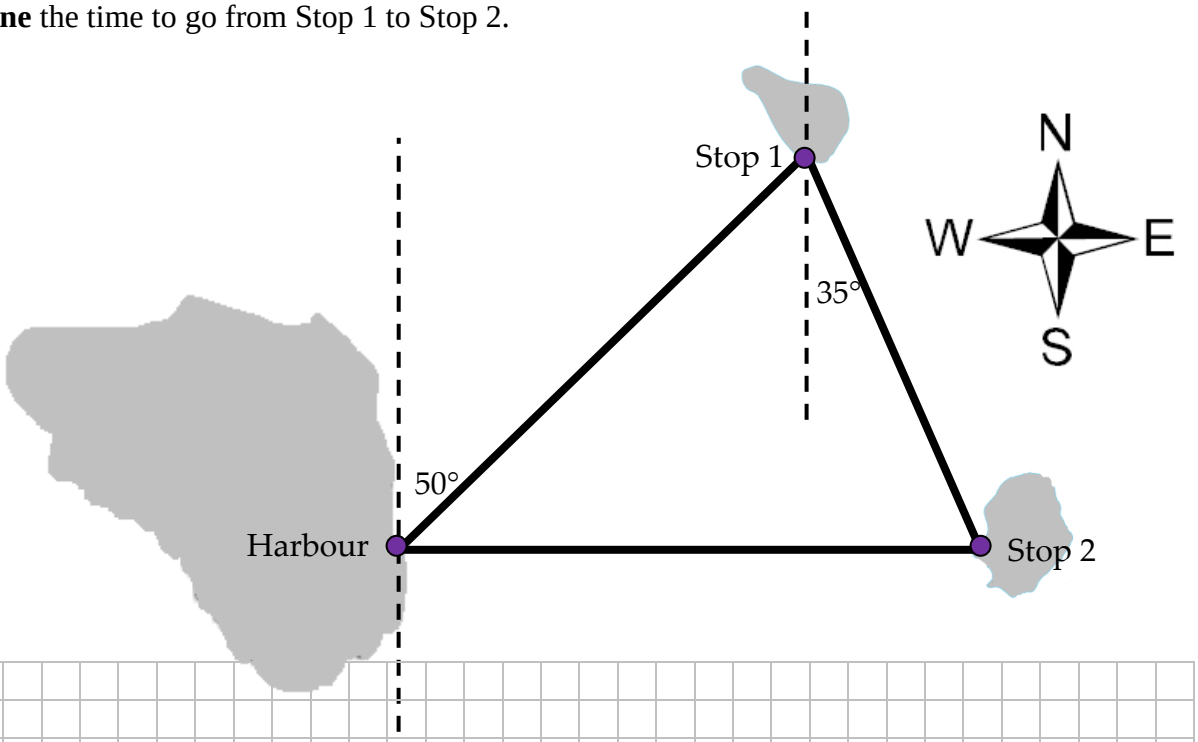
A1) An 8.0 m long ladder is leaning against a fence.
The base of the ladder is 2.0 m from the fence.
Determine the angle the ladder makes with the ground.



A2) **Determine** the value of *x*. Round to the nearest centimetre.
Verify your answer using another method.



A3) A cruise ship, whose path is shown in the diagram below, travels at 25 km/h.
It leaves the harbour and travels for two hours before stopping at Stop 1.
Later, the ship heads towards Stop 2 which is due east of its starting point.
Determine the time to go from Stop 1 to Stop 2.

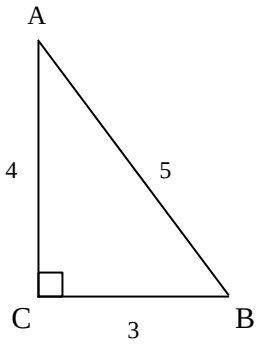


A4) Azra's **tan** key on her calculator is broken .

Azra's brother claims that she doesn't need a **tan** key,

she just needs to calculate $\sin\theta \div \cos\theta$.

a) **Verify** that this property works for the triangle below.
b) Do you think it works for all angles? **Justify** your answer.



B) Analytic Geometry

B1) Two continuous linear relations are defined below.
Determine the point of intersection of the lines defined by these relations.

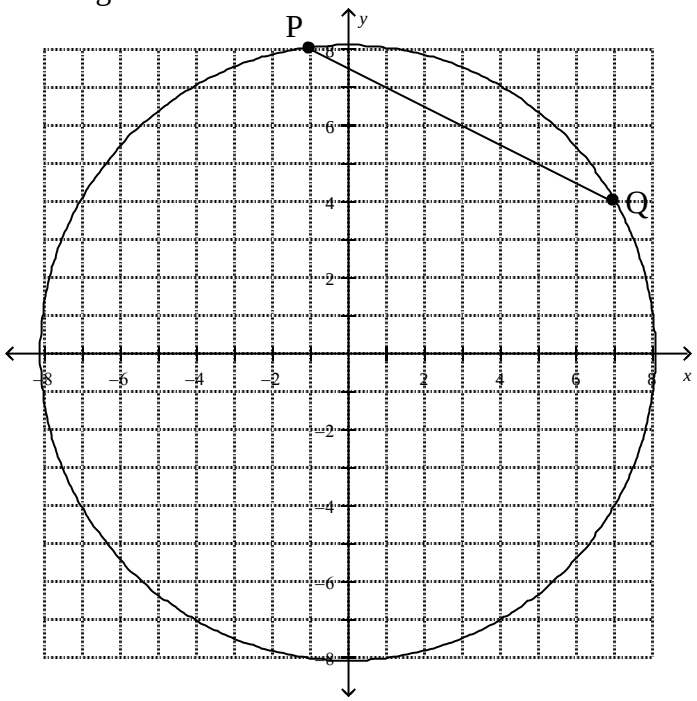
Relation 1:

$y = -3x + 12$

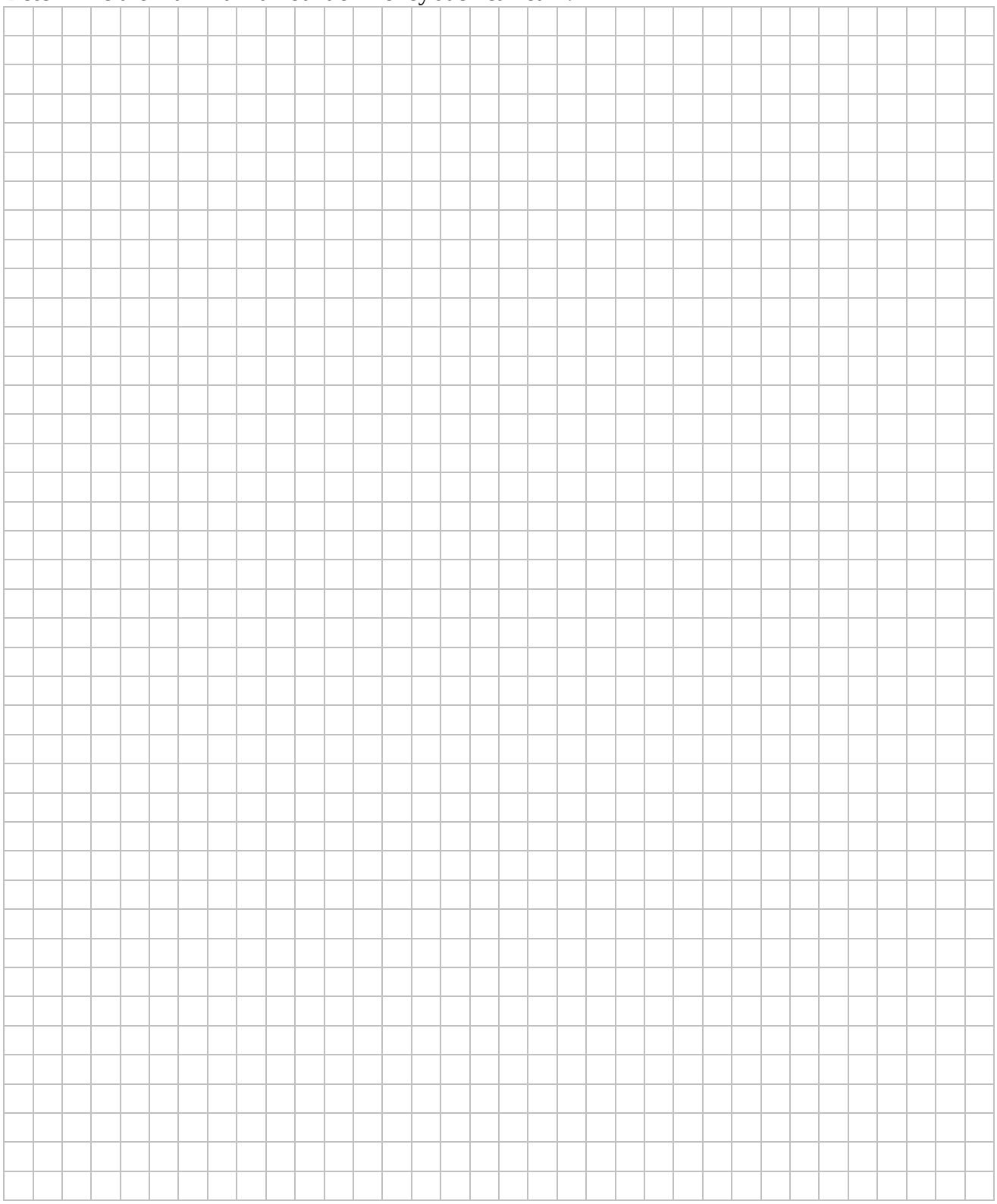
Relation 2:

x	y
–2	–7
–1	–5
0	–3
1	–1
2	1

B2) The points P(–1, 8) and Q(7, 4) are on the circle with equation $x^2 + y^2 = 65$.
Verify that the perpendicular bisector of PQ passes through the centre of the circle.



B3) Jack works at both the Athena Souvlaki Stop and the Bytown Grill.
One week he worked for 30 hours at Athena and 10 hours at Bytown and earned $510.
Another week he worked for 20 hours at Athena and 30 hours at Bytown and earned $690.
Jack can only work 23 hours next week.
Determine the maximum amount of money Jack can earn.



B4) The area of a parallelogram created by the line $y = \frac{4}{3}x$ and three other lines is 100 square units.

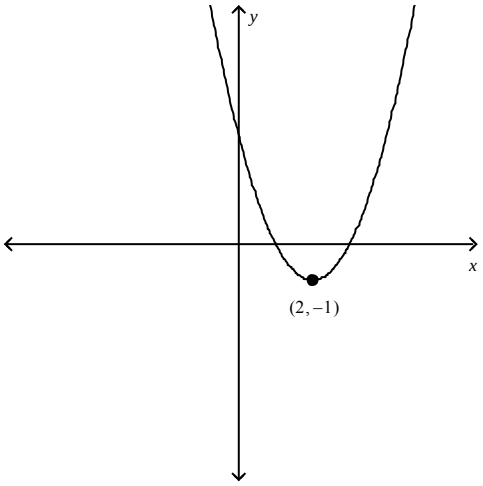
a) **List** the relevant properties of parallelograms and how they can be used to determine the equations of the three other lines.

b) **Determine** equations of the lines containing the other three sides of possible parallelograms. **Justify** your answer.

(Recall: for a parallelogram, $A = bh$, where A is the area, b is the base and h is the height.)

C) Quadratic Relations

C1) The parabola with equation $y = x^2$ is translated so that its vertex is at (2, –1).
State an equation of the new parabola.



C2) A rocket is launched from the top of a very tall building.
The flight of the rocket can be modeled by $h = -5t^2 + 30t + 80$, where h is the height of the rocket in meters relative to ground, t seconds after being launched.
Determine the maximum height of the rocket.

C3) **Determine** the zeros of the quadratic relation with equation $y = -2x^2 - 16x - 24$.

C4) The table below shows data for average time on Facebook by age

Age	**Average number of minutes per day on Facebook**
13	54
14	96
15	126
16	144
17	150
18	144

a) **Determine** an equation which could be used to predict Facebook usage for other ages.

b) Could this model be used to predict average Facebook use for all Facebook users?
Justify your answer.

C5) Quadratic relations may have 2, 1 or 0 zeros.
Using a variety of forms of equations and representations, write examples of each case and **justify** your choices.