SM-2401 Geometry Class Test 1
2020/21 Semester 1
17 September 2020
Time allowed: 60 minutes

Instructions:

- This is an **open-book**, **take-home** test. You are allowed <u>60 minutes</u> to answer the questions, and another <u>30 minutes</u> to upload your solutions to Canvas. Late solutions will be penalised.

- There are three (3) questions totalling 30 marks and one (1) bonus question for 1 mark. The total attainable marks is 30 only.

- Answer **ALL** questions on a separate answer sheet.

- Ensure that you have written your name and student number on your answer sheets that you are submitting.

- The use of calculators is allowed.

Question:	1	2	3	4	Total
Marks:	10	10	10	1	30

1. (10 marks) Mark each of the following statements as either TRUE or FALSE.

   (a) A line in plane geometry has width but no length.

   $\square$ TRUE $\quad\square$ FALSE

   (b) Two angles whose measures add together to give 180 are said to be complementary angles.

   $\square$ TRUE $\quad\square$ FALSE

   (c) Two or more angles are said to be congruent if they have the same angle measure.
   $\square$ TRUE $\quad\square$ FALSE

   (d) A triangle is scalene if all three of its sides have different lengths.
   $\square$ TRUE $\quad\square$ FALSE

   (e) If all the medians of a triangle are also altitudes, the triangle is equilateral.
   $\square$ TRUE $\quad\square$ FALSE

   (f) An obtuse triangle can never be isosceles.

   $\square$ TRUE $\quad\square$ FALSE

   (g) A triangle $\triangle ABC$ has side lengths $|\overline{AB}| = 2$, $|\overline{BC}| = 2$, and $|\overline{AC}| = 3$. The triangle is

      i. isoceles $\qquad\qquad\qquad\qquad\quad$ $\square$ TRUE $\quad\square$ FALSE
      ii. a right triangle $\qquad\qquad\qquad\quad$ $\square$ TRUE $\quad\square$ FALSE

   (h) If a sector of a circle has arc length 4 and central angle $60°$, then the area of the circle is $144/\pi$.

   $\square$ TRUE $\quad\square$ FALSE

   (i) If a circle is inscribed inside a triangle $\triangle ABC$, and a second circle is circumscribed around $\triangle ABC$, then the two circles are always concentric.

   $\square$ TRUE $\quad\square$ FALSE

2. (a) (2 marks) The angles of a triangle have measures $2x + 10$, $3x - 15$, and $4x - 40$ for some number x. Show that the triangle is equilateral. *Hint: All angles in an equilateral triangle are congruent to each other.*

(b) (2 marks) Use the Cosine Rule $a^2 = b^2 + c^2 - 2bc \cos \alpha$ to calculate the value of x for the following triangle:
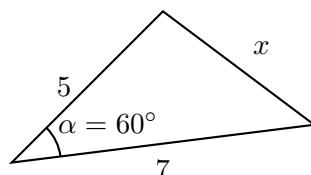
(c) (2 marks) Show that a triangle is with the side lengths side lengths 5, 12 and 13 is a right triangle.

(d) In the diagram below, the angle $\angle ABC$ and $\angle ADB$ are right angles.
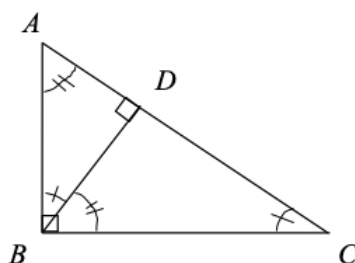
   i. (2 marks) If $m\angle DBC = 40$, what is $m\angle BAD$?
   ii. (2 marks) If $|\overline{AB}| = 3$ and $|\overline{AC}| = 5$, what is $|\overline{BC}|$?

3. (a) In the diagram below, the point C is the centre of the large circle and $\overline{AS}$ is a diameter of this circle. The centre D of the small circle lies on $\overleftrightarrow{AS}$. It passes through A and C and its radius is 1. The line $\overleftrightarrow{BR}$ is parallel to $\overleftrightarrow{AS}$ and a tangent to the small circle. The point of tangency is B.
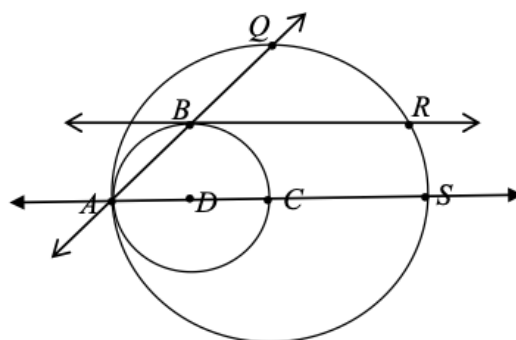
   i. (2 marks) What is $m\angle BAD$?
   ii. (2 marks) What is the length of the line segment $\overline{AQ}$?
   iii. (3 marks) What is the measure of the arc $\overset{\frown}{QR}$?

(b) (3 marks) Consider the sketch below.
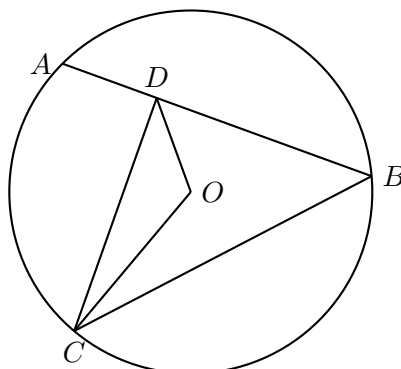
The points A, B and C lie on the circle with centre O. D is a point that lies on the chord $\overline{AB}$. Given that $m\angle ABC = 30$, and that $m\angle BCO = m\angle OCD = 20$, what is the measure of $\angle ODC$?

———— *Bonus Question* ————

4. (1 mark) Find the statement which contradicts the following statement:

"If I work hard, then I will become rich"

A. If I work hard, then I will not become rich.

B. If I do not work hard, then I will become rich.

C. I work hard and I do not became rich.

D. I do not work hard and I become rich.

E. I do not work hard and I do not become rich.

F. I do not work hard or I become rich.

G. I work hard or I do not become rich.

H. I do not work hard or I do not become rich.

———— *End of Paper* ————