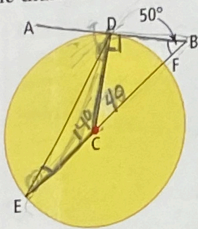Tangents always ~~~~
  - touch the circumference of the circle at exactly one point
  - are perpendicular to the radius

Example 1: Determine Angle Measures in a Circle With a Tangent Line

In the diagram shown, AB is tangent to the circle at point D, BE contains the diameter FE, and $\angle ABE = 50°$.

a) What is the measure of $\angle BDC$? Justify your answer. 90 – tangent
b) What is the measure of central angle $\angle DCE$? Explain your reasoning. 140
c) What type of triangle is $\triangle CDE$? Justify your answer. Isocelse – 2 radii
d) What is the measure of $\angle DEC$? Explain your reasoning.

20°   Isoceseles triangles have
              2 equal angles.
          140 + 2a = 180   a = 20

Example 2: Use the Tangent Chord Relationship

In the diagram, AB is tangent to the circle at point B. BD is a diameter of the circle. AB = 7 mm, AD = 25 mm, and $\triangle BCE$ is an equilateral triangle.
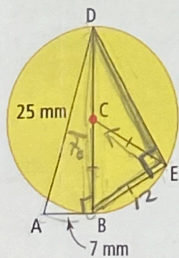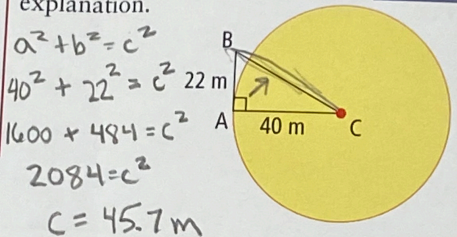

a) $a^2 + b^2 = c^2$
$7^2 + b^2 = 25^2$
$49 + b^2 = 625$
$-49 \qquad -49$
$\sqrt{b^2} = \sqrt{576}$
$b = 24$ mm

b) $24 \div 2 = 12$ mm

d) $a^2 + b^2 = c^2$
$a^2 + 12^2 = 24^2$
$a^2 + 144 = 576$
$-144 \quad -144$
$a^2 = 432$
$21 = a$

a) What is the length of diameter BD? Justify your answer.
b) What is the length of chord BE? Explain your reasoning. 12 mm.
c) What is the measure of the inscribed angle $\angle BED$? $180 \div 2 = 90°$
d) What is the length of chord DE? Justify your answer and express your answer to the nearest millimetre.

Example 3: Solve Problems With Tangents to Circles

A speed skater is practising on a circular track with a radius of 40 m. He falls and slides off the track in a line tangent to the circle. If he slides 22 m, how far is he from the centre of the rink? Express your answer to the nearest tenth of a metre. Include a diagram in your explanation.

$$a^2 + b^2 = c^2$$
$$40^2 + 22^2 = c^2 \quad \text{22 m}$$
$$1600 + 484 = c^2 \quad \text{A} \quad \text{40 m} \quad \text{C}$$
$$2084 = c^2$$
$$c = 45.7 \text{ m}$$

Show You Know

Callan is attempting to land his model airplane when the wire breaks just before touchdown. If the length of the control wire is 10 m and the plane stops at a location 74 m from Callan, how far does the plane travel after the wire breaks. Express your answer to the nearest tenth of a metre.

74 m   10 m

x