Higher tier unit 16a check in test

Calculator

Q1.

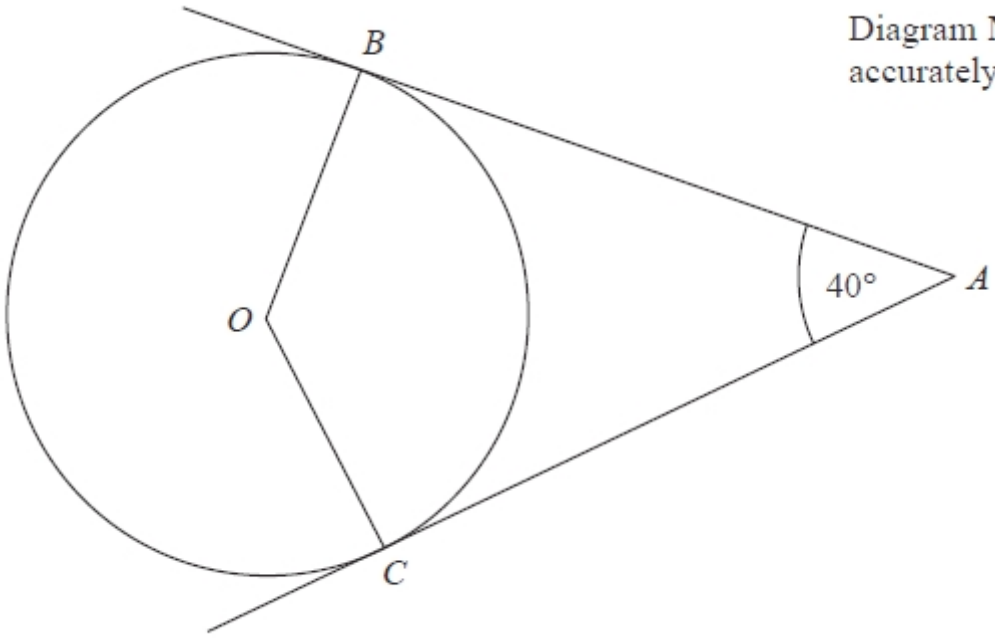


Diagram **NOT** accurately drawn

B and *C* are points on the circumference of a circle, centre *O*.
AB and *AC* are tangents to the circle.
Angle *BAC* = 40°.

Find the size of angle *BCO*.

Q2.

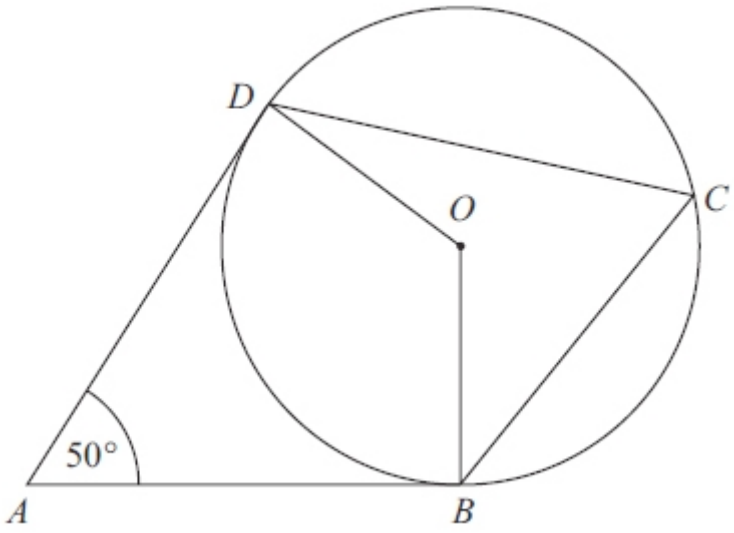


Diagram **NOT** accurately drawn

B, *C* and *D* are points on the circumference of a circle, centre *O*.
AB and *AD* are tangents to the circle.
Angle *DAB* = 50°

Work out the size of angle *BCD*.
Give a reason for each stage in your working.

Q3.

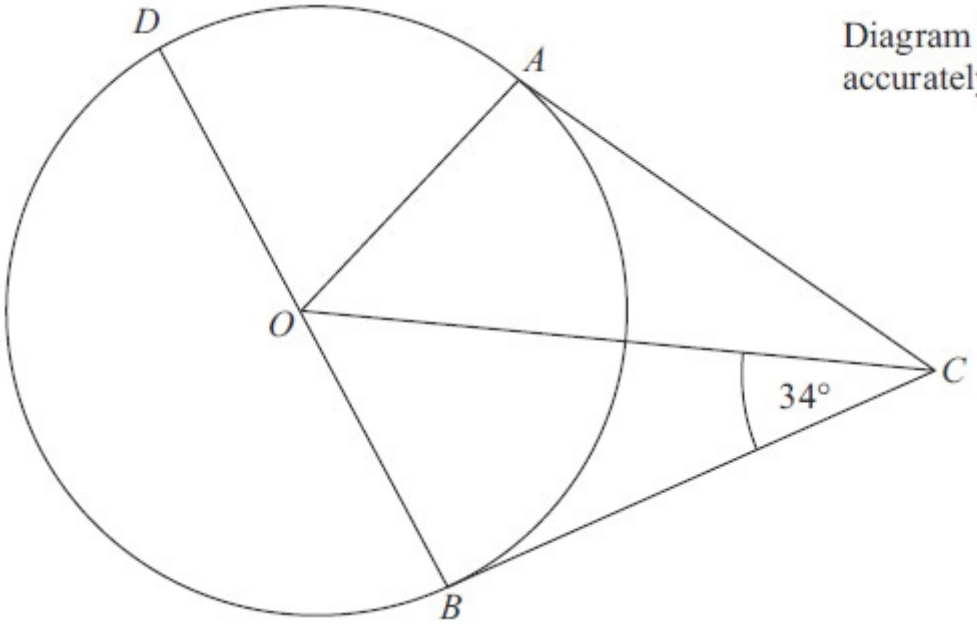


Diagram **NOT** accurately drawn

A, *B* and *D* are points on the circumference of a circle, centre *O*.
BOD is a diameter of the circle.
BC and *AC* are tangents to the circle.
Angle *OCB* = 34°.

Work out the size of angle *DOA*.

Q4.

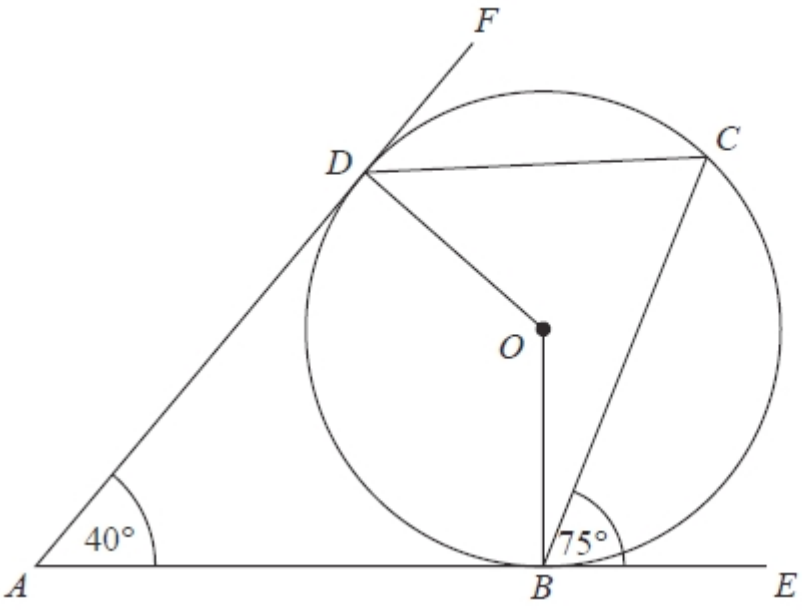


Diagram **NOT** accurately drawn

B, *C* and *D* are points on the circumference of a circle, centre *O*.
ABE and *ADF* are tangents to the circle.

Angle *DAB* = 40°
Angle *CBE* = 75°

Work out the size of angle *ODC*.

Q5.

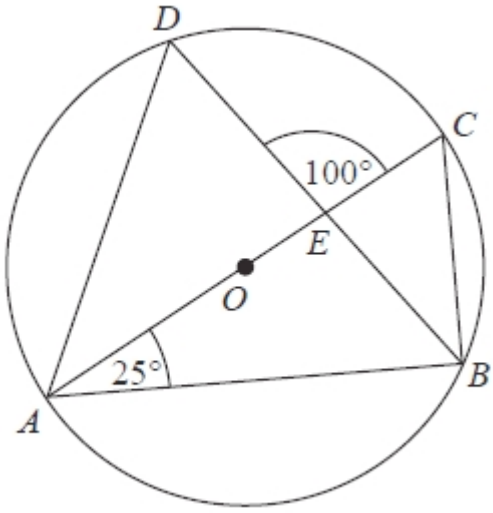


Diagram **NOT** accurately drawn

A, *B*, *C* and *D* are points on the circumference of a circle, centre *O*.
AC is a diameter of the circle.
AC and *BD* intersect at *E*.

Angle *CAB* = 25°
Angle *DEC* = 100°

Work out the size of angle *DAC*.
You must show all your working.

Q6.

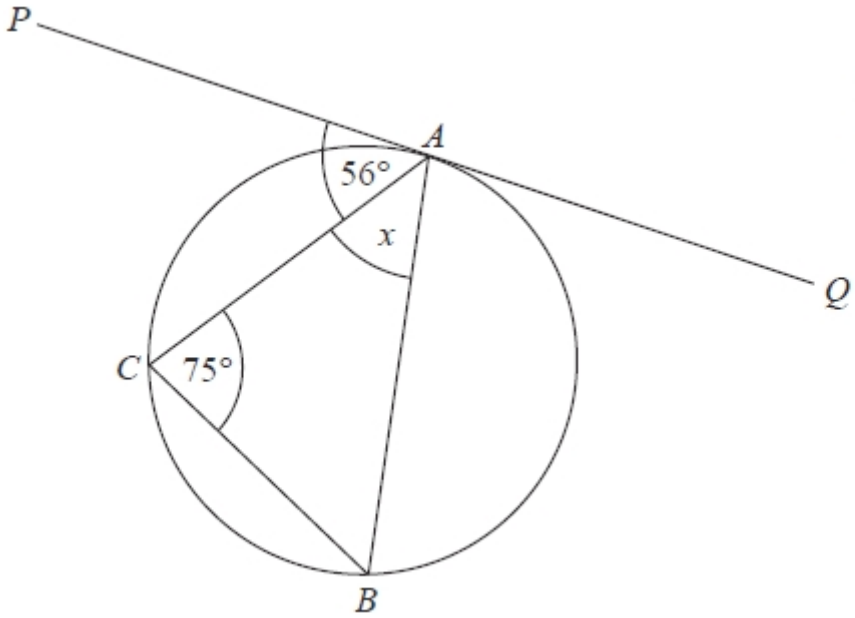


Diagram **NOT** accurately drawn

A, *B* and *C* are points on the circumference of a circle.
The straight line *PAQ* is a tangent to the circle.

Angle *PAC* = 56°
Angle *ACB* = 75°

Work out the size of the angle marked *x*.
Give reasons for each stage of your working.

Q7.

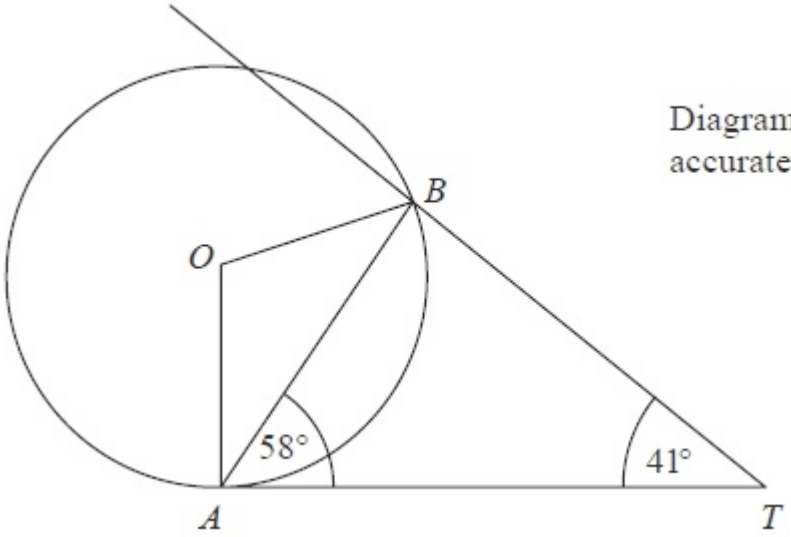


Diagram **NOT** accurately drawn

A and *B* are points on the circumference of a circle, centre *O*.
AT is a tangent to the circle.

Angle *TAB* = 58°.
Angle *BTA* = 41°.

Calculate the size of angle *OBT*.
You must give reasons at each stage of your working.

Q8.

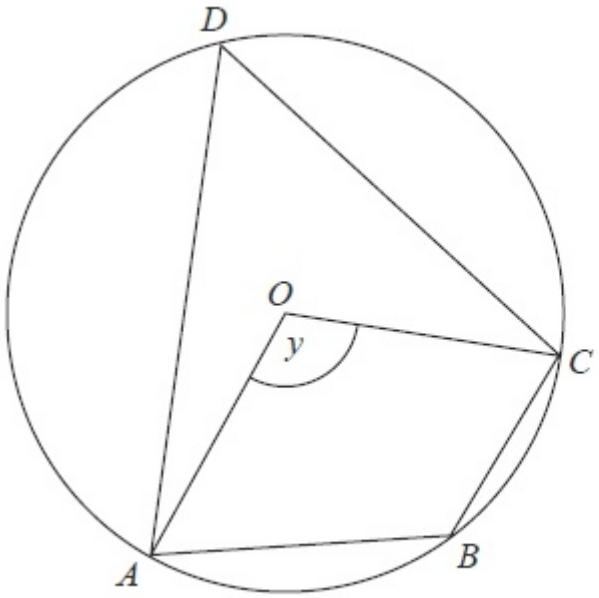


Diagram **NOT** accurately drawn

A, *B*, *C* and *D* are points on the circumference of a circle, centre *O*.
Angle *AOC* = *y*.

Find the size of angle *ABC* in terms of *y*.
Give a reason for each stage of your working.

Q9.

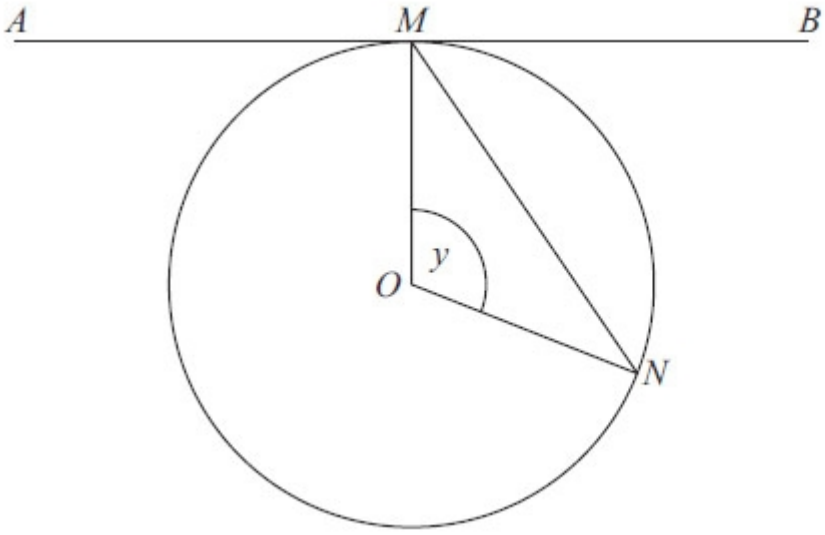


Diagram **NOT** accurately drawn

M and *N* are two points on the circumference of a circle centre *O*.
The straight line *AMB* is the tangent to the circle at *M*.
Angle *MON* = *y*

Prove that angle *BMN* = ½ *y*

Q10.

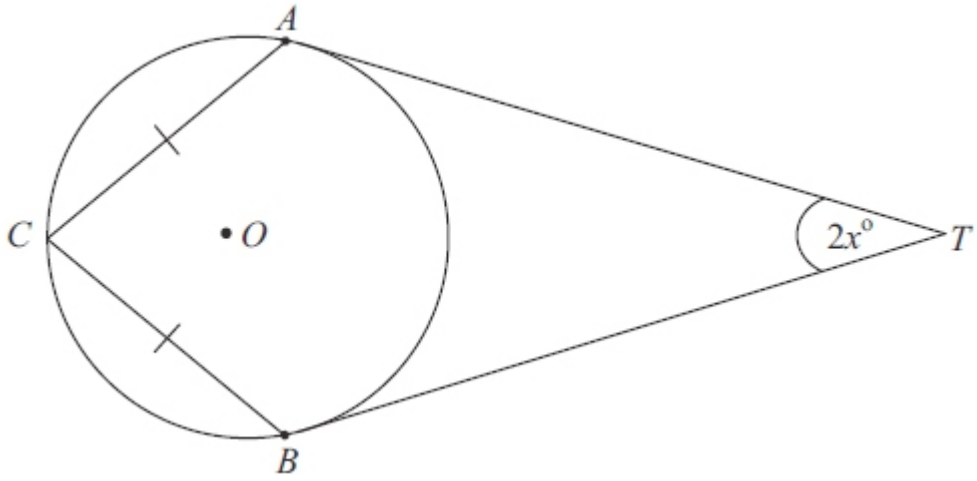


Diagram **NOT** accurately drawn

A, *B* and *C* are points on the circumference of the circle, centre *O*.
TA and *TB* are tangents to the circle. *CA* = *CB*.
Angle *ATB* = 2*x*°.

Prove that angle *ACB* = (90 – *x*)°.

Topics listed in objectives

- Recall the definition of a circle and identify (name) and draw parts of a circle, including sector, tangent, chord, segment;
- Prove and use the facts that:
  - the angle subtended by an arc at the centre of a circle is twice the angle subtended at any point on the circumference;
  - the angle in a semicircle is a right angle;
  - the perpendicular from the centre of a circle to a chord bisects the chord;
  - angles in the same segment are equal;
  - alternate segment theorem;
  - opposite angles of a cyclic quadrilateral sum to 180°;
- Understand and use the fact that the tangent at any point on a circle is perpendicular to the radius at that point;
- Find and give reasons for missing angles on diagrams using:
  - circle theorems;
  - isosceles triangles (radius properties) in circles;
  - the fact that the angle between a tangent and radius is 90°;
  - the fact that tangents from an external point are equal in length.

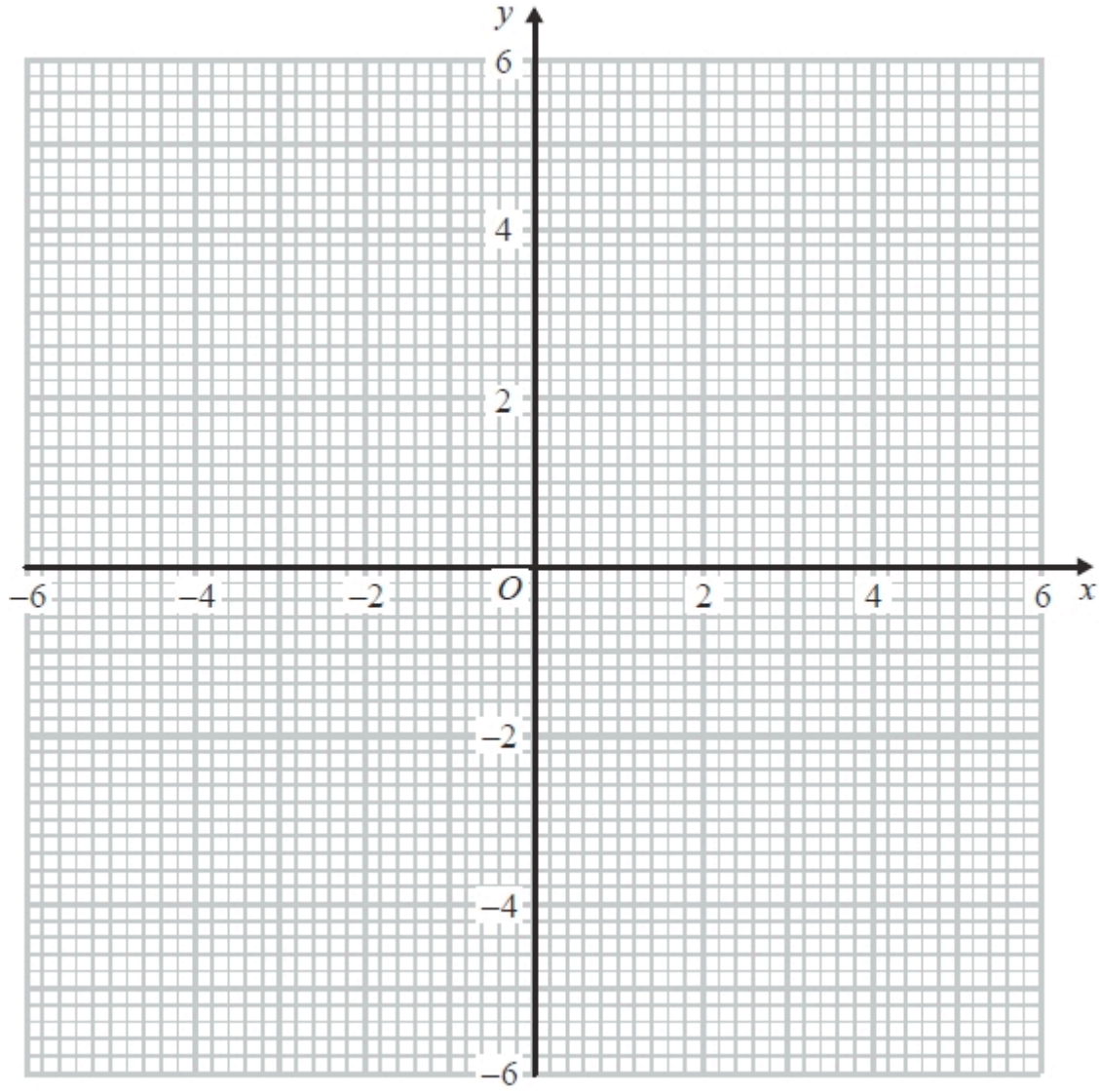
Answers

Q1. 20°
Q2. 65°
Q3. 68°
Q4. 55°
Q5. 35°
Q6. 49°
Q7. 113°
Q8. $(180 - y/2)°$
Q9. $OMN = (180 - y)/2°$ (isosceles triangles) $= (90 - y/2)°$,
so BMN $= (y/2)°$ (tangent at right angle to radius)
Q10. AOB $= 360 - 90 - 90 - 2x = 180 - 2x°$ (tangent at right angle to radius),
so ACB $= 180 - 2x \div 2$ (angle at centre double angle at circumference) $= (90 - x)°$

Higher tier unit 16b check in test

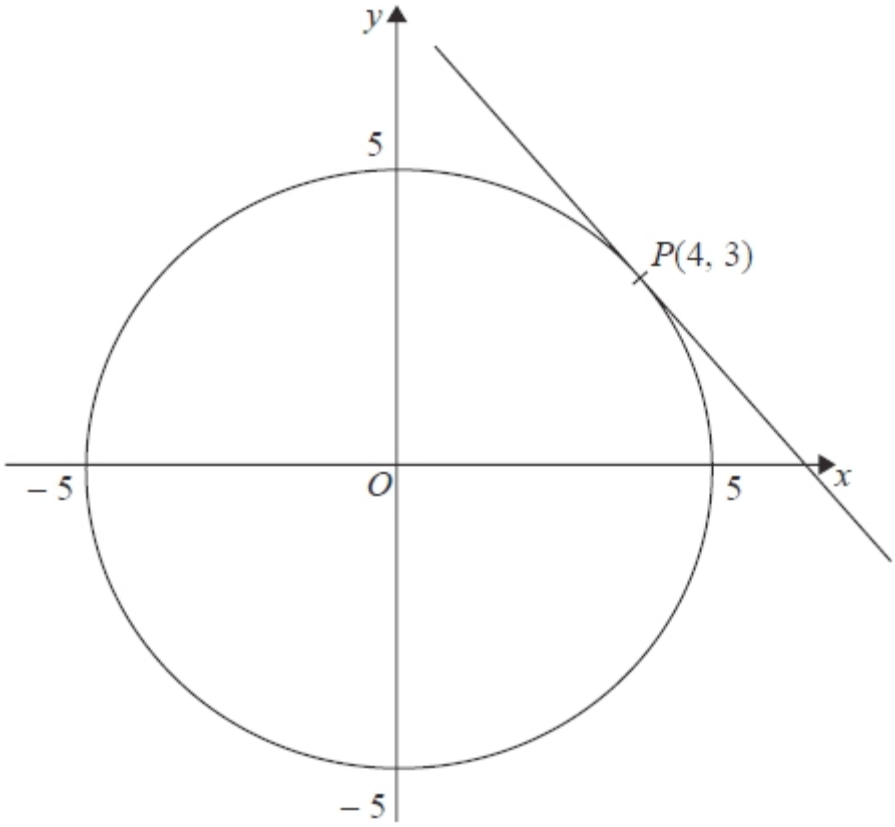
Calculator

Q1. On the grid, construct the graph of $x^2 + y^2 = 16$



[Q2–3 linked]

Q2. Here is a circle, centre O, and the tangent to the circle at the point $P(4, 3)$ on the circle.



Find an equation of the radius OP.

Q3. Using the diagram in question 2, find an equation of the tangent at the point P.

[Q4–5 linked]

Q4. The line l is a tangent to the circle $x^2 + y^2 = 40$ at the point A.
A is the point (2, 6).

Find an equation of the tangent at the point A.

Q5. The line l in question 4 crosses the x–axis at the point P.
Work out the area of triangle OAP.

Topics listed in objectives

- Select and apply construction techniques and understanding of loci to draw graphs based on circles and perpendiculars of lines;
- Find the equation of a tangent to a circle at a given point, by:
  - finding the gradient of the radius that meets the circle at that point (circles all centre the origin);
  - finding the gradient of the tangent perpendicular to it;
  - using the given point;
- Recognise and construct the graph of a circle using $x^2 + y^2 = r^2$ for radius r centred at the origin of coordinates.

Answers

Q1. circle correctly drawn, centre (0, 0), radius 4

Q2. $y = \frac{3}{4}x$

Q3. $y = \frac{4}{3}x + \frac{25}{3}$

Q4. $y = \frac{1}{3}x + 6\frac{2}{3}$

Q5. P (20, 0), so area triangle $OAP = \frac{1}{2} \times 20 \times 6 = 60$