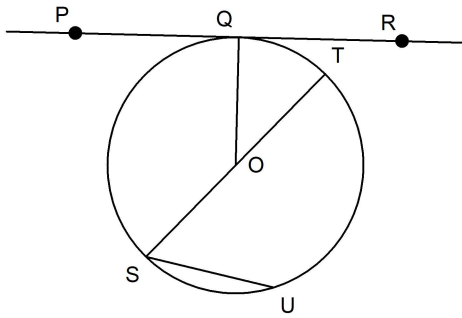


**circle**

**Multiple Choice**

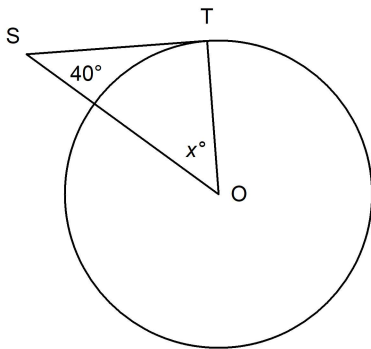
Identify the choice that best completes the statement or answers the question.

- \_\_\_\_\_ 1. O is the centre of this circle.  
Which line is a tangent?



- a. OQ                      b. ST                      c. PR                      d. SU

- \_\_\_\_\_ 2. O is the centre of this circle and point T is a point of tangency.  
Determine the value of  $x^\circ$ .

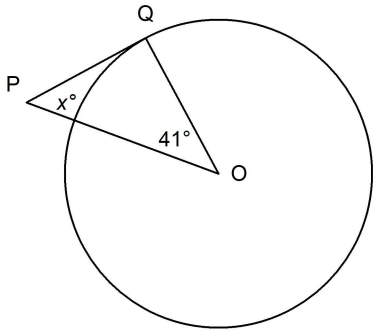


- a.  $90^\circ$                       b.  $50^\circ$                       c.  $130^\circ$                       d.  $40^\circ$

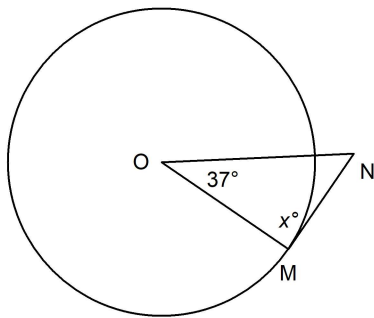
Name: \_\_\_\_\_

ID: A

- \_\_\_\_\_ 3. O is the centre of this circle and point Q is a point of tangency.  
Determine the value of  $x^\circ$ .

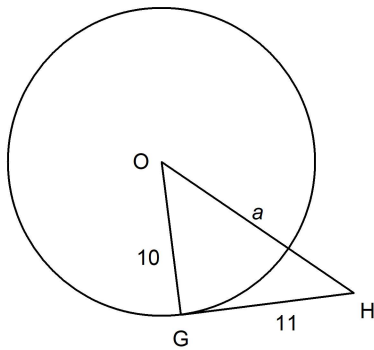


- a.  $139^\circ$                       b.  $49^\circ$                       c.  $41^\circ$                       d.  $90^\circ$
- \_\_\_\_\_ 4. O is the centre of this circle and point M is a point of tangency.  
Determine the value of  $x^\circ$ .



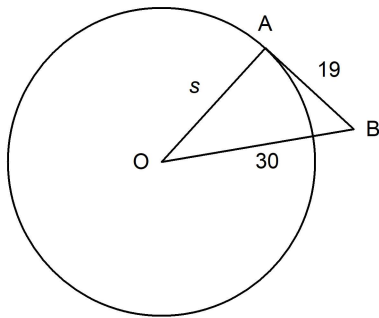
- a.  $37^\circ$                       b.  $53^\circ$                       c.  $143^\circ$                       d.  $90^\circ$

- \_\_\_\_\_ 5. O is the centre of this circle and point G is a point of tangency.  
Determine the value of  $a$ . If necessary, give your answer to the nearest tenth.



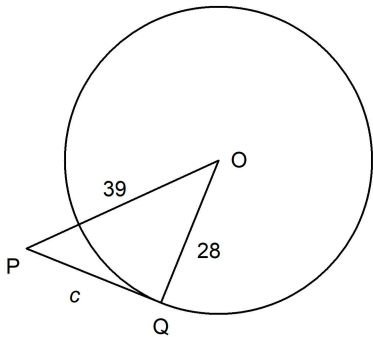
- a. 11.3                      b. 22.5                      c. 4.6                      d. 14.9

- \_\_\_\_\_ 6. O is the centre of this circle and point A is a point of tangency.  
Determine the value of  $b$ . If necessary, give your answer to the nearest tenth.



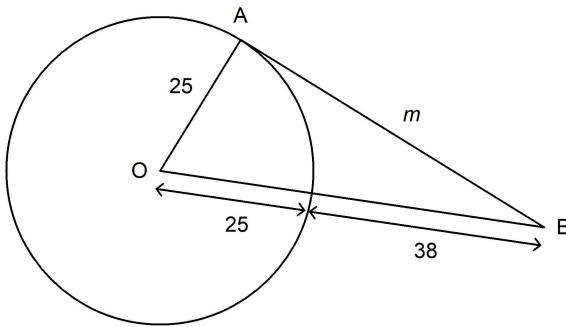
- a. 5.5                      b. 11                      c. 23.2                      d. 35.5

- \_\_\_\_\_ 7. O is the centre of this circle and point Q is a point of tangency.  
Determine the value of  $c$ . If necessary, give your answer to the nearest tenth.



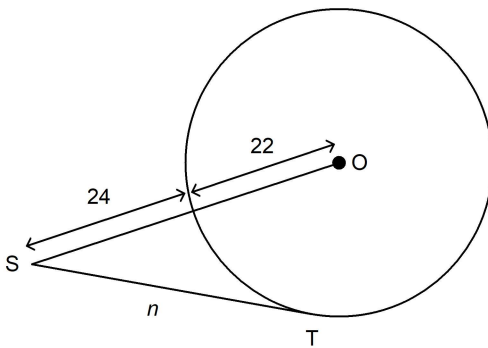
- a. 48                      b. 27.1                      c. 11                      d. 5.5

8. O is the centre of this circle and point A is a point of tangency.  
Determine the value of  $m$ . If necessary, give your answer to the nearest tenth.



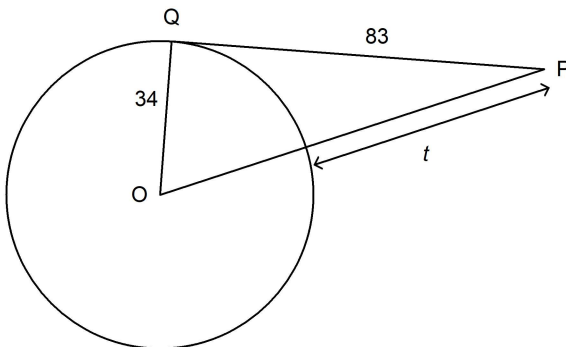
- a. 38                      b. 7.2                      c. 67.8                      d. 57.8

9. O is the centre of this circle and point T is a point of tangency.  
Determine the value of  $n$ . If necessary, give your answer to the nearest tenth.



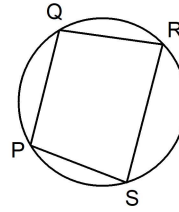
- a. 5.7                      b. 51                      c. 24                      d. 40.4

10. O is the centre of this circle and point Q is a point of tangency.  
Determine the value of  $t$ . If necessary, give your answer to the nearest tenth.



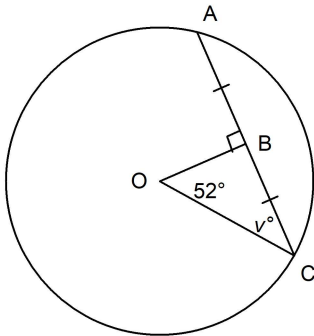
- a. 61.3                      b. 55.7                      c. 55                      d. 82.2

11. Which of the following constructions would enable you to determine the centre of this circle?
- Draw the perpendicular bisectors of PS and PQ.
  - Join PR and QS.
  - Join the mid-points of PS and QR and the mid-points of PQ and SR.

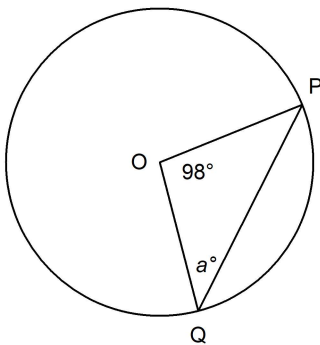


- a. i and iii      b. iii      c. i      d. ii
12. A circle has radius 7 cm. Which of the following measures could NOT be the length of a chord in the circle: 2 cm, 11 cm, 14 cm, or 17 cm?
- a. 17 cm      c. 2 cm  
b. 11 cm      d. 14 cm

13. O is the centre of the circle. Determine the value of  $v^\circ$ .

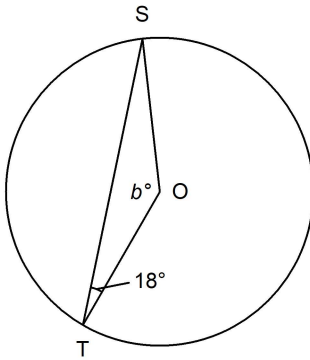


- a.  $19^\circ$       b.  $71^\circ$       c.  $52^\circ$       d.  $38^\circ$
14. O is the centre of the circle. Determine the value of  $a^\circ$ .



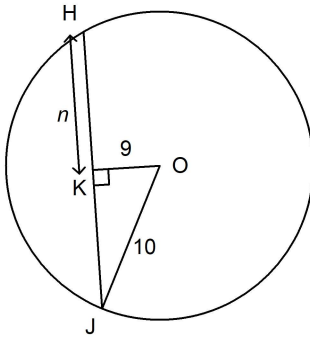
- a.  $49^\circ$       b.  $20.5^\circ$       c.  $41^\circ$       d.  $69.5^\circ$

15. O is the centre of the circle.  
Determine the value of  $b^\circ$ .



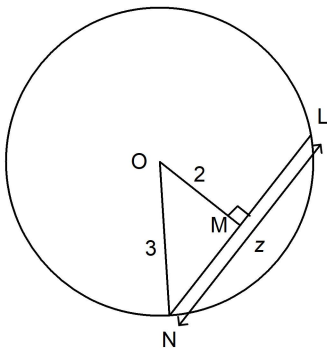
- a.  $144^\circ$       b.  $81^\circ$       c.  $72^\circ$       d.  $18^\circ$

16. O is the centre of the circle.  
Determine the value of  $n$  to the nearest tenth, if necessary.



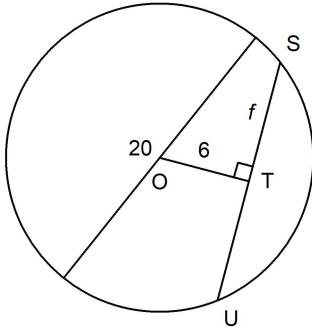
- a. 13.5      b. 4.4      c. 19      d. 1

17. O is the centre of the circle.  
Determine the value of  $z$  to the nearest tenth, if necessary.



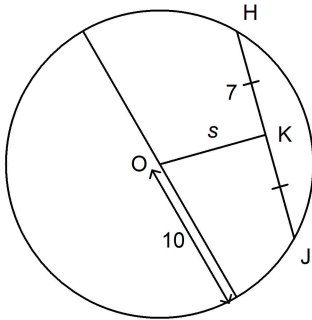
- a. 4.5      b. 3.6      c. 5      d. 1

18. O is the centre of the circle.  
Determine the value of  $f$  to the nearest tenth, if necessary.



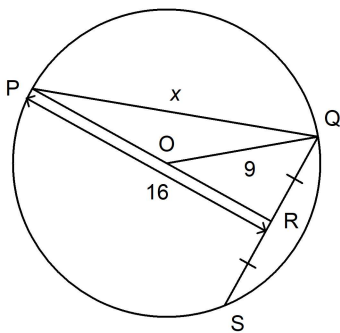
- a. 4                      b. 8                      c. 64                      d. 11.7

19. O is the centre of the circle.  
Determine the value of  $s$  to the nearest tenth, if necessary.



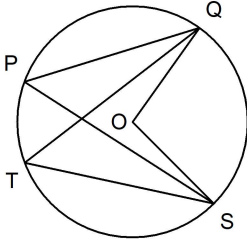
- a. 3                      b. 7.1                      c. 12.2                      d. 51

20. O is the centre of the circle.  
Determine the value of  $x$  to the nearest tenth, if necessary.

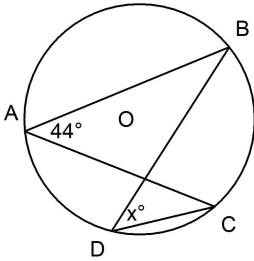


- a. 5.7                      b. 19.6                      c. 288                      d. 17

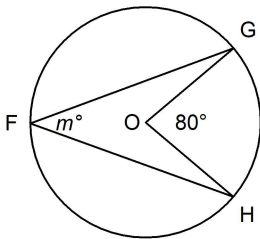
- \_\_\_\_\_ 21. O is the centre of this circle.  
Identify all the inscribed angles subtended by the minor arc QS.



- a.  $\angle QOS$   
 b.  $\angle PQT$  and  $\angle PST$   
 c.  $\angle QPS$  and  $\angle QTS$   
 d.  $\angle QPS$
- \_\_\_\_\_ 22. O is the centre of this circle.  
Determine the value of  $x^\circ$ .



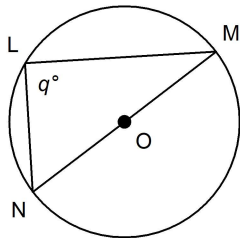
- a.  $44^\circ$   
 b.  $90^\circ$   
 c.  $180^\circ$   
 d.  $88^\circ$
- \_\_\_\_\_ 23. O is the centre of this circle.  
Determine the value of  $m^\circ$ .



- a.  $90^\circ$   
 b.  $80^\circ$   
 c.  $180^\circ$   
 d.  $40^\circ$

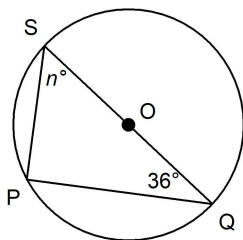


24. O is the centre of this circle.  
Determine the value of  $q^\circ$ .



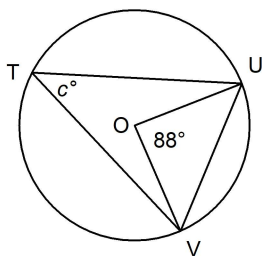
- |               |                |
|---------------|----------------|
| a. $60^\circ$ | c. $180^\circ$ |
| b. $90^\circ$ | d. $45^\circ$  |

25. O is the centre of this circle.  
Determine the value of  $n^\circ$ .



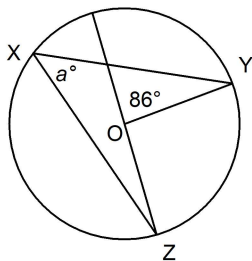
- |                |               |
|----------------|---------------|
| a. $108^\circ$ | c. $90^\circ$ |
| b. $54^\circ$  | d. $36^\circ$ |

26. O is the centre of this circle.  
Determine the value of  $c^\circ$ .



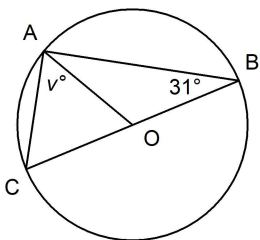
- |               |                |
|---------------|----------------|
| a. $90^\circ$ | c. $180^\circ$ |
| b. $44^\circ$ | d. $88^\circ$  |

27. O is the centre of this circle.  
Determine the value of  $a^\circ$ .



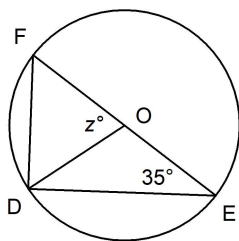
- |               |               |
|---------------|---------------|
| a. $47^\circ$ | c. $94^\circ$ |
| b. $86^\circ$ | d. $90^\circ$ |

28. O is the centre of this circle.  
Determine the value of  $v^\circ$ .



- |                |               |
|----------------|---------------|
| a. $118^\circ$ | c. $90^\circ$ |
| b. $59^\circ$  | d. $31^\circ$ |

29. O is the centre of this circle.  
Determine the value of  $z^\circ$ .

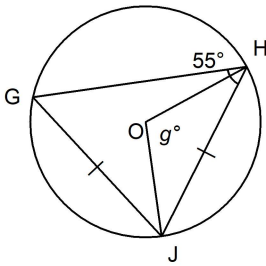


- |                |               |
|----------------|---------------|
| a. $55^\circ$  | c. $90^\circ$ |
| b. $110^\circ$ | d. $70^\circ$ |

Name: \_\_\_\_\_

ID: A

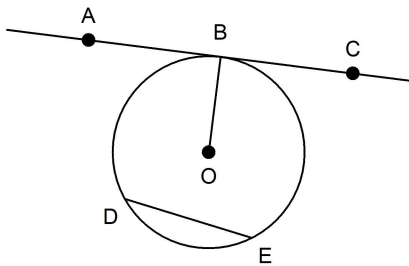
30. O is the centre of this circle.  
Determine the value of  $g^\circ$ .



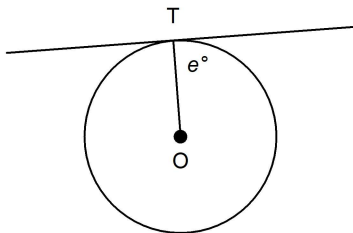
- a.  $70^\circ$   
b.  $55^\circ$   
c.  $110^\circ$   
d.  $90^\circ$

### Short Answer

31. O is the centre of this circle.  
Which line is a tangent?



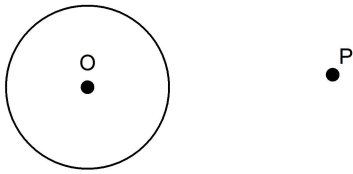
32. O is the centre of this circle. Point T is a point of tangency.  
What is the value of  $e^\circ$ ?



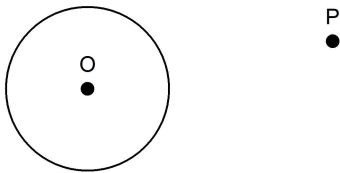
Name: \_\_\_\_\_

ID: A

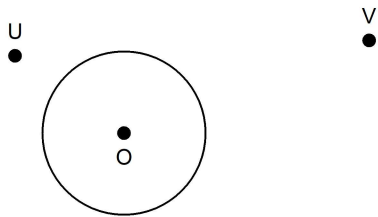
33. Draw a line through point P that is NOT a tangent to the circle.



34. Draw a line through point P that is a tangent to the circle.  
Label the point of tangency Q.



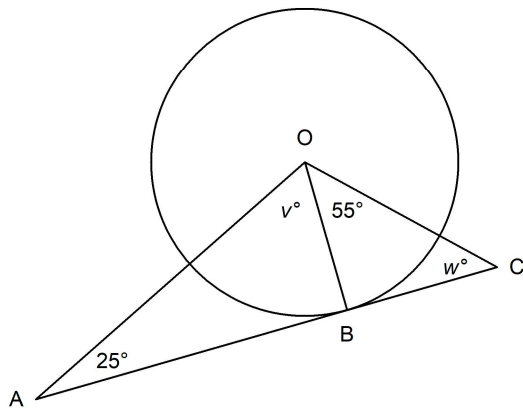
35. Is the line that passes through points U and V a tangent to the circle?



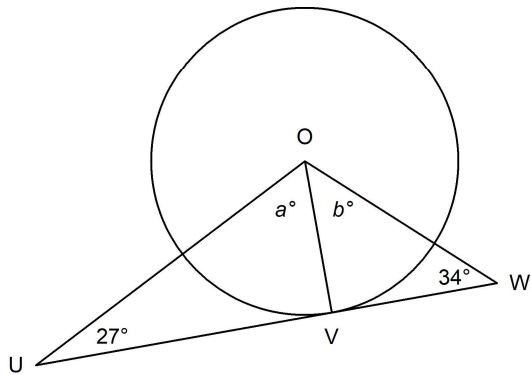
Name: \_\_\_\_\_

ID: A

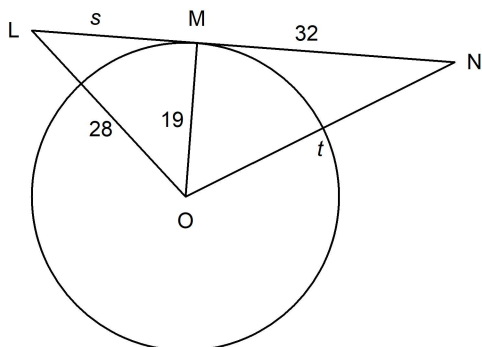
36. O is the centre of this circle and point B is a point of tangency. Determine the values of  $v^\circ$  and  $w^\circ$ .



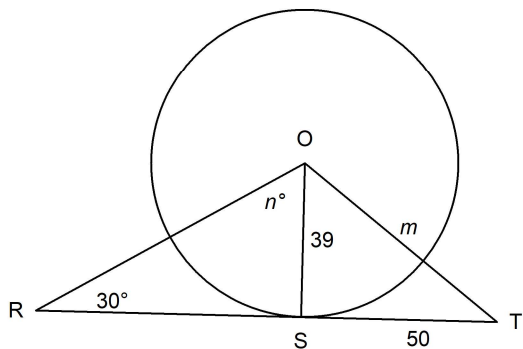
37. O is the centre of this circle and point V is a point of tangency. Determine the values of  $a^\circ$  and  $b^\circ$ .



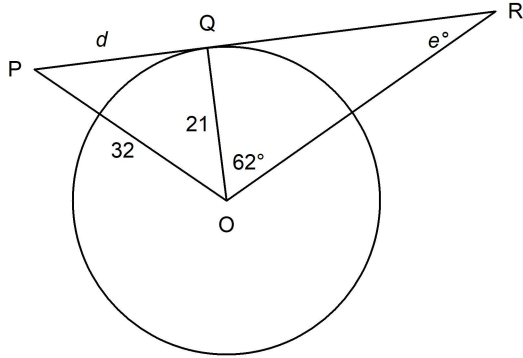
38. O is the centre of this circle and point Q is a point of tangency.  
 Determine the values of  $s$  and  $t$ . If necessary, give your answers to the nearest tenth.



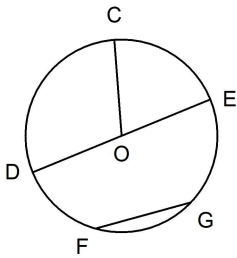
39. O is the centre of this circle and point S is a point of tangency.  
 Determine the values of  $m$  and  $n^\circ$ . If necessary, give your answers to the nearest tenth.



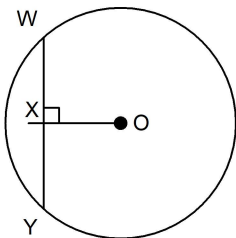
40. O is the centre of this circle and point Q is a point of tangency.  
Determine the values of  $d$  and  $e^\circ$ . If necessary, give your answers to the nearest tenth.



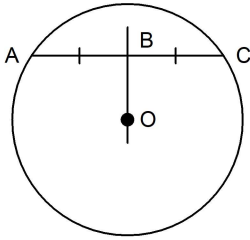
41. O is the centre of this circle.  
Which line segment is a diameter?



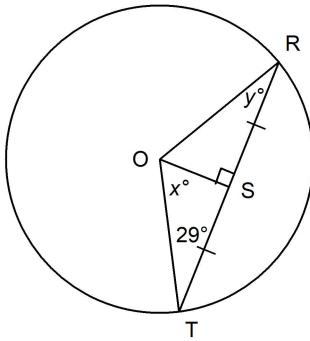
42. O is the centre of the circle.  
What can you say about the lengths of WX and XY?



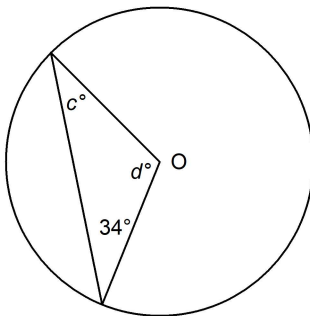
43. O is the centre of the circle.  
What can you say about the measure of  $\angle OBC$ ?



44. Point O is the centre of this circle.  
Determine the values of  $x^\circ$  and  $y^\circ$ .

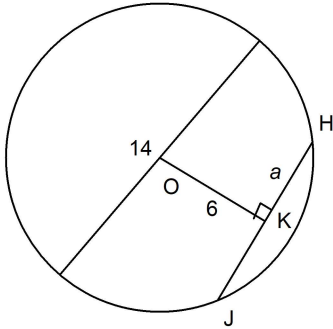


45. Point O is the centre of this circle.  
Determine the values of  $c^\circ$  and  $d^\circ$ .

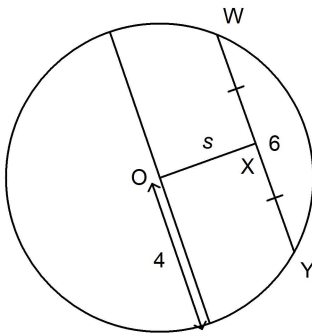




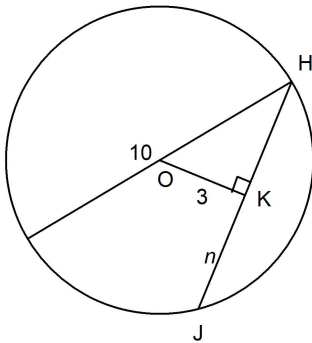
46. Point O is the centre of this circle. Without solving for  $a$ , sketch and label the length of any extra line segments you need to draw to determine the value of  $a$ .



47. Point O is the centre of this circle. Without solving for  $s$ , sketch and label the lengths of any extra line segments you need to draw to determine the value of  $s$ .



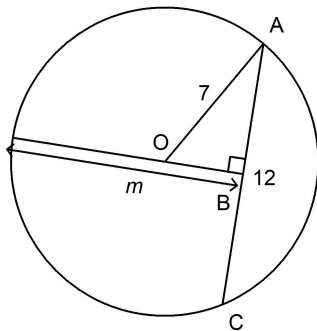
48. Point O is the centre of this circle.  
Determine the value of  $n$  to the nearest tenth, if necessary.



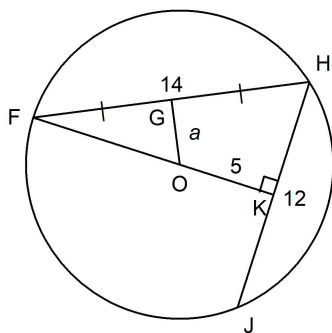
Name: \_\_\_\_\_

ID: A

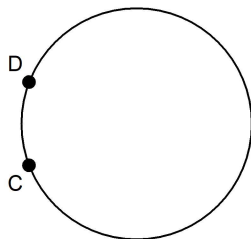
49. Point O is the centre of this circle.  
Determine the value of  $m$  to the nearest tenth, if necessary.



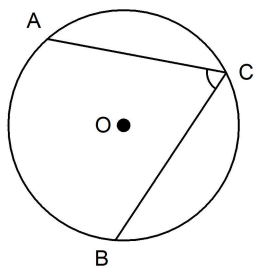
50. Point O is the centre of this circle.  
Determine the value of  $a$  to the nearest whole number.



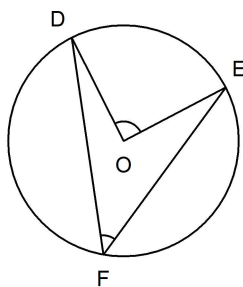
51. Label the major arc CD and the minor arc CD of this circle.



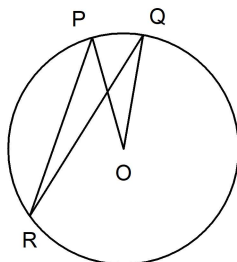
52. O is the centre of this circle. Is  $\angle ACB$  a central angle or an inscribed angle?



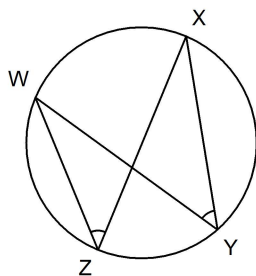
53. O is the centre of this circle.  
What is the relationship between the measures of  $\angle DOE$  and  $\angle DFE$ ?



54. O is the centre of this circle.  
In this circle, identify the inscribed angle and the central angle subtended by the same minor arc.



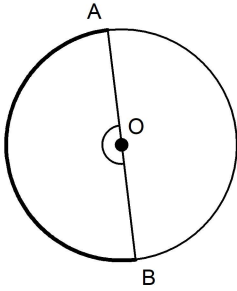
55. What is the relationship between the measures of  $\angle WYX$  and  $\angle WZX$ ?



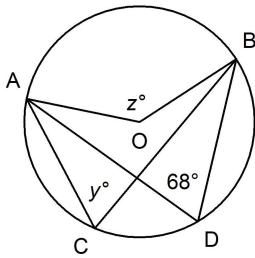
Name: \_\_\_\_\_

ID: A

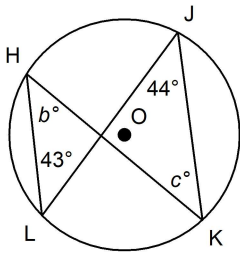
56. Point O is the centre of the circle. Arc AB is a semicircle.  
What is the measure of  $\angle AOB$ ?



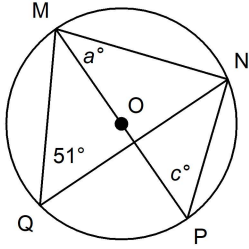
57. Point O is the centre of this circle.  
Determine the values of  $y^\circ$  and  $z^\circ$ .



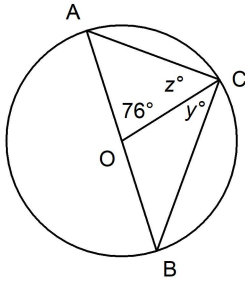
58. Point O is the centre of the circle.  
Determine the values of  $b^\circ$  and  $c^\circ$ .



59. Point O is the centre of the circle.  
Determine the values of  $a^\circ$  and  $c^\circ$ .

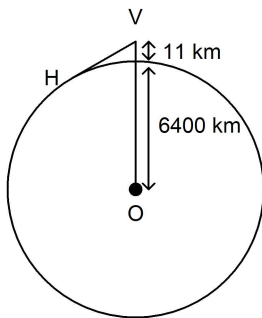


60. Point O is the centre of the circle.  
Determine the values of  $y^\circ$  and  $z^\circ$ .

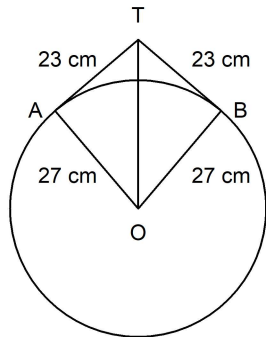


**Problem**

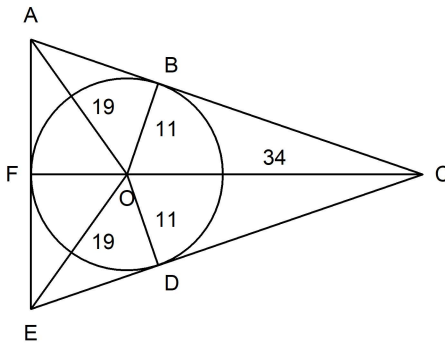
61. A Ruppell's Griffon Vulture holds the record for the bird with the highest documented flight altitude. It was spotted at a height of about 11 km above the Earth's surface. The radius of Earth is approximately 6400 km. How far was the vulture from the horizon, H? Calculate this distance to the nearest kilometre.



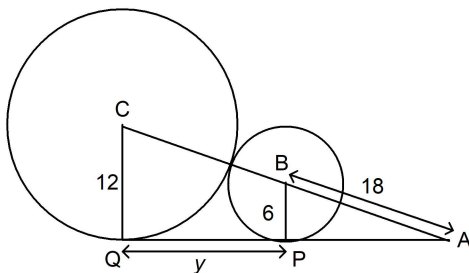
62. A circular mirror with radius 27 cm hangs from a hook.  
The wire is 46 cm long and is a tangent to the circle at points A and B.  
How far, to the nearest tenth, above the top of the mirror is the hook?



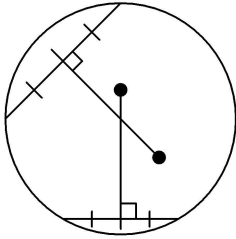
63. When are two tangent lines to a circle parallel?  
Draw a sketch to support your answer.
64. AC, AE, and CE are tangents to this circle. The points of tangency are: B, F, and D  
The circle has radius 11. The distance from the centre of the circle to each vertex of the triangle is:  $OC = 34$ ,  $OA = OE = 19$   
Determine the side lengths of  $\triangle ACE$ , to the nearest tenth.



65. AQ is a tangent to the circle with centre B and to the circle with centre C.  
The points of tangency are P and Q.  
Determine the value of  $y$  to the nearest tenth.



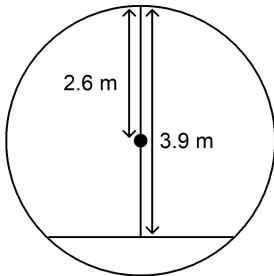
66. Draw a point at the centre of this circle. Label the point O.  
How do you know your answer is correct?



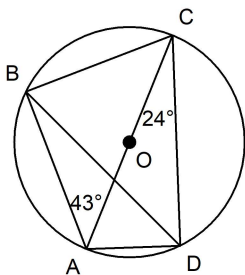
67. a) In a circle, can a chord be longer than a diameter of the circle? Explain.  
b) In a circle, can a chord be shorter than a radius of the circle? Explain.
68. This arc is part of a circle.  
Explain how you could locate the centre of the original circle.



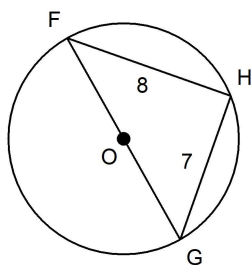
69. A circle has diameter 32 cm. How far from the centre of the circle, to the nearest centimetre, is a chord 20 cm long?
70. A pedestrian underpass is constructed using a cylindrical pipe of radius 2.6 m. The bottom of the pipe will be filled and paved. The headroom at the centre of the path is 3.9 m.  
How wide is the path to the nearest tenth of a metre?



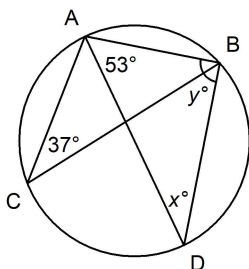
71. Determine the measure of each interior angle of quadrilateral ABCD.



72. Point  $O$  is the centre of the circle.  
Determine the radius of the circle to the nearest tenth.  
What circle property did you use?



73. Determine the values of  $x^\circ$  and  $y^\circ$ .  
What can you say about line segment  $AD$ ?

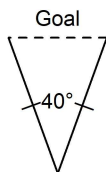




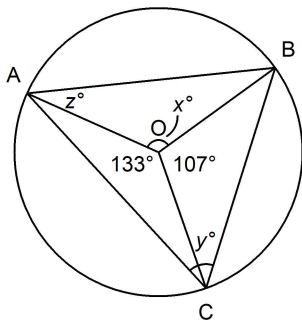
Name: \_\_\_\_\_

ID: A

74. Sheila is planning a shooting drill for a soccer team. She wants the soccer players to practice shooting on a net with a shooting angle of  $20^\circ$ . She has sketched this diagram. Complete Sheila's sketch to show the curve or line along which she should have the players stand so their shooting angle is  $20^\circ$ .



75. Point O is the centre of the circle. Determine the values of  $x^\circ$ ,  $y^\circ$ , and  $z^\circ$ .



## circle

## Answer Section

## MULTIPLE CHOICE

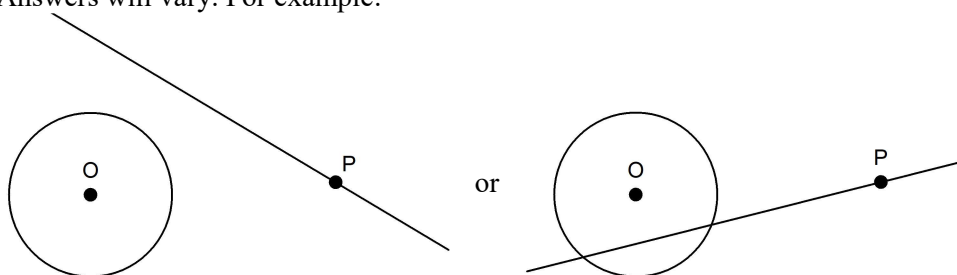
1. ANS: C                   PTS: 1                   DIF: Easy                   LOC: 9.SS1  
REF: 8.1 Properties of Tangents to a Circle  
TOP: Shape and Space (Measurement)   KEY: Conceptual Understanding
2. ANS: B                   PTS: 1                   DIF: Easy                   LOC: 9.SS1  
REF: 8.1 Properties of Tangents to a Circle  
TOP: Shape and Space (Measurement)   KEY: Conceptual Understanding
3. ANS: B                   PTS: 1                   DIF: Easy                   LOC: 9.SS1  
REF: 8.1 Properties of Tangents to a Circle  
TOP: Shape and Space (Measurement)   KEY: Conceptual Understanding
4. ANS: D                   PTS: 1                   DIF: Easy                   LOC: 9.SS1  
REF: 8.1 Properties of Tangents to a Circle  
TOP: Shape and Space (Measurement)   KEY: Conceptual Understanding
5. ANS: D                   PTS: 1                   DIF: Easy                   LOC: 9.SS1  
REF: 8.1 Properties of Tangents to a Circle  
TOP: Shape and Space (Measurement)   KEY: Conceptual Understanding
6. ANS: C                   PTS: 1                   DIF: Easy                   LOC: 9.SS1  
REF: 8.1 Properties of Tangents to a Circle  
TOP: Shape and Space (Measurement)   KEY: Conceptual Understanding
7. ANS: B                   PTS: 1                   DIF: Easy                   LOC: 9.SS1  
REF: 8.1 Properties of Tangents to a Circle  
TOP: Shape and Space (Measurement)   KEY: Conceptual Understanding
8. ANS: D                   PTS: 1                   DIF: Moderate               LOC: 9.SS1  
REF: 8.1 Properties of Tangents to a Circle  
TOP: Shape and Space (Measurement)   KEY: Conceptual Understanding
9. ANS: D                   PTS: 1                   DIF: Moderate               LOC: 9.SS1  
REF: 8.1 Properties of Tangents to a Circle  
TOP: Shape and Space (Measurement)   KEY: Conceptual Understanding
10. ANS: B                   PTS: 1                   DIF: Moderate               LOC: 9.SS1  
REF: 8.1 Properties of Tangents to a Circle  
TOP: Shape and Space (Measurement)   KEY: Conceptual Understanding
11. ANS: C                   PTS: 1                   DIF: Easy                   REF: 8.2 Properties of Chords in a Circle  
LOC: 9.SS1                TOP: Shape and Space (Measurement)   KEY: Conceptual Understanding
12. ANS: A                   PTS: 1                   DIF: Easy                   REF: 8.2 Properties of Chords in a Circle  
LOC: 9.SS1                TOP: Shape and Space (Measurement)   KEY: Conceptual Understanding
13. ANS: D                   PTS: 1                   DIF: Easy                   REF: 8.2 Properties of Chords in a Circle  
LOC: 9.SS1                TOP: Shape and Space (Measurement)   KEY: Conceptual Understanding
14. ANS: C                   PTS: 1                   DIF: Easy                   REF: 8.2 Properties of Chords in a Circle  
LOC: 9.SS1                TOP: Shape and Space (Measurement)   KEY: Conceptual Understanding
15. ANS: A                   PTS: 1                   DIF: Easy                   REF: 8.2 Properties of Chords in a Circle  
LOC: 9.SS1                TOP: Shape and Space (Measurement)   KEY: Conceptual Understanding
16. ANS: B                   PTS: 1                   DIF: Easy                   REF: 8.2 Properties of Chords in a Circle  
LOC: 9.SS1                TOP: Shape and Space (Measurement)   KEY: Conceptual Understanding

17.	ANS: A LOC: 9.SS1	PTS: 1 TOP: Shape and Space (Measurement)	DIF: Easy	REF: 8.2 Properties of Chords in a Circle KEY: Conceptual Understanding
18.	ANS: B LOC: 9.SS1	PTS: 1 TOP: Shape and Space (Measurement)	DIF: Moderate	REF: 8.2 Properties of Chords in a Circle KEY: Conceptual Understanding
19.	ANS: B LOC: 9.SS1	PTS: 1 TOP: Shape and Space (Measurement)	DIF: Moderate	REF: 8.2 Properties of Chords in a Circle KEY: Conceptual Understanding
20.	ANS: D LOC: 9.SS1	PTS: 1 TOP: Shape and Space (Measurement)	DIF: Moderate	REF: 8.2 Properties of Chords in a Circle KEY: Conceptual Understanding
21.	ANS: C LOC: 9.SS1	PTS: 1 TOP: Shape and Space (Measurement)	DIF: Easy	REF: 8.3 Properties of Angles in a Circle KEY: Conceptual Understanding
22.	ANS: A LOC: 9.SS1	PTS: 1 TOP: Shape and Space (Measurement)	DIF: Easy	REF: 8.3 Properties of Angles in a Circle KEY: Conceptual Understanding
23.	ANS: D LOC: 9.SS1	PTS: 1 TOP: Shape and Space (Measurement)	DIF: Easy	REF: 8.3 Properties of Angles in a Circle KEY: Conceptual Understanding
24.	ANS: B LOC: 9.SS1	PTS: 1 TOP: Shape and Space (Measurement)	DIF: Easy	REF: 8.3 Properties of Angles in a Circle KEY: Conceptual Understanding
25.	ANS: B LOC: 9.SS1	PTS: 1 TOP: Shape and Space (Measurement)	DIF: Easy	REF: 8.3 Properties of Angles in a Circle KEY: Conceptual Understanding
26.	ANS: B LOC: 9.SS1	PTS: 1 TOP: Shape and Space (Measurement)	DIF: Moderate	REF: 8.3 Properties of Angles in a Circle KEY: Conceptual Understanding
27.	ANS: A LOC: 9.SS1	PTS: 1 TOP: Shape and Space (Measurement)	DIF: Moderate	REF: 8.3 Properties of Angles in a Circle KEY: Conceptual Understanding
28.	ANS: B LOC: 9.SS1	PTS: 1 TOP: Shape and Space (Measurement)	DIF: Moderate	REF: 8.3 Properties of Angles in a Circle KEY: Conceptual Understanding
29.	ANS: D LOC: 9.SS1	PTS: 1 TOP: Shape and Space (Measurement)	DIF: Moderate	REF: 8.3 Properties of Angles in a Circle KEY: Conceptual Understanding
30.	ANS: C LOC: 9.SS1	PTS: 1 TOP: Shape and Space (Measurement)	DIF: Moderate	REF: 8.3 Properties of Angles in a Circle KEY: Conceptual Understanding

**SHORT ANSWER**

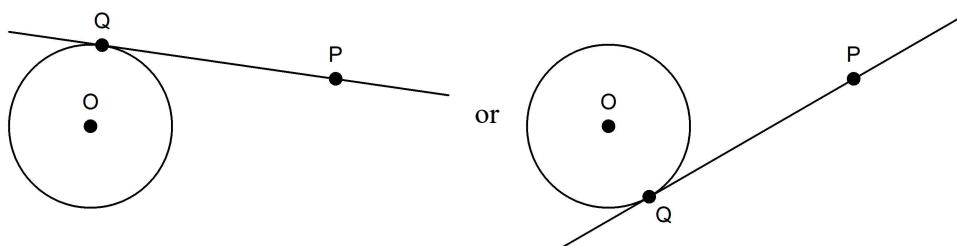
31.	ANS: AC	PTS: 1 LOC: 9.SS1	DIF: Easy TOP: Shape and Space (Measurement)	REF: 8.1 Properties of Tangents to a Circle KEY: Conceptual Understanding
32.	ANS: 90°	PTS: 1 LOC: 9.SS1	DIF: Easy TOP: Shape and Space (Measurement)	REF: 8.1 Properties of Tangents to a Circle KEY: Conceptual Understanding

33. ANS:  
Answers will vary. For example:



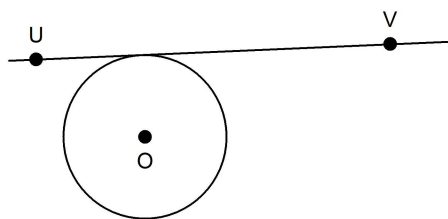
PTS: 1                      DIF: Easy                      REF: 8.1 Properties of Tangents to a Circle  
LOC: 9.SS1                      TOP: Shape and Space (Measurement)                      KEY: Conceptual Understanding

34. ANS:



PTS: 1                      DIF: Moderate                      REF: 8.1 Properties of Tangents to a Circle  
LOC: 9.SS1                      TOP: Shape and Space (Measurement)                      KEY: Conceptual Understanding

35. ANS:  
Yes.



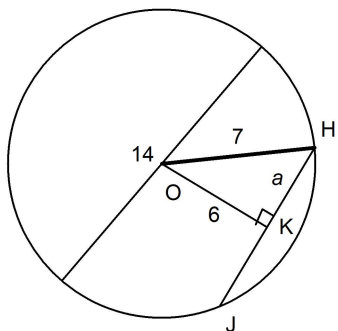
PTS: 1                      DIF: Moderate                      REF: 8.1 Properties of Tangents to a Circle  
LOC: 9.SS1                      TOP: Shape and Space (Measurement)                      KEY: Conceptual Understanding

36. ANS:  
 $v^\circ = 65^\circ, w^\circ = 35^\circ$

PTS: 1                      DIF: Moderate                      REF: 8.1 Properties of Tangents to a Circle  
LOC: 9.SS1                      TOP: Shape and Space (Measurement)                      KEY: Conceptual Understanding

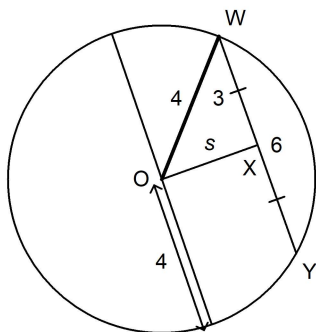
37. ANS:  
 $a^\circ = 63^\circ, b^\circ = 56^\circ$
- PTS: 1                      DIF: Moderate      REF: 8.1 Properties of Tangents to a Circle  
 LOC: 9.SS1                TOP: Shape and Space (Measurement)      KEY: Conceptual Understanding
38. ANS:  
 $s = 20.6, t = 37.2$
- PTS: 1                      DIF: Moderate      REF: 8.1 Properties of Tangents to a Circle  
 LOC: 9.SS1                TOP: Shape and Space (Measurement)      KEY: Conceptual Understanding
39. ANS:  
 $m = 63.4, n^\circ = 60^\circ$
- PTS: 1                      DIF: Moderate      REF: 8.1 Properties of Tangents to a Circle  
 LOC: 9.SS1                TOP: Shape and Space (Measurement)      KEY: Conceptual Understanding
40. ANS:  
 $d = 24.1, e^\circ = 28^\circ$
- PTS: 1                      DIF: Moderate      REF: 8.1 Properties of Tangents to a Circle  
 LOC: 9.SS1                TOP: Shape and Space (Measurement)      KEY: Conceptual Understanding
41. ANS:  
 DE
- PTS: 1                      DIF: Easy              REF: 8.2 Properties of Chords in a Circle  
 LOC: 9.SS1                TOP: Shape and Space (Measurement)      KEY: Conceptual Understanding
42. ANS:  
 $WX = XY$
- PTS: 1                      DIF: Easy              REF: 8.2 Properties of Chords in a Circle  
 LOC: 9.SS1                TOP: Shape and Space (Measurement)      KEY: Conceptual Understanding
43. ANS:  
 $\angle OBC = 90^\circ$
- PTS: 1                      DIF: Easy              REF: 8.2 Properties of Chords in a Circle  
 LOC: 9.SS1                TOP: Shape and Space (Measurement)      KEY: Conceptual Understanding
44. ANS:  
 $x^\circ = 61^\circ, y^\circ = 29^\circ$
- PTS: 1                      DIF: Easy              REF: 8.2 Properties of Chords in a Circle  
 LOC: 9.SS1                TOP: Shape and Space (Measurement)      KEY: Conceptual Understanding
45. ANS:  
 $c^\circ = 34^\circ, d^\circ = 112^\circ$
- PTS: 1                      DIF: Easy              REF: 8.2 Properties of Chords in a Circle  
 LOC: 9.SS1                TOP: Shape and Space (Measurement)      KEY: Conceptual Understanding

46. ANS:  
Answers may vary. For example:



PTS: 1                      DIF: Easy                      REF: 8.2 Properties of Chords in a Circle  
 LOC: 9.SS1                      TOP: Shape and Space (Measurement)                      KEY: Conceptual Understanding

47. ANS:  
Answers may vary. For example:



PTS: 1                      DIF: Easy                      REF: 8.2 Properties of Chords in a Circle  
 LOC: 9.SS1                      TOP: Shape and Space (Measurement)                      KEY: Conceptual Understanding

48. ANS:  
 $n = 4$

PTS: 1                      DIF: Moderate                      REF: 8.2 Properties of Chords in a Circle  
 LOC: 9.SS1                      TOP: Shape and Space (Measurement)                      KEY: Conceptual Understanding

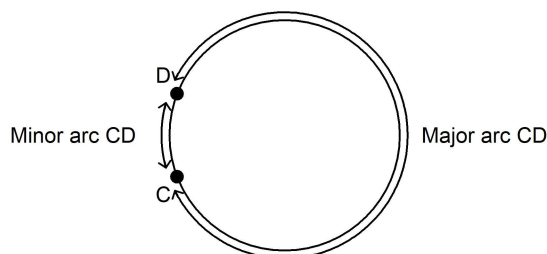
49. ANS:  
 $m = 10.6$

PTS: 1                      DIF: Moderate                      REF: 8.2 Properties of Chords in a Circle  
 LOC: 9.SS1                      TOP: Shape and Space (Measurement)                      KEY: Conceptual Understanding

50. ANS:  
 $a = 3$

PTS: 1                      DIF: Moderate                      REF: 8.2 Properties of Chords in a Circle  
 LOC: 9.SS1                      TOP: Shape and Space (Measurement)                      KEY: Conceptual Understanding

51. ANS:



PTS: 1                      DIF: Easy                      REF: 8.3 Properties of Angles in a Circle  
 LOC: 9.SS1                      TOP: Shape and Space (Measurement)                      KEY: Conceptual Understanding

52. ANS:

Inscribed angle

PTS: 1                      DIF: Easy                      REF: 8.3 Properties of Angles in a Circle  
 LOC: 9.SS1                      TOP: Shape and Space (Measurement)                      KEY: Conceptual Understanding

53. ANS:

$$\angle DOE = 2\angle DFE, \text{ or } \angle DFE = \frac{1}{2}\angle DOE$$

PTS: 1                      DIF: Easy                      REF: 8.3 Properties of Angles in a Circle  
 LOC: 9.SS1                      TOP: Shape and Space (Measurement)                      KEY: Conceptual Understanding

54. ANS:

Inscribed angle:  $\angle PRQ$ Central angle:  $\angle POQ$ 

PTS: 1                      DIF: Easy                      REF: 8.3 Properties of Angles in a Circle  
 LOC: 9.SS1                      TOP: Shape and Space (Measurement)                      KEY: Conceptual Understanding

55. ANS:

$$\angle WYX = \angle WZX$$

PTS: 1                      DIF: Easy                      REF: 8.3 Properties of Angles in a Circle  
 LOC: 9.SS1                      TOP: Shape and Space (Measurement)                      KEY: Conceptual Understanding

56. ANS:

 $180^\circ$ 

PTS: 1                      DIF: Easy                      REF: 8.3 Properties of Angles in a Circle  
 LOC: 9.SS1                      TOP: Shape and Space (Measurement)                      KEY: Conceptual Understanding

57. ANS:

$$y^\circ = 68^\circ, z^\circ = 136^\circ$$

PTS: 1                      DIF: Easy                      REF: 8.3 Properties of Angles in a Circle  
 LOC: 9.SS1                      TOP: Shape and Space (Measurement)                      KEY: Conceptual Understanding

58. ANS:

$$c^\circ = 43^\circ, b^\circ = 44^\circ$$

PTS: 1

DIF: Easy

REF: 8.3 Properties of Angles in a Circle

LOC: 9.SS1

TOP: Shape and Space (Measurement)

KEY: Conceptual Understanding

59. ANS:

$$a^\circ = 39^\circ, c^\circ = 51^\circ$$

PTS: 1

DIF: Moderate

REF: 8.3 Properties of Angles in a Circle

LOC: 9.SS1

TOP: Shape and Space (Measurement)

KEY: Conceptual Understanding

60. ANS:

$$y^\circ = 38^\circ, z^\circ = 52^\circ$$

PTS: 1

DIF: Moderate

REF: 8.3 Properties of Angles in a Circle

LOC: 9.SS1

TOP: Shape and Space (Measurement)

KEY: Conceptual Understanding

**PROBLEM**

61. ANS:

$$OV = 11 \text{ km} + 6400 \text{ km}$$

$$= 6411 \text{ km}$$

$$OH = 6400 \text{ km}$$

Use the Pythagorean Theorem in  $\triangle OHV$  to solve for HV.

$$HV^2 = OV^2 - OH^2$$

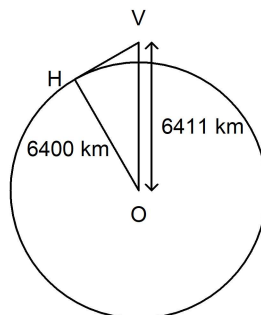
$$HV^2 = 6411^2 - 6400^2$$

$$HV^2 = 140\,921$$

$$HV = \sqrt{140\,921}$$

$$HV \doteq 375.3944\dots$$

The vulture was about 375 kilometres from the horizon.



PTS: 1

DIF: Moderate

REF: 8.1 Properties of Tangents to a Circle

LOC: 9.SS1

TOP: Shape and Space (Measurement)

KEY: Problem-Solving Skills



62. ANS:

The distance from the centre of the mirror to the hook is: OT

So, the distance from the top of the mirror to the hook is:  $OT - 27$  cm

Solve for OT.

$$OT^2 = 27^2 + 23^2$$

$$OT^2 = 1258$$

$$OT = \sqrt{1258}$$

$$OT \doteq 35.4682\dots$$

So,

$$OT - 27 \text{ cm}$$

$$= 35.4682\dots \text{ cm} - 27 \text{ cm}$$

$$= 8.4682\dots \text{ cm}$$

So, the hook is about 8.5 cm above the mirror.

PTS: 1

DIF: Moderate

REF: 8.1 Properties of Tangents to a Circle

LOC: 9.SS1

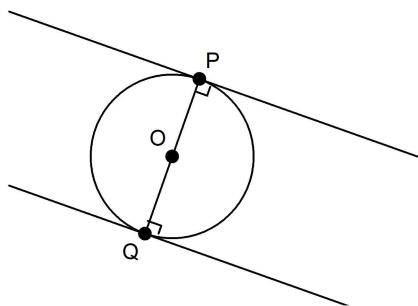
TOP: Shape and Space (Measurement)

KEY: Problem-Solving Skills

63. ANS:

Two tangent lines are parallel when they intersect a circle at opposite endpoints of a diameter.

For example, in this sketch, the tangent through Q is perpendicular to the diameter PQ, and the tangent through P is also perpendicular to the diameter PQ, so the tangent lines are parallel.



PTS: 1

DIF: Moderate

REF: 8.1 Properties of Tangents to a Circle

LOC: 9.SS1

TOP: Shape and Space (Measurement)

KEY: Conceptual Understanding | Communication

64. ANS:

$$AC = AB + BC$$

Use the Pythagorean Theorem in  $\triangle OAB$  and  $\triangle OBC$ :

$$AB^2 = OA^2 - OB^2 \quad \text{and} \quad BC^2 = OC^2 - OB^2$$

$$AB^2 = 19^2 - 11^2 \quad BC^2 = 34^2 - 11^2$$

$$AB = \sqrt{19^2 - 11^2} \quad BC = \sqrt{34^2 - 11^2}$$

$$AB \doteq 15.4919... \quad BC \doteq 32.1714...$$

So,  $AC \doteq 15.4919... + 32.1714...$ 

$$\doteq 47.6633...$$

$$AE = AF + FE$$

Use the Pythagorean Theorem in  $\triangle OAF$  and  $\triangle OEF$ :

$$AF^2 = OA^2 - OF^2 \quad \text{and} \quad FE^2 = OE^2 - OF^2$$

$$AF^2 = 19^2 - 11^2 \quad FE^2 = 19^2 - 11^2$$

$$AF = \sqrt{19^2 - 11^2} \quad FE = \sqrt{19^2 - 11^2}$$

$$AF \doteq 15.4919... \quad FE \doteq 15.4919...$$

So,  $AE \doteq 15.4919... + 15.4919...$ 

$$\doteq 30.9838...$$

$$CE = CD + DE$$

Use the Pythagorean Theorem in  $\triangle OCD$  and  $\triangle ODE$ :

$$CD^2 = OC^2 - OD^2 \quad \text{and} \quad DE^2 = OE^2 - OD^2$$

$$CD^2 = 34^2 - 11^2 \quad DE^2 = 19^2 - 11^2$$

$$CD = \sqrt{34^2 - 11^2} \quad DE = \sqrt{19^2 - 11^2}$$

$$CD \doteq 32.1714... \quad DE \doteq 15.4919...$$

So,  $CE \doteq 32.1714... + 15.4919...$ 

$$\doteq 47.6633...$$

The triangle has side lengths of about 47.7, 47.7, and 31.

PTS: 1

DIF: Moderate

REF: 8.1 Properties of Tangents to a Circle

LOC: 9.SS1

TOP: Shape and Space (Measurement)

KEY: Problem-Solving Skills

65. ANS:  
Use the Pythagorean Theorem in  $\triangle ABP$  to solve for AP.

$$AP^2 = 18^2 - 6^2$$

$$AP = \sqrt{18^2 - 6^2}$$

$$AP \doteq 16.9706\dots$$

$$\triangle ABP \cong \triangle ACQ$$

Consider  $\triangle ACQ$  as an enlargement of  $\triangle ABP$ .

The scale ratio is:

$$\frac{CQ}{BP} = \frac{12}{6}$$

$$= 2$$

$$\text{So, } AQ = 2(AP)$$

Then,

$$y = AQ - AP$$

$$= 2(AP) - AP$$

$$= AP$$

$$\text{So, } y \doteq 17.0$$

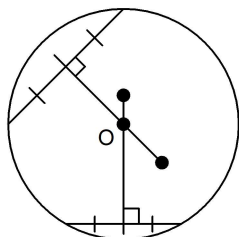
PTS: 1

DIF: Difficult REF: 8.1 Properties of Tangents to a Circle

LOC: 9.SS1

TOP: Shape and Space (Measurement) KEY: Problem-Solving Skills

66. ANS:



I know that the centre of the circle lies along the perpendicular bisector of a chord. So, when two different perpendicular bisectors are drawn, the centre of the circle is the point where they intersect.

PTS: 1

DIF: Easy REF: 8.2 Properties of Chords in a Circle

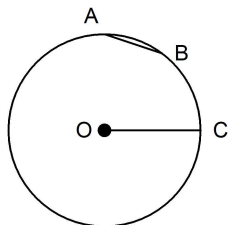
LOC: 9.SS1

TOP: Shape and Space (Measurement)

KEY: Problem-Solving Skills | Communication

67. ANS:

- a) No. A chord joins two points on a circle. Given one point on a circle, the point farthest from that point is on the opposite side of the circle. The line connecting these two points passes through the centre of the circle, so it is a diameter.
- b) Yes. For example, in this circle, chord AB is shorter than radius OC.



PTS: 1                    DIF: Moderate        REF: 8.2 Properties of Chords in a Circle

LOC: 9.SS1                TOP: Shape and Space (Measurement)

KEY: Problem-Solving Skills | Communication

68. ANS:

Draw two chords.

Construct the perpendicular bisectors of the chords.

The intersection of the perpendicular bisectors is the centre of the circle.

PTS: 1                    DIF: Moderate        REF: 8.2 Properties of Chords in a Circle

LOC: 9.SS1                TOP: Shape and Space (Measurement)

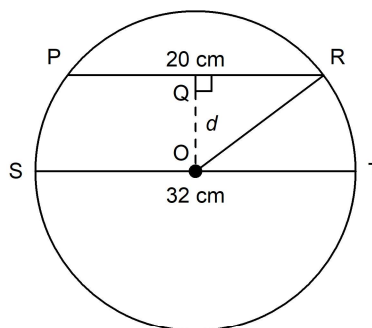
KEY: Problem-Solving Skills | Communication

69. ANS:  
Sketch a diagram.

Let  $d$  represent the distance from the chord to the centre of the circle.

Draw a radius from the centre to one end of the chord.

Label the known lengths.



PR is a chord of the circle, and OQ is perpendicular to the chord, passing through the centre of the circle, so  $PQ = QR$  and QR is  $\frac{1}{2}$  of PR:

$$\begin{aligned} QR &= \frac{1}{2}(20 \text{ cm}) \\ &= 10 \text{ cm} \end{aligned}$$

ST is a diameter of the circle, and OR is a radius of the circle, so OR is  $\frac{1}{2}$  of ST:

$$\begin{aligned} OR &= \frac{1}{2}(32 \text{ cm}) \\ &= 16 \text{ cm} \end{aligned}$$

Use the Pythagorean Theorem in  $\triangle OQR$ .

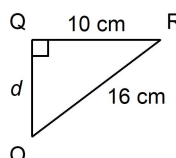
$$d^2 + 10^2 = 16^2$$

$$d^2 = 16^2 - 10^2$$

$$d^2 = 156$$

$$d = \sqrt{156}$$

$$d \doteq 12.4899\dots$$



So, the chord is approximately 12 cm from the centre of the circle.

PTS: 1

DIF: Moderate

REF: 8.2 Properties of Chords in a Circle

LOC: 9.SS1

TOP: Shape and Space (Measurement)

KEY: Conceptual Understanding

70. ANS:

Draw a radius from the centre of the pipe, O,  
to an edge of the path, E.

Label the midpoint of the path F.

OE is a radius, so:  $OE = 2.6 \text{ m}$

$OF = 3.9 \text{ m} - 2.6 \text{ m}$

$$= 1.3 \text{ m}$$

Use the Pythagorean Theorem in  $\triangle OEF$  to  
solve for EF.

$$EF^2 + 1.3^2 = 2.6^2$$

$$EF^2 = 2.6^2 - 1.3^2$$

$$EF^2 = 5.07$$

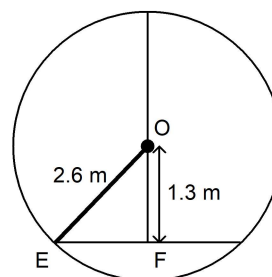
$$EF = \sqrt{5.07}$$

$$EF = 2.2516\dots$$

The width of the path is twice the length of EF.

$$2(2.2516\dots) = 4.5033\dots$$

So, the width of the path is about 4.5 m.



PTS: 1

DIF: Difficult

REF: 8.2 Properties of Chords in a Circle

LOC: 9.SS1

TOP: Shape and Space (Measurement)

KEY: Problem-Solving Skills

71. ANS:

AC is a diameter of the circle, so  $\angle ABC = 90^\circ$  and  $\angle ADC = 90^\circ$ .

The sum of the interior angles of a triangle is  $180^\circ$ . So, in  $\triangle ABC$ :

$$43^\circ + 90^\circ + \angle ACB = 180^\circ$$

$$133^\circ + \angle ACB = 180^\circ$$

$$\angle ACB = 180^\circ - 133^\circ$$

$$\angle ACB = 47^\circ$$

So,  $\angle BCD = 47^\circ + 24^\circ$

$$= 71^\circ$$

The sum of the interior angles of a triangle is  $180^\circ$ . So, in  $\triangle ACD$ :

$$24^\circ + 90^\circ + \angle CAD = 180^\circ$$

$$114^\circ + \angle CAD = 180^\circ$$

$$\angle CAD = 180^\circ - 114^\circ$$

$$\angle CAD = 66^\circ$$

So,  $\angle BAD = 66^\circ + 43^\circ$

$$= 109^\circ$$

So, the interior angles of quadrilateral ABCD have these measures:

$$\angle ABC = 90^\circ, \angle BCD = 71^\circ, \angle ADC = 90^\circ, \angle BAD = 109^\circ$$

PTS: 1

DIF: Moderate

REF: 8.3 Properties of Angles in a Circle

LOC: 9.SS1

TOP: Shape and Space (Measurement)

KEY: Problem-Solving Skills

72. ANS:

Use the Angles in a Semicircle Property:  $FG$  is a diameter of the circle, so  $\angle FHG = 90^\circ$ .

Use the Pythagorean Theorem in right  $\triangle FGH$  to determine the length of the hypotenuse, or diameter,  $d$ .

$$d^2 = 8^2 + 7^2$$

$$d^2 = 113$$

$$d = \sqrt{113}$$

$$d \doteq 10.6301\dots$$

So, the diameter of the circle is approximately 10.6.

The radius of the circle is  $\frac{1}{2}$  the diameter.

$$\frac{1}{2}(10.6301\dots) \doteq 5.3150\dots$$

So, the radius of the circle is approximately 5.3.

PTS: 1                      DIF: Moderate              REF: 8.3 Properties of Angles in a Circle

LOC: 9.SS1                      TOP: Shape and Space (Measurement)

KEY: Problem-Solving Skills | Communication

73. ANS:

Since  $\angle ACB$  and  $\angle ADB$  are inscribed angles subtended by the same arc  $AB$ , they are congruent.

$$x^\circ = 37^\circ$$

The sum of the interior angles of a triangle is  $180^\circ$ . So, in  $\triangle ABD$ :

$$53^\circ + 37^\circ + y^\circ = 180^\circ$$

$$90^\circ + y^\circ = 180^\circ$$

$$y^\circ = 180^\circ - 90^\circ$$

$$y^\circ = 90^\circ$$

Since arc  $AD$  subtends right  $\angle ABD$ , arc  $AD$  is a semicircle and line segment  $AD$  is a diameter of the circle.

PTS: 1                      DIF: Moderate              REF: 8.3 Properties of Angles in a Circle

LOC: 9.SS1                      TOP: Shape and Space (Measurement)

KEY: Problem-Solving Skills | Communication

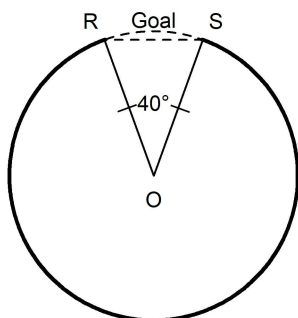


74. ANS:

Label the endpoints of the goal, R and S, and the third point O.

Construct a circle with radius OR about point O.

Sheila should have the players stand along the major arc RS.



PTS: 1

DIF: Moderate

REF: 8.3 Properties of Angles in a Circle

LOC: 9.SS1

TOP: Shape and Space (Measurement)

KEY: Problem-Solving Skills | Communication

75. ANS:

The sum of the central angles in a circle is  $360^\circ$ .

$$133^\circ + 107^\circ + x^\circ = 360^\circ$$

$$240^\circ + x^\circ = 360^\circ$$

$$x^\circ = 360^\circ - 240^\circ$$

$$x^\circ = 120^\circ$$

$\angle ACB$  is an inscribed angle and  $\angle AOB$  is a central angle subtended by the same arc.

$$\text{So, } \angle ACB = \frac{1}{2} \angle AOB$$

$$y^\circ = \frac{1}{2} \times 120^\circ$$

$$y^\circ = 60^\circ$$

OA and OB are radii, so  $\triangle AOB$  is isosceles with  $\angle OAB = \angle OBA = z^\circ$ .

The sum of the angles in a triangle is  $180^\circ$ , so in  $\triangle AOB$ :

$$z^\circ + z^\circ + 120^\circ = 180^\circ$$

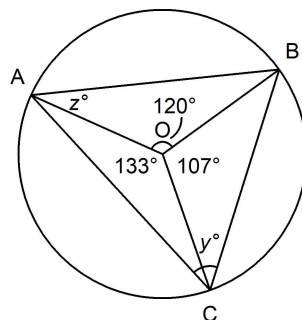
$$2z^\circ + 120^\circ = 180^\circ$$

$$2z^\circ = 180^\circ - 120^\circ$$

$$2z^\circ = 60^\circ$$

$$z^\circ = \frac{60^\circ}{2}$$

$$z^\circ = 30^\circ$$



PTS: 1

DIF: Difficult

REF: 8.3 Properties of Angles in a Circle

LOC: 9.SS1

TOP: Shape and Space (Measurement)

KEY: Problem-Solving Skills