	COMPASSVALE SECONDARY SCHOOL MATHEMATICS DEPARTMENT 2022 SECONDARY 4E5N					
Practice Circles – Singapore Schools Exam Papers						
Name:	() Class:	Marks: 50				
Date:						

The perpendicular bisector of a chord, *RS*, cuts it at *T* and the circumference of the circle at *P*. If RS = 20 cm and TP = 8 cm, find the radius of the circle.



Question 2

In the diagram below, A, C, D and F lie on a circle with centre O. Line OB is perpendicular to chord AC and E is the mid-point of chord DF. Given that AC = 6 cm, DF = 10 cm, OE = 5 cm and OB = y cm, find the value of y correct to 3 significant figures.



In the diagram, A, B, C and D lie on the circumference of a circle. The straight lines AC and BD intersect at X. AB = 4 cm, BX = 2 cm and CD = 9 cm.



- (a) Prove that triangles *ABX* and *CDX* are similar.
- (b) Calculate the length of *CX*.
- (c) Calculate the ratio of area of triangle *ABX* : area of triangle *DCX*.

Question 4

The diagram shows a circle with centre *O*. *AC* is a tangent to the circle. *AOF*, *FDB* and *ODC* are straight lines. Given that $\angle ACO = 24^{\circ}$ and $\angle HAF = 46^{\circ}$.



(a) Write down why $\angle FAB = 90^{\circ}$.

(b) Calculate

(i) $\angle HEF$. (ii) $\angle AFB$. (iii) $\angle HGF$. (iv) $\angle FED$.

Question 5

In the diagram, AC is a diameter of the circle with center O. The chords AE and BC meet at D when produced. Given that $\angle CDE = 22^{\circ}$ and $\angle BAC = 39^{\circ}$.



Find

(a) $\angle ACB$,

(b) $\angle AEB$,

(c) $\angle CBE$.

Question 6

The points A, B, C, D and E lie on a circle, centre O. AD is a diameter of the circle. BQ is a tangent to the circle, $\angle AEB = 24^{\circ}$ and QAD is a straight line.



Calculate, stating your reasons clearly,

- (a) (i) $\angle BAD$.
 - (ii) $\angle BED$.
 - (iii) $\angle BQA$.
 - (iv) reflex $\angle BOD$.
 - (v) $\angle ABQ$.
- (b) If $\angle DAE = x^{\circ}$, show that $\angle QBE = (114 x)^{\circ}$.

(c) Given that $\angle ABE = 43^{\circ}$, determine whether the lines *BO* and *AE* are parallel. Give a reason for your answer.

Question 7

In the diagram, AC is a diameter of the circle ABCDE. AC and ED are extended to meet at F. Given that CE = CF, $\angle AFD = x^{\circ}$ and $\angle BED = y^{\circ}$.



- (a) Explain with reasons why $\angle DBC = x^{\circ}$.
- (b) Find, in terms of x and/or y,
 - (i) $\angle ACD$.
 - (ii) $\angle ACE$.
 - (iii) $\angle BCD$.

Question 8

In the figure below, *PQRST* is a circle with *O* as the centre. *PX* and *RX* are tangents to the circle at points *P* and *R* respectively. Given that $\angle PXR = 78^{\circ}$ and $\angle SPQ = 40^{\circ}$, calculate

- (a) $\angle PRX$.
- (b) $\angle POR$.
- (c) $\angle OST$.
- (d) $\angle QRX$.



 $\overline{A, B, C, D}$ and \overline{E} lie on a circle. AC is a diameter of the circle and AE is parallel to BD. F is the point of intersection of AC and BD. $\angle ABD = 58^{\circ}$.



Find, stating reasons,

- (a) $\angle ABC$.
- (b) $\angle DBC$.
- (c) $\angle CAD$.
- (d) $\angle AED$.

Question 10

In the diagram below, the line AB meets the diameter CD at E. A, B, C and D lie on a circle and $\angle ABD = 60^{\circ}$.

Find

- (a) $\angle CBD$,
- (b) $\angle CDA$,
- (c) $\angle DOA$, given that O is the centre of the circle. Give your answer in radians.
- (d) Hence, calculate the area of the shaded segment shown, given that the radius of the circle is 7 cm.



In the diagram, A, B, C and D lie on a circle, centre O. The tangents at A and B meet at E and $\angle AOB = 76^{\circ}$.



Find, stating your reasons clearly,

- (a) $\angle OBA$.
- (b) $\angle ACB$.
- (c) $\angle BCD$.
- (d) $\angle AEB$.

Question 12

In the diagram, AC is a diameter of the circle ABCD. The straight lines EBA and ECD cut the circle at A, B, C and D. AC and BD cut at F. $\angle CDB = 40^{\circ}$ and $\angle DAC = 33^{\circ}$.



Giving your reasons in your working steps, find

- (a) $\angle DCA$.
- (b) $\angle BCD$.
- (c) $\angle AFB$.
- (d) $\angle AED$.

Question 13

In the diagram, O is the centre of circle ABCDE where DE = DC. Reflex angle $EOC = 240^{\circ}$ and angle $EAB = 100^{\circ}$.

(You must not assume CT is a tangent to the circle at C.)



- (a) Find, giving reasons for each answer, (i) angle *DCE*,
 - (ii) angle *CBE*,
 - (iii) angle CEB.
- (b) Given that $\angle CTE = 20^{\circ}$ and *EBT* is a straight line, show that *CT* is a tangent to the circle at *C*.

Question 14

ABCDEF is a hexagon inscribed in a circle.



Given that $\angle AFE = 148^\circ$, $\angle CDE = 116^\circ$ and FA = FE, find (a) $\angle ACF$, (b) $\angle ABC$.

Question 15

In the diagram, *O* is the centre of circle *ABPC*. $\angle BAC = \angle MCN = 70^{\circ}$ and $\angle POC = 62^{\circ}$. The larger circle *BMNC* passes through *O*. *ACN*, *BPN* and *CPM* are straight lines.



Give reasons and find the value of

- (a) reflex $\angle BOC$.
- (b) $\angle ABP$.
- (c) $\angle MBN$.
- (d) $\angle BMP$.
- (e) $\angle ACO$.

Question 16

 \overline{A} , \overline{B} , \overline{C} , \overline{D} are four points on the circle with centre O. AT is a tangent at A. Form two simultaneous equations in x and y and hence find the value of x and y.



O is the centre of the circle through P, Q and S. PR and QR are tangents to the circle.



- (a) Find $\angle POQ$.
- (b) Find $\angle PSQ$.
- (c) Give a reason for your answer.



The diagram shows a circle *ABCDE*, centre *O*. *CT* and *ET* are tangents to the circle. *BE* is a diameter and angle $BOC = 58^{\circ}$.

- (a) Explain why angle *EAB* is a right angle.
- (b) State two other angles which are right angle.
- (c) Find, giving reasons for each answer,
 - (i) angle *EBC*,
 - (ii) angle BEC,
 - (iii) angle *EDC*,
 - (iv) angle CET,
- (d) Given that *OE* is 3 cm, find the area of quadrilateral *OETC*.

In the diagram, A, B, C and D are points on the circumference of the circle centre O. ABE and DCE are straight lines and ST is a tangent to the circle at A. ST is parallel to DE, $\angle CEB = 36^\circ$ and $\angle DAB = 83^\circ$.



- (a) Calculate
 - (i) angle OAB,
 - (ii) angle ABC,
 - (iii) angle AOD.
- (b) Show that *ACD* is an isosceles triangle.

Question 20

In the figure, AE is a tangent to the circle whose centre is O and ABC is a straight line. $\angle BAE = 38^\circ, \angle BOE = 72^\circ \text{ and } \angle DCE = 40^\circ.$



Find, stating your reasons clearly

- (a) $\angle ECB$,
- (b) $\angle OEC$,
- (c) $\angle CED$,
- (d) $\angle OBA$.

In the diagram A, B, C, D and E lie on a circle centre O. Angle $BCD = 116^{\circ}$ and angle $OED = 54^{\circ}$. EF is tangent to the circle at E.



Find

- (a) angle *DOE*,
- (b) angle *DBE*,
- (c) angle DEF,
- (d) angle OEB,
- (e) angle BAE.

Question 22

In the diagram, ABCD is a quadrilateral inscribed in a circle with centre O. FE and GE are tangents to the circle at B and D respectively and $\angle BOD = 110^\circ$.



(a) Find

(i) $\angle BAD$. (ii) $\angle BCD$.

- (ii) $\angle OBD$.
- $(III) \angle ODD$.
- (b) Explain why *OBED* lie on the circumference of another circle.

In the diagram, *PA* and *PB* are tangents to the circle centre *O*. Given that *Q* is a point on the minor arc *AB* and that $\angle AOB = 160^\circ$, calculate, stating reasons,

- (a) $\angle APB$,
- (b) $\angle AQB$.







Given the *DF* is parallel to *ABC* and $\angle DAB = 84^\circ$, stating your reasons clearly, find

- (a) $\angle ADB$.
- (b) $\angle BOF$.
- (c) $\angle FBC$.
- (d) $\angle DFO$.



In the diagram, *BC* is the diameter of a circle of centre *O*. *PQ* is tangent to the circle at *A*. Given that $\angle ABC = 23^{\circ}$ and $\angle OCD = 50^{\circ}$, find, stating your reasons clearly,

- (a) $\angle ADC$,
- (b) $\angle ADO$,
- (c) $\angle QAD$.

[Answer Key]

<u>Question 1</u> 10.25 cm or $10\frac{1}{4}$ cm

Question 2

y = 6.40

<u>Question 3</u> (b) 4.5 cm (c) 16:81

Question 4

(a) AC is a tangent to circle therefore $\angle FAB = 90^{\circ}$ (b) (i) 46° (ii) 33° (iii) 134° (iv) 123°

Question 5

(a) 51° (b) 51° (c) 29°

Question 6

(a) (i) 66° (ii) 66° (iii) 42° (iv) 228° (v) 24° (c) Not parallel as $\angle EBQ \neq \angle AEB$

Question 7

(b) (i) 90 - x (ii) 2x (iii) 180 - y

Question 8

(a) 51° (b) 102° (c) 39° (d) 1°

Question 9

(a) 90° (b) 32° (c) 32° (d) 122°

Question 10

(a) 90° (b) 30° (c) $\frac{2\pi}{3}$ or 2.09 rad (d) 30.1 cm^2

Question 11

(a)	52°	(b)	38°	(c)	128°
(d)	104°				

Question 12 (a) 57° (b) 107° (c) 83° (d) 17° Question 13 (a) (i) 30° (ii) 60° (iii) 40° Question 14 (a) 16° (b) 96° Question 15 (a) 220° (b) 70° (c) 70° (d) 40° (e) 51° Question 16 x = 20, y = 10**Question** 17 (a) 144° (b) 72° (c) $\angle PSQ = 72^{\circ}$ because angle at centre equals twice angle at circumference. Question 18 (a) Angle in semicircle subtended by the diameter (b) Angle *BET*, angle *OCT* and Angle BCE (c) (i) 61° (ii) 29° (iii) 119° (iv) 61° (d) 16.2 cm^2 Question 19 (a) (i) 54° (ii) 119° (iii) 122° **Question 20** (a) 36° (b) 16° (c) 34° (d) 160° Question 21 (a) 72° (b) 36° (c) 36° (d) 10° (e) 100° **Question 22** (a) (i) 55° (ii) 125° (iii) 35°

(b) A circle going through *O*, *B*, *E* and *D* can be formed with *OE* as the

diameter and $\angle OBE$ and $\angle ODE$ as right angles in semi-circles.		Question 24 (a) 48°	(b)	96°	(c)	48°
Question 23		(d) 6°				
(a) 20°	(b) 100°	Question 25 (a) 23°	(b)	27°	(c)	63°