

Dexter Wong & His Mathematics Team

Summer Course 2022 – 2023

MATHEMATICS Compulsory Part

S4 – S5 Core Assignment Set 4

Name: _____

Centre: _____

Lesson date: SUN/MON/TUE/WED/THU/FRI/SAT

INSTRUCTIONS

1. Attempt ALL questions in this paper. Write your answers in the spaces provided in this Question-Answer Book.
2. Unless otherwise specified, all workings (except for multiple choice questions) must be clearly shown.
3. Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.
4. The diagrams in this paper are not necessarily drawn in scale.

Suggested solution



Distributed in summer course
S4 – S5 Core
Phase 1 – Lesson 4

1. A

$$\angle DAC = 90^\circ$$

$$\angle ACD = 180^\circ - 90^\circ - 48^\circ = 42^\circ$$

$$\angle DAT = \angle ACD = 42^\circ$$

2. B

$$\angle BCD = \angle EBD = 70^\circ$$

$$\angle CDB = \angle EBD = 70^\circ$$

$$\angle CBD = 180^\circ - 70^\circ - 70^\circ = 40^\circ$$

3. D

$$PA = PB \text{ and } \angle PBA = \frac{180^\circ - 44^\circ}{2} = 68^\circ$$

$$\angle ACB = \angle PBA = 68^\circ$$

$$\angle CAB = 180^\circ - 68^\circ - 85^\circ = 27^\circ$$

$$\angle CBR = \angle CAB = 27^\circ$$

$$\angle CRB = \angle ACB - \angle CBR = 41^\circ$$

4. A

$$\angle SPR = \angle SRP = \frac{180^\circ - 60^\circ}{2} = 60^\circ$$

$$\angle PQR = \angle SPR = 60^\circ \text{ and } \angle QPR = 180^\circ - 60^\circ - 48^\circ = 72^\circ$$

$$\widehat{PQ} : \widehat{QR} : \widehat{RP} = 48^\circ : 72^\circ : 60^\circ = 4 : 6 : 5$$

5. A

$$\text{Let } \angle BAQ = x. \text{ Then } \angle ADB = \angle BAQ = x.$$

$$\angle PAB + \angle PBA = \angle BAQ = x \text{ and } \angle APB = \angle ABP = \frac{x}{2}.$$

$$\angle DAB = 180^\circ - 57^\circ.$$

$$57^\circ + x + \frac{x}{2} = 180^\circ$$

$$x = 38^\circ$$

6. D

$$\angle BAC = 180^\circ - 63^\circ - 59^\circ = 58^\circ.$$

$$\angle BOC = 58^\circ \times 2 = 116^\circ \text{ and } \angle BCO = \frac{180^\circ - 116^\circ}{2} = 32^\circ.$$

7. D

$$\angle DCA = \angle DAP = 43^\circ$$

$$\angle ADC = 180^\circ - 123^\circ = 57^\circ$$

$$\angle DAC = 180^\circ - 43^\circ - 57^\circ = 80^\circ$$

8. D

$$\angle BCE = \angle CEG = 70^\circ \text{ and } \angle CBE = \angle CEG = 70^\circ.$$

$$\angle BEC = 180^\circ - 70^\circ - 70^\circ = 40^\circ \text{ and } \angle ABE = \angle BEC = 40^\circ.$$

$$\angle ADE = \angle ABE = 40^\circ.$$

9. C

Note that $\triangle BCD \sim \triangle DCA$.

$$\frac{AC}{DC} = \frac{DC}{BC}$$

$$\frac{AC}{12} = \frac{12}{9}$$

$$AC = 16 \text{ cm}$$

$$AB = 16 - 9 = 7 \text{ cm}$$

10. C

Let $\angle CBD = \angle CDB = x$ and $\angle DAS = y$.

$$\angle BCD = 180^\circ - 2x \text{ and } \angle BAD = 2x.$$

$$\angle ABD = \angle DAS = y.$$

$$y + (2x + y) + 40^\circ = 180^\circ$$

$$x + y = 70^\circ$$

$$\angle ABC = x + y = 70^\circ.$$

11. D

Denote the intersections of BC and the circle by C and F .

$$\angle CAF = \angle ECB = 30^\circ$$

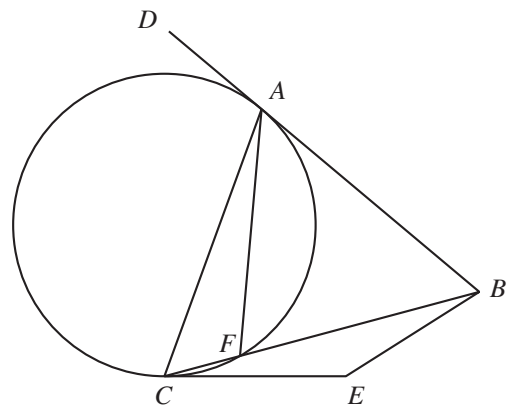
$$\angle BAF = \angle FCA$$

$$\angle FCA + \angle BAF + 30^\circ + 40^\circ = 180^\circ$$

$$2\angle BAF = 110^\circ$$

$$\angle BAF = 55^\circ$$

$$\angle CAD = 180^\circ - 30^\circ - 55^\circ = 95^\circ$$



12. B

$$\angle ADB = \angle TAB = 42^\circ$$

$$\frac{\angle BDC}{\angle ADB} = \frac{\widehat{BC}}{\widehat{AB}}$$

$$\frac{\angle BDC}{42^\circ} = \frac{2}{3}$$

$$\angle BDC = 28^\circ$$

$$\angle ADC = 28^\circ + 42^\circ = 70^\circ$$

13. B

Let $\angle PAB = x$.

$$\angle ABD = \angle PAB = \angle ADB = x$$

$$\angle CAD = \angle ADC = x + 27^\circ$$

$$\angle ACD = 180^\circ - 2(x + 27^\circ) = 126^\circ - 2x$$

$$\angle ACD = \angle ABD$$

$$126^\circ - 2x = x$$

$$x = 42^\circ$$

14. C

$$\angle BAC = 90^\circ$$

$$\angle ABC : \angle BAC = \widehat{AC} : \widehat{BC}$$

$$\angle ABC : 90^\circ = 1 : 3$$

$$\angle ABC = 30^\circ$$

$$\angle CAS = \angle ABC = 30^\circ$$

$$\angle PAS = 180^\circ - 90^\circ - 30^\circ = 60^\circ$$

15. D

$$\angle QPS = 180^\circ - 123^\circ = 57^\circ$$

$$\angle PQS = 180^\circ - 57^\circ - 48^\circ = 75^\circ$$

$$\angle APS = \angle PQS = 75^\circ$$

16. C

Let $\angle PQR = x$.

$$\angle RPQ = \angle PQR = x$$

$$\angle RQS = \angle RPQ = x \text{ and } \angle RPS = \angle PQR = x$$

Consider $\triangle PQS$.

$$(2x) + (2x) + 40^\circ = 180^\circ$$

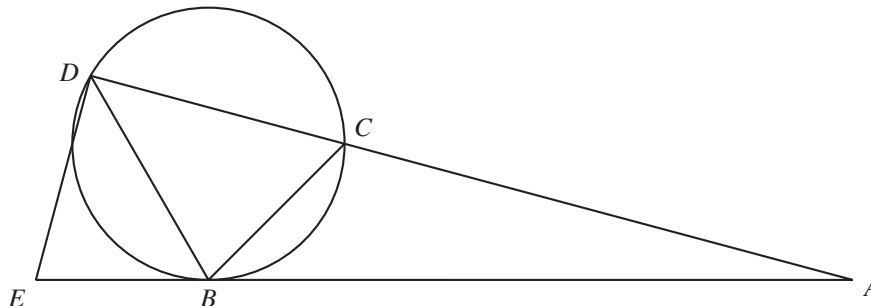
$$x = 35^\circ$$

$$\angle PQR = 35^\circ$$

17. C

I. ✓. $\angle ABC = \angle ADB$ and $\angle BAC = \angle DAB$

II. ✗. Consider the following figure. BD bisects $\angle EDC$ but $\angle ADB \neq \angle AED$ obviously. Two triangles are therefore not similar.



III. ✓. $\angle CDB = \angle BDE$ and $\angle DCB = \angle DBE$

18. C

$$\angle ACB = \angle TAB = 34^\circ$$

$$\angle BAC = \angle ACB = 34^\circ$$

$$\angle ABC = 180^\circ - 34^\circ - 34^\circ = 112^\circ$$

19. C

$$\angle BAC = 90^\circ$$

$$\angle ABC = 180^\circ - 90^\circ - 35^\circ = 55^\circ$$

$$\angle CAP = \angle ABC = 55^\circ$$

20. A

$$\angle AEB = \angle SAB = 60^\circ$$

$$\angle BCD = \angle AEB = 60^\circ$$

$$\angle BCE : \angle ECD = 15^\circ : 60^\circ - 15^\circ = 1 : 3$$

21. A

$$\angle AGE = 2 \times 66^\circ = 132^\circ$$

$$\angle CEA = 132^\circ \times \frac{6}{5+6} = 72^\circ$$

$$\angle CAT = \angle CEA = 72^\circ \text{ and } \angle ATC = 180^\circ - 2 \times 72^\circ = 36^\circ$$

22. A

$$\angle ACB = 90^\circ$$

$$\angle ABC = 180^\circ - 90^\circ - 26^\circ = 64^\circ$$

$$\angle DCA = \angle ABC = 64^\circ$$

$$\angle AFD = \angle FGA + \angle FAG = 116^\circ$$

$$\angle FDC = 116^\circ - 64^\circ = 52^\circ$$

23. A

Let $\angle RAB = x$.

$$\angle ABC = \angle BRA + \angle RAB = 22^\circ + x.$$

$$\angle BAC = 90^\circ \text{ and } \angle QAC = \angle ABC = 22^\circ + x.$$

$$(22^\circ + x) + [90^\circ + (22^\circ + x)] + 36^\circ = 180^\circ$$

$$x = 5^\circ$$

24. A

$$\angle BCA = \angle BAQ = 76^\circ$$

$$\angle BCD = 180^\circ - 76^\circ = 104^\circ$$

$$\angle BED = \angle BCD = 104^\circ$$

25. A

$$\angle ABE = \angle QAE = x$$

$$\angle EDC = \angle ABE$$

$$y = x$$

26. A

$$\angle CAB = 90^\circ \text{ and } \angle EAC = 130^\circ - 90^\circ = 40^\circ$$

$$\angle DCE = \angle EAC = 40^\circ$$

27. C

$$EC = EA \text{ and } \angle ECA = \angle EAC = 36^\circ.$$

$$FA = FD \text{ and } \angle FDA = \angle DAF = 28^\circ.$$

$$\angle ADC = \angle EAC = 36^\circ \text{ and } \angle ACD = \angle FAD = 28^\circ.$$

$$\angle CBD = 180^\circ - (36^\circ + 28^\circ) - (36^\circ + 28^\circ) = 52^\circ.$$

28. C

$$\angle ADE = \angle CAE = 80^\circ$$

$$\angle ADF = \angle AEF = 36^\circ$$

$$\angle EDF = 80^\circ - 36^\circ = 44^\circ$$

29. A

$$\angle DBA = \angle DAP = a \text{ and } \angle DBC = 180^\circ - a.$$

$$\text{Reflex } \angle COD = 2\angle DBC = 360^\circ - 2a.$$

$$(360^\circ - 2a) + x = 360^\circ$$

$$x = 2a$$

30. C

$$\angle CAD = \angle DCS = 39^\circ$$

$$\angle ADB = \angle PAB = 47^\circ$$

$$\angle AKD = 180^\circ - 39^\circ - 47^\circ = 94^\circ$$

31. $\angle BCD = 90^\circ$ 1M
 In $\triangle CDK$, $\angle CDK = \angle BKC - \angle DCK = 81^\circ - x$
 In $\triangle BDC$, $\angle CBD = 180^\circ - 90^\circ - (81^\circ - x) = x + 9^\circ$
 $\angle ABD = \angle ACD = x$ 1M
 $\angle ABC = x + (x + 9^\circ) = 2x + 9^\circ$
 $\angle BCQ = \angle CDK = 81^\circ - x$ 1M
 $\angle ABC = \angle BCQ$
 $2x + 9^\circ = 81^\circ - x$
 $x = 24^\circ$ 1A
32. (a) $\angle ADC = \angle BAD = 40^\circ$ 1A
 $\angle DAC = 180^\circ - 40^\circ - 25^\circ = 115^\circ$
 $\angle ABD = \angle DAC = 115^\circ$ 1A
 (b) $\angle EAC = \angle ADC = 40^\circ$
 $\angle DAE = 115^\circ - 40^\circ = 75^\circ$
 $\widehat{AE} : \widehat{ED} = 40^\circ : 75^\circ = 8 : 15$ 1M+1A
33. (a) In $\triangle TPR$, $TR = TP$ and so $\angle TRP = \angle TPR$ 1M
 $\angle TPR + \angle TRP + \angle PTR = 180^\circ$
 $\angle TPR = \frac{180^\circ - 62^\circ}{2} = 59^\circ$
 $\angle PAR + (59^\circ + 38^\circ) = 180^\circ$ 1M
 $\angle PAR = 83^\circ$ 1A
 (b) In $\triangle TPR$, $\angle PRC = \angle TPR + \angle PTR = 121^\circ$ 1M
 $\angle PSR = \angle PRC = 121^\circ$ 1M+1A
34. (a) $\angle DCF = 90^\circ$ 1M
 $\angle DBA = \angle ABC - \angle DBC = 20^\circ$
 $\angle DCB = \angle DBA = 20^\circ$ 1M+1A
 (b) $\angle DCF = 90^\circ$ 1M
 $\angle KCF = \angle DCF - \angle DCB = 70^\circ$ 1M
 In $\triangle ABK$, $\angle DKC = \angle DAB + \angle ABK = 125^\circ$ 1M
 In $\triangle CKF$, $\angle CFK = \angle DKC - \angle KCF = 55^\circ$ 1A

35. (a) $\angle TAQ = 90^\circ$ (tangent $\perp$ radius)

$\angle TDC = 90^\circ$ (tangent $\perp$ radius)

$= \angle TAQ$

So, A, T, D and Q are concyclic. (ext. $\angle =$ int. opp. $\angle$)

Marking Scheme		
Case 1	Any correct proof with correct reasons.	4
Case 2	Any correct proof without reasons.	3
Case 3	Incomplete proof with any one correct step with reason.	≤ 2

(b) $\angle TCD = 180^\circ - 90^\circ - 76^\circ = 14^\circ$

1M

$\angle BAC = \angle TCD = 14^\circ$

1A

$\angle BCR = \angle BAC = 14^\circ$

1A

$\angle PAB = 180^\circ - 90^\circ - 14^\circ = 76^\circ$

1A