

REG-TTC-2324-ASM-SET 4-MATH**Suggested solutions****Multiple Choice Questions**

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|-------|-------|-------|-------|-------|
| 1. C | 2. C | 3. C | 4. D | 5. B |
| 6. A | 7. B | 8. B | 9. B | 10. D |
| 11. C | 12. A | 13. C | 14. B | 15. B |
| 16. C | 17. B | 18. B | 19. C | 20. D |
| 21. D | 22. C | 23. D | 24. D | 25. D |
| 26. A | 27. D | 28. A | 29. A | 30. A |
| 31. D | 32. B | 33. C | 34. B | 35. B |
| 36. D | 37. B | 38. C | 39. C | 40. A |
| 41. B | 42. A | 43. B | 44. C | 45. A |

1. C

$$\frac{\angle BAD}{\angle BDC} = \frac{\widehat{BD}}{\widehat{BC}}$$

$$\frac{\angle BAD}{20^\circ} = \frac{2}{1}$$

$$\angle BAD = 40^\circ$$

$$\angle ADB = 90^\circ$$

$$\angle ABD + \angle ADB + \angle BAD = 180^\circ$$

$$\angle ABD = 50^\circ$$

2. C

$$\angle AOE = 2 \times 25^\circ = 50^\circ.$$

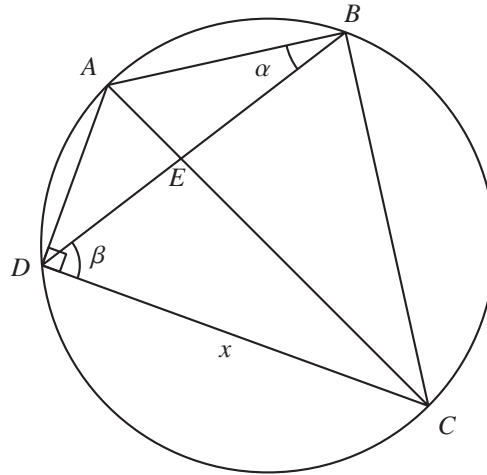
$$\text{Since } OA = AE, \angle AEO = \angle AOE = 50^\circ.$$

$$\angle ABC = 180^\circ - \angle ADC = 155^\circ.$$

$$\angle ECB = \angle ABC - \angle BEC = 105^\circ.$$

3. C

Draw circle $ABCD$.



Note that AC is a diameter of the circle and $\angle ABC = 90^\circ$.

We have $\angle ACD = \angle ABD = \alpha$ and $\angle BAC = \angle BDC = \beta$.

$$\begin{aligned} BC &= AC \sin \beta \\ &= \left(\frac{x}{\cos \alpha} \right) \sin \beta \\ &= \frac{x \sin \beta}{\cos \alpha} \end{aligned}$$

4. D

$$\begin{aligned} \angle OCA &= 180^\circ - \angle EFC - \angle CEF \\ &= 180^\circ - (180^\circ - \angle BFC) - (180^\circ - \angle CED) \\ &= \angle BFC + \angle CED - 180^\circ \\ &= 30^\circ \end{aligned}$$

So, $\angle OAC = 30^\circ$, $\angle AOC = 120^\circ$ and $\angle COD = 60^\circ$.

$$\frac{1+a}{b} = \frac{120^\circ}{60^\circ}$$

$$1+a = 2b$$

$$2b - a = 1$$

5. B

$\angle DAO = \angle ADO = 46^\circ$ and $\angle OCA = \angle OAC = 64^\circ - 46^\circ = 18^\circ$.

$\angle AOC = 180^\circ - 2 \times 18^\circ = 144^\circ$ and reflex $\angle AOC = 360^\circ - 144^\circ = 216^\circ$.

$$\angle ABC = \frac{1}{2} \times 216^\circ = 108^\circ.$$

6. A

Let O be the centre of the circle.

Then $\angle AOC = 2\angle ABC = 56^\circ$.

$$\frac{56^\circ}{360^\circ} = \frac{\widehat{AC}}{\text{circumference}}$$

Circumference = 45 cm

7. B

$$\angle ADE = \angle DAC + \angle ACD$$

$$= 36^\circ + 24^\circ$$

$$= 60^\circ$$

$$\angle ABE = \angle ADE$$

$$= 60^\circ$$

$$\angle ABD = \angle ABE + \angle DBE$$

$$90^\circ = 60^\circ + \angle DBE$$

$$\angle DBE = 30^\circ$$

8. B

Since $\widehat{PS} = \widehat{SR}$, we have $\angle POS = \angle ROS = \frac{136^\circ}{2} = 68^\circ$.

Since $OP = OS$, we have $\angle SPO = \angle PSO = \frac{180^\circ - 68^\circ}{2} = 56^\circ$.

9. B

$$\angle ADB = 90^\circ$$

$$(2\angle CBD) + (22^\circ + 90^\circ) = 180^\circ$$

$$\angle CBD = 34^\circ$$

$$\angle BCD = 180^\circ - 22^\circ - 34^\circ$$

$$= 124^\circ$$

10. D

$$\angle P + \angle R = 180^\circ$$

$$\angle P = 180^\circ \times \frac{3}{3+5}$$

$$= 67.5^\circ$$

$$\angle Q = \angle P \times \frac{4}{3}$$

$$= 90^\circ$$

$$\angle S = 180^\circ - 90^\circ = 90^\circ$$

11. C

$$\angle CAD = \angle CBD = 90^\circ$$

$$\angle BDC = \angle BAC = \alpha$$

$$BC = CD \sin \alpha$$

$$AD = CD \cos \beta$$

$$\frac{BC}{AD} = \frac{CD \sin \alpha}{CD \cos \beta} = \frac{\sin \alpha}{\cos \beta}$$

12. A

$$\angle BAD = 180^\circ - \angle DCE = 82^\circ.$$

$$\angle ABE = \angle BAD - \angle AEB = 47^\circ.$$

13. C

$$\angle ABD = 90^\circ$$

We have $\angle ABO = 60^\circ$, $\angle OBD = 30^\circ$ and $\angle DBE = 15^\circ$.

$$\angle DAE = \angle DBE = 15^\circ$$

$$DE = 6 \sin 15^\circ \approx 1.55 \text{ cm}$$

$$\angle CED = \angle BAD = \angle OBA = 60^\circ$$

$$\angle CDE = \angle ABE = 105^\circ$$

$$\angle DCE = 180^\circ - 60^\circ - 105^\circ = 15^\circ = \angle DBE$$

$$CD = BD = 6 \sin 60^\circ = 3\sqrt{3} \text{ cm}$$

$$\begin{aligned} \text{Area of } \triangle CDE &= \frac{1}{2}(CD)(DE) \sin 105^\circ \\ &\approx 3.90 \text{ cm}^2 \end{aligned}$$

$$\angle DOE = 2 \times 15^\circ = 30^\circ$$

Required area

$$\begin{aligned} &= (\text{area of } \triangle CDE) - \left[3^2 \pi \times \frac{30^\circ}{360^\circ} - \frac{1}{2}(3)^2 \sin 30^\circ \right] \\ &\approx 3.79 \text{ cm}^2 \end{aligned}$$

14. B

$$\angle AOC = 2 \times 74^\circ = 148^\circ.$$

$$\angle COD = \frac{148^\circ - 52^\circ}{2} = 48^\circ.$$

$$\angle ODC = \frac{180^\circ - 96^\circ}{2} = 42^\circ.$$

15. B

$$\angle BCD = 90^\circ \text{ and } \angle BDC = \angle DBC = \frac{180^\circ - 90^\circ}{2} = 45^\circ.$$

$$\angle BAC = \angle BDC = 45^\circ \text{ and } \angle ABE = \angle AEB = \frac{180^\circ - 45^\circ}{2} = 67.5^\circ.$$

$$\angle BAD = 90^\circ \text{ and } \angle BDA = 180^\circ - 90^\circ - 67.5^\circ = 22.5^\circ.$$

$$\angle ACB = \angle BDA = 22.5^\circ.$$

16. C

$$\begin{aligned}\angle CAD &= \angle BAC \times \frac{16}{24} = 42^\circ \\ \angle ACB &= 180^\circ - 90^\circ - 63^\circ = 27^\circ \text{ and } \angle ADE = \angle ACB = 27^\circ \\ \angle AED &= 180^\circ - 27^\circ - 42^\circ = 111^\circ\end{aligned}$$

17. B

$$\begin{aligned}\angle ABC &= 140^\circ \\ \angle AEC &= \frac{360^\circ - \angle ABC}{2} \\ &= 110^\circ \\ \angle DAE &= \angle ADC - \angle AED \\ &= 140^\circ - 110^\circ \\ &= 30^\circ\end{aligned}$$

18. B

$$\begin{aligned}\angle BDC &= \frac{70^\circ}{2} = 35^\circ \text{ and } \angle ACD = 90^\circ. \\ \angle BEC &= 90^\circ + 35^\circ = 125^\circ.\end{aligned}$$

19. C

Let M , N and T be mid-points of AB , CD and EF respectively.

$$AB = CD = EF \rightarrow OT = OM = ON$$

$$\triangle OMQ \cong \triangle ONQ \text{ and } \triangle ONR \cong \triangle OTR$$

Let $\angle OQN = a$ and $\angle ORN = b$.

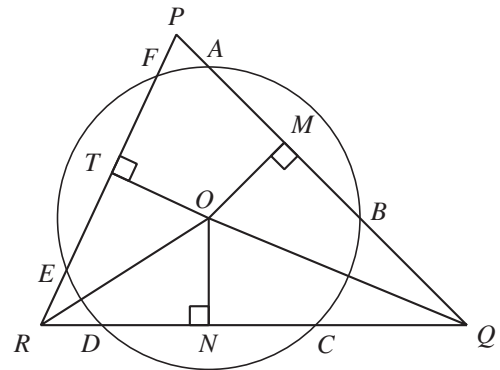
We have $\angle OQM = a$ and $\angle ORT = b$.

$$2a + 2b + 42^\circ = 180^\circ$$

$$a + b = 69^\circ$$

$$\angle QOR = 180^\circ - (a + b)$$

$$= 111^\circ$$



20. D

Note that $\triangle EBC \sim \triangle EDA$.

$$\begin{aligned}\frac{CE}{AE} &= \frac{BE}{DE} \\ \frac{CE}{4+8} &= \frac{8}{10+CE}\end{aligned}$$

$$(CE)^2 + 10(CE) - 96 = 0$$

$$CE = 6 \text{ cm} \quad \text{or} \quad -16 \text{ cm (rejected)}$$

21. D

$$\begin{aligned}\text{Radius} &= \sqrt{7^2 + \left(\frac{48}{2}\right)^2} \\ &= 25 \text{ cm}\end{aligned}$$

Let θ be the angle of the sector corresponding to the shaded segment.

$$\begin{aligned}\cos \frac{\theta}{2} &= \frac{7}{25} \\ \theta &\approx 147^\circ\end{aligned}$$

$$\begin{aligned}\text{Required area} &= 25^2 \pi \times \frac{\theta}{360^\circ} - \frac{(48)(7)}{2} \\ &\approx 636 \text{ cm}^2\end{aligned}$$

22. C

$$\angle OAB + \angle OBA + \angle AOB = 180^\circ$$

$$2(44^\circ) + \angle AOB = 180^\circ$$

$$\angle AOB = 92^\circ$$

$$\angle BOD = 2\angle BCD$$

$$92^\circ + \angle AOD = 2(62^\circ)$$

$$\angle AOD = 32^\circ$$

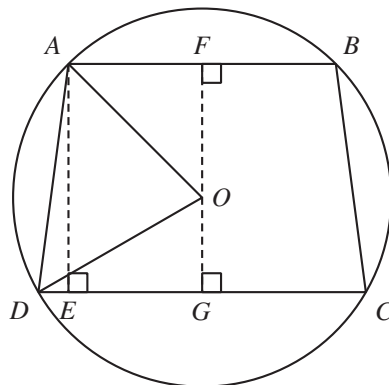
23. D

Note that $\angle ADC = \angle BCD = 80^\circ$ and $AB \parallel CD$.

Let E be a point on CD such that $AE \perp CD$.

Let F and G be the mid-points of AB and CD respectively.

Denote the centre of the circle by O .



Consider $\triangle ADE$.

$$\tan \angle ADE = \frac{AE}{DE}$$

$$\tan 80^\circ = \frac{AE}{\left(\frac{8-6}{2}\right)}$$

$$AE = \tan 80^\circ \text{ cm}$$

Let $OG = x$ cm. Consider $\triangle ODG$ and $\triangle OAF$.

$$r^2 = 3^2 + (AE - x)^2 = 4^2 + x^2$$

$$-2(AE)x = 7 - AE^2$$

$$x \approx 2.22$$

Required area = $r^2\pi$

$$= (4^2 + x^2)\pi$$

$$\approx 65.7 \text{ cm}^2$$

24. D

$$\angle CAD = \angle CAB = \frac{50^\circ}{2} = 25^\circ$$

$$\angle ABC = 90^\circ$$

$$\angle ABC + \angle BCA + \angle BAC = 180^\circ$$

$$\angle BCA = 65^\circ$$

$$\angle AEB = \angle BCA = 65^\circ$$

25. D

Reflex $\angle AOC = 2x$. So, $y = 360^\circ - 2x$.

26. A

Centre of small circle lies on RT , then $\angle SRT = \angle TRU$.

$$\angle RTU = \angle RUQ = 40^\circ \text{ and } \angle RTS = 90^\circ$$

$$\angle SRU = 180^\circ - (40^\circ + 90^\circ) = 50^\circ$$

$$\angle TRU = \frac{50^\circ}{2} = 25^\circ \text{ and } \angle PUT = \angle TRU = 25^\circ$$

27. D

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

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

28. A

$$BD \text{ is diameter} \Rightarrow \angle DAB = 90^\circ$$

$$\text{Let } \angle CAE = \theta.$$

$$\text{Consider } \triangle CAE, \angle ACD = \angle CAE + 14^\circ = \theta + 14^\circ.$$

$$\text{Since } AT \text{ is tangent, } \angle DAT = \angle ACD = \theta + 14^\circ.$$

$$\text{Consider } \triangle TAE,$$

$$47^\circ + (90^\circ + \theta + 14^\circ) + 14^\circ = 180^\circ$$

$$\theta = 15^\circ$$

29. A

$$BC \text{ is a diameter, } \angle BDC = 90^\circ.$$

$$\text{Since } \triangle BDC \sim \triangle CDA, \frac{BD}{BC} = \frac{CD}{AC}$$

$$\frac{BD}{CD} = \frac{3}{4}$$

$$\angle BCD = \tan^{-1} \frac{3}{4} \text{ and } BD = 9 \sin \angle BCD = 5.4 \text{ cm.}$$

30. A

$$\angle DAC = \angle ABC$$

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

$$\angle ADE + \angle BAD + \angle ABC + \angle BED = 360^\circ$$

$$54^\circ + 90^\circ + 2\angle ABC + 90^\circ = 360^\circ$$

$$\angle ABC = 63^\circ$$

$$\angle ABC + 90^\circ + \angle BCA = 180^\circ$$

$$\angle BCA = 27^\circ$$

31. D

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

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

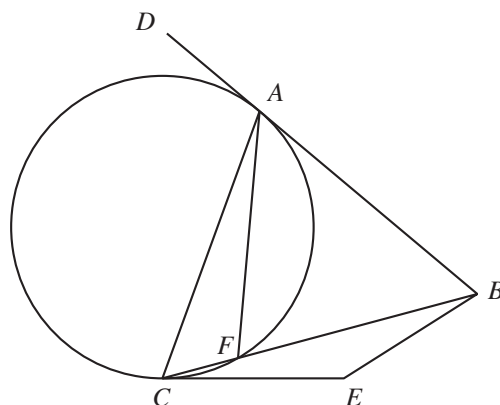
$$\angle BAF = \angle FCA$$

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

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

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

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



32. B

$$\text{Since } DQ = AQ, \angle ADQ = \frac{180^\circ - 50^\circ}{2} = 65^\circ.$$

$$\angle ACD = \angle ADQ = 65^\circ$$

$$\angle ADC = 180^\circ - 100^\circ = 80^\circ \text{ and } \angle CAD = 180^\circ - 65^\circ - 80^\circ = 35^\circ$$

$$\text{Since } BC = CD, \angle BAC = \angle CAD = 35^\circ.$$

$$\angle DCE = \angle BAD = 35^\circ + 35^\circ = 70^\circ$$

$$\angle CED = \angle CDQ - \angle DCE = 80^\circ + 65^\circ - 70^\circ = 75^\circ$$

$$\angle PEB = 180^\circ - 75^\circ = 105^\circ$$

33. C

$$\angle AOC + \angle OAC + \angle OCA = 180^\circ$$

$$\angle AOC + 2(27^\circ) = 180^\circ$$

$$\angle AOC = 126^\circ$$

$$\angle BOC = \angle AOC \times \frac{2}{1+2} = 84^\circ$$

$$\angle BAC = \frac{\angle BOC}{2} = 42^\circ$$

$$\angle BCD = \angle BAC = 42^\circ$$

34. B

$$\angle DCA = \angle YAD = 31^\circ$$

$$AX = AB \Rightarrow \angle XAB = \frac{180^\circ - 64^\circ}{2} = 58^\circ$$

$$\angle ACB = \angle XAB = 58^\circ$$

$$\angle BCD = 31^\circ + 58^\circ = 89^\circ$$

35. B

Let $\angle CAP = x$. Then $\angle ABC = \angle CAP = x$.

$$\angle DBA + \angle BAP = 180^\circ$$

$$40^\circ + x + x + 90^\circ = 180^\circ$$

$$x = 25^\circ$$

36. D

$$\angle EOD = 2\angle CBE = 30^\circ \text{ and } \angle EDO = \angle EOD = 30^\circ$$

$$\angle ODC = \frac{180^\circ - 30^\circ}{2} = 75^\circ \text{ and } \angle CDB = 75^\circ - 30^\circ = 45^\circ$$

$$\angle ABC = \angle CDB = 45^\circ \text{ and } \angle BAC = 180^\circ - 2 \times 45^\circ = 90^\circ$$

37. B

Let O be the centre of the semi-circle $ABCD$.

We have $OC \perp EF$ and $OB \perp BE$.

$$\text{Thus, } \angle BOC = 360^\circ - 90^\circ - 90^\circ - 90^\circ = 90^\circ.$$

$$\angle AOC = \angle AFE + 90^\circ = 132^\circ$$

$$\angle AOB = 132^\circ - 90^\circ = 42^\circ$$

$$\angle ACB = \frac{\angle AOB}{2} = 21^\circ$$

38. C

$$\angle ADC = 180^\circ - 100^\circ = 80^\circ$$

$$\angle ADB = 80^\circ \times \frac{2}{2+3} = 32^\circ$$

$$\angle BCA = \angle ADB = 32^\circ$$

$$\angle DAT = \angle ADC - \angle ATD = 50^\circ$$

$$\angle ACT = \angle DAT = 50^\circ$$

$$\angle BCT = 32^\circ + 50^\circ = 82^\circ$$

39. C

$$\angle OBC + \angle OCB + \angle BOC = 180^\circ$$

$$\angle BOC = 180^\circ - 2 \times 55^\circ$$

$$= 70^\circ$$

$$\angle OCT = 90^\circ$$

$$\angle OTC + \angle OCT + \angle COT = 180^\circ$$

$$\angle OTC = 180^\circ - 70^\circ - 90^\circ$$

$$\angle ATC = 20^\circ$$

40. A

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

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

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

41. B

Let O be the centre of circle ABD .

$$\angle EAO = \frac{60^\circ}{2} = 30^\circ \text{ and } AO = 9 \tan 30^\circ = 3\sqrt{3} \text{ cm.}$$

$$BC = AC - AB = 9 \tan 60^\circ - 2 \times (3\sqrt{3}) \approx 5.20 \text{ cm.}$$

42. A

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

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

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

43. B

$$EA = ED$$

$$\angle EDA = \frac{180^\circ - 86^\circ}{2} = 47^\circ$$

$$\angle ACD = \angle EDA = 47^\circ$$

$$\angle FGH = 180^\circ - \angle FEH = 94^\circ$$

$$\angle GBC = \frac{180^\circ - 94^\circ}{2} = 43^\circ$$

$$\angle BDC = \angle GBC = 43^\circ$$

$$\angle AID = \angle BDC + \angle ACD = 90^\circ$$

44. C

RT is the angle bisector of $\angle SRP$. So, $\angle SRP = 24^\circ$.

$$\angle QPS = \angle QSR.$$

$$\angle QPS + (\angle QSR + 70^\circ) + 24^\circ = 180^\circ$$

$$\angle QPS = 43^\circ$$

45. A

$$\angle CBP = \angle BCP = \angle BAC = 56^\circ$$

$$\angle BPC = 180^\circ - 56^\circ - 56^\circ = 68^\circ$$

$$\angle PBD = 90^\circ$$

$$\angle BQP = 180^\circ - 90^\circ - 68^\circ$$

$$= 22^\circ$$