REG-POC-2425-ASM-SET 4-MATH
Suggested solutions

Multiple Choice Questions

1. B	2. B	3. C	4. B	5. C
6. D	7. C	8. C	9. C	10. D
11. D	12. B	13. C	14. B	15. C
16. D	17. C	18. A	19. C	20. C
21. D	22. C	23. A	24. D	25. A
26. B	27. C	28. D	29. D	30. B

1. B

Reflex $\angle AOD = 2\angle AED = 200^\circ$
$\angle AOB = 200^\circ - 130^\circ = 70^\circ$
$\angle ACB = \dfrac{\angle AOB}{2} = 35^\circ$

2. B

$\angle BAD = 180^\circ - 95^\circ = 85^\circ$
$\angle ADE = \angle BAD = 85^\circ$

3. C

$\angle ADC = 180^\circ - 110^\circ = 70^\circ$
$\angle ACD = 90^\circ$
$\angle DAC = 180^\circ - 90^\circ - 70^\circ = 20^\circ$
Since $BC = CD$, $\angle DAC = \angle BAC$ and $\angle BAD = 2 \times 20^\circ = 40^\circ$.
$\angle BED = \angle BAD = 40^\circ$

4. B

$\angle ABC = 180^\circ - (x + 40^\circ) = 140^\circ - x$
$\angle ABC = \angle CDF$
$140^\circ - x = 2x - 70^\circ$
$x = 70^\circ$

5. C

Let $\angle ADB = x$.
Since $AB = BC = CD$, we have $\angle ADB = \angle BDC = \angle CBD = x$.
$\angle ABC + \angle ADC = 180^\circ$
$(75^\circ + x) + 2x = 180^\circ$
$x = 35^\circ$

6. D

$\angle ACB = 90^\circ$

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

$\angle ADC = 180^\circ - \angle ABC = 90^\circ + y$

$\angle CAD = \angle ACD = x$

$(90^\circ + y) + x + x = 180^\circ$

$y = 90^\circ - 2x$

7. C

$\angle EBC = \angle EDF = 76^\circ$

$\angle AEC = \angle EBC \times \frac{1+1}{3+1} = 38^\circ$

$\angle ABC = 180^\circ - \angle AEC = 142^\circ$

8. C

$\angle BAD : \angle BCD = (3+5) : (3+4)$

$= 8 : 7$

Since $\angle BAD + \angle BCD = 180^\circ$, $\angle BAD = 180^\circ \times \frac{8}{8+7} = 96^\circ$.

9. C

Since $BC = CD$, $\angle BAC = \angle CAD = \frac{58^\circ}{2} = 29^\circ$.

$\angle ACD = 90^\circ$

$\angle ADC = 180^\circ - 90^\circ - 29^\circ = 61^\circ$

$\angle AEC = \angle ADC = 61^\circ$

10. D

$\angle CED = \frac{30^\circ}{2} = 15^\circ$.

$\angle ABD + \angle AED = 180^\circ$

$x + (y + 15^\circ) = 180^\circ$

$x + y = 165^\circ$

11. D

$\angle ADC = 180^\circ - 110^\circ = 70^\circ$

$\angle ACD = 180^\circ - 95^\circ = 85^\circ$

$\angle CAD = 180^\circ - 70^\circ - 85^\circ = 25^\circ$

12. B

$\angle DCE = \frac{44^\circ}{2} = 22^\circ$

$\angle BCE + \angle BAE = 180^\circ$

$(y - 22^\circ) + x = 180^\circ$

$x + y = 202^\circ$

13. C

$\angle ABC = 180^\circ - 68^\circ = 112^\circ$
$\angle ABD = 90^\circ$
$\angle CBD = 112^\circ - 90^\circ = 22^\circ$
$\angle BDC = \angle CBD = 22^\circ$
$\angle ADB = 68^\circ - 22^\circ = 46^\circ$

14. B

Let $\angle FAG = x$.
$\angle FEG = \angle FAE + \angle AFE$
$= x + 12^\circ$
$\angle ABG = 180^\circ - \angle BAG - \angle AGB$
$= 180^\circ - x - 18^\circ$
$= 162^\circ - x$
$\angle ABC = \angle FEG$
$30^\circ + 162^\circ - x = x + 12$
$x = 90^\circ$

15. C

Let $\angle BDE = x$. Then $\angle DBE = x$ and $\angle AEB = 2x$.
$\angle BEC = 90^\circ$.
$(24^\circ + x) + (2x + 90^\circ) = 180^\circ$
$x = 22^\circ$
$\angle EAB = 180^\circ - (24^\circ + x) - x = 112^\circ$.

16. D

Let $\angle BAD = x$.
$\angle CDF = \angle BAD + \angle AED = x + 32^\circ$
$\angle BCD = \angle CDF + \angle AFB = (x + 32^\circ) + 26^\circ = x + 58^\circ$
$\angle BAD + \angle BCD = 180^\circ$
$x + (x + 58^\circ) = 180^\circ$
$x = 61^\circ$

17. C

$\angle BAD = 180^\circ - 114^\circ = 66^\circ$
$\angle OAD = 66^\circ - 28^\circ = 38^\circ$
$\angle ODA = \angle OAD = 38^\circ$
$\angle ABC = 180^\circ - (38^\circ + 42^\circ) = 100^\circ$

18. A

$\angle BAD = 180^\circ - 72^\circ = 108^\circ$
$\angle OAD = 108^\circ - 58^\circ = 50^\circ$
$\angle ODA = \angle OAD = 50^\circ$
$\angle AOD = 180^\circ - 50^\circ - 50^\circ = 80^\circ$

19. C

Let $\angle ACB = 2x$.
Then $\angle BAC = 3x$ and $\angle CAD = 4x$.
$\angle ACD = 90^\circ$

$$\angle BAD + \angle BCD = 180^\circ$$

$$(2x + 4x) + (90^\circ + 3x) = 180^\circ$$

$$x = 10^\circ$$

$\angle BCD = 90^\circ + 2x = 110^\circ$

20. C

$\angle ABE = 90^\circ$
$x + 90^\circ + \angle AEB = 180^\circ$

$$x + \angle AEB = 90^\circ$$

$\angle BCD + \angle BED = 180^\circ$

$$y + \angle BED = 180^\circ$$

$(x + \angle AEB) + (y + \angle BED) = 90^\circ + 180^\circ$

$$x + y + z = 270^\circ$$

21. D

Reflex $\angle SOP = 360^\circ - 100^\circ = 260^\circ$
$\angle STP = \dfrac{260^\circ}{2} = 130^\circ$
$\angle RTP = 180^\circ - 135^\circ = 45^\circ$
$\angle STR = 130^\circ - 45^\circ = 85^\circ$

22. C

$\angle BCE = 180^\circ - 115^\circ = 65^\circ$
$\angle DCE = 105^\circ - 65^\circ = 40^\circ$
$\angle DEC = \angle DCE = 40^\circ$
$\angle CEF = 95^\circ - 40^\circ = 55^\circ$
$\angle BAF + \angle BCE + \angle CEF = 180^\circ$

$$\angle BAF + 55^\circ + 65^\circ = 180^\circ$$

$$\angle BAF = 60^\circ$$

23. A

$\angle BCD = \angle DEF = 105^\circ$
$\angle BAD = 180^\circ - \angle BCD = 180^\circ - 105^\circ = 75^\circ$

24. D

Since CQ is a diameter of the circle CPQ, we have $\angle CPQ = 90^\circ$.

A. ✓. $\angle PQC = 180^\circ - 90^\circ - 40^\circ$

$= 50^\circ$

B. ✓. $\angle BAP = \angle CQP$ and $\angle ABC = \angle QPC$.

$\triangle ABC \sim \triangle PQC$

C. ✓. $\angle ABC = \angle CPQ = 90^\circ$

D. ✗.

25. A

Since $OB = OC$, $\angle ODC = \angle ODB = a$.

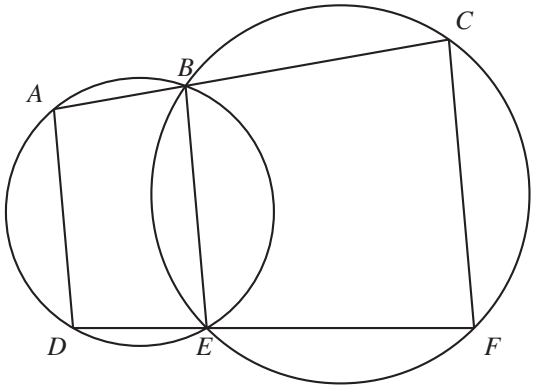
$\angle BOC = 2\angle BAC = 2b$

$\angle BOC + \angle BDC = 180^\circ$

$a + b = 90^\circ$

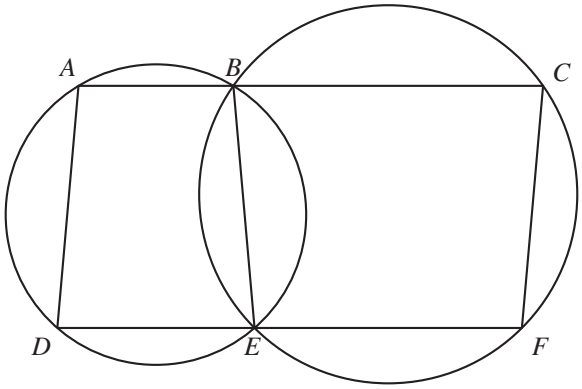
26. B

I. ✗. Consider the figure below. We have AC and DF are not parallel obviously.



II. ✓. Since $\angle BAD = \angle BEF$ and $\angle BEF + \angle BCF = 180°$, $\angle BAD + \angle BCF = 180°$. Thus, $AD // CF$.

III. ✗. Consider the figure below. Both $\angle ADE$ and $\angle BCF$ are acute angle.



Thus, $\angle ADE + \angle BCF < 90° + 90° = 180°$.

27. C

Note that $\angle CDE = \angle CBA = 90°$.

$AE = \sqrt{AB^2 + BE^2}$

$= 715\,\text{cm}$

Consider $\triangle ABE$ and $\triangle ADE$.

$\tan \angle BAE = \dfrac{275}{660}$ and $\cos \angle DAE = \dfrac{572}{715}$

$\angle BAE = \tan^{-1} \dfrac{5}{12}$ $\angle DAE = \cos^{-1} \dfrac{4}{5}$

In $\triangle ABC$,

$$\cos \angle BAC = \frac{660}{AC}$$

$$\cos\left(\tan^{-1} \frac{5}{12} + \cos^{-1} \frac{4}{5}\right) = \frac{660}{572 + CD}$$

$$CD = 728\,\text{cm}$$

28. D

Rectangle must be a cyclic quadrilateral *(opp. ∠s supp.)*.

29. D

$\angle CBD = \angle CDB$

$\angle CBD + \angle CDB = 56°$

$\angle CDB = 28°$

Since $\angle BAC = \angle CDB = 28°$, A, B, C and D are concyclic.

$\angle BCA = \angle ADB = 36°$

30. B

I. ✓. Since G is the orthocentre of $\triangle ABC$, $\angle AQG = \angle ARG = 90°$.
$AQGR$ is a cyclic quadrilateral *(opp. ∠s supp.)*.

II. ✓. Since G is the orthocentre of $\triangle ABC$, $\angle CQB = \angle CRB = 90°$.
$BCQR$ is a cyclic quadrilateral *(converse of ∠s in the same segment)*.

III. ✗. Note that the circle passing through C, Q and R is circle $BCQR$.
Since P is a point on the line segment BC, P lies inside the circle $BCQR$.
$CPRQ$ cannot be a cyclic quadrilateral.

 END OF PAPER