REG-ST-2425-ASM-SET 2-MATH
Suggested solutions

Multiple Choice Questions

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

1. $\boxed{\text{D}}$

$\angle QPR$ is the largest angle.

$$8^2 = 6^2 + 7^2 - 2(6)(7)\cos\angle QPR$$
$$\angle QPR \approx 76^\circ$$

Required angle is 76°.

2. $\boxed{\text{D}}$

Let E be a point on CD such that $AE // BC$.
Then $ABCE$ is a parallelogram.
$DE = 100 - 60 = 40\,\text{cm}$, $\angle ADE = 180^\circ - 120^\circ = 60^\circ$ and $\angle AED = \angle BCD = 180^\circ - 110^\circ = 70^\circ$

$$\frac{AD}{\sin 70^\circ} = \frac{40}{\sin(180^\circ - 60^\circ - 70^\circ)}$$
$$AD \approx 49\,\text{cm}$$

3. $\boxed{\text{A}}$

A. ✗. We have $A : B : C = 1 : 2 : 3$. Take $A = 30^\circ$, then $B = 60^\circ$ and $C = 90^\circ$.
We have $\sin A : \sin B : \sin C \neq 1 : 2 : 3$.

B. ✓.

C. ✗. Take $A = 30^\circ$, then $B = 60^\circ$ and $C = 90^\circ$.
We have $\cos A : \cos B : \cos C = \dfrac{\sqrt{3}}{2} : \dfrac{1}{2} : 0 \neq \sqrt{3} : 1 : 1$.

4. $\boxed{\text{D}}$

$\angle AOB = 360^\circ - 240^\circ = 120^\circ$ and $\angle ACB = \dfrac{1}{2}(120^\circ) = 60^\circ$

$AB^2 = 4^2 + 3^2 - 2(3)(4)\cos 60^\circ$

$AB = \sqrt{13}\,\text{cm}$

5. $\boxed{\text{D}}$

Let $ED = 3$ cm. Then $DE = 2$ cm and $AB = 5$ cm.
$BE = \sqrt{5^2 + 3^2} = \sqrt{34}$ cm and $CE = \sqrt{5^2 + 2^2} = \sqrt{29}$ cm.

$$5^2 = (\sqrt{34})^2 + (\sqrt{29})^2 - 2(\sqrt{34})(\sqrt{29})\cos\theta$$
$$\cos\theta \approx 0.605$$

6. $\boxed{\text{A}}$

$$\text{Required area} = 4^2\pi \times \frac{60^\circ}{360^\circ} - \frac{1}{2}(4)(4)\sin 60^\circ$$
$$\approx 1.45\text{ cm}^2$$

7. $\boxed{\text{A}}$

$$\frac{\sin\theta}{3} = \frac{\sin 150^\circ}{5}$$
$$\sin\theta = \frac{3}{10}$$
$$\tan\theta = \frac{3}{\sqrt{10^2 - 3^2}}$$
$$= \frac{3}{\sqrt{91}}$$

8. $\boxed{\text{B}}$

$AC = r\sin\alpha$

$\angle CAB = 180^\circ - \beta - \gamma$

$$\frac{BC}{\sin[180^\circ - (\beta + \gamma)]} = \frac{r\sin\alpha}{\sin\beta}$$
$$\frac{BC}{\sin(\beta + \gamma)} = \frac{r\sin\alpha}{\sin\beta}$$
$$BC = \frac{r\sin\alpha\sin(\beta + \gamma)}{\sin\beta}$$

9. $\boxed{\text{C}}$

$$\frac{1}{2}(16)(AB)\sin 30^\circ = 24$$
$$AB = 6\text{ cm}$$

10. $\boxed{\text{C}}$

$$10^2 = x^2 + (3x)^2 - 2(x)(3x)\cos 50^\circ$$
$$100 = x^2(10 - 6\cos 50^\circ)$$
$$x = \sqrt{\frac{100}{10 - 6\cos 50^\circ}} \quad \text{or} \quad -\sqrt{\frac{100}{10 - 6\cos 50^\circ}} \text{ (rejected)}$$
$$\approx 4.03$$

11. $\boxed{\text{C}}$

$$\frac{1}{2}(8)(AC)\sin 30° = 28$$
$$AC = 14\text{ cm}$$

12. $\boxed{\text{D}}$

$$\frac{\sin\angle ACB}{5} = \frac{\sin 50°}{8}$$
$$\angle ACB \approx 28.6° \quad \text{or} \quad 151° \text{ (rejected)}$$

13. $\boxed{\text{B}}$

$$\frac{\sin x°}{8} = \frac{\sin 78°}{12}$$
$$x \approx 41$$

14. $\boxed{\text{C}}$

Since $5^2 + 12^2 = 13^2$, $\angle PRQ = 90°$.

$$\cos P : \cos Q = \frac{5}{13} : \frac{12}{13}$$
$$= 5 : 12$$

15. $\boxed{\text{C}}$

$$\frac{\sin\angle TPQ}{5} = \frac{\sin 120°}{7}$$
$$\angle TPQ \approx 38.2° \quad \text{or} \quad 140° \text{ (rejected)}$$

Let X be a point on the circle such that XQ is a diameter of the circle.

$\angle PXQ = \angle TPQ$ and radius $= \dfrac{XQ}{2} = \dfrac{1}{2} \times \dfrac{PQ}{\sin\angle PXQ} \approx 5.66\text{ cm}$

16. $\boxed{\text{B}}$

$$2(5)(\pi) \times \frac{\angle AOB}{360°} = \pi$$
$$\angle AOB = 36°$$

Required area $= \dfrac{1}{2}(5)(5)\sin 36°$

$\approx 7.35\text{ cm}^2$

17. $\boxed{\text{A}}$

$$b^2 = a^2 + (2\sqrt{2})^2 - 2(a)(2\sqrt{2})\cos 45°$$
$$(6-a)^2 = a^2 + 8 - 4a$$
$$8a = 28$$
$$a = 3.5$$

18. $\boxed{\text{D}}$

Let $s = \dfrac{6 + (x + 5) + (x + 3)}{2} = 7 + x$.

$$\sqrt{(7 + x)(1 + x)(2)(4)} = \sqrt{728}$$
$$x^2 + 8x - 84 = 0$$
$$x = 6 \quad \text{or} \quad -14 \text{ (rejected)}$$

Distance $= \dfrac{\sqrt{728} \times 2}{11} \approx 4.9$

19. $\boxed{\text{B}}$

Let O be the centre. Radius $= \dfrac{AD}{2} = \dfrac{\sqrt{10^2 + 24^2}}{2} = 13\text{ cm}$

$AC^2 = OA^2 + OC^2 - 2(OA)(OC)\cos\angle AOC$

$\angle AOC \approx 135°$

Area $= 13^2\pi \times \dfrac{\angle AOC}{360°} - \dfrac{1}{2}(13)^2 \sin\angle AOC \approx 139\text{ cm}^2$

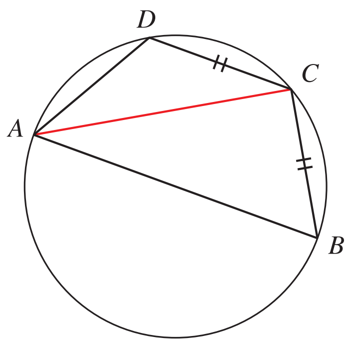
20. $\boxed{\text{B}}$

Join AC as shown.

In $\triangle ABC$,

$AC^2 = AB^2 + BC^2 - 2(AB)(BC)\cos 60°$

$AC = \sqrt{21}$



And

$BC^2 = AC^2 + AB^2 - 2(AC)(AB)\cos\angle BAC$

$\angle BAC \approx 49.1°$

Since $CD = BC$, $\angle CAD = \angle BAC \approx 49.1°$.

In $\triangle ACD$, $\angle ADC = 120°$ and $\angle ACD = 180° - 120° - \angle BAC \approx 10.9°$.

Area of quadrilateral $= \dfrac{1}{2}(CD)(AC)\sin\angle ACD + \dfrac{1}{2}(AB)(BC)\sin 60° \approx 10.4$ and it refers to $6\sqrt{3}$.

21. $\boxed{\text{B}}$

$$\begin{aligned}\text{Required ratio} &= \frac{1}{2}(BD)(BE)\sin\angle ABC : \frac{1}{2}(AB)(BC)\sin\angle ABC \\ &= (BD)(BE) : (AB)(BC) \\ &= (BD)(BE) : \left(\frac{5BD}{3}\right)\left(\frac{9BE}{4}\right) \\ &= 4 : 15\end{aligned}$$

22. $\boxed{\text{B}}$

$$\begin{aligned}\text{Required area} &= 6^2\pi \times \frac{40°}{360°} - \frac{1}{2}(6)(3)\sin 40° \\ &\approx 6.78\text{ cm}^2\end{aligned}$$

23. $\boxed{\text{C}}$

Let $s = \dfrac{5+6+7}{2} = 9\,\text{cm}$.

$$\begin{aligned}\text{Area of } \triangle ABC &= \sqrt{9(9-5)(9-6)(9-7)} \\ &= \sqrt{216}\,\text{cm}^2\end{aligned}$$

Let r cm be the radius of the inscribed circle.

Consider the area of $\triangle ABC$.

$$\begin{aligned}\sqrt{216} &= \frac{5r}{2} + \frac{6r}{2} + \frac{7r}{2} \\ r &= \frac{\sqrt{216}}{9}\end{aligned}$$

$$\begin{aligned}\text{Required area} &= r^2\pi \\ &= \frac{8\pi}{3}\,\text{cm}^2\end{aligned}$$

24. $\boxed{\text{B}}$

Put $AB = 5\,\text{cm}$. Then $BC = 7\,\text{cm}$ and $CA = 9\,\text{cm}$.

$$9^2 = 5^2 + 7^2 - 2(5)(7)\cos\angle B$$

$$\angle B \approx 95.7^\circ$$

25. $\boxed{\text{D}}$

$AB^2 + BC^2 = CA^2$ and so $\angle ABC = 90^\circ$.

Let $AC = 5k$. Then $AB = 3k$ and $BC = 4k$.

$$\begin{aligned}\frac{(3k)(4k)}{2} &= 150 \\ k &= 5 \quad \text{or} \quad -5 \text{ (rejected)}\end{aligned}$$

$AC = 5(5) = 25$

26. $\boxed{\text{B}}$

$\angle POQ = 230^\circ - 110^\circ = 120^\circ$

$PQ = 2 \times \sqrt{2}\sin\dfrac{120^\circ}{2} = \sqrt{6}$

27. $\boxed{\text{A}}$

Let $BP = 1$. So, $PQ = QC = 1$ and $AB = AC = 3$.

In $\triangle ABP$, $AP = \sqrt{3^2 + 1^2 - 2(1)(3)\cos 60^\circ} \approx 2.65$. Similarly, $AQ = AP \approx 2.65$

In $\triangle APQ$, $\angle PAQ = \cos^{-1}\dfrac{AP^2 + AQ^2 - PQ^2}{2(AP)(AQ)} \approx 22^\circ$

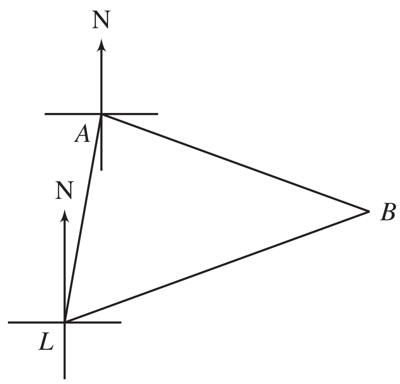
28. $\boxed{\text{C}}$

Refer to the notations in the figure.

$\angle LAB = 10° + 70° = 80°$ and $\angle ALB = 70° - 10° = 60°$

$$\frac{400}{\sin 60°} = \frac{BL}{\sin 80°}$$

$$BL = \frac{400 \sin 80°}{\sin 60°}$$



29. $\boxed{\text{B}}$

$\angle ABC = 30° + 50° = 80°$

$$AC^2 = 8^2 + 6^2 - 2(8)(6)\cos 80°$$

$$AC \approx 9.13\text{ km}$$

Required distance is 9.13 km.

30. $\boxed{\text{C}}$

$\angle CAB = 90° - 65° = 25°$ and $\angle ABC = 90° + 12° = 102°$.

$\angle ACB = 180° - 25° - 102° = 53°$

$$\frac{BC}{\sin 25°} = \frac{4.5}{\sin 53°}$$

$$BC \approx 2.4\text{ m}$$

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