REG-TTC-2425-ASM-SET 1-MATH
Suggested solutions

Multiple Choice Questions

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

1. B

$\angle QPR = \angle QSR = 48^\circ$
$\angle RPT = 90^\circ$
$\angle QPT = 90^\circ - 48^\circ = 42^\circ$

2. C

$\angle OBD = 90^\circ$
$\angle DOB = 180^\circ - 90^\circ - 32^\circ = 58^\circ$
$\angle BFE = \dfrac{\angle DOB}{2} = 29^\circ$
$\angle ECB = 180^\circ - 90^\circ - 29^\circ = 61^\circ$

3. A

$\angle AOB = 180^\circ - 2 \times 44^\circ = 92^\circ$
$\angle ODC = 90^\circ$
$90^\circ + (\angle BOD + 92^\circ) + 44^\circ + (180^\circ - 76^\circ) = 360^\circ$
$\angle BOD = 30^\circ$

4. C

$\angle AEB = \angle CBO = 50^\circ$
$\angle OAE = 90^\circ$
$\angle EOA = 180^\circ - 90^\circ - 50^\circ = 40^\circ$
$\angle EOC = 2\angle CBO = 100^\circ$
$\angle AOC = 100^\circ + 40^\circ = 140^\circ$
$\angle OAC = \dfrac{180^\circ - 140^\circ}{2} = 20^\circ$
$\angle DAE = 90^\circ - 20^\circ = 70^\circ$
$\angle EDC = 70^\circ + 50^\circ = 120^\circ$

5. B

Let $\angle ACB = 2\theta$. Then $\angle BAC = 3\theta$.

$\angle ABC = 90^\circ$

$2\theta + 3\theta + 90^\circ = 180^\circ$

$\theta = 18^\circ$

$\angle ACP = 90^\circ$

$\angle BQC = 90^\circ - 3\theta = 36^\circ$

6. B

$\angle ABC = \dfrac{82^\circ}{2} = 41^\circ$

Consider $\triangle ABP$.

$38^\circ + 41^\circ + (90^\circ + \angle BAO) = 180^\circ$

$\angle BAO = 11^\circ$

7. B

$\angle OAD = 90^\circ$

$\angle AOD = 180^\circ - 90^\circ - 44^\circ = 46^\circ$

$\angle ABC = \dfrac{\angle AOD}{2} = 23^\circ$

8. C

$\angle OAQ = 90^\circ$

$\angle OCA = \angle OAC = 90^\circ - 68^\circ = 22^\circ$

$\angle AOC = 180^\circ - 2 \times 22^\circ = 136^\circ$

$\angle BOC = 136^\circ - 100^\circ = 36^\circ$

$\angle OBC = \dfrac{180^\circ - 36^\circ}{2} = 72^\circ$

9. B

$\angle OBC = 90^\circ$

$\angle AOB = 90^\circ - 28^\circ = 62^\circ$

$\angle DOE = \angle AOB = 62^\circ$

$\angle OED = \dfrac{180^\circ - 62^\circ}{2} = 59^\circ$

10. C

$\angle OAT = \angle OBT = 90^\circ$

$\angle AOB = 360^\circ - 60^\circ - 90^\circ - 90^\circ = 120^\circ$

Required length $= 2\pi(6)\left(\dfrac{360^\circ - 120^\circ}{360^\circ}\right)$

$= 8\pi$ cm

11. C

$\angle ACB = \angle QAB = 64^\circ$

$\angle AOB = 2\angle ACB = 128^\circ$

$OA = OB$ and $\angle OBA = \dfrac{180^\circ - 128^\circ}{2} = 26^\circ$

$\angle BOC = \angle OBA = 26^\circ$

Reflex $\angle AOC = 360^\circ - 26^\circ - 128^\circ = 206^\circ$

$\angle ABC = \dfrac{206^\circ}{2} = 103^\circ$

12. C

$\angle OCB = \angle ABC = 24^\circ$

$\angle BOP = 2\angle OCB = 48^\circ$

$\angle OBP = 90^\circ$

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

13. A

$\angle YOZ = 360^\circ - 126^\circ - 134^\circ = 100^\circ$

$\angle OZP = \angle OYP = 90^\circ$

$\angle QPR = 360^\circ - 90^\circ - 90^\circ - 100^\circ = 80^\circ$

14. B

$\angle ACQ = 90^\circ$

$\angle QAC = 180^\circ - 90^\circ - 57^\circ = 33^\circ$

$\angle ADC = 90^\circ$

$\angle DCA = 180^\circ - 90^\circ - 33^\circ = 57^\circ$

$\angle ABD = \angle DCA = 57^\circ$

15. C

Let the radius be r cm.

$$15^2 + r^2 = (r + 9)^2$$

$$225 + r^2 = r^2 + 18r + 81$$

$$r = 8$$

Required radius is 8 cm.

16. B

$OC = \sqrt{16^2 - 10^2} = \sqrt{156}$ cm

Consider the area of $\triangle OBC$,

$$\frac{(BC)(OA)}{2} = \frac{(OB)(OC)}{2}$$

$$OA \approx 7.8 \text{ cm}$$

Required radius is 7.8 cm.

17. A

$\angle OAT = 90^\circ$

$TA = \sqrt{(5+4)^2 - 4^2}$

$= \sqrt{65}\,\text{cm}$

18. D

$\angle OAC = \angle OCA = 52^\circ$

$\angle AOC = 180^\circ - 52^\circ - 52^\circ = 76^\circ$

$\angle ABC = \dfrac{\angle AOC}{2} = 38^\circ$

$\angle OAD = 90^\circ$

$\angle BDA = 180^\circ - 90^\circ - 38^\circ = 52^\circ$

19. D

$\angle OCA = 90^\circ$

$\cos \angle CAO = \dfrac{OA}{AB}$

$\angle CAO = \cos^{-1} \dfrac{3}{5}$

$\sin \angle CAO = \dfrac{OC}{OA}$

$OC = 4.8\,\text{cm}$

Radius is 4.8 cm.

20. C

Let $OB = OC = r$ cm.

$OF = (r - 18)$ cm

$\angle OFB = 90^\circ$

$BF = \dfrac{BD}{2} = 24\,\text{cm}$

$r^2 = (r-18)^2 + 24^2$

$r^2 = r^2 - 36r + 900$

$36r = 900$

$r = 25$

$AF = r + (r - 18)$

$= 32\,\text{cm}$

21. D

$\angle AOB = 2\angle OCB = 40^\circ$

$\angle OBA = 90^\circ$

$\tan 40^\circ = \dfrac{9}{OB}$

$OB \approx 10.7\,\text{cm}$

Radius is 10.7 cm.

22. A

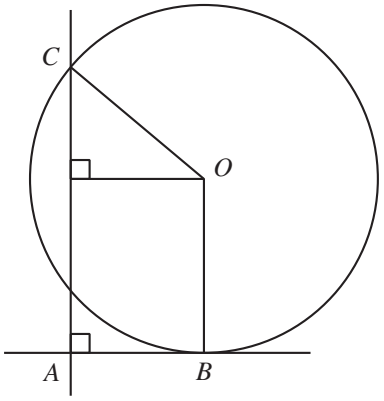
Denote the centre by O. Let M be a point on AC such that $AB // OM$.

Note that $OBCA$ is a trapezium.

In $\triangle OMC$,

$$OM = \sqrt{OC^2 - MC^2}$$
$$= \sqrt{17^2 - (32 - 17)^2}$$
$$= 8\,\text{cm}$$

$AB = OM = 8\,\text{cm}$



23. B

Let G be a point on AC such that $FG \perp AC$.

$CA = 3\,\text{cm}$, $BF = 2\,\text{cm}$ and $CG = 3 - 2 = 1\,\text{cm}$.

$AB = FG = \sqrt{(3 + 4 + 2)^2 - 1^2} = \sqrt{80}\,\text{cm}$

24. B

Let O be the centre of the circle.

Let the radius be r cm.

$OE = BE = r\,\text{cm}$

Let G be a point on AF such that $OG \perp AF$.

Then $OG = AB = 4\,\text{cm}$ and $EG = (10 - r)\,\text{cm}$.

$$r^2 = (10 - r)^2 + 4^2$$
$$r^2 = r^2 - 20r + 116$$
$$r = 5.8$$

25. D

Let O be the centre of circle, and the radius be r cm.

$OE = OC = r\,\text{cm}$ and $BE = \frac{8}{2} = 4\,\text{cm}$ (by symmetry).

Let F be a point on BC such that $OF \perp BC$. Then $CF = BC - OE = (8 - r)\,\text{cm}$.

$$r^2 = (8 - r)^2 + 4^2$$
$$0 = -16r + 80$$
$$r = 5$$

26. C

$OB = \sqrt{20^2 - 12^2} = 16\,\text{cm}$

Note that $\angle OR \perp AB$. Consider the area of $\triangle AOB$.

$$\frac{(AB)(OR)}{2} = \frac{(OA)(OB)}{2}$$

$$OR = 9.6\,\text{cm}$$

Required radius is 9.6 cm.

27. B

$\angle ACB = 90°$ and $\angle ABD = 90°$

$\angle BAC = \angle DAB$

$\triangle ABC \sim \triangle ADB$

Let the radius of the circle be r.

$$\frac{AC}{AB} = \frac{AB}{AD}$$

$$\frac{6}{2r} = \frac{2r}{6+2}$$

$$r = 2\sqrt{3}$$

Required radius is $2\sqrt{3}$ cm.

28. C

Join OE and let the radius of circle be r.

$OD = 8 - r$.

$DE = \sqrt{(8-r)^2 - r^2} = \sqrt{64 - 16r}$

As $\triangle OED \sim \triangle ABD$ *(AA)*,

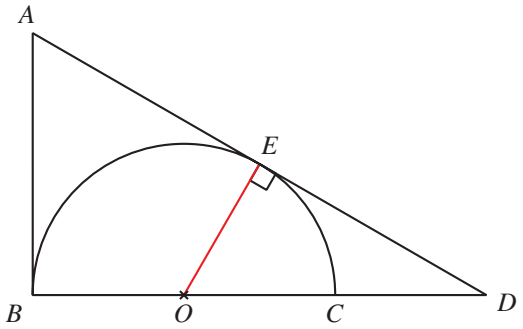
$$\frac{AB}{BD} = \frac{6}{8} = \frac{r}{\sqrt{64-16r}} = \frac{OE}{ED}$$

$$\frac{9}{16} = \frac{r^2}{64-16r}$$

$$9 = \frac{r^2}{4-r}$$

$$0 = r^2 + 9r - 36$$

$r = 3$ or -12 (rejected)



29. C

$\angle XAC = \angle XCO$

$\angle AXC = 90^\circ$

We have $\triangle XAC \sim \triangle XCO$.

$$\frac{XA}{XC} = \frac{XC}{XO}$$

$$\frac{2}{XC} = \frac{XC}{1}$$

$$XC^2 = 2$$

$$AC^2 = XC^2 + OX^2$$

$$= 2 + 1^2$$

$$= 3$$

30. D

$\angle OMB = 90^\circ$ and $\angle ODC = 90^\circ$

$\angle OMC + \angle ODC = 90^\circ + 90^\circ = 180^\circ$

Thus, O, M, C, D are concyclic.

$\angle BMD = \angle DOC = 180^\circ - 90^\circ - 40^\circ = 50^\circ$

END OF PAPER