

**REG-TTC-2324-ASM-SET 2-MATH****Suggested solutions****Multiple Choice Questions**

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

1. D

$$\angle APB = \angle CPB = 34^\circ$$

$$\angle OAP = 90^\circ$$

$$\angle AOB = 90^\circ + 34^\circ = 124^\circ$$

$$\angle OAB = \angle ABP = \frac{180^\circ - 124^\circ}{2} = 28^\circ$$

2. D

$$\angle BQO = \angle AQO = 43^\circ$$

$$\angle ORB = \angle ORC = 32^\circ$$

$$\angle QOR = 180^\circ - 43^\circ - 32^\circ = 105^\circ$$

3. D

$$\angle POE = \angle QOE$$

$$\angle QOD = \angle ROD$$

$$\angle POR = 2(\angle QOE + \angle QOD) = 2x$$

$$\angle OPA = \angle ORA = 90^\circ$$

$$y + 2x + 90^\circ + 90^\circ = 180^\circ$$

$$2x + y = 180^\circ$$

4. A

$$\angle BCA = 90^\circ \text{ and } \angle CBA = 180^\circ - 90^\circ - 42^\circ = 48^\circ$$

$$\angle OBC = \frac{48^\circ}{2} = 24^\circ$$

$$\angle BOC = 180^\circ - 90^\circ - 24^\circ = 66^\circ$$

5. A

$$\angle OAC = \angle OAB = \frac{\angle BAC}{2} = 30^\circ$$

$$\tan \angle OAC = \frac{OC}{AC}$$

$$\tan 30^\circ = \frac{OC}{4}$$

$$OC = \frac{4\sqrt{3}}{3} \text{ cm}$$

$$\text{Required radius is } \frac{4\sqrt{3}}{3} \text{ cm.}$$

6. C

Let  $O$  be the centre of the circle.

$$\angle OQR = \angle OSR = 90^\circ$$

$$\angle QOS = 360^\circ - 90^\circ - 90^\circ - 50^\circ = 130^\circ$$

$$\text{Reflex } \angle QOS = 360^\circ - 130^\circ = 230^\circ$$

$$\angle QMS = \frac{\text{reflex } \angle QOS}{2} = 115^\circ$$

7. B

Let  $O$  be the centre of the circle.

$$\angle OAP = \angle OCP = 90^\circ$$

$$\angle AOC = 360^\circ - 90^\circ - 38^\circ - 90^\circ = 142^\circ$$

$$\text{Reflex } \angle AOC = 360^\circ - 142^\circ = 218^\circ$$

$$\angle ABC = \frac{\text{reflex } \angle AOC}{2} = 109^\circ$$

8. D

Let  $O$  be the centre of circle.

$$\angle OPB = \angle OQB = \angle OSL = \angle ORL = 90^\circ$$

$$\angle HAC = \angle HCA = \frac{108^\circ}{2} = 54^\circ \text{ and } \angle BCH = \angle HCA = 54^\circ$$

$$\text{In } OQCS, \angle QOS = 360^\circ - 54^\circ - 90^\circ \times 2 = 126^\circ \text{ and } \angle ROS = 126^\circ \times \frac{4}{4+5} = 56^\circ$$

$$\text{In } OPHS, \angle POS = 360^\circ - 108^\circ - 90^\circ \times 2 = 72^\circ$$

$$\text{In } OPAR, \angle BAK = 360^\circ - 56^\circ - 72^\circ - 90^\circ \times 2 = 52^\circ$$

9. C

$$PA = PD$$

$$\angle PAD = \frac{180^\circ - 38^\circ}{2} = 71^\circ$$

$$\angle ADC = \angle PAD = 71^\circ$$

$$\angle ABC = 180^\circ - \angle ADC = 109^\circ$$

10. C

$$\begin{aligned}
 EB &= ED \\
 \angle EBD &= \frac{180^\circ - 32^\circ}{2} = 74^\circ \\
 \angle FBG &= 180^\circ - \angle EBD = 106^\circ \\
 \angle EFG + \angle FBG &= \angle GIB \\
 \angle EFG &= 146^\circ - 106^\circ \\
 &= 40^\circ
 \end{aligned}$$

11. C

$$\begin{aligned}
 \angle OAP &= 90^\circ \text{ and } \angle BAP = 90^\circ - 21^\circ = 69^\circ. \\
 PA &= PB \text{ and } \angle APB = 180^\circ - 2 \times 69^\circ = 42^\circ. \\
 \angle BCA &= 180^\circ - 90^\circ - 42^\circ = 48^\circ.
 \end{aligned}$$

12. C

$$\begin{aligned}
 \angle BAK &= 136^\circ - 55^\circ = 81^\circ. \\
 CA &= CD \text{ and } \angle ACD = 180^\circ - 2 \times 81^\circ = 18^\circ. \\
 \angle KED &= \angle ABK - \angle BCE = 55^\circ - 18^\circ = 37^\circ.
 \end{aligned}$$

13. D

$$\begin{aligned}
 \text{Let } \angle ATB &= a. \text{ Then } \angle BTC = 50^\circ - a. \\
 TA &= TB \text{ and } \angle ABT = \frac{180^\circ - a}{2}. \\
 TB &= TC \text{ and } \angle TBC = \frac{180^\circ - (50^\circ - a)}{2}. \\
 \angle ABC &= \frac{180^\circ - a}{2} + \frac{180^\circ - (50^\circ - a)}{2} = 155^\circ.
 \end{aligned}$$

14. A

$$\begin{aligned}
 AB &= AE \text{ and } \angle ABE = \frac{180^\circ - 38^\circ}{2} = 71^\circ. \\
 \angle OBA &= 90^\circ \text{ and } \angle OBG = 90^\circ - 71^\circ = 19^\circ. \\
 \angle BGD &= 80^\circ + 19^\circ = 99^\circ.
 \end{aligned}$$

15. A

$$\begin{aligned}
 CB &= CD \text{ and } \angle CDB = \angle DBC = 34^\circ. \\
 \angle BDF &= 180^\circ - 100^\circ = 80^\circ. \\
 \angle FDE &= 180^\circ - 80^\circ - 34^\circ = 66^\circ. \\
 ED &= EF, \angle EFD = \angle EDF = 66^\circ \text{ and } \angle DEF = 180^\circ - 66^\circ - 66^\circ = 48^\circ.
 \end{aligned}$$

16. A

$$\begin{aligned}
 \angle PBA &= \angle PAB = \frac{180^\circ - 42^\circ}{2} = 69^\circ \\
 \angle ABD &= 180^\circ - 69^\circ - 35^\circ = 76^\circ \\
 \angle ACD &= 180^\circ - 76^\circ = 104^\circ
 \end{aligned}$$

17. C

Let  $E$  be the intersection of  $AB$  produced and  $DC$  produced.

$$EA = ED \text{ and } \angle EDA = \angle EAD = 70^\circ.$$

$$\angle ABC = 360^\circ - 70^\circ - 70^\circ - 80^\circ = 140^\circ.$$

18. A

$$SP = SQ \text{ and } \angle SQP = \angle SPQ = \frac{180^\circ - 38^\circ}{2} = 71^\circ$$

$$SQ = SR \text{ and } \angle SQR = \angle SRQ = \frac{180^\circ - 16^\circ}{2} = 82^\circ$$

$$\angle PQR = 71^\circ + 82^\circ = 153^\circ$$

19. C

$$PA = PC$$

$$\angle PCA = \angle PAC = \frac{180^\circ - 64^\circ}{2} = 58^\circ$$

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

$$\angle BCQ = 180^\circ - 90^\circ - 58^\circ = 32^\circ$$

20. B

We have  $AC = AF$ ,  $BC = BH$  and  $EF = EH$ .

Let  $BH = x$ .

$$BC = BH = x$$

$$EF = EH = 7 - x$$

$$AB + BC = AE + EF$$

$$9 + x = 10 + (7 - x)$$

$$x = 4$$

21. C

Let the radius be  $r$ .

$$QB = QA = 9$$

$$RC = RB = 25 - 9 = 16$$

Let  $T$  be a point on  $RC$  such that  $QT \perp RC$ .

$$TC = QA = 9 \text{ and } RT = RC - TC = 16 - 9 = 7$$

$$QR^2 = QT^2 + RT^2$$

$$25^2 = (2r)^2 + 7^2$$

$$r^2 = 144$$

$$r = 12 \text{ or } -12 \text{ (rejected)}$$

22. D

Note that  $BC = BH = 4$  cm,  $EF = EH = 7$  cm and  $AC = AF$ .

$$AB + BC = AE + EF$$

$$AB + 4 = 12 + 7$$

$$AB = 15 \text{ cm}$$

23. D

$$\angle OBA = \angle OBC = 20^\circ$$

$$\angle OCB = 180^\circ - 130^\circ - 20^\circ = 30^\circ$$

$$\angle OCA = \angle OCB = 30^\circ$$

$$\angle BAC = 180^\circ - 2(20^\circ) - 2(30^\circ) = 80^\circ$$

24. B

Let  $CR = x$ .

$$BR = CR = x$$

$$SD = SC = 10 - x$$

$$QA = QB = 5 - x$$

$$PD = PA = 3 - (5 - x) = x - 2$$

$$SP = PD + SD$$

$$= (x - 2) + (10 - x)$$

$$= 8$$

25. B

Let  $BP = x$  cm.

$$BR = BP = x \text{ cm}$$

$$AQ = AR = (12 - x) \text{ cm}$$

$$CQ = CP = (9 - x) \text{ cm}$$

$$AC = AQ + CQ$$

$$7 = (12 - x) + (9 - x)$$

$$x = 7$$

26. A

Refer to the figure. Let  $BD = BF = r$  cm.

$$AB = \sqrt{10^2 - 8^2} = 6 \text{ cm}$$

$$AE = AF = (6 - r) \text{ cm}$$

$$CE = CD = (8 - r) \text{ cm}$$

$$AE + CE = AC$$

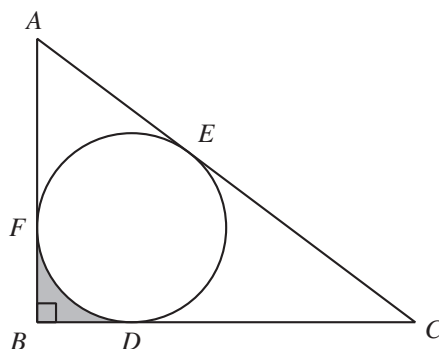
$$(6 - r) + (8 - r) = 10$$

$$r = 2$$

Required area

$$= 2^2 - 2^2 \pi \left( \frac{90^\circ}{360^\circ} \right)$$

$$= (4 - \pi) \text{ cm}^2$$



27. C

Let the radius be  $r$  cm.

Note that  $\triangle OBP \sim \triangle RQP$ .

$$\frac{OB}{RQ} = \frac{PB}{PQ}$$

$$\frac{r}{\sqrt{17^2 - 8^2}} = \frac{8 - r}{8}$$

$$8r = 120 - 15r$$

$$r = \frac{120}{23}$$

28. C

$$\angle PAQ = 90^\circ = \angle OBQ \text{ and } \angle PQA = \angle OQB.$$

So,  $\triangle OBQ \sim \triangle PAQ$ .

Let  $BP = x$ . Then  $AP = BP = x$ .

$$\frac{OB}{PA} = \frac{OQ}{PQ}$$

$$\frac{1}{x} = \frac{3}{\sqrt{2^2 + x^2}}$$

$$x^2 + 4 = 9x^2$$

$$x = \frac{1}{\sqrt{2}} \quad \text{or} \quad -\frac{1}{\sqrt{2}} \text{ (rejected)}$$

29. C

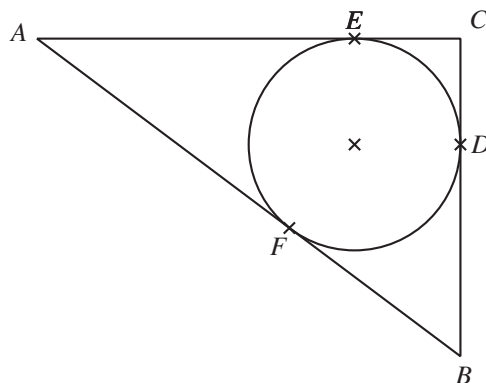
Let  $D, E, F$  be the point of contact of the inscribed circle and  $BC, AC, AB$  respectively.

Let  $CE = x$ . Then  $AE = 12 - x$ ,  $CD = x$  and  $BD = 5 - x$ .

By tangent properties,  $AF = 12 - x$  and  $BF = 5 - x$ .

Since  $AB = \sqrt{5^2 + 12^2} = 13$ , we have  $x = 2$ .

Thus, the coordinates of incentre are  $(10, 3)$ .



30. A

Note that  $\angle ABC = 90^\circ$ .

Let the radius be  $r$  cm.

The coordinates of centre are  $(r, -14 + r)$ .

Consider the length of  $AC$ .

$$(24 - r) + (18 - r) = \sqrt{18^2 + 24^2}$$

$$r = 6$$

The coordinates of centre are  $(6, -8)$ .

