REG-TTC-2425-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

$\angle APB = \angle CPB = 34^\circ$
$\angle OAP = 90^\circ$
$\angle AOB = 90^\circ + 34^\circ = 124^\circ$
$\angle OAB = \angle ABP = \dfrac{180^\circ - 124^\circ}{2} = 28^\circ$

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

$\angle BCA = 90^\circ$ and $\angle CBA = 180^\circ - 90^\circ - 42^\circ = 48^\circ$
$\angle OBC = \dfrac{48^\circ}{2} = 24^\circ$
$\angle BOC = 180^\circ - 90^\circ - 24^\circ = 66^\circ$

5. A

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

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

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

$OC = \dfrac{4\sqrt{3}}{3}$ cm

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

6. C

Let O be the centre of the circle.

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

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

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

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

7. B

Let O be the centre of the circle.

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

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

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

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

8. D

Let O be the centre of circle.

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

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

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

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

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

9. C

$PA = PD$

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

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

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

10. C

$EB = ED$

$\angle EBD = \dfrac{180^\circ - 32^\circ}{2} = 74^\circ$

$\angle FBG = 180^\circ - \angle EBD = 106^\circ$

$\angle EFG + \angle FBG = \angle GIB$

$\angle EFG = 146^\circ - 106^\circ$

$= 40^\circ$

11. C

$\angle OAP = 90^\circ$ and $\angle BAP = 90^\circ - 21^\circ = 69^\circ$.

$PA = PB$ and $\angle APB = 180^\circ - 2 \times 69^\circ = 42^\circ$.

$\angle BCA = 180^\circ - 90^\circ - 42^\circ = 48^\circ$.

12. C

$\angle BAK = 136^\circ - 55^\circ = 81^\circ$.

$CA = CD$ and $\angle ACD = 180^\circ - 2 \times 81^\circ = 18^\circ$.

$\angle KED = \angle ABK - \angle BCE = 55^\circ - 18^\circ = 37^\circ$.

13. D

Let $\angle ATB = a$. Then $\angle BTC = 50^\circ - a$.

$TA = TB$ and $\angle ABT = \dfrac{180^\circ - a}{2}$.

$TB = TC$ and $\angle TBC = \dfrac{180^\circ - (50^\circ - a)}{2}$.

$\angle ABC = \dfrac{180^\circ - a}{2} + \dfrac{180^\circ - (50^\circ - a)}{2} = 155^\circ$.

14. A

$AB = AE$ and $\angle ABE = \dfrac{180^\circ - 38^\circ}{2} = 71^\circ$.

$\angle OBA = 90^\circ$ and $\angle OBG = 90^\circ - 71^\circ = 19^\circ$.

$\angle BGD = 80^\circ + 19^\circ = 99^\circ$.

15. A

$CB = CD$ and $\angle CDB = \angle DBC = 34^\circ$.

$\angle BDF = 180^\circ - 100^\circ = 80^\circ$.

$\angle FDE = 180^\circ - 80^\circ - 34^\circ = 66^\circ$.

$ED = EF$, $\angle EFD = \angle EDF = 66^\circ$ and $\angle DEF = 180^\circ - 66^\circ - 66^\circ = 48^\circ$.

16. A

$\angle PBA = \angle PAB = \dfrac{180^\circ - 42^\circ}{2} = 69^\circ$

$\angle ABD = 180^\circ - 69^\circ - 35^\circ = 76^\circ$

$\angle ACD = 180^\circ - 76^\circ = 104^\circ$

17. C

Let E be the intersection of AB produced and DC produced.
$EA = ED$ and $\angle EDA = \angle EAD = 70^\circ$.
$\angle ABC = 360^\circ - 70^\circ - 70^\circ - 80^\circ = 140^\circ$.

18. A

$SP = SQ$ and $\angle SQP = \angle SPQ = \dfrac{180^\circ - 38^\circ}{2} = 71^\circ$
$SQ = SR$ and $\angle SQR = \angle SRQ = \dfrac{180^\circ - 16^\circ}{2} = 82^\circ$
$\angle PQR = 71^\circ + 82^\circ = 153^\circ$

19. C

$PA = PC$
$\angle PCA = \angle PAC = \dfrac{180^\circ - 64^\circ}{2} = 58^\circ$
$\angle ACB = 90^\circ$
$\angle BCQ = 180^\circ - 90^\circ - 58^\circ = 32^\circ$

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 $QT \perp RC$.
$TC = QA = 9$ and $RT = RC - TC = 16 - 9 = 7$
$QR^2 = QT^2 + RT^2$

$$25^2 = (2r)^2 + 7^2$$
$$r^2 = 144$$
$$r = 12 \quad \text{or} \quad -12 \text{ (rejected)}$$

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.
$BR = BP = x$ cm
$AQ = AR = (12 - x)$ cm
$CQ = CP = (9 - x)$ cm
$AC = AQ + CQ$
$7 = (12 - x) + (9 - x)$
$x = 7$

26. A

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

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

$AE = AF = (6 - r)$ cm

$CE = CD = (8 - r)$ cm

$$AE + CE = AC$$

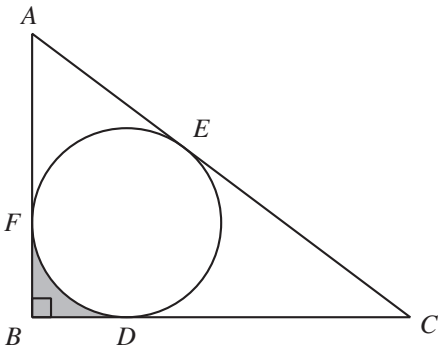
$$(6 - r) + (8 - r) = 10$$

$$r = 2$$

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

$\angle PAQ = 90^\circ = \angle OBQ$ 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

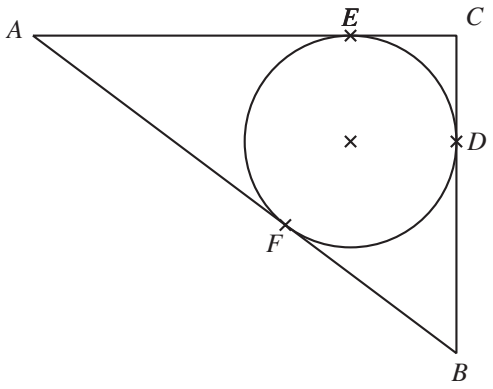
Let D, E, F be the point of contact of the inscribed circle and BC, AC, AB respectively.

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 $\angle ABC = 90°$.

Let the radius be r cm.

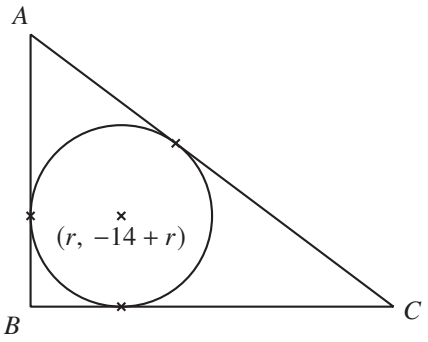
The coordinates of centre are $(r,\ -14 + r)$.

Consider the length of AC.

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

$$r = 6$$

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



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