

7th CLASS

MATHEMATICS

IIT FOUNDATION

STUDY MATERIAL

4. LINES AND ANGLES

TEACHING TASK

3EE MAIN LEVEL QUESTIONS

- ① Two angles are complementary if their measures add up to 90 degrees. If an angle x is equal to its complement, then

$$x = 90^\circ - x \Rightarrow x + x = 90^\circ$$

$$\Rightarrow 2x = 90^\circ \Rightarrow x = \frac{90}{2} = 45^\circ \quad \text{Ans: A}$$

② $a + 25 = b + 65 = 90^\circ$

here angles are should be equal to 90° .

$$\text{So, } a + 25 = 90, \quad b + 65 = 90^\circ$$

$$a = 90 - 25, \quad b = 90 - 65^\circ$$

$$a = 65^\circ, \quad b = 25^\circ$$

Ans: A

③ $\angle ABC + 68^\circ = 156^\circ$

$$\angle ABC = 156 - 68 = 88^\circ$$

$$\therefore \angle ABC = 88^\circ \quad \text{Ans: A}$$

④ Let the angles be $4x$ and $5x$.

Supplementary $\Rightarrow 4x + 5x = 180^\circ$

$$\Rightarrow 9x = 180^\circ \Rightarrow x = \frac{180}{9} = 20^\circ$$

$$4x \Rightarrow 4 \times 20^\circ = 80^\circ$$

Ans: C

$$5x \Rightarrow 5 \times 20^\circ = 100^\circ$$

⑤ $\angle CDE = 80^\circ$ $AB \parallel CD$, $BC \parallel DE$

$$\angle CDE + \angle DCB = 180^\circ$$

$$80^\circ + \angle DCB = 180^\circ \Rightarrow \angle DCB = 180^\circ - 80^\circ$$

$$\Rightarrow \angle DCB = 100^\circ$$

$$BC \parallel DE \Rightarrow \angle DCB = \angle ABC$$

$$x = \angle BCD$$

$$x = 100^\circ$$

Ans = B

⑥ $AB \parallel CD$ and $CD \parallel EF$

So, $\angle CAB, \angle CEF, \angle ACD$.

$$\Rightarrow \angle ACD = \angle CEF - \angle CAB$$

$$\Rightarrow x = 126^\circ - 35^\circ$$

$$x = 91^\circ$$

Ans: D

⑦ If two angles are x and y .

$$x + y = 180 \text{ (for supplementary angle)}$$

$$x + 36^\circ = 180^\circ$$

$$x = 180^\circ - 36^\circ$$

$$x = 144^\circ$$

Ans: D

⑧ $l \parallel m$ and $p \parallel n$ $\angle 1 = 75^\circ$

here opposite angles are equal.

$$\therefore \angle 1 = 75^\circ = \angle 3 = \dots$$

Through option

$$A) \Rightarrow \angle 2 = 75^\circ + \frac{90^\circ}{3} \Rightarrow 75^\circ + 30^\circ \Rightarrow 105^\circ$$

$$B) \Rightarrow \angle 2 = 75^\circ + \frac{90^\circ \times 2}{3} \Rightarrow 75^\circ + 60^\circ = 130^\circ$$

$$C) \angle 2 = 75^\circ + \frac{90^\circ}{2} = 75^\circ + 45^\circ = 120^\circ$$

$$D) \angle 2 = 75^\circ + \frac{90^\circ}{6} = 75^\circ + 15^\circ = 90^\circ$$

Ans: A

So option A is true.

⑨ $LM \parallel QR$, $\frac{PL}{LQ} = \frac{3}{5}$, $PR = 5.6 \text{ cm}$,

$$\Rightarrow \frac{PL}{PQ} = \frac{PM}{PR} \quad \begin{array}{l} PQ = PL + LQ \\ PQ = 3 + 5 = 8 \end{array}$$

$$\Rightarrow \frac{PL}{PQ} \times PR = PM \Rightarrow \frac{3}{8} \times 5.6 = PM$$

$$\Rightarrow PM = 3 \times 0.7 = 2.1 \text{ cm} \quad \text{Ans: C}$$

⑩ parallel lines EF, GH, IJ,

$$\frac{EG}{GI} = \frac{FH}{HJ} \Rightarrow \frac{EG}{GI} \times HJ = FH$$

$$\Rightarrow HJ = FH \times \frac{GI}{EG} \Rightarrow HJ = 3 \times \frac{4^2}{2}$$

$$\Rightarrow HJ = 3 \times 2 = 6 \text{ cm} \quad \text{Ans: D}$$

ADVANCED LEVEL QUESTIONS

Multi correct answer type

⑪ A complete rotation is 360° , which is equivalent to four right angles, each right angle is 90°

Ans: B

12) Through the options:

A) $\angle B = 60^\circ$, $\angle Q = 100^\circ$, if these don't match the expected complementary or supplementary relationships straight forwardly.

B) $\angle B = 60^\circ$, $\angle Q = 90^\circ$, In this case, the angles are not directly complementary or supplementary to the given information.

C) $\angle B + \angle Q = 30^\circ$, this option is not typical because angle sums don't generally equal to such a small sum in standard geometric contexts.

D) $\angle B$ is the complement of 30° and $\angle Q$ is the supplement of 90° .

→ The complement of 30° is 60° $\angle B = 60^\circ$

→ The supplement of 90° is 90° , so $\angle Q = 90^\circ$

ANS: D

STATEMENT TYPE

- (13) Supplement is 180° according to the statement:

$$x = 2(180^\circ - x) - 30^\circ$$

$$x = 360^\circ - 2x - 30^\circ \Rightarrow 3x = 330^\circ \Rightarrow x = 110^\circ$$

So, the supplement is $180^\circ - 110^\circ = 70^\circ$

Thus, statement-I is true.

Statement II: This statement is false. Angles that sum up to 180° are known as supplementary angles, not complementary angles. It is false.

Ans: B

- (14) Statement I: $x + 20^\circ = 70^\circ \Rightarrow x = 70^\circ - 20^\circ \Rightarrow x = 50^\circ$

$$y + 30^\circ = 180^\circ \Rightarrow y = 180^\circ - 30^\circ \Rightarrow y = 150^\circ$$

$$z - 25 = 135^\circ \Rightarrow z = 135^\circ + 25^\circ \Rightarrow z = 160^\circ$$

Let calculate the sum: $x + y + z = 50^\circ + 150^\circ + 160^\circ$

It is a complete angle. $= 360^\circ$.

Statement-II: Four consecutive right angles (90°) form a complete angle 360° .

$$\Rightarrow 90^\circ + 90^\circ + 90^\circ + 90^\circ = 360^\circ$$

Ans: A

COMPREHENSION TYPE:

(15) $a = 137^\circ, b = 59^\circ, c = 37^\circ, d = 68^\circ$

$$(a-b)^\circ \Rightarrow (137^\circ - 59^\circ) = 78^\circ$$

Ans: B

less than 90° is a acute angle

(16) $(a+b)^\circ \Rightarrow 137^\circ + 59^\circ = 196$

The angle is more than 180° so, it is a reflex angle

Ans: C

INTEGER TYPE QUESTIONS:

(17) $\frac{AB}{AC} = \frac{AD}{AE}$ (Substitute the given values)

$$\frac{12}{16} = \frac{AD}{AE} \Rightarrow AE = AC - CE = 16 - 4 = 12$$

$$\frac{12}{16} = \frac{AD}{12} \Rightarrow 12 \times 12 = 16 \times AD \Rightarrow AD = \frac{12 \times 12}{16}$$

$$AD = 3 \times 3 = 9 \text{ cm.}$$

(18) A complete rotation of a ray OA about O makes an angle equal to 360° .

Since a right angle is 90° , we can convert 360° to right angles as follows: $\frac{360^\circ}{90^\circ} = 4$.

So, a complete rotation makes an angle equal to 4 Right angles.

Matrix matching type questions.

(A)

(a) $90^\circ - x^\circ$ is a complement angle of x° .

Ans: 8

(b)

180° is a straight angle. Ans: 9

(c)

360° is a complete angle. Ans: 10

(d)

$180^\circ - x^\circ$ is a supplement of x° angle:

Ans: 11

(20)

- (a) If a transversal t intersects two lines l and m on all transversals in distinct points A and B .

Ans: P

- (b) Two parallel lines makes equal intercepts equal intercepts on any other transversal as well.

Ans: Q

- (c) If three parallel lines make equal intercepts on one transversal in the same proportion

Ans: R

- (d) Three or more parallel lines intersecting any two transversals an intercept AB on t .

Ans: S

LEARNERS TASK

Conceptual understanding questions (CQ's)

- ① If the terminal ray and initial ray become opposite, then the angle is a straight angle, which measures 180° .

Ans: B

- ② The measure of an angle that is greater than 90° and less than 180° is an obtuse angle.

Ans: B

- ③ If the sum of the measure of the any two angles is 180° , then they are said to be supplementary angles.

Ans: B

- ④ If the sum of measure of any two angles is 90° then they are said to be complementary angles.

Ans: A

- ⑤ A reflex angle is an angle whose measure is greater than 180° but less than 360° .

Ans: C

- ⑥ The distance between two parallel lines are constant. It can not change at any point.

Ans: A

- ⑦ Alternate angles are a pair of angles that-

- * are on either side of the transversal
- * are either both interior angles or both exterior angles
- * are not adjacent angles.

Ans: D

- ⑧ → Supplementary angles add up to 180° , but corresponding angles are equal, not supplementary.
→ complementary angles add up to 90° , but corresponding angles are equal, not complementary.

→

Ans: A

- ⑨ When a transversal intersects two parallel lines, the alternate angles are equal. This is another fundamental property of parallel lines and transversals.

Alternate angles are angles that are on opposite sides of the transversal and inside the two parallel lines.

Ans: D

- ⑫ A transversal is a straight line that intersects two or more given lines at different points. This means that the transversal line cuts across the other lines at distinct points, forming angles and segments.

Ans: A

JEE MAINS LEVEL QUESTIONS

- ① Let the two complementary angles be $7x$ or $8x$.

$$7x + 8x = 90 \Rightarrow 15x = 90^\circ \Rightarrow x = \frac{90^\circ}{15} = 6^\circ$$

Now substitute x values.

$$7x = 7(6^\circ) = 42^\circ$$

$$8x = 8(6^\circ) = 48^\circ$$

Ans: C

- ② Let's write an equation based on this:

$$x + (x + 20^\circ) = 90^\circ \Rightarrow 2x + 20 = 90^\circ$$

$$2x = 90 - 20 \Rightarrow 2x = 70 \Rightarrow x = \frac{70}{2} = 35^\circ$$

Now, substitute x .

$$x + 20 = 35 + 20 = 55^\circ.$$

Ans: D

③ Let's write an equation based on this.

$$x^\circ + (2x - 21)^\circ = 180^\circ$$

$$3x - 21 = 180 \Rightarrow 3x = 180 + 21 \Rightarrow 3x = 201$$

$$x = \frac{201}{3} = 67^\circ$$

Ans: B

④ Let's write the ratios as $4x$ and $11x$.

$$\text{Total part: } 4x + 11x = 180^\circ$$

$$15x = 180^\circ$$

$$x = \frac{180}{15} = 12^\circ$$

Substitute x :

$$4x \Rightarrow 4(12) = 48^\circ$$

Ans: C

$$11x \Rightarrow 11(12) = 132^\circ$$

⑤ $x = \frac{y}{4} = \frac{z}{3} = 35^\circ$, we can find the values of y and z .

$$y = 4x = 4(35^\circ) = 140^\circ$$

$$z = 3x = 3(35^\circ) = 105^\circ$$

$$\therefore x + y + z = 35^\circ + 140^\circ + 105^\circ = 280^\circ$$

Ans: D

⑥ Since, the angles are complementary, their sum is 90° .

The larger angle is $x+10^\circ$.

$$\therefore x + (x+10) = 90^\circ \Rightarrow 2x + 10 = 90 \Rightarrow 2x = 90 - 10$$

$$2x = 80 \Rightarrow x = \frac{80}{2} = 40^\circ$$

Now, find the larger angle.

$$x+10 = 40+10 = 50^\circ$$

So, the two complementary angles are 40° and 50°

Ans: C

⑦ We can write an equation:

$$(3x+40) + (x-20) = 180^\circ$$

$$4x + 20 = 180^\circ \Rightarrow 4x = 180 - 20 \Rightarrow 4x = 160$$

$$x = \frac{160}{4} \Rightarrow 40^\circ$$

So, the value of x is 40° . Ans: C

⑧ $PF \parallel BE \parallel CD$ $\angle ABC = 100^\circ$, $\angle BCD = 110^\circ$
 $\angle APF$ should be less than 90° , so here.

$$x + 100 = 180 \text{ (supplementary angle)}$$

$$x = 180 - 100 \Rightarrow x = 80^\circ$$

$$\text{here } x = 110 - 80$$

$$= 30^\circ$$

Ans: A

⑨ $\angle EFB = 66^\circ$ $\angle BFO = 43^\circ$ $\angle OFG = 23^\circ$
 $\angle OFD = y^\circ$

From given information and figure.

$$\angle BFO = \angle OFD \Rightarrow y = 43^\circ$$

Ans: B

⑩ $PQ \parallel RS \parallel XY$, $y:z = 4:5$

Let ratio are $4x$ and $5x$.

measuring angle are $\angle Z + \angle Y$ should be straight angle that means 180°

$$\Rightarrow \angle Z + \angle Y = 180 \Rightarrow 5x + 4x = 180^\circ$$

$$\Rightarrow 9x = 180^\circ \Rightarrow x = \frac{180^\circ}{9} = 20^\circ$$

Substitute x value.

$$y = 4x \Rightarrow 4(20) = 80^\circ$$

Ans: B

ADVANCED LEVEL QUESTIONS

Multi correct answer type:

11

* $2 \times 90^\circ = 180^\circ$, which is the sum of angles in a linear pair.

* 180° is the direct answer, as the sum of angles in a linear pair is always 180° .

Ans: A and C.

Statement Type:

12 Statement-1: Since $l \parallel m$, corresponding angles are equal. $\angle 1 = \angle 7 = 110^\circ$, $\angle 6 = \angle 2$ alternate interior angles. $\angle 1 + \angle 6 = 180^\circ$ (Linear pair), $110^\circ + \angle 6 = 180^\circ$
 $\angle 6 = 180 - 110^\circ \Rightarrow \angle 6 = 70^\circ$. So this statement is true.
Statement-11:

$$\angle 1 = \angle 3 = \angle 5 = \angle 7 = 110^\circ$$

$$\angle 2 = \angle 4 = \angle 6 = \angle 8 = 70^\circ$$

This is consistent with the results from Statement-1. So, Statement-11 is also true.

Ans: A

Comprehension Type:

(13) $AQ = 6\text{cm}$, $QS = 9\text{cm}$, $SB = 12\text{cm}$.

$AQ : QS : SB = 2 : 3 : 4$, Since $CD = 30\text{cm}$.

$$\frac{CD}{DP+PR} = \frac{4}{2+3} \Rightarrow \frac{30}{DP+PR} = \frac{4}{5} \Rightarrow 30 \times 5 = 4(DP+PR)$$

$$DP+PR = \frac{150}{4}$$

$$DP+PR = 15\frac{2}{3}$$

Ans: B

Integer type:

- (14) The angle between two parallel lines is always 0° , as parallel lines never intersect and remain equidistant from each other.

Matrix matching type:

(15)

(a) $x^\circ \Rightarrow$ alternate exterior angle are equal

$$\angle DH = \angle BG \quad 80, x^\circ = 50^\circ \quad \text{Ans: } x$$

(b) $y^\circ \Rightarrow \angle RSP = \angle SRC$

$$y^\circ = t^\circ (\because t = 120)$$

$$y^\circ = 120^\circ (\because \text{Alternate angle})$$

(c) $\angle CRS = \angle FRQ$

$$t^\circ = 120^\circ \text{ opposite angles}$$

$$x = 50^\circ$$

$$x + t = 120 + 50 = 170^\circ$$

Ans: S

(d) $z - y \Rightarrow$ To find z already we know that straight angle is 180°

$$\therefore x + z = 180^\circ$$

$$50^\circ + z = 180^\circ \Rightarrow z = 180^\circ - 50^\circ$$

$$z = 130^\circ$$

Ans: t

$$z - y = 130^\circ - 120^\circ = 10^\circ$$