Practice set 2.1

Q. 1. In figure 2.5, line RP||line MS and line DK is their transversal. ∠DHP = 85°

Find the measures of following angles.

i. ∠RHD ii. ∠PHG Iii ∠HGS iv. ∠MGK



Fig. 2.5

Answer : Given: RP || line MS and line DK is their transversal.

(i) \angle DHP + \angle RHD = 180° (linear pair angle) means that linear pair is a pair of adjacent, supplementary angle. Adjacent means next to each other, and supplementary means that measures of the two angles add up to equal 180°.

 \angle DHP + \angle RHD = 180°

 $85^\circ + \angle RHD = 180^\circ (\angle DHP = 85^\circ given)$

∠ RHD = 180° -85°

 \angle RHD = 95°

(ii) \angle RHD \cong \angle PHG (vertically opposite angles formed are congruent)

So, \angle PHG = 95°

(iii) line RP || line MS (given)





 \angle DHP \cong \angle HGS (corresponding angles) if two parallel line are cut by a transversal, then the pairs of corresponding angle are congruent.

 \angle DHP = 85° (given)

So, ∠ HGS = 85°

(iv) \angle HGS $\cong \angle$ MKG (vertically opposite angles formed are congruent)

So, ∠ MKG = 85°

Q. 2. In figure 2.6, line p|| line q and line 1 and line m are transversals. Measures of some angles are shown. Hence find the measures of $\angle a$, $\angle b$, $\angle c \angle d$.



Fig. 2.6

Answer : Given line P || line Q and line L and M are transversal.

To find: $\angle a$, $\angle b$, $\angle c \angle d$.

Construction: extend G and E in answer diagram.

 \angle a + \angle e = 180° (linear pair angle) means that linear pair is a pair of adjacent, supplementary angle.

Adjacent means next to each other, and supplementary means that measures of the two angles add up to equal 180°.

∠ a + 110° = 180° (given) ∠ a = 180° -110° ∠ a = 70°







- $\angle a \cong \angle g$ (vertically opposite angles formed are congruent
- \angle a = 70° (prove above)
- $\angle \ 70^\circ \cong \angle \ g$

Line P || line Q and line L transversals (given)

 \angle g = \angle b (corresponding angles)

Line P || line Q and line M is transversal (given)

 \angle c \cong \angle f (corresponding angles) if two parallel line are cut by a transversal, then the pairs of corresponding angle are congruent.

So,
$$\angle f = 115^{\circ}$$
 (given)
Then, $\angle c = 115^{\circ}$
 $f = 180^{\circ}$ (linear pair angle)
 $\angle d + 115^{\circ} = 180^{\circ}$ (given)
 $\angle d = 180^{\circ} - 115^{\circ}$
 $\angle d = 65^{\circ}$

Q. 3. In figure 2.7 line /|| line m and line n|| line p. Find \angle a, \angle b, \angle c from the given measure of an angle.





Answer : Given line L || line M and line P is transversal.

To find: $\angle a$, $\angle b$, $\angle c$

Construction: extend E and D in answer diagram

 \angle e \cong \angle d (corresponding angle theorem) if two parallel line are cut by a transversal, then the pairs of corresponding angle are congruent.



- $\therefore \angle d = 45^{\circ}$ (given above diagram)
- \angle a + \angle d = 180° (linear pair angle)
- ∠ a + 45° = 180°
- ∠ a = 180° -45°
- ∠ a = 135°
- $\angle a \cong \angle b$ (vertically opposite angles formed are congruent)





∴∠b = 135°

Line N || line P and line M is transversal (given)

 $z \angle b \cong \angle c$ (corresponding angle theorem) if two parallel line are cut by a transversal, then the pairs of corresponding angle are congruent.

∴∠ c = 135°.

Q. 4. In figure 2.8, sides of \angle PQR and \angle XYZ are parallel to each other. prove that, \angle PQR $\cong \angle$ XYZ



Fig. 2.8

Answer : Given ∠ PQR AND ∠XYZ are parallel and also YZ and QR are parallel

TO find: \angle PQR $\cong \angle$ XYZ

Construction: extend sag XY such that Q-S-R.



PQ|| XY (given)

PQ || XS and QR is transversals (from construction)

 \angle PQR $\cong \angle$ XSR (corresponding angle theorem) if two parallel line are cut by a transversal, then the pairs of corresponding angle are congruent)(1)

YZ||SK and XS is transversals (given)

 \angle XYZ \cong \angle XSR (corresponding angle theorem) if two parallel line are cut by a transversal, then the pairs of corresponding angle are congruent.)(2)

Equation (1) and (2) right side is equal

So that, \angle PQR \cong \angle XYZ hence proved.

Q. 5. In figure 2.9, line AB || line CD and line PQ is transversal. Measure of one of the angles is given.

Hence find the measures of the following angles. i. \angle ART ii. \angle CTQ







Answer : Given AB ||line CD and line PQ sis transversal .and \angle PRB 105° and \angle BRT 105°

To find: \angle ART, \angle CTQ, \angle DTQ, \angle PRB

ightarrow ART + ightarrow BRT = 180° ° (linear pair angle) means that linear pair is a pair of adjacent, supplementary angle.

Adjacent means next to each other, and supplementary means that measures of the two angles add up to equal 180 °.)

∠ ART + 105° = 180 (∠ BRT = 105 ° given)





∠ ART = 180° -105°

 $\angle ART = 75^{\circ}$

 \angle ART \cong \angle PRQ (vertically opposite angles formed are congruent).

So, \angle PRB = 75° ($\because \angle$ ART 75°)

Line AB || line CD line PQ is transversal (given)

 \angle BRT $\cong \angle$ DTQ (corresponding angle theorem) if two parallel line are cut by a transversal, then the pairs of corresponding angle are congruent).

∠ DTQ = 105 (∠ BRT is 105°)

So that, \angle DTQ = 105°

 \angle ART \cong \angle CTQ (corresponding angle theorem) if two parallel line are cut by a transversal, then the pairs of corresponding angle are congruent).

So that, \angle CTQ = 75° (because \angle ART is 75°)

Practice set 2.2

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Q. 1. In figure 2.18, $y = 108^{\circ}$. and $x = 71^{\circ}$ Are the lines *m* and *n* parallel? Justify?



Answer : Given $x = 71^{\circ}$, $y = 108^{\circ}$.

To find: Are the lines m and n parallel or not?

$$X + y = 108^{\circ} + 71^{\circ}$$
 (already given)

= 179°

X + y ≠ 180°

They from a pair of interior angle which are not supplement.

 \therefore Line M is not parallel to Line N.

Q. 2. In figure 2.19, if $\angle a \cong \angle b$ then prove that line L || line M.



Answer:

∠a≅∠b

To find: line L || line M

Construction: extend C in figure.



 $\angle a \cong \angle b$ (given)

 \angle b \cong \angle c (vertically opposite angle)

 \angle a \cong \angle c (if whenever an element A is related to an element B and B is related to an element C then A is also related to c that is called transitivity)

But they form a pair of corresponding angle that are congruent.





 \therefore line L || line M (hence proved).

Q. 4. In figure 2.21, if ray BA || ray DE, $\angle c = 50^{\circ}$ and $\angle D = 100^{\circ}$. Find the measure of $\angle ABC$.



Fig. 2.21

(Hint: Draw a line passing through point C and parallel to line AB.).

Answer : Given: ray \angle BA $\parallel \angle$ DE and \angle c = 50°, \angle D = 100°.

To find: \angle ABC.

Construction: Extend AB such that A-B-F-G.

BA || DE (given)

AG || DE(construction) and DC is transversal.



 \angle D \cong \angle GFC ((corresponding angle theorem) if two parallel line are cut by a transversal, then the pairs of corresponding angle are congruent).

∠d = 100° (given)

So that \angle GFC = 100°

 \angle GFC + \angle BFC = 180(linear pair angle



- \angle GFC = 100 (proved above)
- \angle GFC + \angle BFC = 180°
- ∠ 100 + ∠ BFC = 180°
- ∴ ∠ BFC = 100-180°
- ∠ BFC = 80°
- $\ln\Delta\,BFC$
- \angle BFC + \angle c + \angle FBC = 180° (sum of angle of Δ)
- \angle 80° + 50° + \angle FBC = 180° (already given value above \angle BFC and \angle c)
- ∠ FBC = 180° -50°
- ∠ FBC = 130°
- \angle ABC + \angle FBC = 180°
- ∠ ABC + 50 ° = 180°
- ∠ ABC = 180-50°
- ∠ ABC = 130.

Q. 5. In figure 2.22, ray AE || ray BD, ray AF is the bisector of \angle EAB and ray BC is the bisector of \angle ABD. Prove that line AF || line BC.



Fig. 2.22

Answer : Given ray AE || ray BD. ray AF is bisector of \angle EAB and ray BC is the bisector of \angle Abd.

To find: line AF || line BC





 \angle EAB = 2x (ray AF bisector \angle EAB)

When a line, shape, or angle inti two exactly equal parts is called bisector.

 \angle ABD = 2y (ray BC bisector \angle ABD)

Ray AE || ray BD and Ab is transversal.

 \angle EAD \cong \angle ABD (alternate angle) two angle formed when a line crosses two other lines, that lie on opposite side of the transversal line and on opposite relative sides of the other lines. If the two lines crossed are parallel, the alternate angles are equal.)

2x = 2y

X = y

∠ FAB∠ ABC

But they form a pair of alternate angle that are congruent.

∴ line AF || line BC (hence proved)

Q. 6. A transversal EF of line AB and line CD intersects the lines at point P and Q respectively. Ray PR and ray QS are parallel and bisectors of \angle BPQ and \angle PQC respectively.

Prove that line AB|| line CD.



Fig. 2.23

Answer : ray PR || SQ and PQ is transversal (given)

To find: AB || CD

 \angle RPQ \cong \angle PQS (alternate angle) two angle formed when a line crosses two other lines, that lie on opposite side of the transversal line and on opposite relative sides of the other lines. If the two lines crossed are parallel, the alternate angles are equal.)

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 \angle BPQ = 2x (ray PR bisect \angle BPQ)

 \angle PQC = 2y (ray SQ bisect \angle PQC)

When a line, shape, or angle inti two exactly equal parts is called bisector.

X = y

2x = 2y (multiply 2 on both side)

 $\angle BPQ = \angle PQC$

But they form a pair of alternate angle that are congruent.

∴ AB || CD (hence proved)

Problem set 2

Q. 1 A. Select the correct alternative and fill in the blank in the following statements.

If a transversal intersects two parallel lines then the sum of interior angles on the same side of the transversal is

- **A. 0°**
- **B. 90°**
- **C. 180°**

D. 360°

Answer : When a transversal intersects two parallel lines, then sum of the interior angles, formed on the same side of the transversal is 180°.

Q. 1 B. Select the correct alternative and fill in the blank in the following statements.

The number of angles formed by a transversal of two lines is

A. 2

- B. 4
- **C.** 8
- D. 16





Answer : When two parallel lines cut by I third line, the third line is called the transversal .8 angles are formed when parallel lines M and N are cut by a transversal line T.



Q. 1 C. Select the correct alternative and fill in the blank in the following statements.

A transversal intersects two parallel lines. If the measure of one of the angles is 40° then the measure of its corresponding angle is

A. 40° B. 140° C. 50° D. 180°

Answer : A transversal intersects two parallel line so; corresponding angle is equal so that corresponding angle is also 40°

Q. 1 D. Select the correct alternative and fill in the blank in the following statements.

In ΔABC∠ A =760, ∠ B = 480, ∠ C = …

A. 66° B. 56° C. 124° D. 28°

Answer : $\angle A + \angle b + \angle C = 180^{\circ}$ (the sum of the measures of the interior angle of a triangle is 180°

 $\angle A + \angle B + \angle C = 180^{\circ}$





 $\angle 76 + \angle 48 + \angle C = 180^{\circ}$ $\angle 124 + \angle c = 180^{\circ}$ $\angle C = 180-124$ $\angle C = 56^{\circ}$

Q. 1 E. Select the correct alternative and fill in the blank in the following statements.

Two parallel lines are intersected by a transversal. If measure of one of the alternate interior angles is 75° then the measure of the other angle is

A. 105° B. 15° C. 75° D. 45°

Answer : If measure of one of the alternate interior angles is 75° then the measure of the other angle is 75° because two parallel are intersected by transversal.

Q. 2. Ray PQ and ray PR are perpendicular to each other. Points B and A are in the interior and exterior of \angle QPR respectively. Ray PB and ray PA are perpendicular to each other.

Draw a figure showing all these rays and write -

i. A pair of complementary angles

ii. A pair of supplementary angles.

iii. A pair of congruent angles.

iii. A pair of congruent angles.

Answer : The figure is attached below:





(i) \angle RPB + \angle BPQ = 90°

(ii) $\angle RPQ + \angle BPA = 180^{\circ}$

(iii) \angle RPQ = \angle BPA (congruent angle)

(iv) \angle RPB = \angle QPA (congruent angle)

Q. 3. Prove that, if a line is perpendicular to one of the two parallel lines, then it is perpendicular to the other line

Answer : The diagram is given below:



To find: transversal line will be perpendicular to other parallel line.

AB || CD and EF is transversal both.

So, \angle EOB = \angle O O1D = 90°

So that transversal line will perpendicular to other parallel line also. (hence proved)

Q. 4. In figure 2.24, measures of some angles are shown. Using the measures find the measures of $\angle x$ and $\angle y$ hence show that line I || line m.







Answer : Given: value of $\angle x$ and $\angle y$

To find: line I || line m

 \angle y = 180-50 ° (linear pair angle) means that linear pair is a pair of adjacent, supplementary angle. Adjacent means next to each other, and supplementary means that measures of the two angles add up to equal 180 °.)

∠ y = 130 °

Transversal line making same angle to both line.

So, that line L || line M.

Q. 5. Line AB || CD || Line EF and line QP is their transversal. If Y: z = 3:7 then find the measure of $\angle x$. (See figure 2.25.)



Fig. 2.25

Answer : Given line AB || CD || Line EF and line QP is their transversal.

To find: $\angle X$.

AB || CD || EF (linear pair angle) (linear pair angle) means that linear pair is a pair of adjacent, supplementary angle .Adjacent means next to each other ,and supplementary means that measures of the two angles add up to equal 180 °.

X = z (alternate interior angles)(1)

Alternate interior angles are a pair of angles on the inner side of each of those two lines but on opposite side of the transversal.

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Y: z = 3:7 (given)

Let the common ratio between y and z be a

 $X + y = 180^{\circ}$ (co -interior angles on the same side of the transversal)

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Z + y = 180^{\circ} \text{ (using equation 1)}
7a + 3a = 180^{\circ}
10a = 180^{\circ}
A = 18^{\circ}
\therefore x = 7a
X = 7 \times 18^{\circ}
X = 126^{\circ}
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Q. 6. In figure 2.26, if line Q || line R and p is their transversal and if $a = 80^{\circ}$ find the values of *f* and g.



Fig. 2.26

Answer : Given line Q || line R and p is their transversal. and $a = 80^{\circ}$

To find: vlues of F and G.

∠ a = 80°

 $\angle a = \angle c = 80^{\circ}$ (vertically opposite angle)

 \angle c + \angle f = 180° (angle made on the same side of parallel lines are supplementary means their sum is 180°)

 $\angle 80^{\circ} + \angle f = 180^{\circ}$

∠ f = 180 = 80





∠ f = 100 °

 $ightharpoonup f +
ightharpoonup g = 180^{\circ}$ ° (linear pair angle) means that linear pair is a pair of adjacent, supplementary angle. Adjacent means next to each other, and supplementary means that measures of the two angles add up to equal 180.)

∠ g = 180-100

∠ g = 80°

Q. 7. In figure 2.27, if line AB || line CF and line BC || line ED then prove that $\angle ABC = \angle FDE$



Answer : Given: Line AB || CF and line BC || ED

To find: $\angle ABC = \angle FDE$

Construction: G and h in diagram.

AB || CD and BC is transversal both

So, $\angle ABC = \angle PCG$ (linear pair angle)





BC || ED and PF is transversal line to both

So, \angle ECG = \angle CDH

 \angle CD = \angle FDE (Both angle is opposite)

 $\therefore \angle ABC = \angle FDE$ (hence proved)

Q. 8. In figure 2.28, line PS is a transversal of parallel line AB and line CD. If Ray QX, ray QY, ray RX, ray RY are angle bisectors, then prove that $\Box QXRY$ is a rectangle.



Answer : Given: PS is transversal of parallel line AB and line CD.

To find: QRY is rectangle.

$$\angle AQR + \angle CRQ = 180^{\circ}$$

$$\frac{\angle AQR}{2} + \frac{\angle CRQ}{2} = \frac{180^{\circ}}{2} \text{ (divide by 2)}$$

$$\angle XQR + \angle XRQ = 90^{\circ}$$

$$\frac{\angle AQR}{2} = \angle XQR \text{ and } \frac{\angle CRQ}{2} = \angle XRQ \text{ QX and RX are bisector)}$$

$$\ln \Delta XQR$$

$$\angle XQR + \angle XRQ + \angle QXR = 180^{\circ}$$

$$90^{\circ} + \angle QXR = 180^{\circ} (\angle XQR + \angle XRQ = 180^{\circ} \text{ proved above)}$$





 $\angle QXR = 180^{\circ} -90^{\circ}$ $\angle QXR = 90^{\circ}$ Similarly, $\angle QYR = 90^{\circ}$ $\angle AQR + \angle BQR = 180 \text{ (straight line)}$ $\frac{\angle AQR}{2} + \frac{\angle BR}{2} = \frac{180^{\circ}}{2} \text{ (divide by 2)}$ $\angle XQR + \angle YQR = 90^{\circ} \text{ (QX and QY are bisector } \angle)$ $\angle XQY = 90^{\circ}$

Similarly, \angle XRY = 90°

If any quadrilateral has all the angle 90° it is a rectangle, so that QXRY is rectangle.



