HELP ME CONSTRUCT

A REAL COMPANION TO P.7 MATHEMATICS WORK

(Mathematics is the highway to the island of success)





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Dedicated to all the Less Fortunate Street Kids across the Country. May GOD Bless You and give You a Future

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PREFACE

All those focussed learners who have been on their toes yearning to grasp and understand constructions in mathematics should now breathe a sigh of relief.

This celebrated book comes with a sole purpose of providing final solutions to all your problems in constructions. Besides, it contains comprehensive and brain storming questions especially those that find space in UNEB papers.

It is also designed to help teachers easily and effectively conduct lessons in mathematics constructions. The knowledge acquired in constructions is not only essential in helping learners pass examinations but also to develop the practical skills and techniques which are useful in developing their careers in future. It is a common problem that pupils put a lot of effort in acquainting themselves with theoretical knowledge and put less effort in this practical part of mathematics. This greatly affects their performance in mathematics.

With the sequence of work organised in this book, it is hoped that pupils will do a lot of practice and understand well the underlying principles of construction and angle properties.

It is also hoped that teachers will find this book very helpful when organising construction questions for their learners.

ACKNOWLEDGEMENT

I am immensely thankful to the ALMIGHTY GOD for providing the wisdom and energy during the preparation of this book.

I also acknowledge my gratitude to Mr. EPODOI BENJAMIN for his wise counsel and valuable contributions towards the production of this book.

In a special way, I also thank the HEAD TEACHERS, MATHEMATICS TEACHERS and PUPILS who have made this book part of learning materials in their schools.

May the Almighty God give you wisdom and unending blessings to culminate in a blossoming excellence upon emerging a victor.

To any person who could have wished to make any contribution towards the improvement of this book, fear not the truth as we build the future generation.

Technical advice on construction

- ✓ Always use firm/ tight pair of compasses. Loose ones result into error
- ✓ Always use short pencil on the pair of compasses for construction.
- ✓ Always grip / hold the pair of compasses correctly.
- ✓ Avoid drawing broken lines
- ✓ Avoid repeating lines and arcs as this results into very thick lines and untidy work
- ✓ Use very sharp pencils in construction
- ✓ Avoid unnecessary crossing and rubbing of work.

CONSTRUCTION

- ✓ Sketch should reflect the accurate diagram.
- ✓ Show all the properties of the required figure
- ✓ Sketch should be small to a reasonable size
- ✓ Always read the questions twice for clarity and follow instructions well ***(especially where you are required to measure, drop a perpendicular, bisect angle, calculate, construct, draw, measure ½ or ¾ of a line)***
- ✓ Accurate constructions should be neat and accurate
- ✓ All the given letters and values of lengths and angles must be transferred and indicated on the diagram.

MEASUREMENT

1. Measuring lengths

Most rulers measure lengths in *centimetres* (**cm**), while others in *millimetres* (**mm**). one must therefore be able to convert the value of length from one unit to another.

For convenience, all measurement of length must always start from the ***0cm*** mark on the ruler.

Unit: The standard unit for measuring length is ***metres (m)*** however, ***centimetres*** (**cm**) is always used in constructions. But just in case one is required to measure and record length in other units like ***metres*** then, correct conversion of units must be done.

It is also important to note that the **value being recorded should reflect the sensitivity of the instrument used.** (I.e. A ruler has ***10 small divisions*** between successive units, each of which represents ***0.1cm)*** therefore, the value of length obtained using a ruler must be recorded to **one decimal place** (***1dp***). Examples; 5.0cm, 4.5cm, 8.4cm, **NOT** 5cm, 4cm, etc.

2. Measuring angles

A protractor measures angles in ***degrees (^{0}) to zero decimal places*** as whole numbers e.g. ***30^0, 45^0, 75^0, 68^0, 12^0*, etc. NOT 30.0^0, 45.0^0, 75.0^0**, etc. this is because **each small division on a protractor represents 1^0**, *NOT 0.1^0*

The unit degrees (^{0}) should be written ***slightly above*** the ***measured value*** e.g. **53^0**, NOT 530, 53_0, 53 or 53_0

MATHEMATICS IS A UNIQUE SUBJECT.

Mathematics is a very *simple* but *unique subject*. It has its own *principles*, which when followed, this subject becomes interesting, enjoyable, and liked by both pupils and teachers and performed best among all the subjects.

This is why you will realise that pupils who like mathematics perform highly, while those who do not have interest and love for it find it hard to pass.

It is a common saying that *practice makes perfect*. This is true however, learners do not know how to make practice in mathematics. When revising mathematics, you don't revise like other subjects. You need to *keep on writing every number down*, even if the question appears to be very simple. In this way, you concentrate well, dodge sleep and recall everything you have revised. Moreover, even the simple questions help you to improve upon your speed, accuracy, neatness, and recall very well what you already know.

While doing this, revise few numbers at a time, but frequently (around 5 times a day but each time cover around 2 to 3 questions which are related, both simple and complicated) and try to visit all topics.

REMEMBER THE FOLLOWING

- ✓ *People who accomplish great things pay attention even to minute details.*
- ✓ *Knowledge is a pleasure but regular practice is the key to it.*
- ✓ *Opportunity knocks once at every man's door.*
- ✓ *Failure is expected by losers but ignored by winners*
- ✓ *All things are difficult before they are easy.*
- ✓ *Hard work breaks no bone. It pains but pays.*
- ✓ *Strong fire creates a difference between bricks and mud blocks, hard work creates a difference between successful people and failures.*
- ✓ *A positive attitude is a strong force.*
- ✓ *Do not let your parents down. They brought you up*
- ✓ *Give your all to CHRIST JESUS. He gave his all to you.*

PRIMARY SEVEN CONSTRUCTIONS BOOKLET

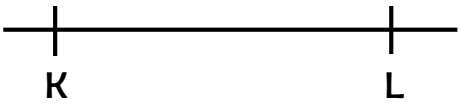
LINES, ANGLES AND GEOMETRIC FIGURES

[DRAWING AND MEASURING LINES]

1. Draw line AB =4cm

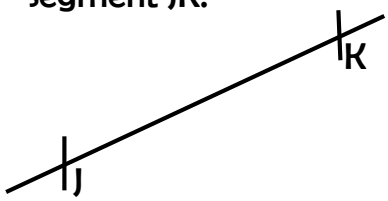
2. Draw line PQ= 5.5 cm

3. Measure the line segment KL.



4. In the space provided below, draw a line segment NM = 6.4 cm

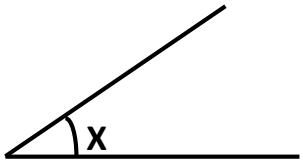
5. Use a ruler to measure line segment JK.



DRAWING AND MEASURING ANGLES

Using a sharp pencil, protractor and a ruler, draw an angle of 50°

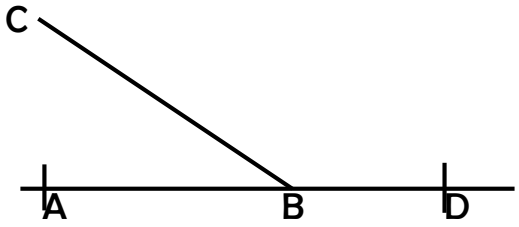
Use a protractor to measure the size of the angle, X below.



X=.....

Draw an angle of 45°using a ruler, sharp pencil and protractor only.

What is the size of angle ABC ?



Use a ruler, protractor and sharp pencil to draw the following angles.

a. 40°

b. 50^{o}

c. 60^{o}

d. 140^{o}

e. 75^{o}

f. 120^{o}

g. $22\frac{1}{2}^{o}$

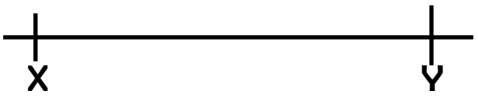
BISECTING LINES AND ANGLES

Bisecting means dividing in to two equal parts (halves)

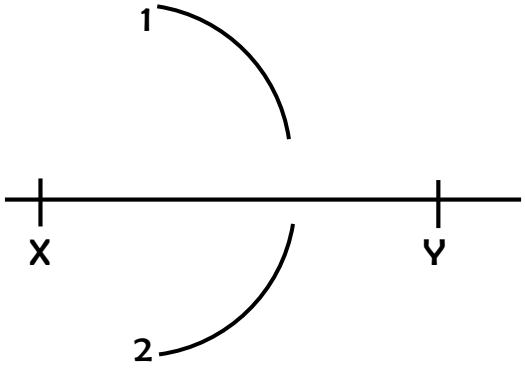
[a] Bisecting line segments

Examples

Use a pair of compasses to bisect line segment XY below.

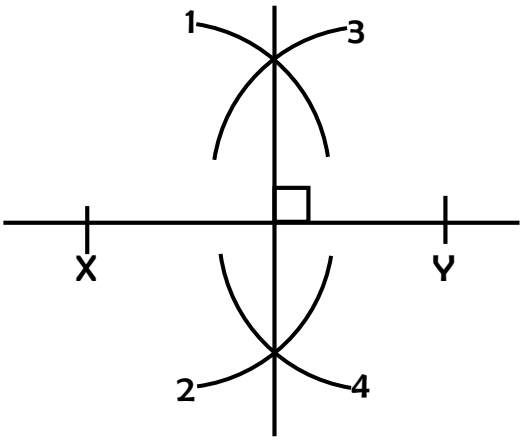


Step 1: Place the compass at point X and adjust it slightly longer than half of the line segment XY. Mark the arcs 1 and 2



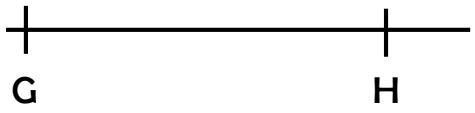
Step 2: Using the same radius of the compasses, place the compass at point Y and mark the arcs 3 and 4

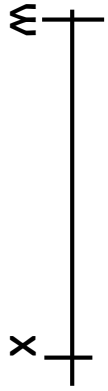
Step 3: Draw a straight line through the points of intersection of the arcs 1,3 and 2,4 respectively

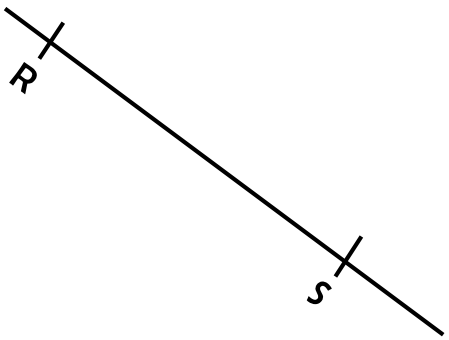


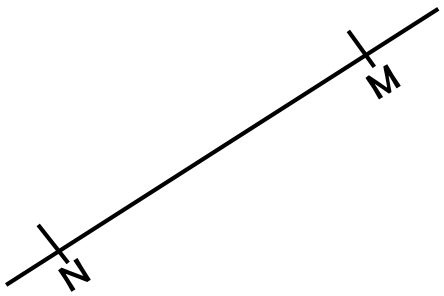
Activity

Using a pair of compasses, sharp pencil and ruler only, bisect the following line segments.







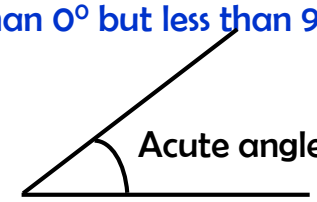


[b] Bisecting angles

Types of angles

Acute angles

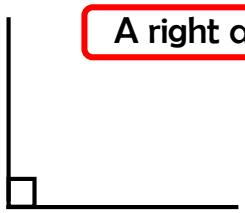
These are angles which are greater than 0° but less than 90°



Right angles

These are angles formed by two lines which are perpendicular to each other.

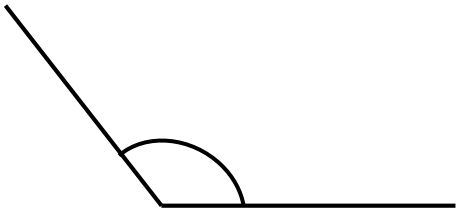
A right angle measures 90°



Obtuse angles

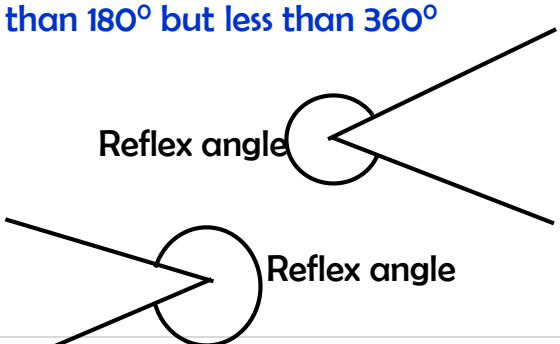
These are angles which are greater than 90° but less than 180°

Angles between 90° and 180°



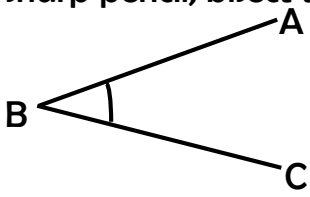
Reflex angles

These are angles which are greater than 180° but less than 360°

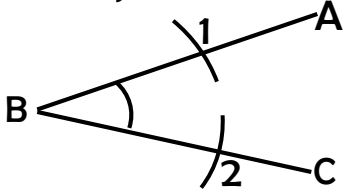


How to bisect angles

Using a pair of compasses and a sharp pencil, bisect the angle ABC

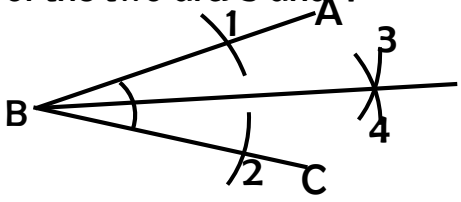


Step 1: Place the compass at point B and adjust it to mark arcs 1 and 2



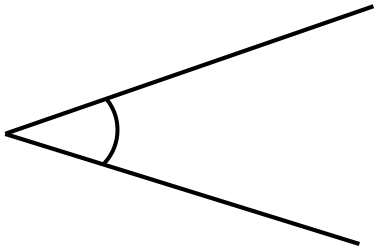
Step 2: Place the compass at point 1 and mark arc 3, transfer the compass at point 2 and mark arc 4

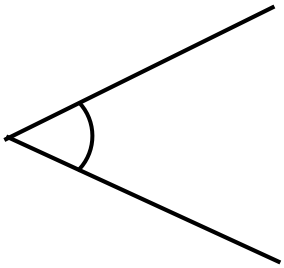
Step 3: Draw a straight line joining point B to the point of intersection of the two arcs 3 and 4



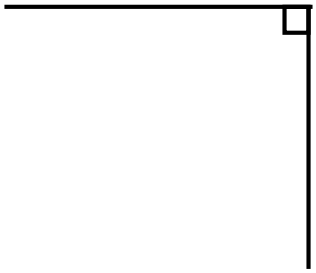
Exercise

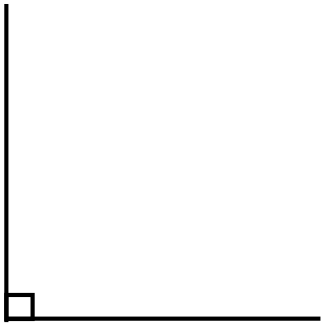
1. Bisect the following acute angles



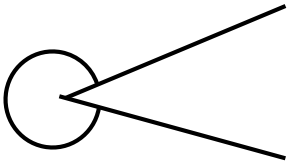


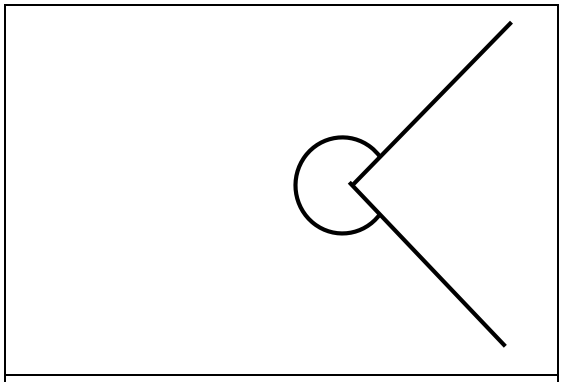
2. Bisect the following right angles



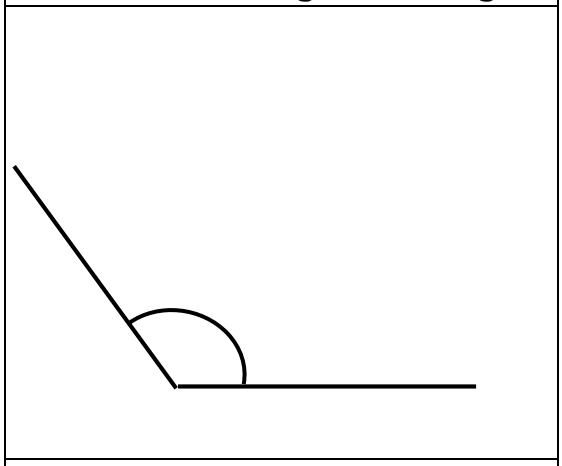


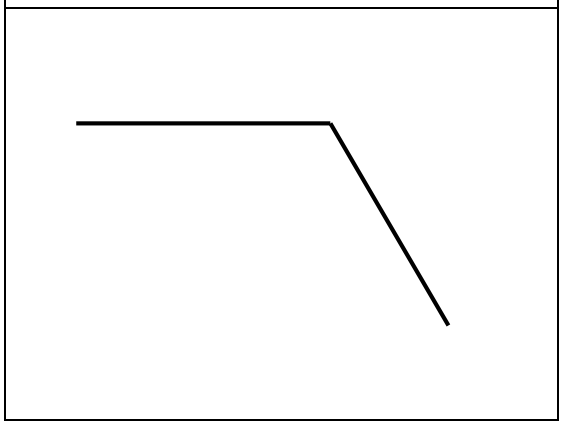
3. Bisect the following reflex angles





Bisect the following obtuse angles

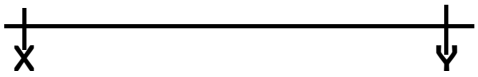




DROPPING PERPENDICULAR LINE

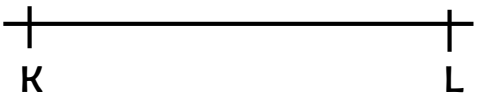
1. Drop a perpendicular from point R to meet line XY

R •

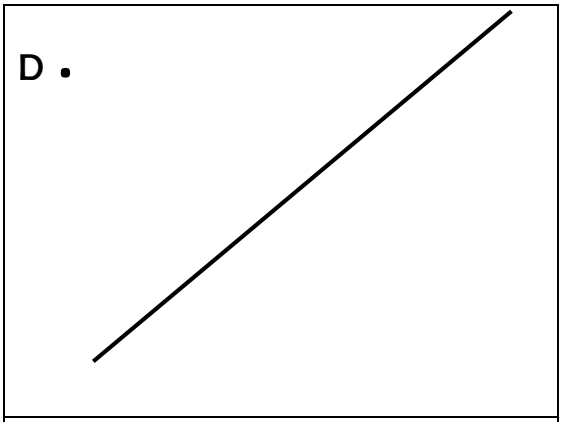


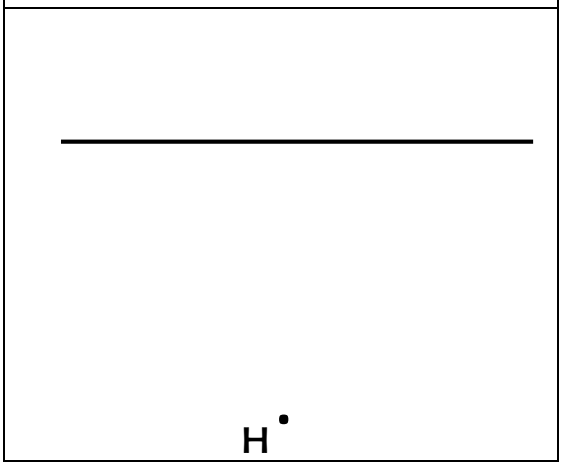
2. In the diagram below, drop a perpendicular line from point E to meet line KL at point O

• E



In the diagrams below, drop perpendicular lines from the given points.

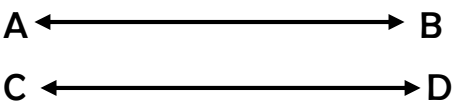




CONSTRUCTION

Construction of parallel lines

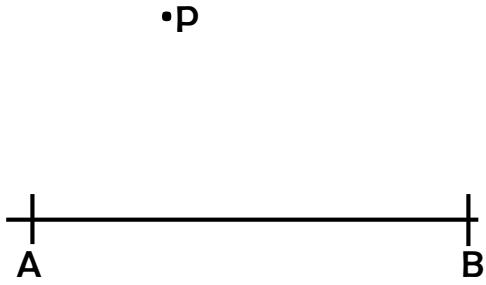
NB: Parallel lines are lines which do not meet at all.



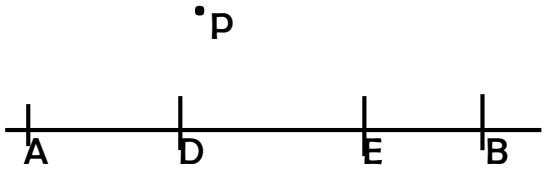
In the diagram above, line AB is parallel to line CD (AB // CD)

Examples

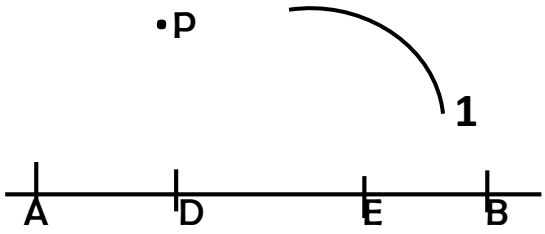
Using a pair of compasses, a ruler and sharp pencil, construct a line parallel to line AB through point P.



Step 1: mark any two points, say D and E on line AB

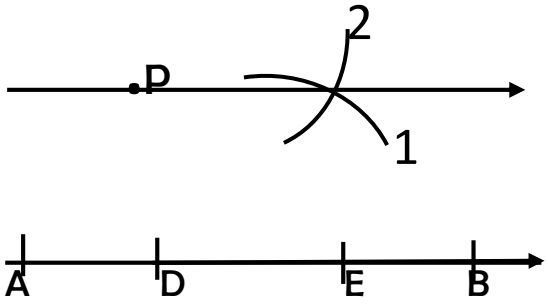


Step 2: With radius DP and centre E, draw an arc 1



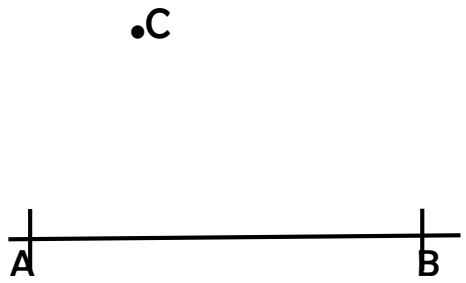
Step 3: With radius DE and centre P, construct the second arc 2

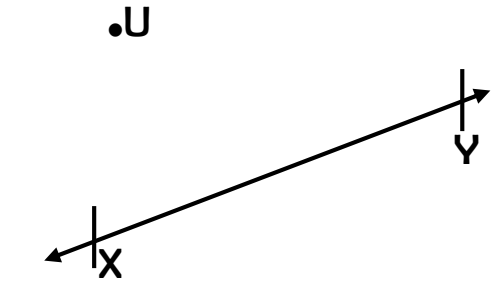
step 4: Join point P to the point of intersection of the two arcs.

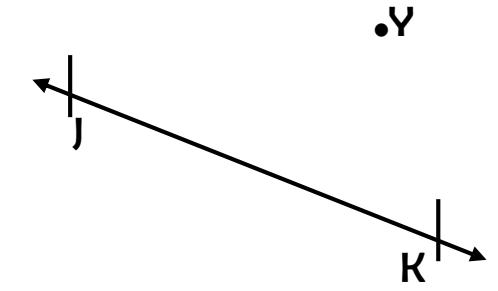


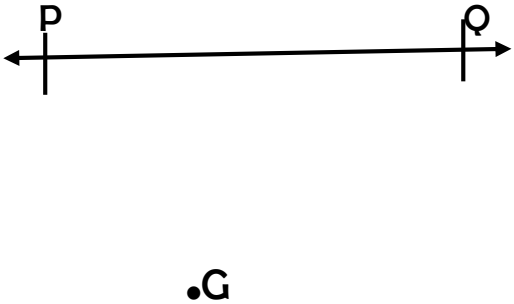
Activity

Construct parallel lines through the given points.









ANGLES FORMED ON PARALLEL LINES

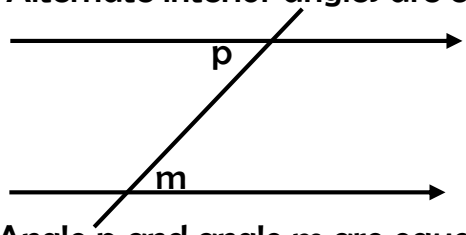
These are angles formed when two parallel lines are intersected by a transversal.

TYPES OF ANGLES FORMED ON PARALLEL LINES

1. Alternating angles

- Alternate interior angles

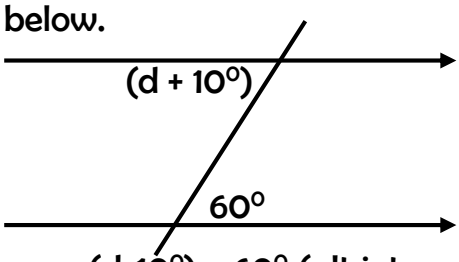
Alternate interior angles are equal



Angle p and angle m are equal

Calculations

Find the value of d in the diagram below.

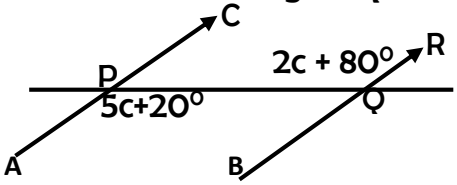


(d+10°) = 60° (alt int. angles)

d + 10° - 10° = 60° – 10°

d = 60°

Find the size of angle PQR



Value of c

5c + 20° = 2c + 80°

5c + 20° -20° = 2c +80°-20°

5c-2c = 2c-2c + 60°

3c = 60°

$\frac{3c}{3} = \frac{60^0}{3}$

c = 20°

Angle PQR = 2Xc + 80°

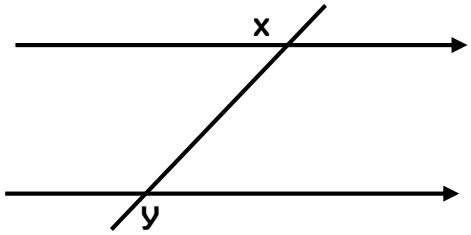
(2 x 20°) + 80°

40° + 80°

120°

Alternate exterior angles

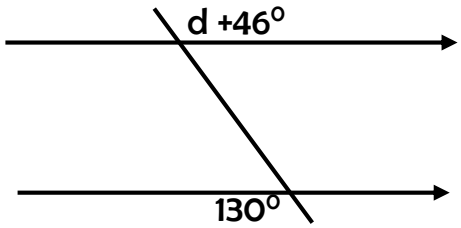
Alternate exterior angles are equal



From the diagram, angles x and y are equal.

Example

What is the value of d in the diagram below?



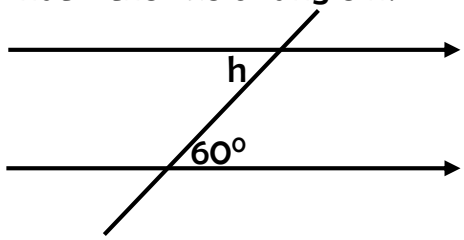
d + 46° = 130° (alt ext. angles)

d + 46° – 46° = 130° – 46°

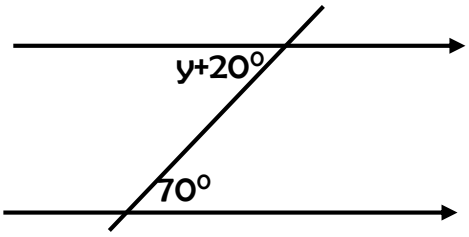
d = 84°

Activity

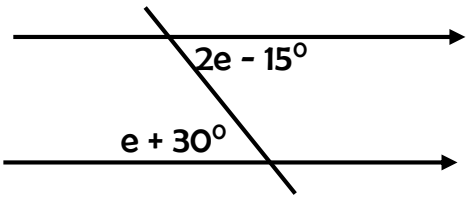
What is the size of angle h?



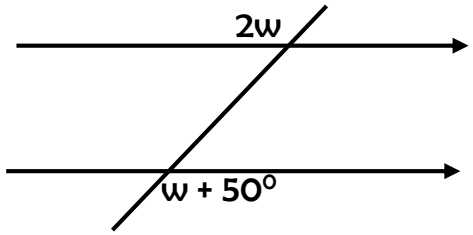
Find the value of y in degrees



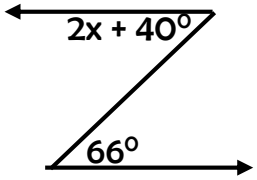
Calculate the value of e in the diagram below.



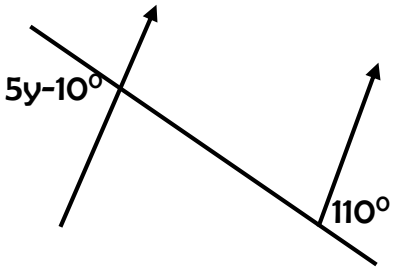
The diagram below shows angles on two parallel lines. Find the value of w in degrees.



What is the value of x in the figure?

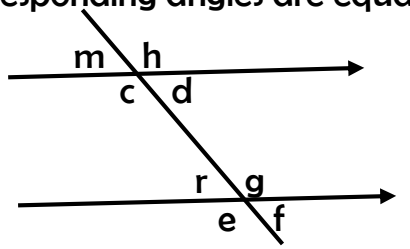


Find the value of y below.



2. Corresponding angles

Corresponding angles are equal



In the diagram above;

m = r (corresponding angles)

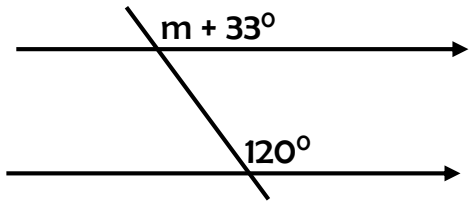
c = e (corresponding angles)

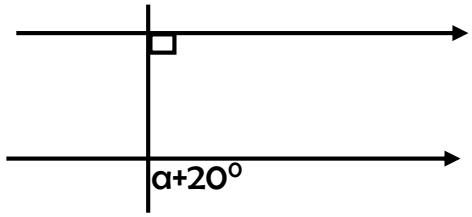
h = g (corresponding angles)

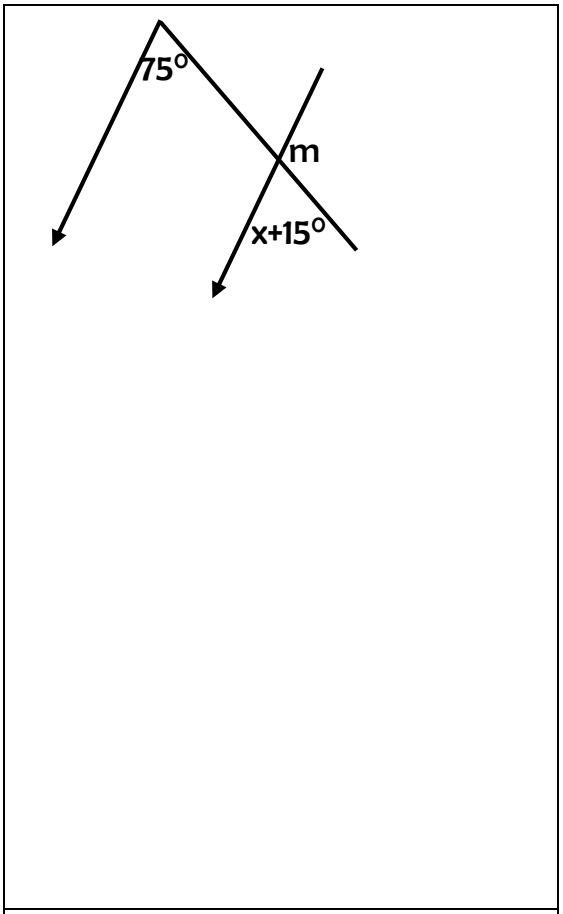
d = f (corresponding angles)

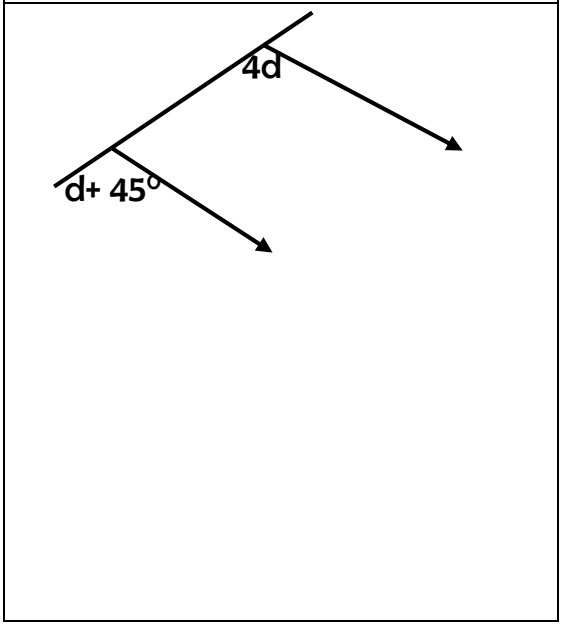
<u>Activity</u>

Find the value of the unknowns



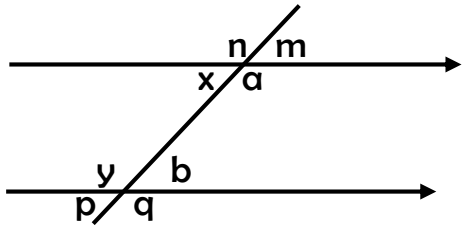






3. Co interior angles and co exterior angles

Co interior angles add up to 180° and so do co-exterior angles.



x+y = 180° (co int. angles)

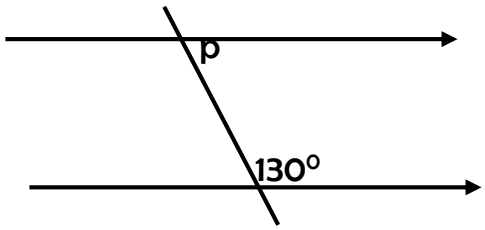
a+b = 180° (co int. angles)

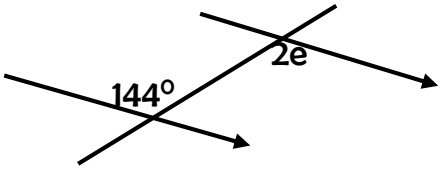
p+n = 180° (co – ext. angles)

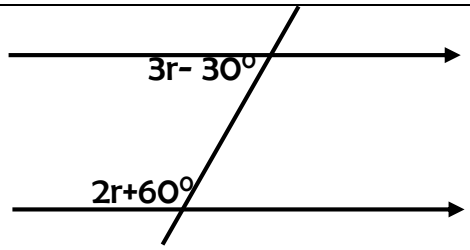
q+m = 180° (co – ext. angles)

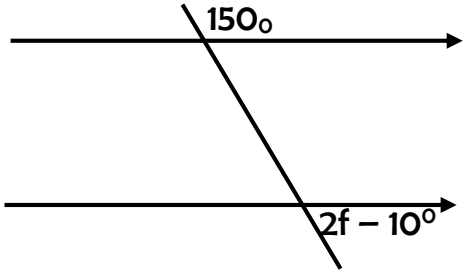
Exercise

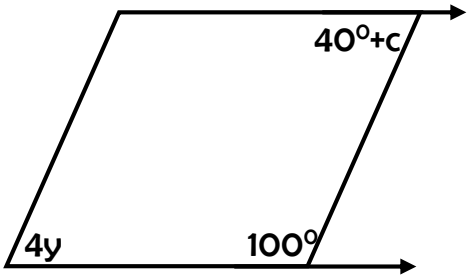
Workout the value of the unknowns

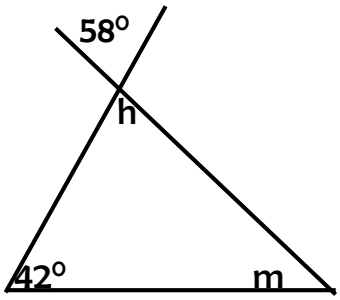




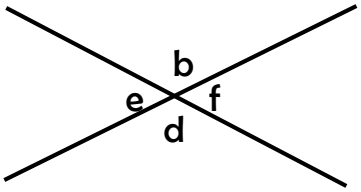








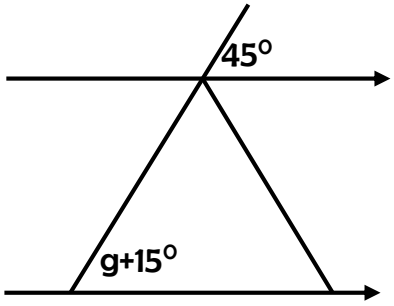
4. Vertically opposite angles.



Vertically opposite angles are equal therefore;

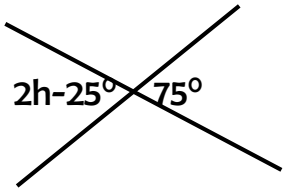
e = f (vertically opposite)

b =d (vertically opposite)



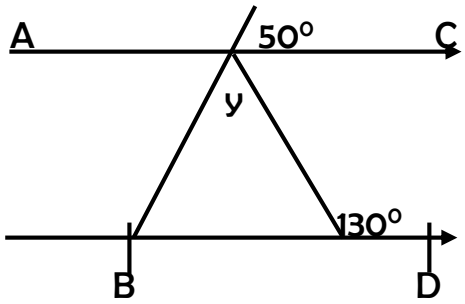
Exercise

Calculate the following

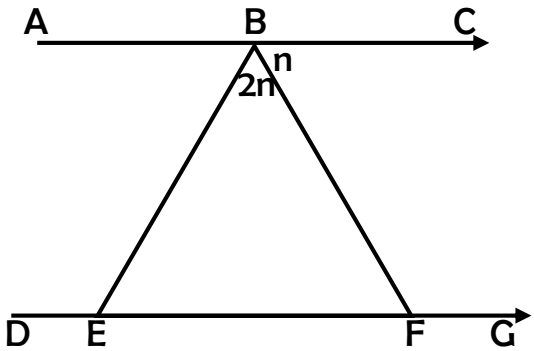


More about angles on parallel lines

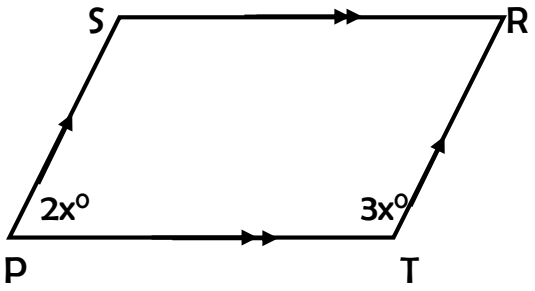
1. In the figure below, line AC is parallel to line BD. Find the size of angle marked y.



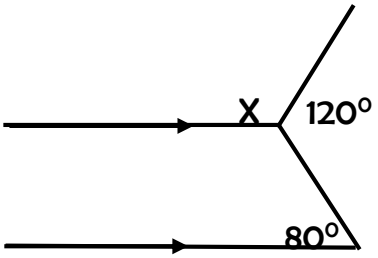
2.In the figure below, angle BED=120°. Find the value of n and size of angle BFG



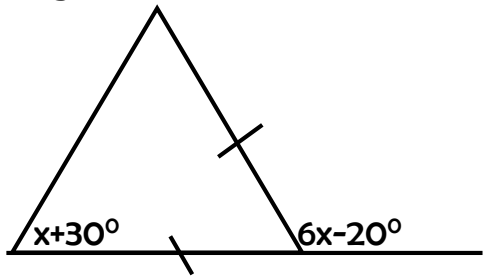
3. Calculate the size of angle RPS in the diagram below.



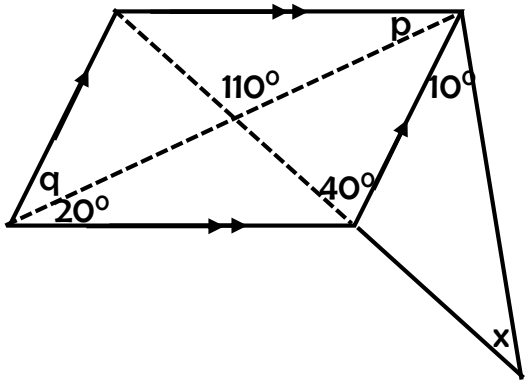
4.Workout the value of x in degrees



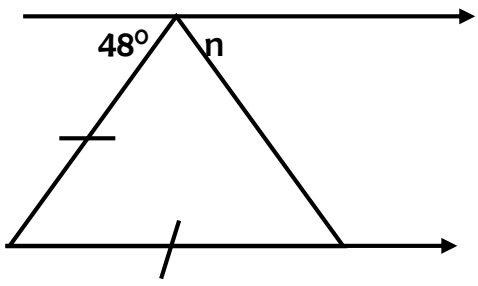
5. find the value of x in the isosceles triangle below



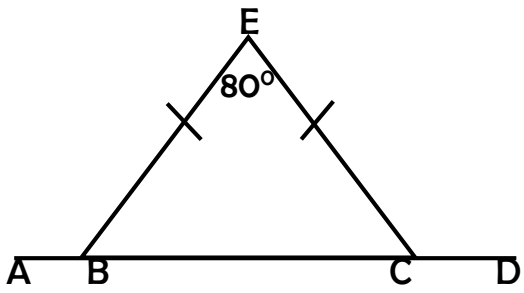
7.Find the values of p, q and x in the diagram below.



6. What is the size of angle marked n in the figure?



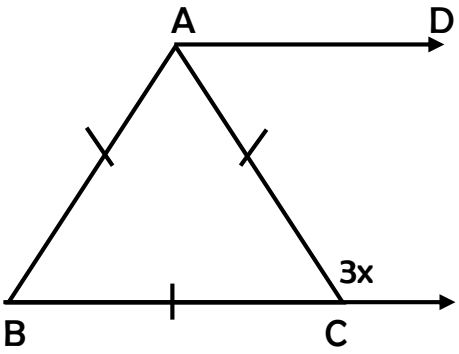
8. Below is an isosceles triangle BCE.



(a) Find the size of angle EBC

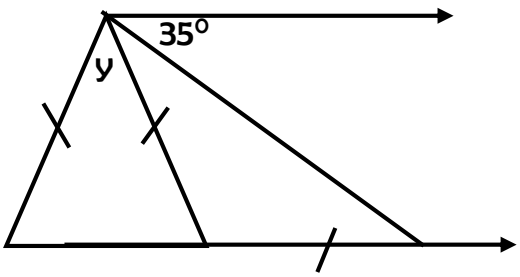
(b) What is the size of angle ECD?

9. In the figure below, ABC is an equilateral triangle and line AD is parallel to line BC.

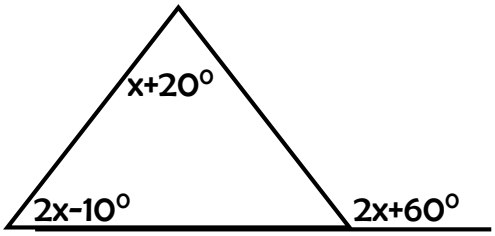


Find the value of x in degrees.

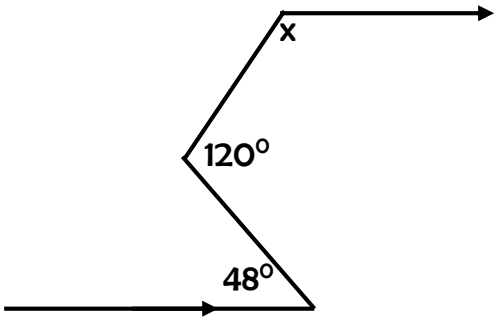
10.Calculate the measure of angle y



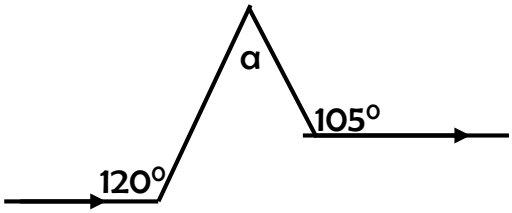
11. Use the diagram below to find the value of x.



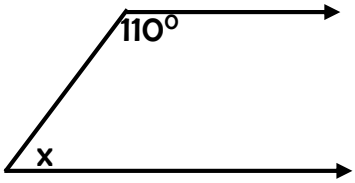
12. What is the size of angle x?



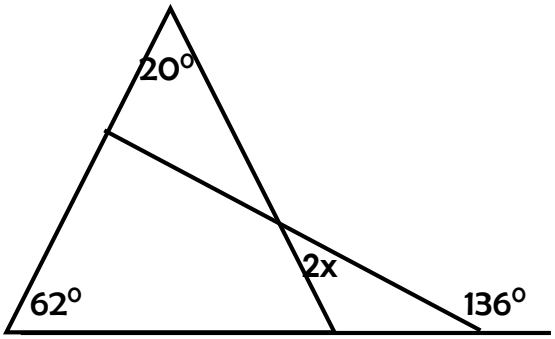
13. What is the size of angle a?



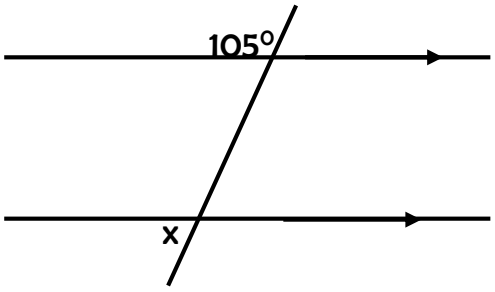
14. Find the size of angle marked m



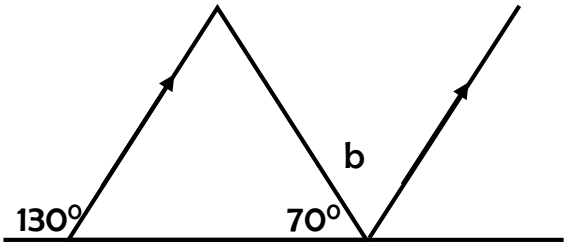
15. In the diagram below, calculate the value of x



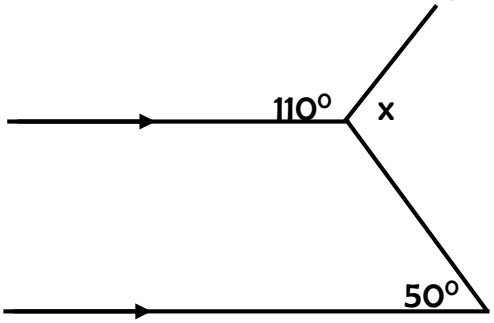
16. Determine the size of angle marked x below



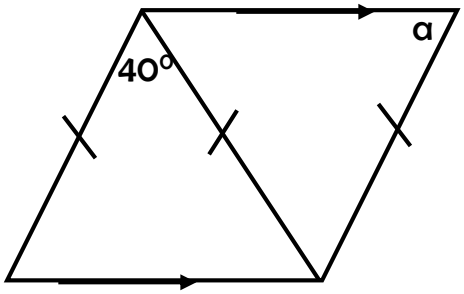
17. Find the value of b in degrees



18. Workout the size of angle j.

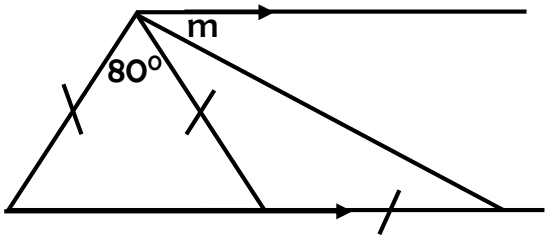


19. use the diagram below to find the value of a.

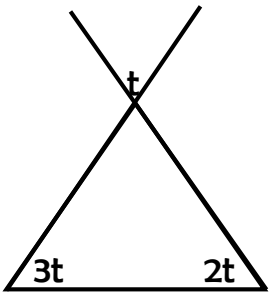


20. Diagram below shows two isosceles triangles joined together.

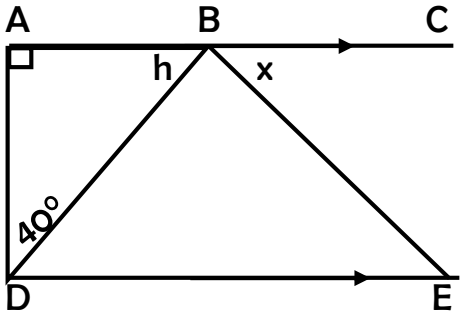
Find the size of angle marked m.



21. Find the size of the largest angle in the figure below.



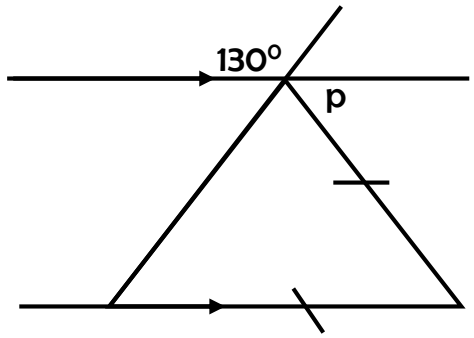
22. In the figure below, line AC is parallel to line DE and line EB=ED.



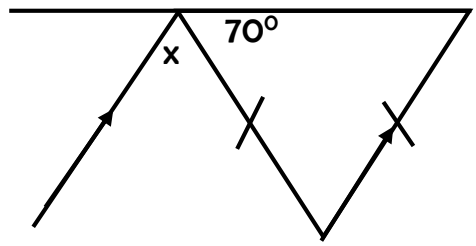
(i) What is the value of h in degrees?

(ii) Find the value of x.

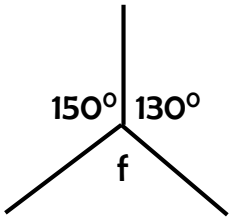
23. What is the size of angle p?



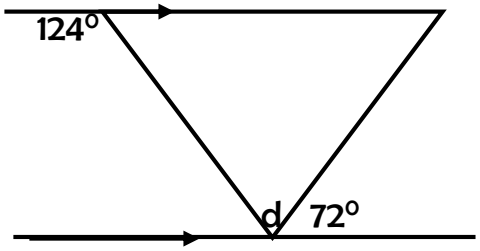
24. calculate the value of x in the figure below.



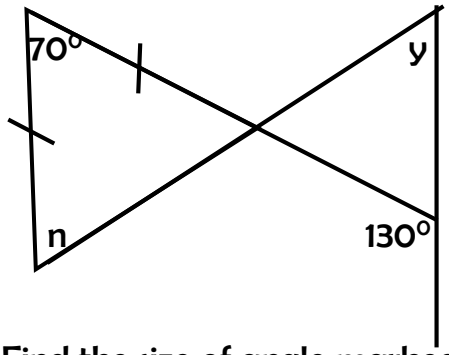
25.What is the size of angle f?



26. Study the diagram below carefully and use it to find the value of d in degrees.



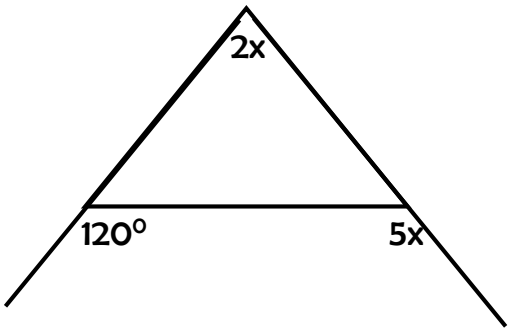
27. Study the diagram below carefully and use it to answer questions that follow.



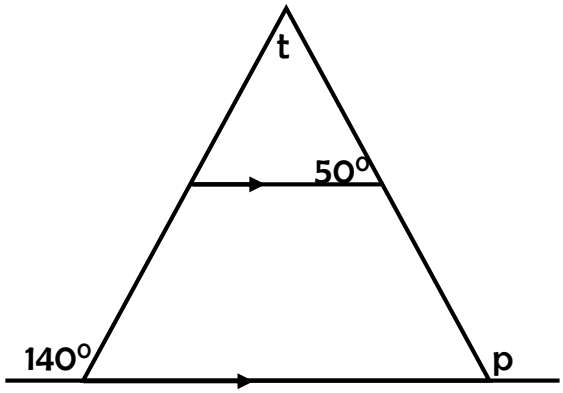
(a) Find the size of angle marked n.

(b) What is the value of y in degrees?

28. In the diagram, find the value of x in degrees.



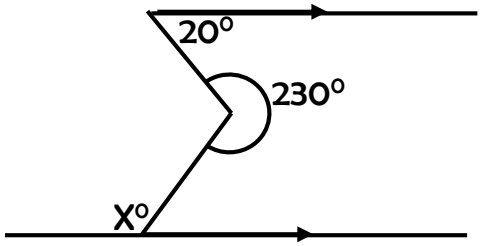
29. Study the diagram below well.



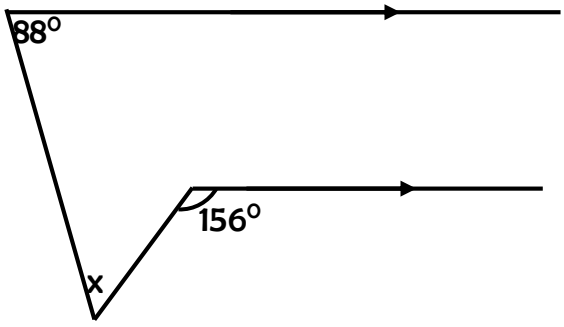
(i) Find the value of t.

(ii) What is the size of angle p?

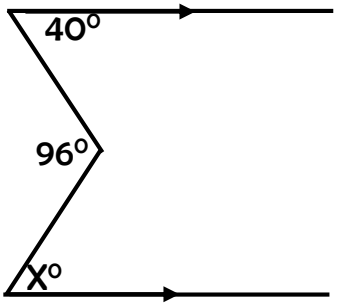
30. Use the diagram below to find the value of x.



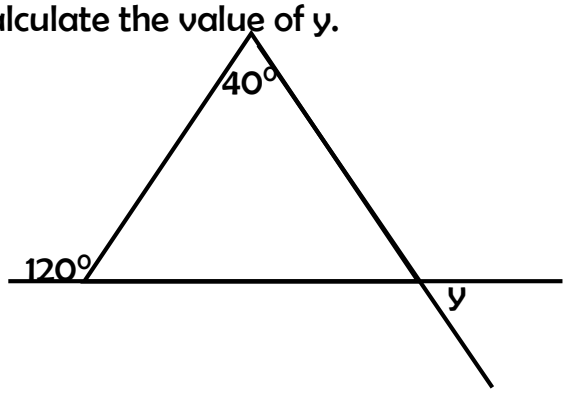
31. What is the size of angle x in the figure below?



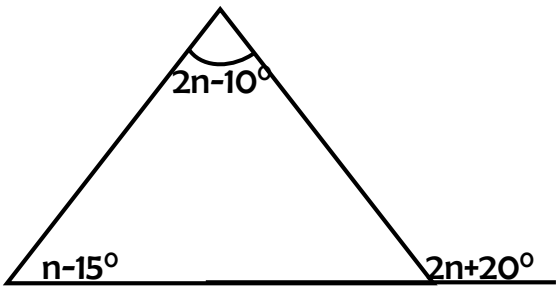
32. Workout the size of angle u below.



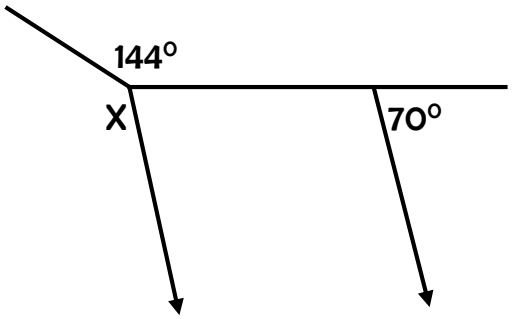
33. Use the figure below to calculate the value of y.



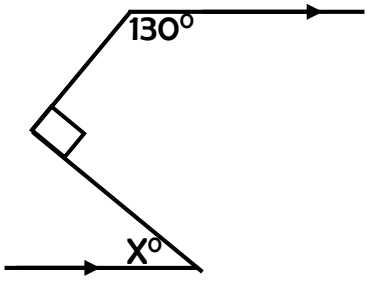
34. Workout the value of n in the given figure below.



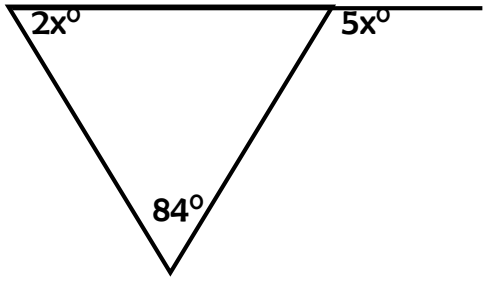
35. calculate the size of angle marked b.



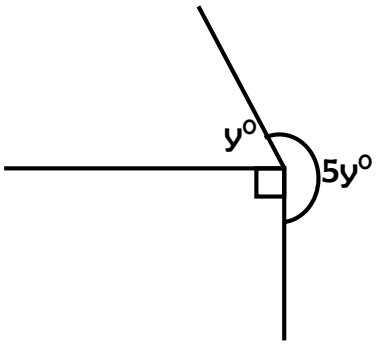
36. What is the size of angle marked X?



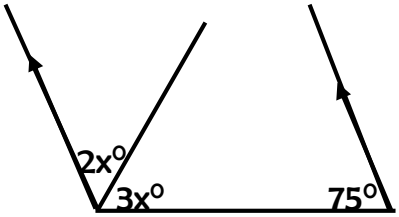
37. Use the diagram below to find the value of x.



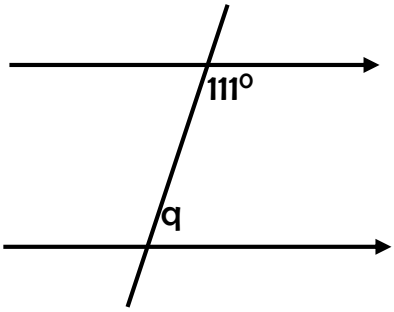
38. Calculate the value of y in the figure below.



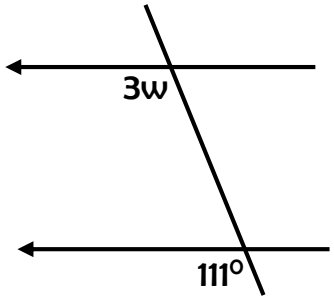
39. In the diagram below, workout the value of x



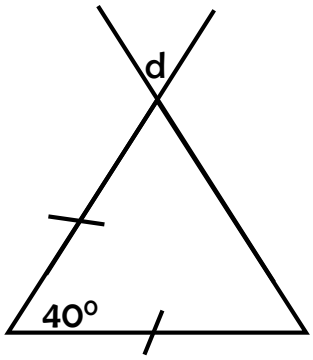
40. What is the size of angle q?



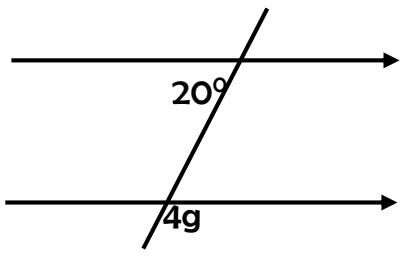
41. Find the value of w in degrees.



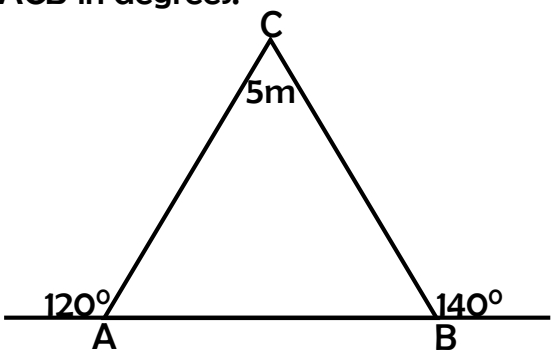
42. Use the diagram below to calculate the size of angle d.



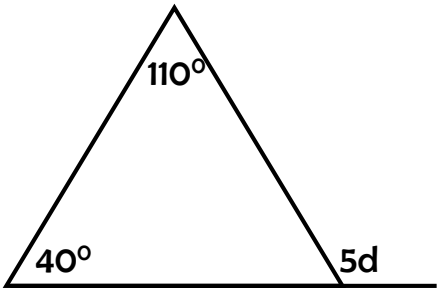
43. Find the value of g in the figure.



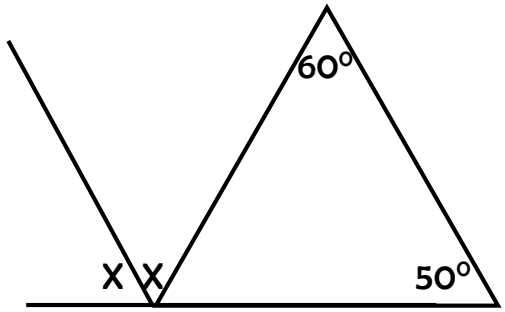
44. The diagram below is of a triangle ABC. Find the size of angle ACB in degrees.



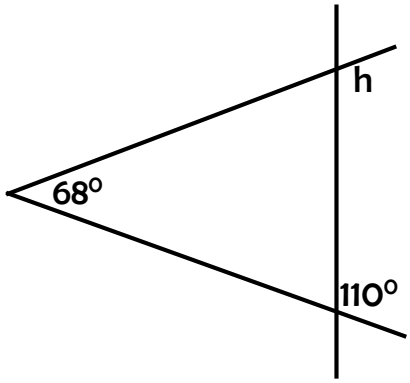
45. Workout the value of d in the diagram below in degrees.



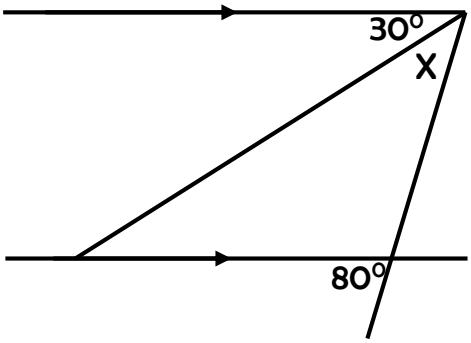
46. In the figure below, workout the value of X.



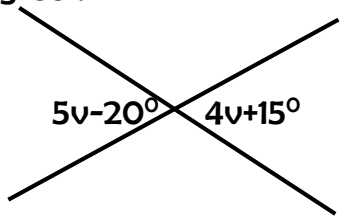
47. Find the size of angle marked h.



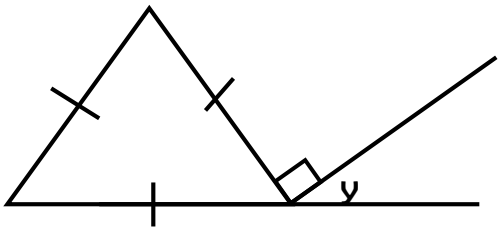
48. What is the size of angle marked X in the figure below?



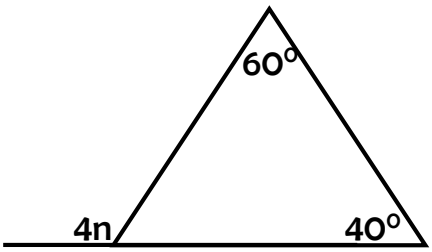
49. Calculate the value of v in degrees.



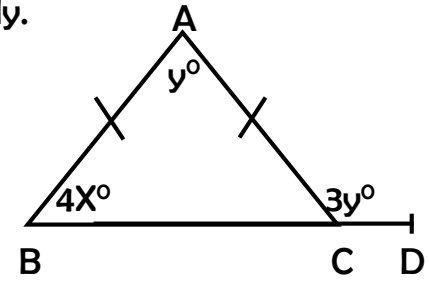
50. Use the diagram below to find the size of angle y.



51. Calculate the value of n.



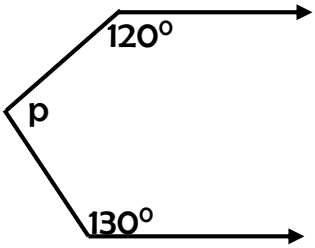
52. Study the diagram below carefully.



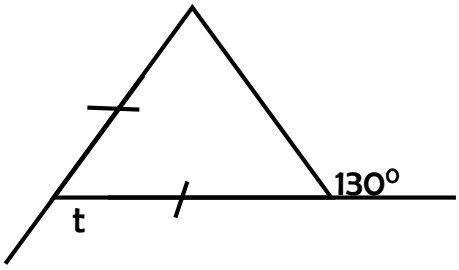
(a) Find the value of X and y.

(b) What is the size of angle ACD?

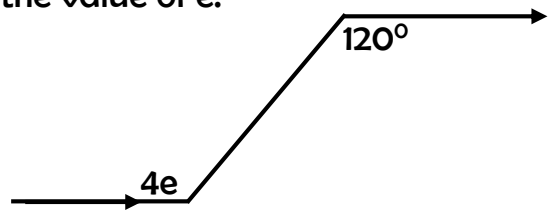
53. Find the value of p in degrees.



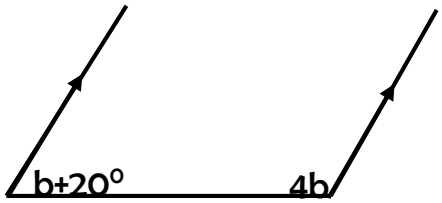
54. Calculate the value of angle t.



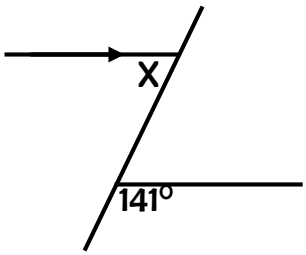
55. Use the diagram below to find the value of e.



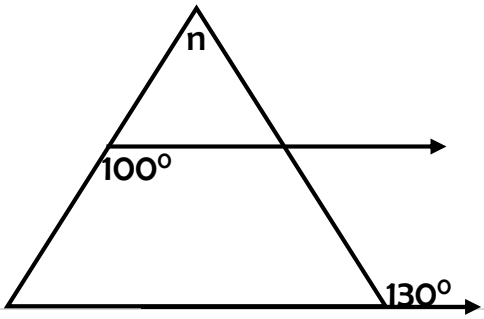
56. What is the value of b below?



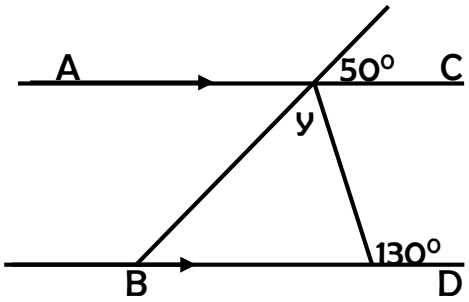
57. Workout the size of angle X.



58.Find the size of angle marked m.

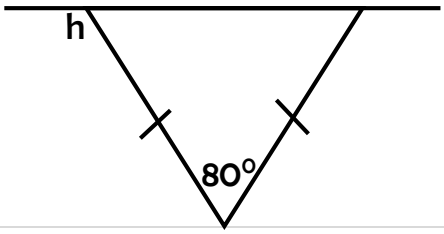


59. in the diagram below, line AC is parallel to line BD.

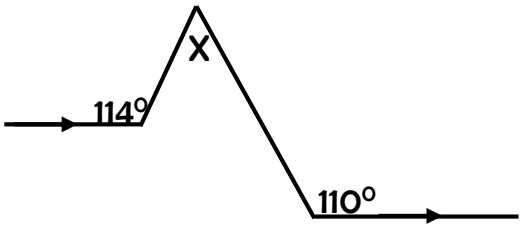


Find the size of angle marked y

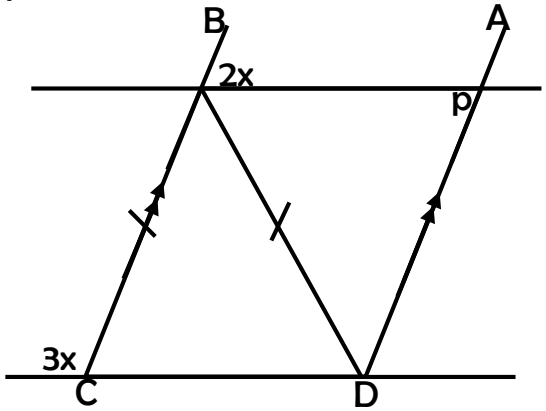
60. Find the size of angle h.



61. What is the size of angle X?

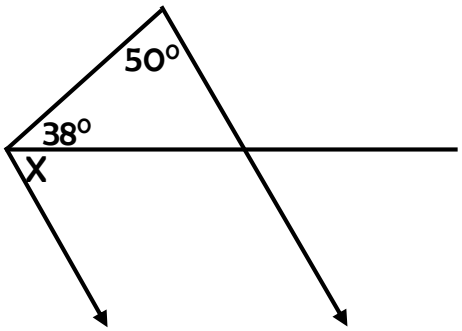


62. In the figure below, line BC is parallel to line AD.



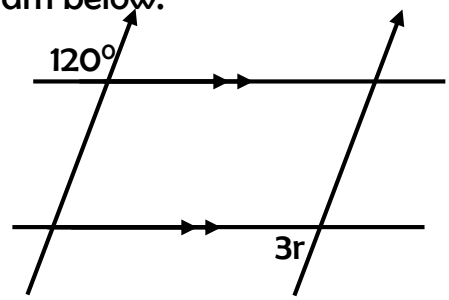
(a) Find the value of X in degrees.

64. What is the value of X in the diagram below.

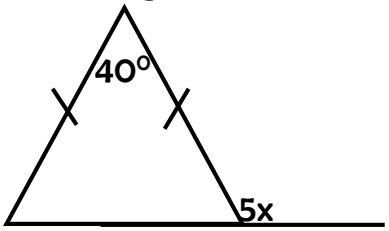


(b) Calculate the size of angle p on the diagram above.

63. Workout the value of r in the diagram below.



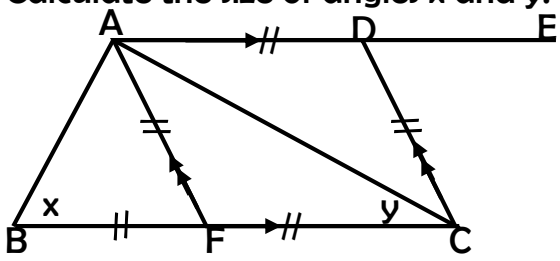
65. The diagram below shows an isosceles triangle.



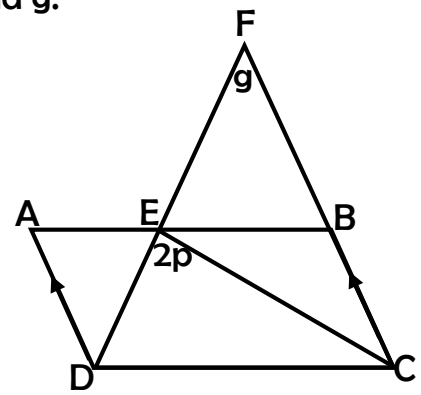
Find the value of X.

66. In the diagram below, line AF is parallel to line DC and line BC is parallel to line AE. Angle CDE = 40°

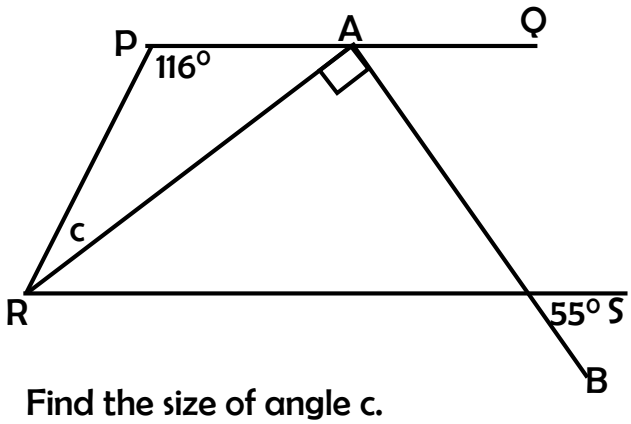
Calculate the size of angles x and y.



67. In the figure below, line AB is parallel to line DC. Angle DAB=70°, ADF=50° and BCE=20°. Study it carefully and find the values of p and g.

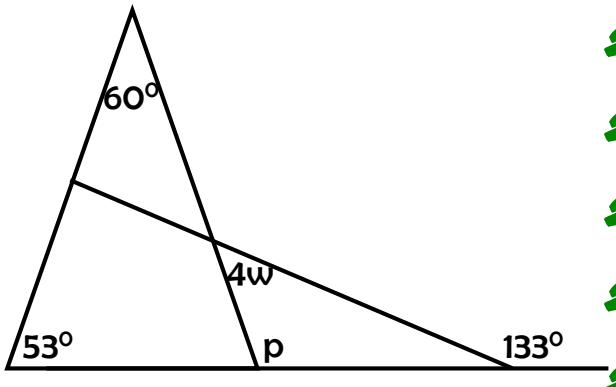


68. In the figure below, PQ is parallel to RS and AB is perpendicular to AR. Study the figure and answer the questions that follow.



Find the size of angle c.

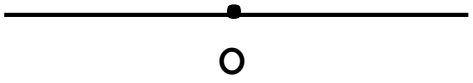
69. Study the figure below and use it to answer the questions that follow.



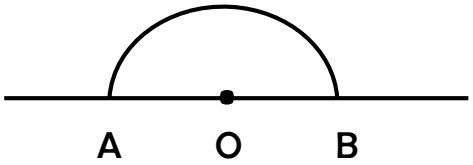
CONSTRUCTION OF ANGLES

Constructing angle 90^0

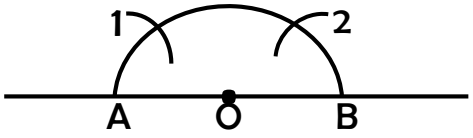
Step 1: Use a sharp pencil and a ruler to draw a straight line and mark point O at the centre.



Step 2: Put the pin of the pair of compasses at point O and construct a semi-circular arc AB

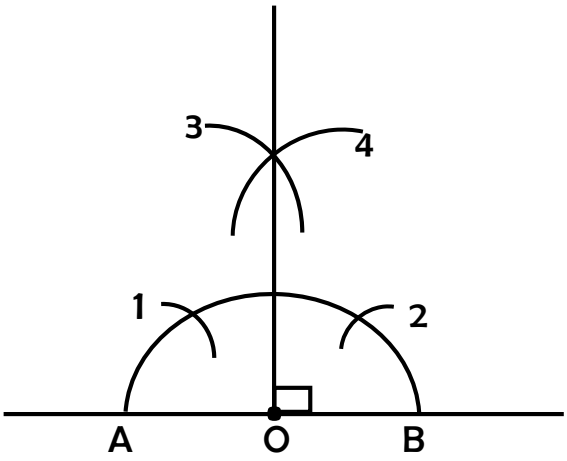


Step 3: Put the pin at point A to mark the arc 1 and at point B to mark the arc 2.



Step 4: Put the pin at points 1 and 2 and mark the arcs 3 and 4 respectively.

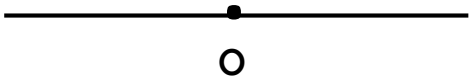
Step 5: Draw a straight line through the point of intersection of arcs 3 and 4 to meet point O.



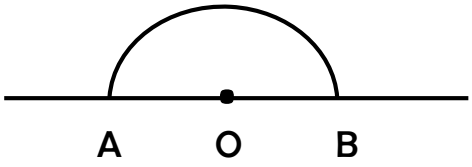
Activity
Construct angle 90^0 in the spaces below

CONSTRUCTING ANGLES 60° AND 120°

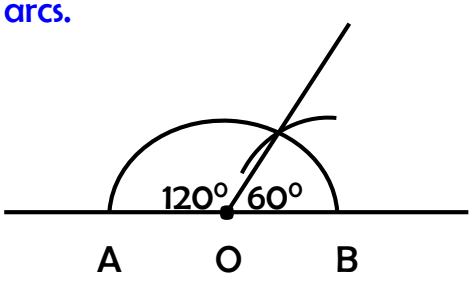
Step 1: Use a sharp pencil and a ruler to draw a straight line and mark point O at the centre.



Step 2: Put the pin of the pair of compasses at point O and construct a semi-circular arc AB



Step 3: Put the pin at point B to mark the arc 1 and draw a straight line from point O passing through the point of intersection of the two arcs.



Activity

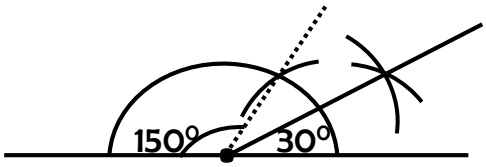
Using a pair of compasses, ruler and sharp pencil, construct the following angles
60°

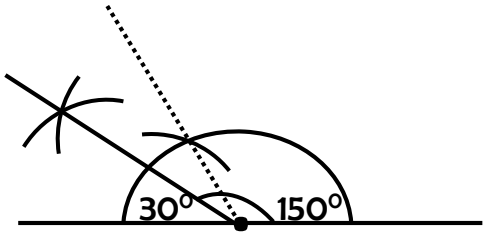
120°
60°
120°

Angles formed by bisecting other angles.

Angles 30° and 150°

These angles are formed by bisecting angle 60°





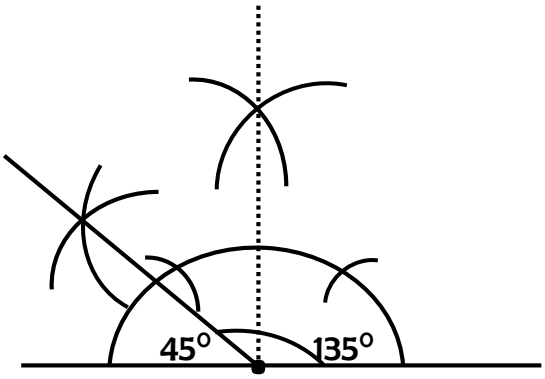
Activity

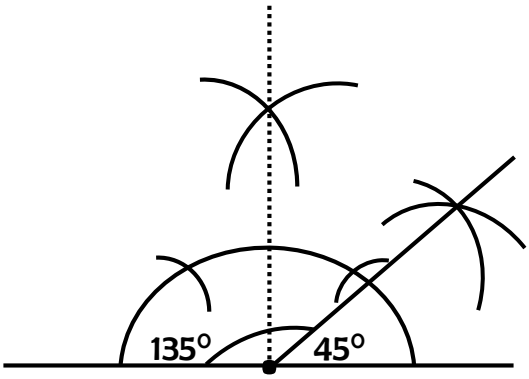
In the spaces provided below, construct the given angles.
30°
150°

30°
150°
30°
150°

Angles 45° and 135°

These angles are formed by bisecting 90°





Activity

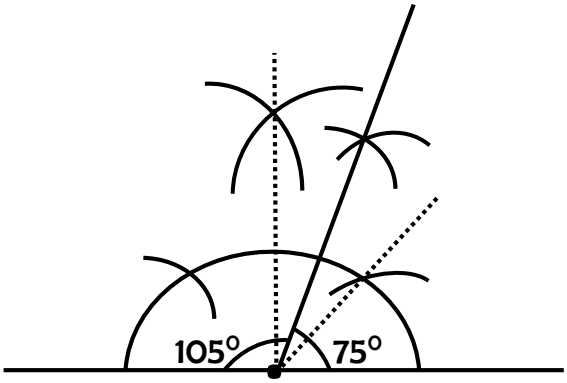
Construct the given angles in the spaces provided below.
45°

135°
45°
135°

45°

Angles 75° and 105°

These angle are constructed by bisecting the angle formed between 60° and 90°



Activity

Construct the following angles

75°

105°

75°

105°

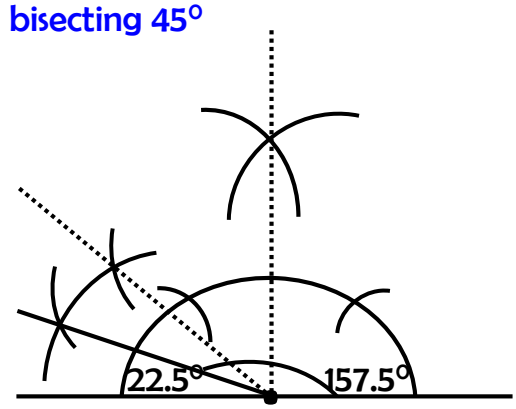
75°

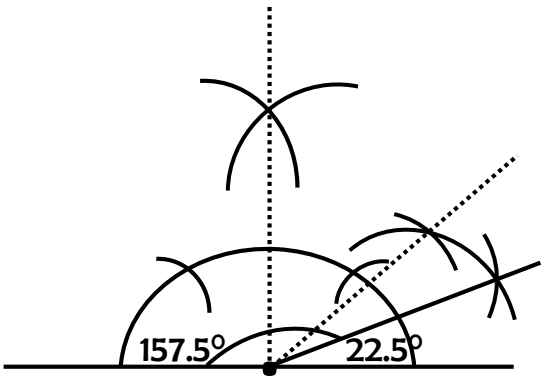
105°

Angles $22\frac{1}{2}°$ and $157\frac{1}{2}°$

Or (22.5° and 157.5°)

These angles are formed by bisecting 45°





Activity

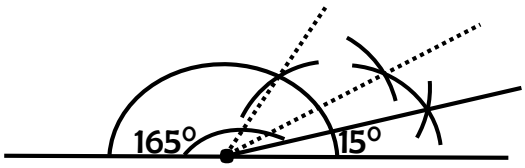
Construct the given angles

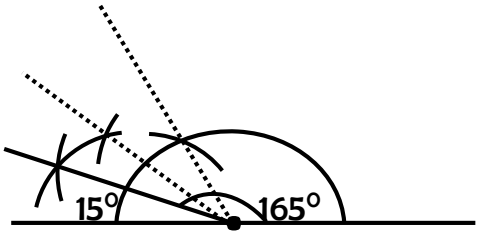
22.5°

157.5^{o}	22.5^{o}
22.5^{o}	157.5^{o}
157.5^{o}	22.5^{o}

Angles 15° and 165°

These angles are formed by bisecting 30°





Activity

Construct the given angles
15°
165°

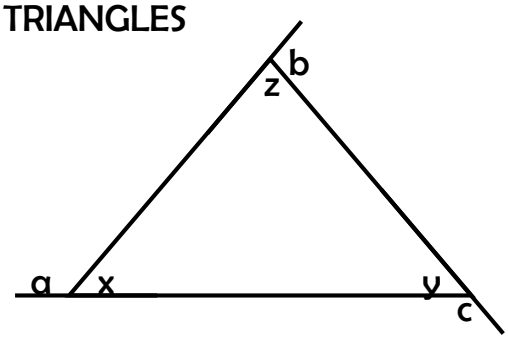
15°
165°
165°

Constructing different plane shapes

The knowledge got from construction of the angles above can be applied to construct different figures

Examples

TRIANGLES



Triangle are three sided polygons.

The interior angle sum of a triangle is 180^{o}

$x + y + z = 180^{o}$

Exterior angle sum is 360^{o}

$a + b + c = 360^{o}$

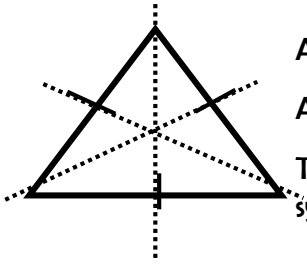
Two interior angles add up to one opposite exterior angle

- $x + z = c$
- $y + z = a$
- $x + y = b$

NB: These properties should be properly understood

TYPES OF TRIANGLES

❖ Equilateral triangles

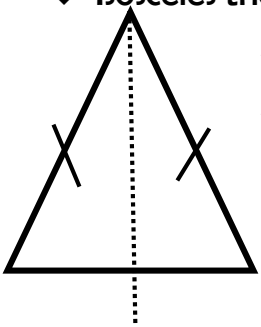


All sides are equal

All angles are equal

Three lines of folding symmetry

❖ Isosceles triangles

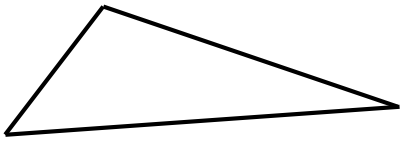


Two sides are equal

Two angles are equal

One line of folding symmetry

❖ Scalene triangles

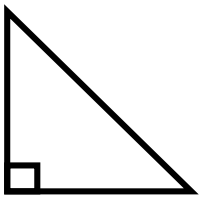


All sides are not equal

All angles are not equal

No line of folding symmetry

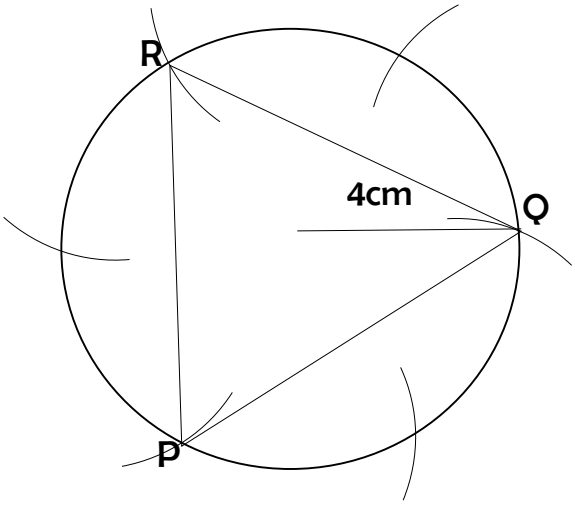
❖ Right angled triangles



One of the three angles is 90^{o}

CONSTRUCTION OF TRIANGLES

Construct a triangle PQR in a circle of radius 4cm.



Activity

1. Using a pair of compasses, ruler and sharp pencil, construct a triangle ABC in a circle of radius 4.5cm.

a) Measure angle ACB =.....

b) Measure the length of line BC = ...cm

a) In the space provided below, construct a triangle XYZ in a circle of radius 5cm using a pair of compasses, sharp pencil and ruler.

b) Calculate its perimeter.

Construct a circle of radius OJ = 4.3cm with a centre O. Use the same radius to mark six arcs along its circumference. Join the arcs to form a triangle JKL

Measure the angle OJK = ...

Using a pair of compasses, ruler and sharp pencil, construct a triangle PQR in a circle of diameter 6cm.

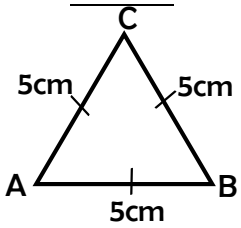
Use a pair of compasses and sharp pencil to construct an equilateral triangle in a circle whose radius is 3.8cm.

Using a pair of compasses, sharp pencil and a ruler, construct a regular three sided polygon in a circle of diameter 8.8 cm. Measure the sides of the triangle and calculate its perimeter.

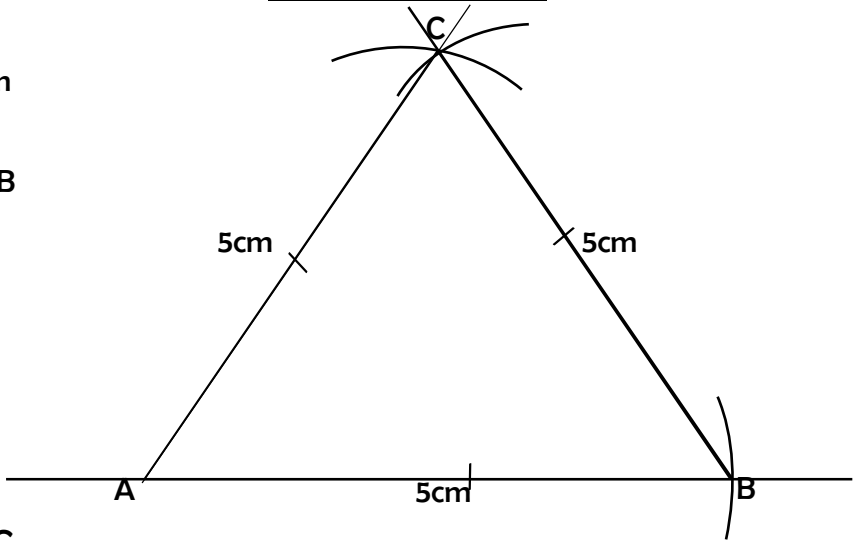
Constructing triangles with given sides (SSS)

Construct an equilateral triangle ABC of side 5cm.

Sketch



accurate diagram



Measure angle ABC

Angle ABC = 60°

1. (a) Using a pair of compasses, a ruler and sharp pencil only, construct a triangle PQR such that line PQ = QR = RP = 5cm.

(b) Using a protractor, measure the size of angle RQP in degrees.

2. (a) Construct an isosceles triangle XYZ in which line XY= 5cm and line YZ = XZ = 6cm.

(b) Measure angle ZXY = ...

3. (a) Construct a three sided polygon UVW where line UV = 8 cm, VW = 10cm and UW = 6 cm.

(b) Measure the size of angle WUV = ...

(a) Using a ruler, sharp pencil and a pair of compasses only, construct a triangle PQR with PQ = 6cm, QP = 4cm and PR = 5cm.

(b)Measure the size of angle RPQ

Constructing a triangle given two sides and one angle (SSA)

1. (a) With the help of a pair of compasses, a ruler and a pencil only, construct a triangle EFG where EF = 7cm, and angle FEG = 60° and EG = 5cm.

(b) What is the size of angle GFE?

2. (a) Using a pair of compasses, ruler and sharp pencil, construct a triangle RSP in which line RS = 5cm, angle RSP = 120° and line SP = 4 cm.

(b) Measure and record the size of angle PRS.

3. (a) Construct an isosceles triangle XYZ such that line XY = XZ = 6cm and angle YXZ = 90° using a pair of compasses.

(b) What is the size of angle XYZ ?

4. (a) With the help of a ruler, sharp pencil and pair of compasses only, construct a triangle ABE where angle BAE = 75°, line AB = 6.3cm and line BE = 8cm.

(b) Measure line AE = ... cm

(c) Measure angle ABE = ...

5 (a) Using a pair of compasses, a ruler and a sharp pencil, construct a triangle PQR in which line PQ = 5.8 cm, angle PQR = 60° and line QP = 7cm. Drop a perpendicular bisector from point R to meet line PQ at point K.

(b) Measure line RK = ...cm.

(c) Using line RK as the height, find the area of the triangle PQR.

5. (a) Use a pair of compasses to construct a triangle UFD such that line UF = 6 cm, angle UFD = 120° and line FD = $\frac{2}{3}$ of line UF. Bisect the angle UFD and let the bisector meet line UD at point Y.

(b) Measure the length FY = ... cm

Constructing triangle given two angles and one side.

1. (a) Use a pair of compasses, a ruler and a pencil only to construct a triangle LMN where line LM = 6cm and angle MLN = 90° and angle LMN = 30°

(b) Measure line MN = ...

2. (a) Construct a triangle XYZ such that line XY = 6.8 cm, angle XYZ = 60° and angle YXZ = 45°.

(b) Measure line YZ = ... and angle XZY = ...

3. (a) Using a pair of compasses, ruler and sharp pencil only, construct a triangle BAG such that line BA = 4 cm, angle BAG = 120^0 and line AG = 5cm. Extrapolate line BA using dotted lines and drop a perpendicular line from point G to meet the extrapolated line at point D.

(b) Measure line GD = ... cm.

(c) Workout the area of the triangle BAG

4. (a) Using a pair of compasses, a ruler and sharp pencil, construct a triangle WXY in which line WX = 4.5cm, angle XWY = 105° and line XY is twice line WX.

(b) Measure angle WXY = ...

5. With the help of a ruler, sharp pencil and pair of compasses, construct a triangle STU such that line ST = 5.8 cm, angle TSU = 60° and angle SUT = 75°.

(b) Measure and record the size of angle STU = ...

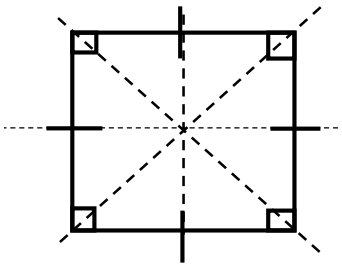
CONSTRUCTING QUADRILATERALS

A quadrilateral is any four sided polygon.

Types of quadrilaterals.

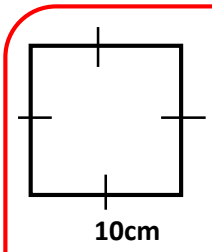
✓ Square	✓ Rectangle	✓ Trapezium
✓ Rhombus	✓ Parallelogram	✓ Kite

1. SQUARE



Properties of a square

- ✓ All sides are equal
- ✓ All angles are equal [right angles (90^0)]
- ✓ Has four lines of folding symmetry
- ✓ Its diagonals are equal and intersect at 90^0
- ✓ Opposite sides are parallel



A = S X S

A = 10cm X 10cm

A = 100 cm^2



A = $\frac{1}{2}$ X d_1 X d_2

A = $\frac{1}{2}$ X 10 cm X 10 cm

A = 50 cm^2



A = 4($\frac{1}{2}$ X b X h)

A = 4 x $\frac{1}{2}$ X 5cm X 5 cm

A = 50 cm^2

Construction of square

1. Construct a square ABCD in a circle of radius 3.5 cm.

2 (a) Using a sharp pencil, ruler and a pair of compasses only, construct a square PQRS in a circle of radius 4cm.

(b) Measure the length of line PQ = ...

(c) Workout the total distance around the square PQRS

(d) Using diagonals, workout the area of the square.

3. Using a pair of compasses, construct a square KLMN in a circle of diameter 8cm. *Calculate the area of the square*.

4. Construct a square WXYZ in a circle of radius 3.8cm and centre O. Measure the size of angle OXY in degrees.

5. (a) Construct a square EFGH in a circle, given that diagonal EG = 10cm.

(b) Measure the radius of the circle.

6 (a) Construct a quadrilateral ABCD in which lines AB = BC = CD = DA = 5cm and angle BAD = 90°

(b) Measure the length of diagonal BD = ...

(c) Workout the perimeter of the quadrilateral.

7(a) Using a pair of compasses, ruler and pair of compasses, construct a square STUV such that line TU = 6cm and angle STU = 90^{0}.

(b) Bisect the angle TSV and measure the size of angle TSU

(c) Calculate the area of the triangle VSU.

8 (a) Construct a square ABCD in which diagonals AC = BD = 7cm

(b) Measure line AB = ... cm

9 (a) With the help of a pair of compasses, ruler and sharp pencil, construct a square WXYZ of sides 5.5cm. Join point W to Y and X to Z and let the diagonals intersect at point O.

(b) Measure line OX = ...

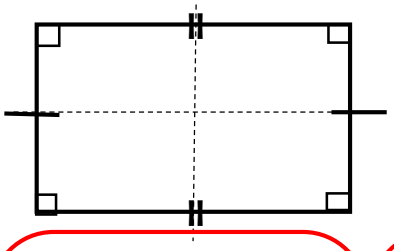
RECTANGLE

Properties of a rectangle

Opposite sides are parallel and equal

All angles equal (right angles (90^0))

Has two lines of folding symmetry

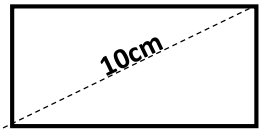




A = L X W

A = 8cm X 6cm

A = 48cm²



$a^2 + b^2 = c^2$

$(8cm)^2 + W^2 = (10cm)^2$

$(8cm \times 8cm) + W^2 = (10cm \times 10cm)$

$64cm^2 - 64cm^2 + W^2 = 100cm^2 - 64cm^2$

Then;

$\sqrt{W^2} = \sqrt{36cm^2}$

A = L X W

W = 6cm

A = 8cm X6cm

A = 48cm²

Constructing a rectangle

1 (a) Using a ruler, sharp pencil and pair of compasses only, construct a rectangle ABCD in which line AB = 6cm, angle ABC = 90^{o} and line BC = 4 cm.

(b) Measure the length of diagonal AC = ...

2 (a) With the help of a pair of compasses, ruler and sharp pencil, construct a rectangle PQRS such that line PQ = 6.5cm, angle PQR = 90^{o} and diagonal PR=10cm.

(b) Measure the length of line QR = ...cm

(c) Measure the size of angle RPQ = ...

3(a) Use a pair of compasses to construct a rectangle EXYZ in which line EX = YZ = 12cm, line XY = EZ = 5cm and angle XEZ = 90°.

(b) Using a ruler, measure the length XZ in centimetres.

4. (a) With the help of a ruler, sharp pencil and a pair of compasses, construct a rectangle ABCD such that line AB = 8cm, diagonals AC = BD = 10cm.

(b) Measure the length of line AD =.....

5. (a) Using a pair of compasses, construct a quadrilateral PQRS such that line PQ = RS = 6cm and line QR = PS, angle PQR = 90° and angle QPR = 30°

(b) Using a protractor, determine the size of angle SPR = ...

(c) Measure the length of line QR = ...

6. (a) With the aid of a pair of compasses, construct a rectangle EFGH such that line EF = 9cm, EFG is a right angle and diagonals EG = FH = 10.5cm.

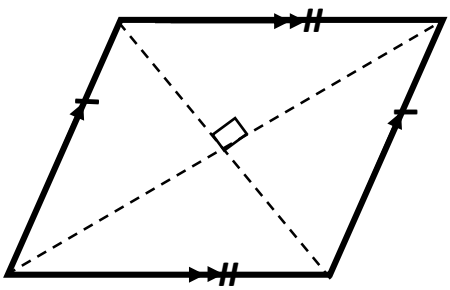
(b) Measure the size of angle FEG = ...

(c) Measure the length of line EH = ...

7. (a) Using a pair of compasses, ruler and sharp pencil, construct a rectangle JKLM where line JK = 8.5cm, angle JKM = 30^{o} and diagonal KM = 9.8cm.

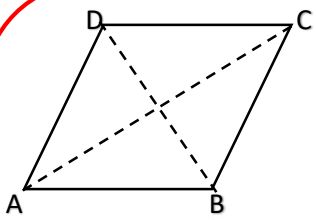
(b) Measure the size of angle MJK = ...

RHOMBUS



Properties of a rhombus

- ✓ All sides are equal
- ✓ Opposite sides are parallel
- ✓ Opposite angles are equal
- ✓ Has two lines of folding symmetry
- ✓ Diagonals are not equal but intersect at 90^{0}



Given that line AC = 8cm and line BD = 6cm,

Find the area of the rhombus

$A = \frac{1}{2} \times d_1 \times d_2$

$A = \frac{1}{2} \times 8\text{ cm} \times 6\text{ cm}$

$A = 24\text{ cm}^2$

OR;

$A = 4 \times (\frac{1}{2} \times d_1 \times d_2)$

$A = 4 \times \frac{1}{2} \times 4\text{cm} \times 3\text{cm}$

$A = 24\text{ cm}^2$

Constructing a rhombus

1 (a) Using a pair of compasses, ruler and sharp pencil, construct a rhombus STUV in which line ST = TU = UV = VS = 5cm and angle STU = 120°.

(b) Measure the length of line SU = ...

(c) Use a ruler to determine the size of angle TSV = ...

2 (a) With the help of a ruler, sharp pencil and pair of compasses only, construct a rhombus ABCD in which line AB = 6cm and angle BAD = 105°.

(b) Measure the shorter diagonal and angle CAB.

3. Using a pair of compasses ruler and sharp pencil only;

(a) Construct a rhombus WXYZ such that diagonals WY = 6cm and XZ = 8cm.

(b) Measure line WX and calculate the perimeter of the rhombus.

4(a) Construct a rhombus EFGH of sides 5.5 cm and angle HEF = 45°.

(b) Extrapolate line EF and drop a perpendicular line from point G to meet line EF at T.

(c) Measure line GT = ...

5(a) With the help of a pair of compasses, construct a rhombus KLMN such that diagonal KM = 8cm and diagonal LN = $\frac{3}{4}$ of line KM.

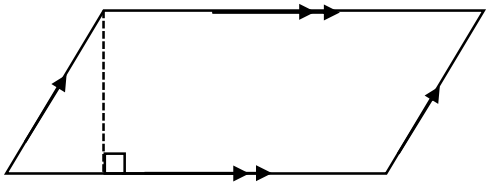
(b) Calculate the area of the figure.

6 (a) Construct a rhombus ABCD such that line AB = 6cm. Bisect line AB and let the bisector meet line AB at H. Mark point D along line the bisector such that lines AD = AB.

Complete the construction by joining points B and D to C.

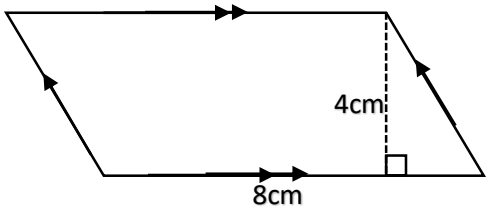
(b) Measure line DH = ...

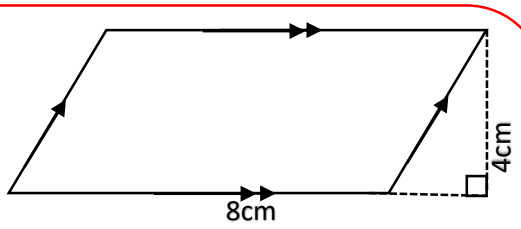
PARALLELOGRAM



Properties of a parallelogram

- ✓ Opposite sides are parallel and equal
- ✓ Has no line of folding symmetry
- ✓ Opposite angles are equal





A = base X perpendicular height

A = 8cm X 4cm

A = $32cm^2$

Constructing a parallelogram

1 (a) With the help of a pair of compasses, construct a parallelogram PQRS in which line PQ = 6cm and line QR = 4cm and angle PQR = 120°.

(b) Measure the length of diagonal QS = ...

2 (a) With the help of a pair of compasses, ruler and sharp pencil only, construct a parallelogram ABCD such that line AB = CD = 8cm. Bisect line AB and let the bisector meet line AB at point R. Mark point D on the bisector such that line RD = 3.5cm.

Join point A to D and complete the construction of the parallelogram.

(b) Measure line BC and calculate the total distance around the figure.

3(a) Use a pair of compasses to construct a quadrilateral KLMN such that line KL = MN = 6.5cm, line LM = KN = 4cm and angle LKN = 105°.

(b) Measure the length of the longer diagonal LN

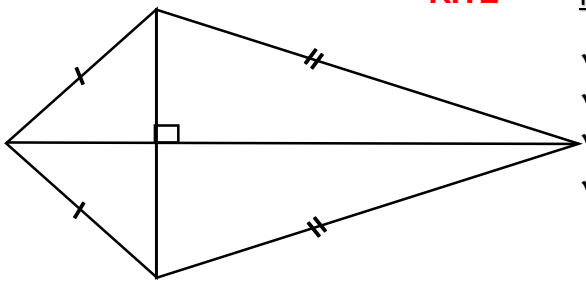
4. (a) Using a pair of compasses, a pencil and a pair of compasses, construct a parallelogram EFGH in which line EF= 7.4 cm, angle FEH = 45° and line FG=5cm.

(b) Measure the size of angle EFG in degrees.

6. (a) With the help of a pair of compasses, construct a parallelogram JKLM such that line JK = 5.5cm, angle KJM = 120° and diagonal KM = 10cm.

(b) Measure line JM = ...

KITE



Properties of kite

- ✓ Adjacent sides are equal
- ✓ Has one line of folding symmetry
- ✓ Diagonals intersect at 90^0
- ✓ Area = $\frac{1}{2}$ X d_1 X d_2
  (where *d* stands for diagonal)

Constructing a kite

1 (a) With the help of a ruler, sharp pencil and pair of compasses, construct a kite ABCD in which line AB = BC = 6cm, line CD = DA = 3cm and angle BAD = 120°.

(b) measure;

i) line DB = ...
ii) line AC = ...
iii) angle DAC = ...
iv) angle DOC = ..., where O is the point of intersection of the two diagonals.

2. (a) Using a pair of compasses, construct a kite PQRS such that the longer diagonal SQ = 12cm and the shorter diagonal PR = 6cm. Let the diagonals intersect at point O such that line OQ = OR = OP.

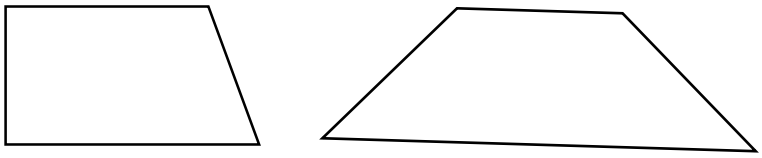
(b) Measure the size of angle OQR = ...

3. (a) Use a pair of compasses and a ruler to construct a kite ABCE in which line AB = 6.5cm, angle ABD = 30° and angle BAD = 105° and line BD is the longer diagonal.

(b) Measure line AD = ...

(c) Join point A to C and measure line AC = ...

TRAPEZIUM



1.(a) Construct a trapezium ABCD in which line AB = 6cm, angle ABC = BAD= 60^{o} and line BC=AD = 3cm.

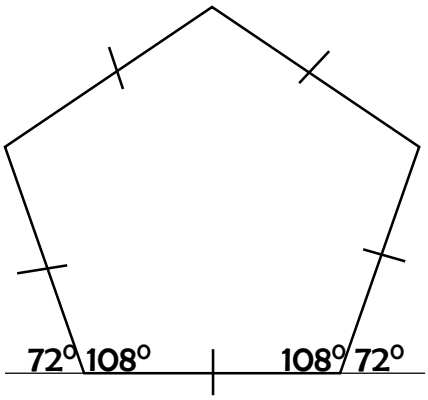
(b) Measure line CD = ...

2. (a) using a pair of compasses, ruler and sharp pencil only, construct a trapezium PQRS such that line PQ = 7cm, angle QPS = 60^{o}, angle PQR = QRS = 90^{o} and line QR = 4cm.

(b) Using a protractor, measure the size of angle PSR

(c) Measure the length of line RS in centimetres.

REGULAR PENTAGON



Properties of a regular pentagon

- ✓ Has 5 equal sides
- ✓ Has 5 equal angles (Each exterior angle measures 72^0 while each interior angle measures 108^0)
- ✓ Its interior angle sum is 540^0
- ✓ Has 5 lines of folding symmetry

1.(a) Using a protractor, pair of compasses, ruler and sharp pencil, construct a regular pentagon of sides 4cm and each exterior angle is 72^0.

(b) Measure the size of one interior angle

(c) Workout the perimeter of the pentagon constructed above

2. (a) Using a ruler, sharp pencil, pair of compasses and a protractor, construct a regular five sided polygon such that each side is 4.5cm and interior angle is 108^{0} each.

(b) Measure the size of one of the exterior angles in degrees.

3. (a) Using a pair of compasses, construct a regular pentagon in a circle of radius 4cm.

(b) Measure the length of one side.

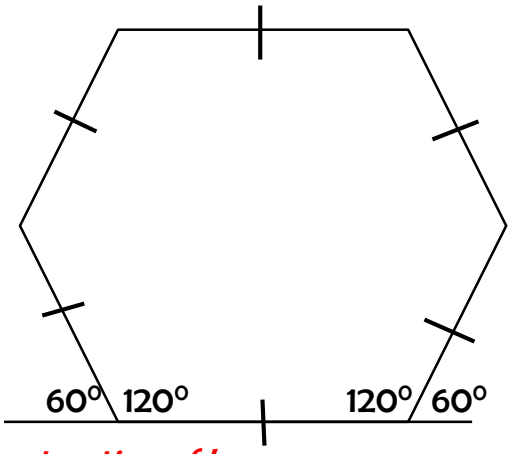
4. (a) With the help of a pair of compasses, construct a regular pentagon in a circle of diameter 8.8cm.

5. (a)Use a protractor, pair of compasses, ruler and pencil, construct a pentagon ABCDE in a circle of radius 4cm and centre O such that ABO forms a triangle with line OA = OB.

(b) Measure line AB = ...cm.

(c) Calculate the total distance around the triangle ABO.

REGULAR HEXAGON



Properties of regular hexagon

- ✓ Has 6 equal sides
- ✓ Has 6 lines of folding symmetry
- ✓ Has 6 equal angles (Each Int. angle = 120^0 while each Ext. angle = 60^0)
- ✓ Its interior angle sum is 720^0

Construction of hexagon

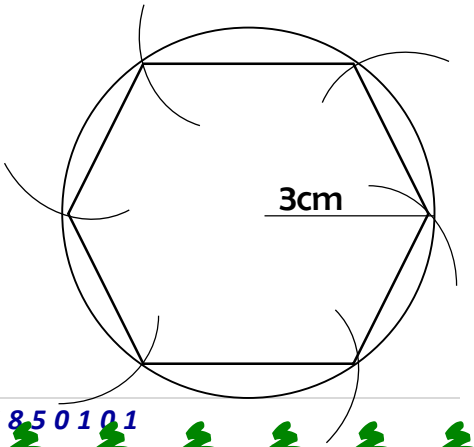
1. (a) Using a pair of compasses, ruler and sharp pencil, construct a regular hexagon of sides 5cm and exterior angle 60°

(b) Workout the perimeter of the hexagon

2. (a) With the help of a pair of compasses, construct a regular six sided polygon of sides 5.5cm

(b) How many lines of folding symmetry has the polygon above?

Constructing a regular hexagon in a circle.



3. (a) Using a pair of compasses, construct a regular hexagon in a circle of radius 3.5cm

(b) Find the perimeter of the hexagon

4. (a) Use a pair of compasses to construct a regular hexagon of sides 4cm in a circle.

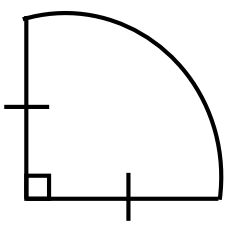
(b) Measure the radius of the circle.

(c) Draw a straight line *through the centre* of the circle *connecting two vertices* of the hexagon and *measure the line*.

5. (a) With the aid of a pair of compasses, ruler and sharp pencil, construct a regular hexagon in a circle whose diameter is 9cm.

(b) Show and state the number of lines of folding symmetry on the figure.

QUADRANT



1. (a)Using a pair of compasses, construct a quadrant PQR such that line PQ = PR = 3.5cm

(b) Using the formula $\boxed{\frac{1}{2} \text{ X } \pi \text{ X } r}$, find the length of curve RQ

(Where $\pi = \frac{22}{7}$ and r = length PQ)

GENERAL EXERCISE

1. (a) Construct a triangle ABC such that AB = 7 cm, AC = 9cm and BC = 8 cm. Bisect angle BAC and let the bisector meet line BC at T. Measure AT and calculate the area of the triangle ABC.

2. (a) Use a pair of compasses to construct a parallelogram ABCD such that AB = 7cm, AB = 4cm and angle BAD = 60°.

(b) Measure the diagonals AC and BD in cm.

3. (a) Using a pair of compasses, ruler and a pencil only, construct a triangle EFG where EF = 8cm, angle GEF = 60°, angle EFG = 45°. From G, drop a perpendicular bisector to meet EF at H.

(b) Measure *GH* = ...cm

(c) Using GH as the height, find the area of triangle EFG.

4. (a)With the help of pair of compasses and a pencil, construct a rhombus PQRS where PQ = 6cm, diagonal PR = 10.4cm and line QS = 6cm.

(b) Measure angle PQR = ...

5. (a) Using a pair of compasses, a ruler and a pencil only, construct a triangle ABC such that AB = 6cm, angle ABC = 45° and line BC = 8cm

(b) Measure angle BCA = ...

6. (a) In the space below, use a pair of compasses, a ruler and a sharp pencil only to construct a regular hexagon of diameter 6cm.

(b) Calculate its perimeter.

7. (a) With the help of a ruler, sharp pencil and a pair of compasses only, construct a triangle ABC in which angle ABC = 90°, line BC = 8cm and

line BA = 6cm

(b) Measure line AC = ...

8. (a) Construct a triangle JKL such that line JK= 6.5cm, line JL= 5cm and line KL=6cm

9. (a) Using a pair of compasses, a ruler and a sharp pencil, construct a triangle JKL where JK = KL = LJ = 5 cm.

(b) Measure angle JKL in degrees

(c) Measure the size of angle KJL = ...

10. (a) Using a ruler, a pencil and a pair of compasses only, construct a triangle ABC in which AB = 7cm, angle ABC = 105° and angle ACB is 30° in the space below.

(b) Measure the length BC = ...

11. (a) Using a pair of compasses, ruler and sharp pencil, construct a triangle EFG where line EF = 8cm, line FG = EG = 6cm.

(b) Measure angle EGF in degrees.

12. (a) Using a ruler, pencil and a pair of compasses only, construct a triangle ABC in which AB = 6cm angle ABC = 120° and angle BAC = 30°

(b) Measure the length of BC = ... cm

1992 / 35. Follow the instructions below and construct a parallelogram in the space provided:

Draw a horizontal line AB of length 7cm.

Draw a perpendicular bisector of line AB.

Mark the point O where the bisector meets the line AB.

Measure a length of 3cm from O along the bisector. Mark this point D.

Join point A to point D. Lines AD and AB form two sides of the parallelogram

(a) Complete the construction of the parallelogram ABCD.

(b) Measure OC

(b) Measure angle BOC

1993 / (a). Using a ruler and a pair of compasses only, construct a triangle PQR in which angle PQR = 90° and angle RPQ = 45° and line PQ = 7.8 cm.

(b) Measure (i) line RP

(ii) line RQ

1996/ 40 (a). The diagonals of a parallelogram bisect each other. Using a pair of compasses, sharp pencil and a ruler, construct a parallelogram PQRT, given that PQ = 7cm, PR = 10 cm and QT = 8cm.

(b) measure QR = ...

1998 / 36 (a). Using a ruler and a pair of compasses only, construct a triangle KPR such that angle KPR = 90°, angle PRK = 30° and line PR = 5.8 cm.

(b) Measure KR = ...

2000 / 38 (a) Using a ruler and a pair of compasses only, construct a triangle XYZ such that XY = YZ = 6cm and angle XYZ = 90°

(b) Measure the length of XZ

2001 / 37(a) Using a pair of compasses, pencil and a ruler only, construct a triangle PQR in which QR = 6 cm, and the point P lies on the perpendicular bisector of QR. Point P is 5cm above QR.

(b) Measure PQ =.....

(c) Measure angle PQR = ...

(d) Workout the area of the triangle PQR

2003 / 37 Using a pencil, ruler and a pair of compasses only, construct triangle ABC in which BC = 6cm, angle ABC = 90° and angle BCA = 30°.

(a) Measure the length of AC

(b) Measure the length of AB

2004 / 35 (a) Using a pair of compasses, a pencil and a ruler only, construct a triangle ABC such that BC = 8 cm, angle ABC = 120° and AB = 6cm.

(b) Measure length AC

(c) Measure angle BCA

2005 / 34 (a) Using a pair of compasses, a ruler and a pencil only, construct a triangle XYZ in which YZ = 6cm, angle XYZ = 30° and angle YZX = 120°

(b) Measure line XY

2006/34 (a) Using a ruler, a pencil and a pair of compasses only, construct triangle KLM in which line KM= 6.5 cm, angle KML = 45° and angle LKM = 60°

(b) Measure line ML

2007 / 33 (a) Using a ruler, a pencil and a pair of compasses only, construct a parallelogram *KLMN* in which *KL* = 4cm, *LM* = 6cm and angle *NKL* = 60°

(b) Measure the length of diagonal *KM*

2008 / 38 (a) Using a pair of compasses, a ruler and pencil only,

(i) Construct a triangle *EFG* in which $\overline{EF}$ = 8cm, angle *GEF* = 60° and angle *EFG* = 45°. From point *G,* drop a perpendicular line to meet *EF* at *H.*

(ii) Measure $\overline{GH}$.....

(b) Using $\overline{GH}$ as the height, find the area of the triangle *EFG.*

2009 / 32 (a) Using a ruler, pencil and pair of compasses only, construct a triangle PQR in which angle PQR = 30° and PRQ = 45° and line QR = 10 cm, the base of the triangle.

(b) Measure;

(i) PQ = ...

(ii) PR = ...

(c) Find the perimeter of triangle PQR

2010 / 32(a) Using a ruler, a pencil and a pair of compasses only, construct a rectangle ABCD in which AB = 10cm and BC = 7cm.

(b) Measure the length of diagonal AC = ...

(c) Measure the angle BAC = ...

2011 / 33 (a) Using a pair of compasses, a ruler and a pencil only, construct a triangle PQR in which line PQ = 6cm, angle RPQ = 60° and angle PQR = 45°.

Construct a perpendicular from R to meet PQ at Y.

(b) Measure RY

2012 / 22 (a) Using a ruler, a pair of compasses and a pencil only, construct a triangle ABC where line AB = 6.4 cm, angle CAB = 60^{o} and angle ABC = 75^{o}

(b) Measure the length BC = ...

2014 /26 (a) Using a ruler, a pencil and a pair of compasses only;

(i) construct a parallelogram ABCD such that line AB = 7 cm, BC = 5cm and angle ABC = 120°

(ii) drop a perpendicular from D to meet AB at M.

(b) Measure the line DM = ...cm

2017 / 28 (a) Using a ruler, a pencil and a pair of compasses only, construct a quadrilateral ABCD where the line AB = 7cm. angle ABC=BAD =60°and AD = BC = 3.5cm.

(b) Measure line DC = ...

(c) Measure the size of angle ADC = ...

2018 / 26 (a) Using a pair of compasses and a ruler only, construct a rhombus UVXY whose diagonals are 14cm and 10cm.

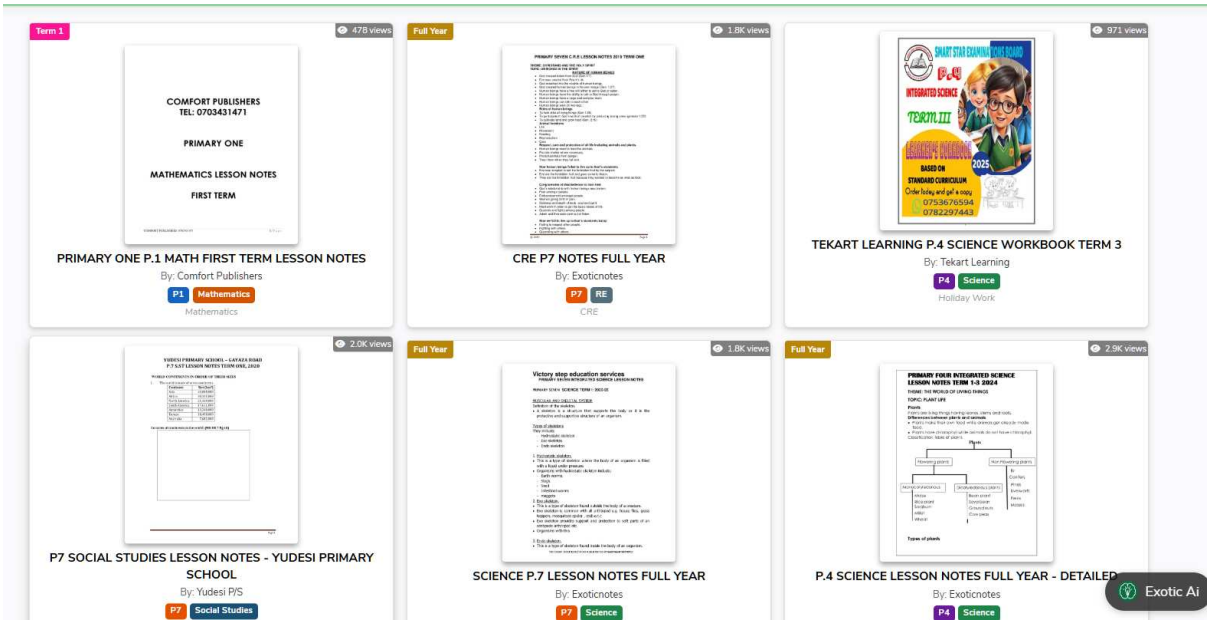
(b) Measure the length VX = ...cm

2020 / 25 Using a ruler and a pair of compasses only,

(a) construct triangle JKL where JK = 6.5 cm, angle LJK = 30° and angle JKL = 105°.

(b) Measure the length LK = ... cm

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