GCSE Maths – Geometry and Measures

Measuring Lines, Angles and Bearings

Worksheet

WORKED SOLUTIONS

* Lengths may not be accurate and to scale.

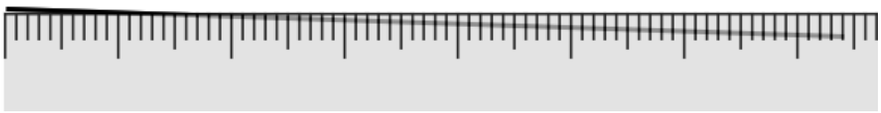
This worksheet will show you how to work out different types of measuring questions. Each section contains a worked example, a question with hints and then questions for you to work through on your own.

Section A

Worked Example

Measure the line segment.

Step 1: Align the starting point of the line segment with “zero line” on the ruler.



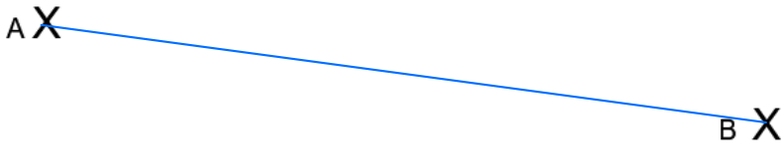
Step 2: Keep the ruler in place with the start and position the ruler to follow the line. The ruler should be parallel to the line.

Step 3: Read off the measurement at the point the line segment ends.

The line segment measures 7.4 cm

Guided Example

Calculate the distance from Point A and B.



Step 1: Connect Points A and B

Step 2: Align the starting point of the line segment with “zero line” on the ruler.

Step 3: Keep the ruler in place with the start and position the ruler to follow the line. The ruler should be parallel to the line.

Step 4: Read off the measurement at the point the line segment ends.

9.5 cm

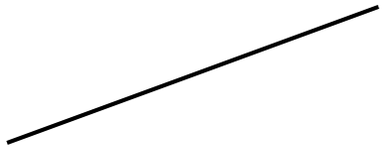
Now it's your turn!
If you get stuck, look back at the worked and guided examples.

1. Measure each line segment.

a)

8.6cm

b)



5.5cm

c)

3.8cm

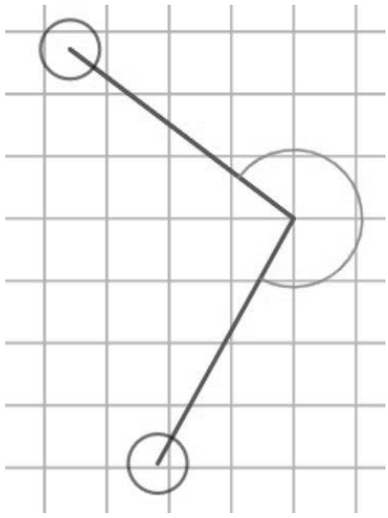
d)

10.1cm

Section B

Worked Example

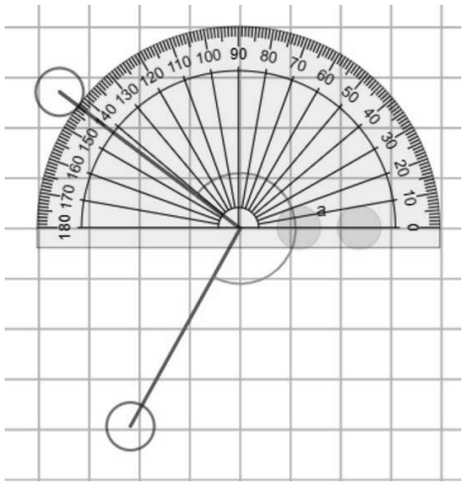
Measure the angle highlighted by the orange curve:

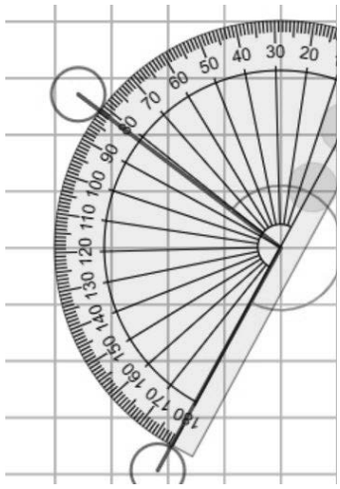


Step 1: Think about whether the line is an acute, obtuse or reflex angle.

The angle highlighted is more than 180° and it is a reflex angle. This means that we have to measure the inside obtuse angle first and then subtract it from $360°$.

Step 2: Align the centre of the protractor with the point of intersection of the two lines. Keeping the protractor fixed at the centre, align the horizontal line on the protractor with an appropriate line segment.





Step 3: Measure the obtuse angle between the two lines.

The interior angle (obtuse) angle is $98°$.

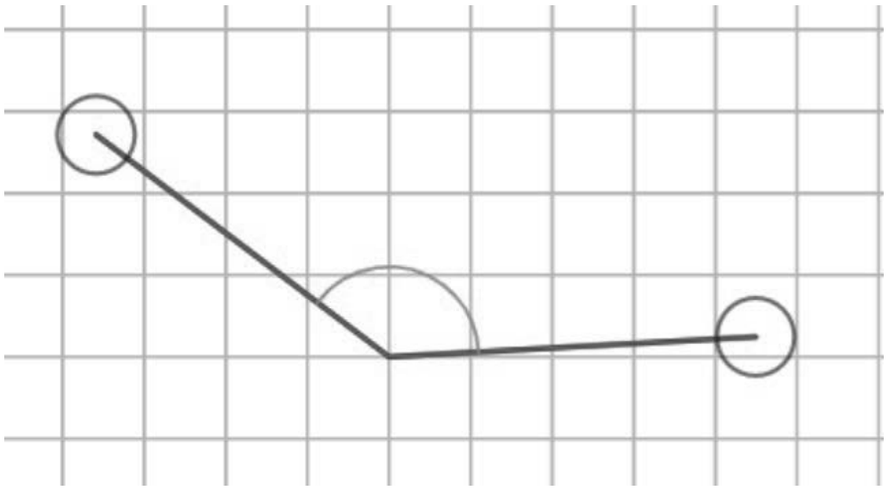
Step 4: To calculate the required exterior angle, subtract the acute angle from $360°$.

$$360° - 98° = 262°$$

The required angle highlighted in orange is $262°$.

Worked Example

Measure the angle highlighted in orange:



Step 1: Think about whether the line is an acute, obtuse or reflex angle.

Obtuse

Step 2: Align the centre of the protractor with the point of intersection of the two lines. Keeping the protractor fixed at the centre, align the horizontal line on the protractor with an appropriate line segment.

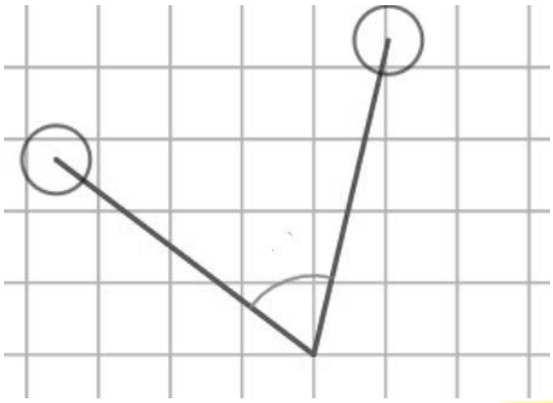
Step 3: Read off the required angle.

140°

Now it's your turn!
If you get stuck, look back at the worked and guided examples.

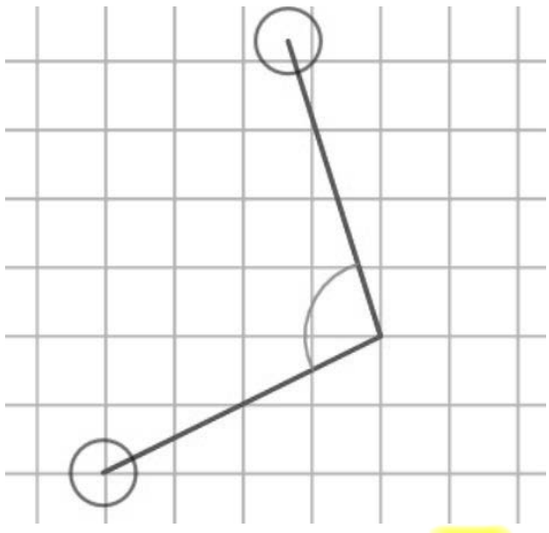
2. Measure each angle highlighted.

a)



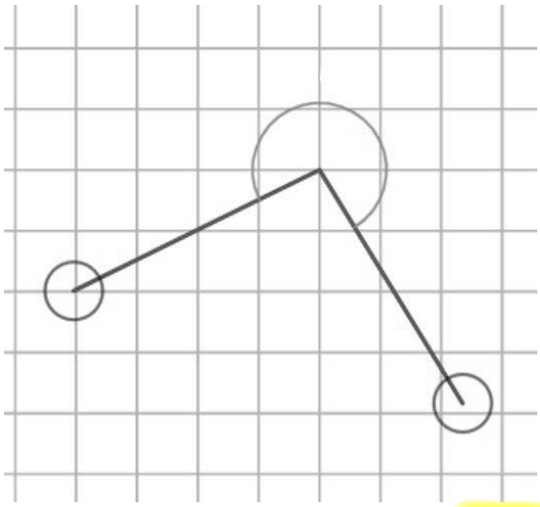
Acute: 69°

b)



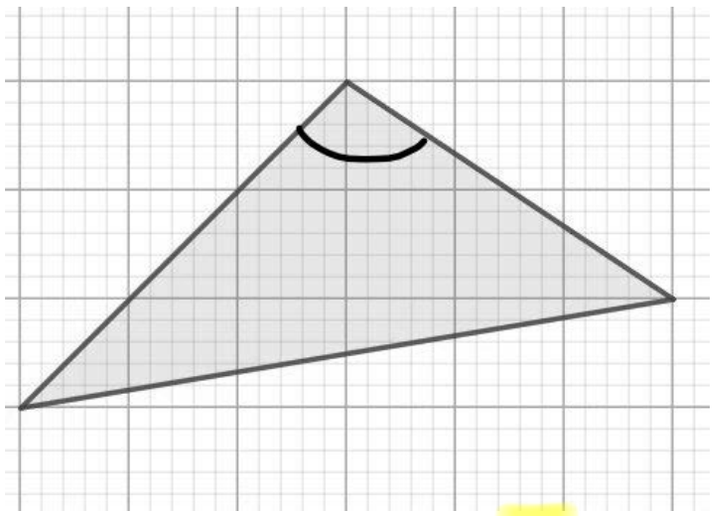
obtuse - 101°

c)



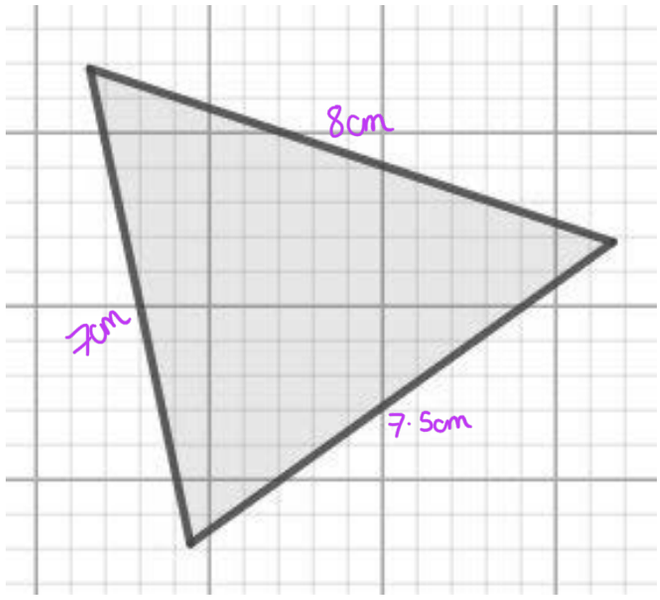
Reflex - 264°

d)



obtuse – 100°

e) Is this triangle an isosceles triangle?



① Measure the lines of the triangle.

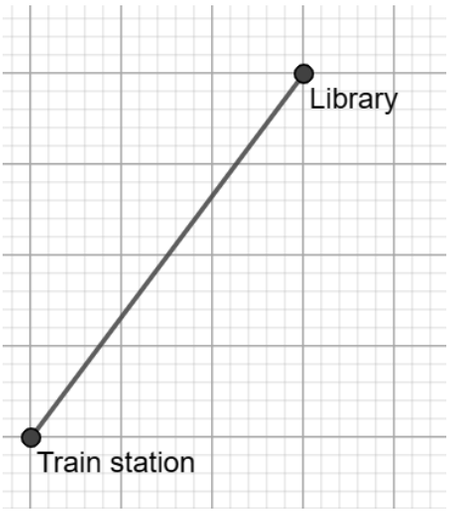
② If two line have the same length, the triangle is isosceles (by definition)

None of the lengths are equal, therefore the triangle is not isosceles.

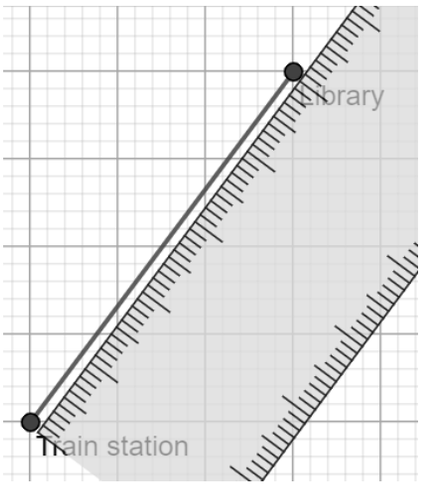
Section C

Worked Example

Iman walks to the library from the station. The map has a scale of $1\text{ cm} : 500\text{ m}$. Assuming she walks along the straight line, how many kilometres does Iman walk?



Step 1: Measure the distance between the two places.



The line measures 5 cm.

Step 2: Use the scale to calculate the actual distance between the library and station.

$$1\text{ cm} : 500\text{ m}$$
$$5\text{ cm} : 2500\text{ m}$$

The actual distance between the library and train station is 2500 m*, which is equal to* 2.5 km.

Iman walks 2.5 *kilometres.*

Worked Example

The map shows the distance from Surat to Mumbai and the map has a scale of 1 cm : 55 km. What is the actual distance between the cities of India?

Step 1: Measure the distance between the cities.

7.5 cm

Step 2: Use the scale to calculate the actual distance between the cities

1 cm : 55 km

÷7.5 ↓ x7.5

7.5 cm : 412.5 km

The actual distance is 412.5 km

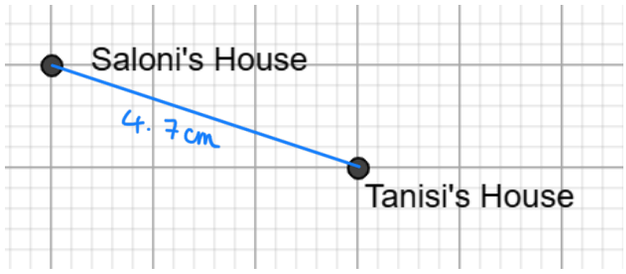
Now it's your turn!
If you get stuck, look back at the worked and guided examples.

3. A map has a scale $2\text{ cm} : 5\text{ miles}$. On a map, the distance between two cities is 30 cm. What is the actual distance between the two cities? Include the units in your answer.

2 cm : 5miles
÷15 ↗ ↘ ×15
30cm : 75miles

The actual distance is 75miles

4. The map below shows the distance between two friends' houses. Every 1 centimetre represents 1200 metres.



a) Calculate how far Tanisi and Saloni live from each other.
b) Tanisi says she has to walk further than the distance calculated. Suggest a reason why this may be.

1 cm : 1200m
÷4.7 ↗ ↘ ×4.7
4.7 cm : 5640m

a) Saloni and Tanisi live 5640m (5.64 km) from each other

b) Tanisi may have to walk further because she may be walking along roads instead of in a straight line.

5. A map has a scale $1\text{ cm} : 6\text{ miles}$. The actual distance between two towns is 108 miles. What is the distance between the two towns on the map?

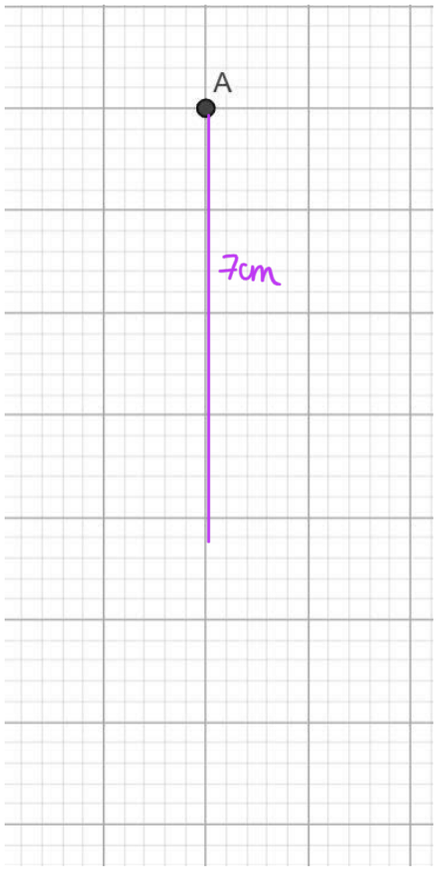
×18 (1cm : 6miles
18cm : 108miles) ÷18

The distance of the map is 18cm

6. This map has a scale of $1\text{ cm} : 2.5\text{ kilometres}$. Point B is exactly 17.5 km south of Point A. Draw Point B on the map.

straight line down

÷7 (1cm : 2.5km
7cm : 17.5km) ÷7

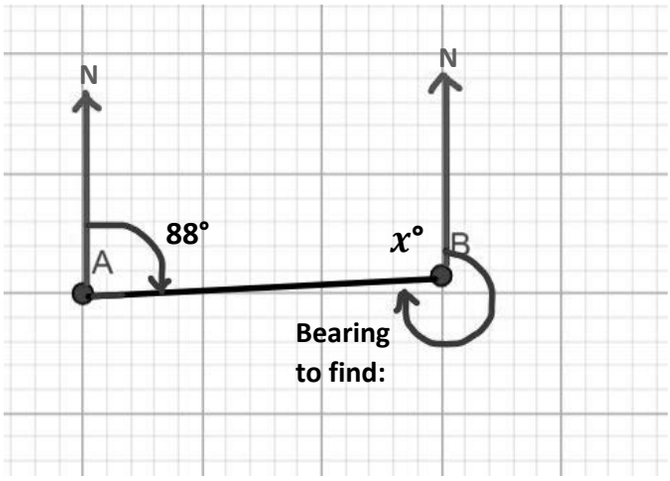


Section D

Worked Example

The bearing from point A to point B is 088°. Calculate the bearing from point B to point A.

Step 1: Draw a quick sketch of the question and label the angles. Draw north lines at each point.



Step 2: Using parallel line rules, calculate angle x.

Angle x and angle 88 are co-interior angles and therefore add up to $180°$*:*

$$x + 88° = 180°$$

$$x = 180° - 88°$$

$$x = 92°$$

Step 3: Calculate the required bearing using angle x.

Using the property that angles at a point add up to $360°$*:*

$$92° + Bearing = 360°$$

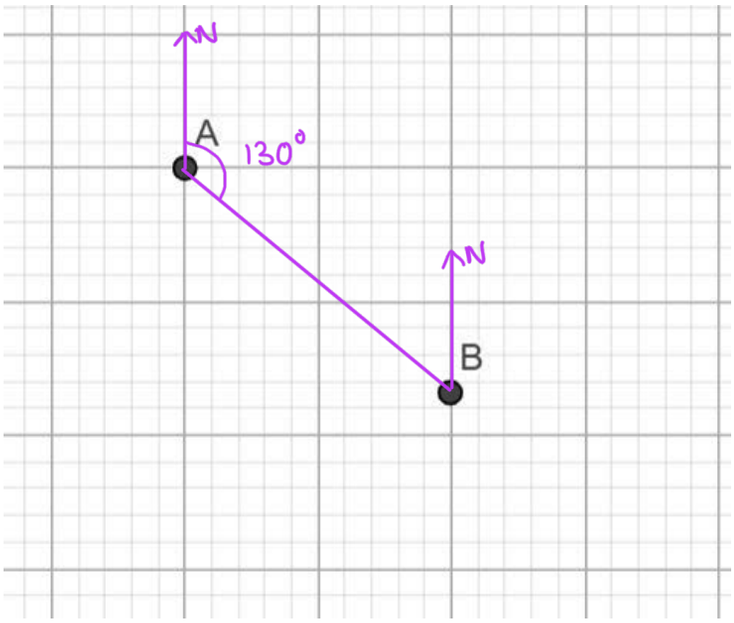
$$Bearing = 360° - 92°$$

$$Bearing = 268°$$

The bearing from B to A is $\mathbf{268}°$.

Worked Example

Calculate the bearing of Point B from Point A.



Step 1: Draw a quick sketch of the question and label the angles. Draw north lines at each point.

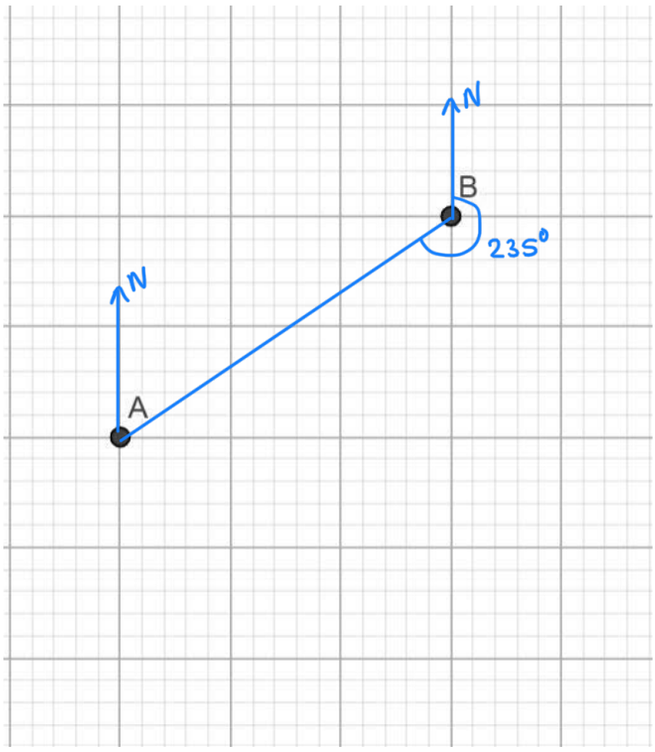
Step 2: Measure the required angle between the two lines in a clockwise motion.

Make sure that the bearing is a three-digit figure.

Bearing : 130°

Now it's your turn!
If you get stuck, look back at the worked and guided examples.

7. Measure the bearing from B to A.

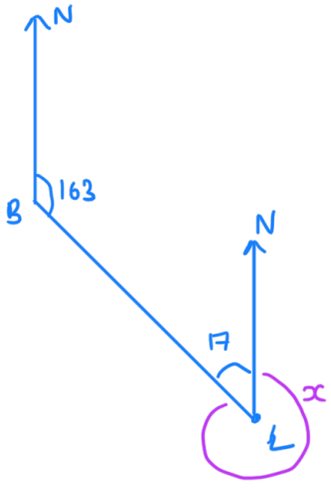


235°

8. The bearing from Birmingham to London is 163°. Calculate the bearing from London to Birmingham.

(B) (L)

Not to scale



Cointeriors angles add to 180°

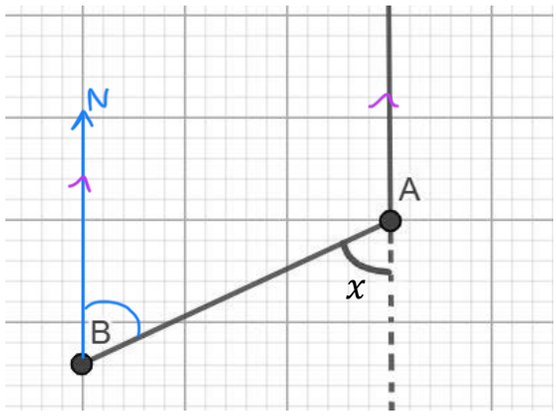
180 - 163 = 17°

Angles around a point add to 360.

Bearing = 360 - 17

= 343°

9. Calculate the bearing from point B to point A. You should find angle x as an intermediate step in your calculation.

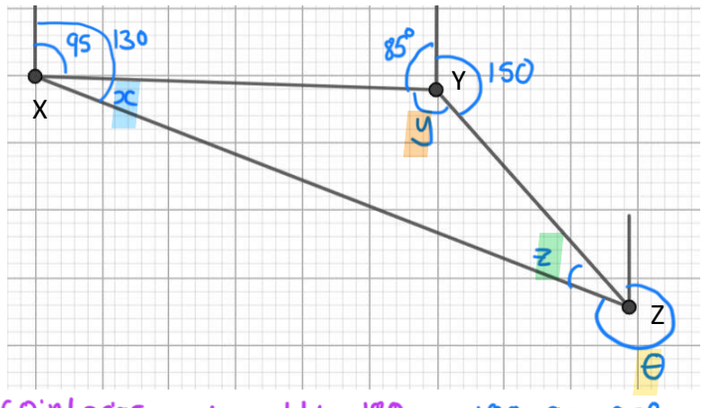


$x = 55°$

Alternate angles :
x = bearing from B
$= 55°$
(3 digit)
$= 055°$

10. The bearing from point X to Y is 095°.
The bearing from point Y to Z is 150°.
The bearing from point X to Z is 130°.

Calculate the bearing from point Z to point X.



(1) x :
$130 - 95 = 35°$
$x = 35°$

(2) y : Cointerior angles add to 180 $180 - 95 = 85°$
Angles around a point add to 360 $360 - 85 - 150 = 125°$
$y = 125°$

(3) z : Angles in a triangle add to 180 $180 - 125 - 35 = 20$
$z = 20°$

(4) θ : Angle around a point add to 360
$\theta = 360 - 20 = 340°$
Bearing from Z $= 340°$