CHAPTER 9

Scale Drawing

**Coordinates**

1. Write down the coordinates of :–

   a   all the points from P to V

   b   the point that has the same
          x and y coordinate

   c   the point 3 along and 1 up from T.
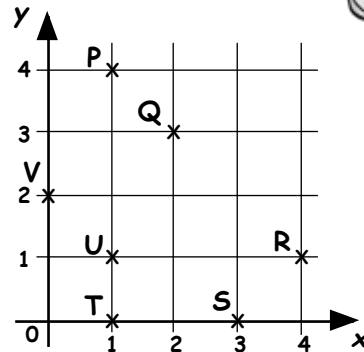
2. Copy the coordinate grid above and plot the following points :–

   A(3, 1),   B(4, 3),   C(0, 1),   D(0, 2),   E(2, 2),   F(1, 3·5).

3. **a**   Write down all the coordinates
          from G to Q.

   b   Write down all the points that
          have the same y coordinate.

   c   Which point has the same
          x and y coordinate ?

   d   HKJR are the vertices of a rectangle.

          State the coordinates of R.

   e   Given that HNKS are the vertices
          of a parallelogram, find and write
          down the coordinates of point S.
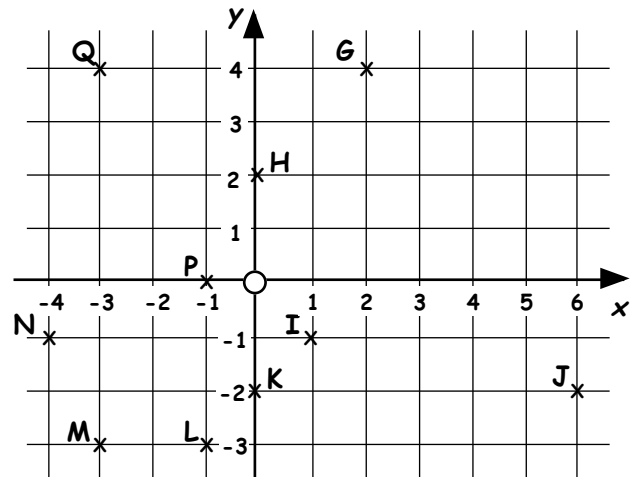
4. **a**   Draw a set of axes (from –5 to 5).

   b   Plot the triangle with vertices of P(0, 3), Q(3, 4) and R(4, –1).

   c   Reflect triangle PQR over the :–   **(i)**   the y axis   **(ii)**   x axis.

5. Repeat question 5a and 5c for the quadrilateral with vertices :–

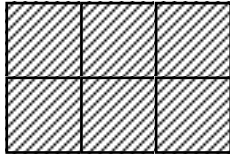   M(–3, –4),   N(–4, 2),   O(1, 0)   and   P(3, –5).
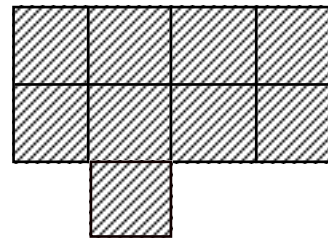
| **Exercise 1** | **Enlarging & Reducing Shapes** |

1. Make a **two-times enlargement** of these shapes.

   Each box represents a square 1 cm by 1 cm.
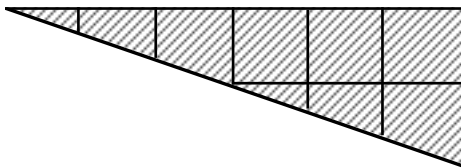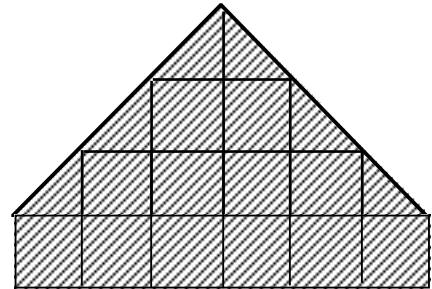
   a

   b
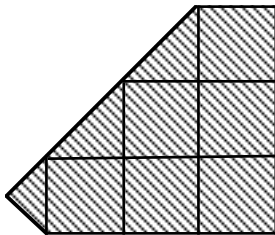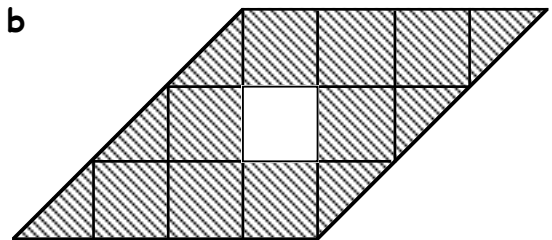
   c

   d

2. Make enlargements or reductions of the following using the given scale :-

   a
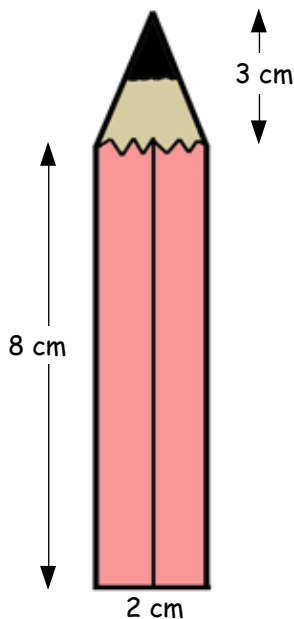
   make a **three times** enlargement

   b

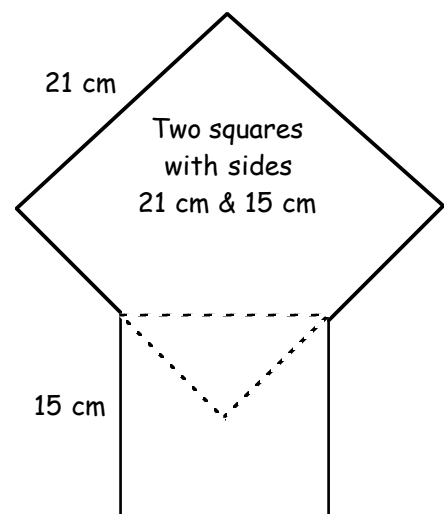   make a **two times** enlargement

   c

   3 cm

   8 cm

   2 cm

   reduce this shape to **half** of its size

   d

   21 cm

   Two squares with sides 21 cm & 15 cm

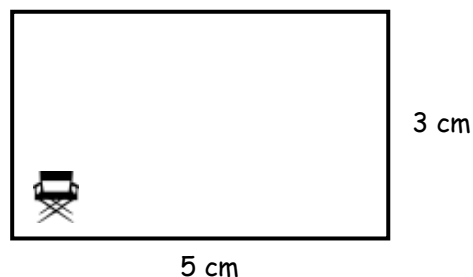   15 cm

   reduce this shape to **one third** its size

| **Exercise 2** | **Using a Scale Drawing to find a length** |

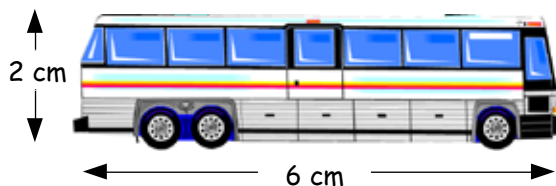**1.** This scale drawing of a large room is made using a scale of :-

     1 cm = 4 m.

a Calculate the **real** length of the room.
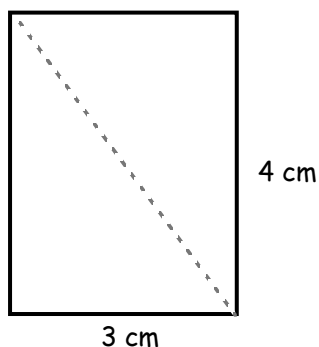
b Now calculate its **real** breadth.

3 cm

5 cm

2. This bus has been drawn using the scale :-

     1 cm = 1·5 m.

a Calculate the **real** length of the bus.

b Calculate its **real** height.

2 cm

6 cm

3.

4 cm

3 cm
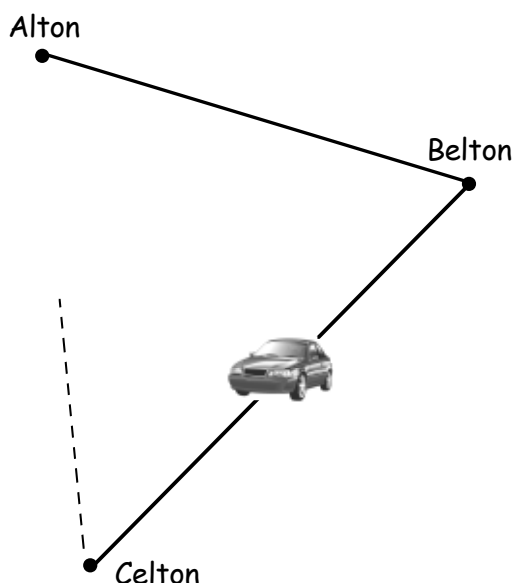
This picture frame is drawn to a scale of :-

     1 cm represents 9 cm.

a Calculate the **real** height of the frame.

b Calculate the **real** width of the frame.

c The real length of a diagonal is 45 cm.

     What is the length of the diagonal in the picture.

4. The map below shows three towns on a road map. Scale :- **1 cm represents 6 km**.

Alton

Belton

Celton

a Use your ruler to measure the distance from Alton to Belton.

b Use the scale of the map to work out the **real** distance between the 2 towns.

c Measure the distance between Belton and Celton and then use the given scale to calculate the **real** distance between them.

d A road going directly from Alton to Celton is to be constructed.

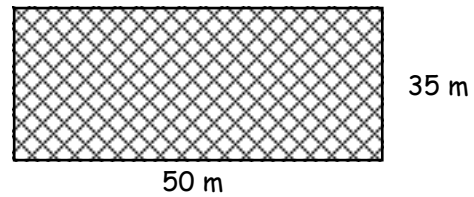   Find the length of the new road in km.

Exercise 3   **Basic Scale Drawing**
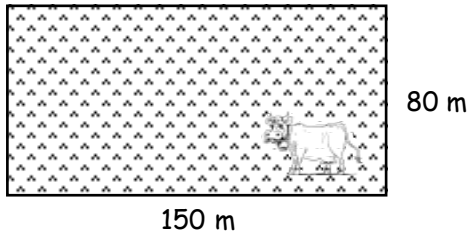
1.   Here is a sketch of an assembly hall.

Make an accurate scale drawing of the hall using the simple scale of :-

   1 cm = 10 metres.

35 m
50 m

2.

80 m
150 m

This is a sketch of a farmer's rectangular field.

Below are the instructions as to how to make an accurate scale drawing of the field using a scale of :-

   1 : 2000. (*i.e. 1 cm = 2000 cm = ... m*).

   a   Copy and complete the scale used.

   b   If 20 metres is represented by 1 centimetre in the scale drawing
      => 80 metres (length) will be represented by (80 ÷ **20**) = 4 centimetres.

   Start your scale drawing by drawing a vertical line 4 centimetres long.

   c   Complete the scale drawing.

3.   A village square has side length 60 metres.

   a   Which of the following would be a suitable scale :-

   (i) 1 cm : 1 m   **(ii)** 1 cm : 10 m   **(iii)** 1 cm : 50 m.

   b   Use your chosen scale to make a scale drawing of the village square.

4.   Stalls are set up in a rectangular market area measuring 35 metres by 55 metres.

   Make a scale drawing of the market area using a scale :- *1 cm represents 5 m*.

5.   a   Make a scale drawing to show this 24 m tall flagpole
      with a support wire as it is viewed from point A,
      7 metres from the base of the tower.

   The scale is *1 cm = 2 m*.

   b   Measure the length of the support wire
      on your scale drawing.

   c   What is the **real** length of the wire ?

T
24 m
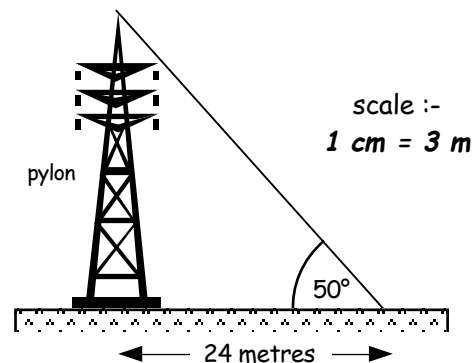A   7 m
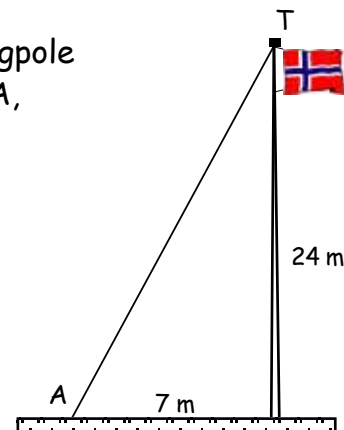
Making a Scale Drawing using a Protractor

1. Eddie is standing 24 metres from a pylon.

   The angle between Eddie's feet and the
   top of the tower is 50°.

   a Make a scale drawing of the sketch.

   Scale :- *1 cm = 3 metres*

   b Calculate the height of the **real** pylon.

   scale :-
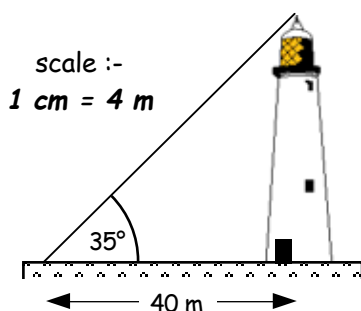   *1 cm = 3 m*

   pylon

   50°

   ← 24 metres →

2. For each of the following :-

   (i) Make a scale drawing using the given scale.

   (ii) Calculate the **real** height of the given object.

   a

   scale :-
   1 cm = 4 m

   35°

   ← 40 m →

   b

   scale :-
   1 cm = 2 m

   T

   A 60° B

   ← 8 m →
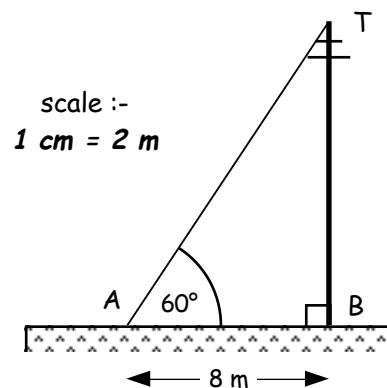
Scale Drawing involving Bearings

1. In what direction do you end up heading each time here :-

   a Walk North, then make a 45° turn anti-clockwise.

   b Drive South West, then make a 90° turn clockwise.

   c Fly East, then make a 315° turn anti-clockwise.

   d Sail North East, then make a 270° turn anti-clockwise.

2. Write each of the following compass directions as a **3 figure bearing** :-

   a West   **b** North West   **c** South   **d** South West

   e East   **f** North   **g** North East   **h** South East.

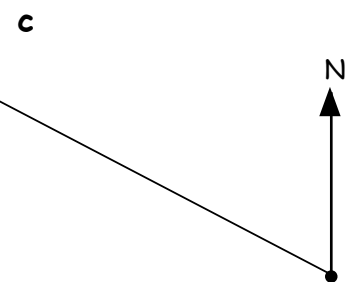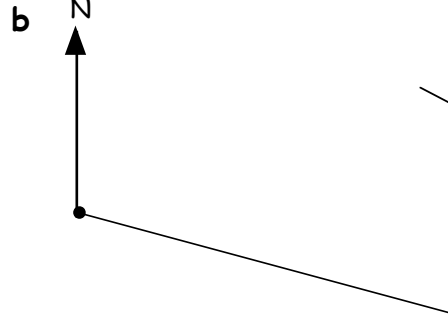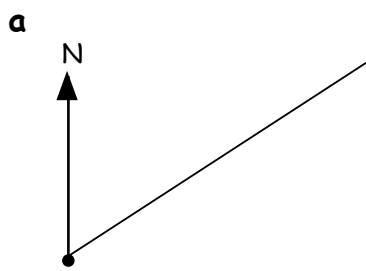**3.** For each of these directions, write down its **3 figure bearing** :-

a

North

68°

b

N

309°

c

N

75°
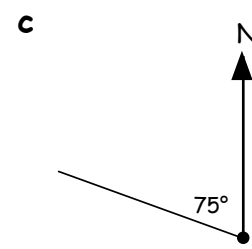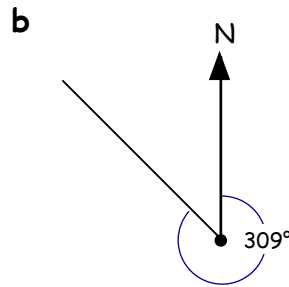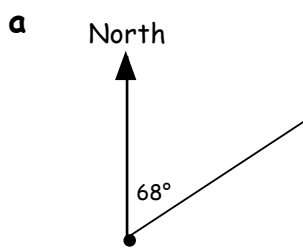
4. Using a protractor, measure and write the **3 figure bearing** for these directions :-

a

N

b

N

c

N

5. Similar to Qu 4, use a protractor to show a **3 figure bearing** of :-

**a** 045°   **b** 110°   **c** 255°   **d** 335°.

6. This sketch highlights a journey made by a yacht.
It sailed for 45 km on a bearing of 060°
from Tee Harbour to Bee Island.

From there, it sailed on a
bearing of 140° for 40 km
to Cee Isle.

a Make a scale drawing
showing the route taken
by the yacht.

b Measure the distance
from Tee Harbour to
Cee Isle on your scale drawing.

c Calculate the distance the yacht had to travel
to return to Tee Harbour from Cee Isle.

N

Bee
Island

140°

N

45 km

40 km

060°

Tee Harbour

Scale 1 cm = 5 km

C
e
e
I
s
l
e
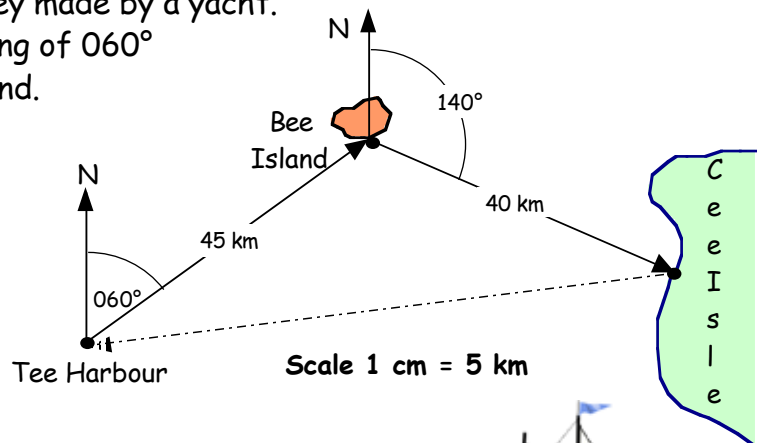
7. An army platoon begins a manoeuvre by leaving HQ
and heading off on a bearing of 115° .

On what bearing must the platoon then set off
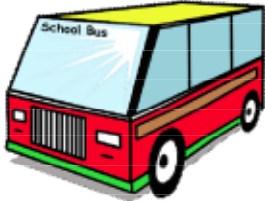in order to return directly to HQ ?

N
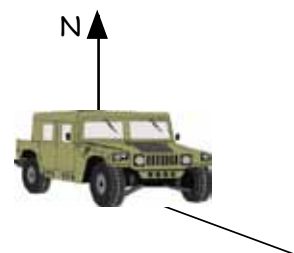
Revisit – Review – Revise 9

1. Write the **3 figure bearing** representing :-

   **a**   South West   **b**   South East   **c**   North East.

2. A toy school bus has been made to a scale :- **1 cm to 1·5 m**.

   If the length of the toy bus is 6 cm, what is the length of the **real** school bus ?

3. On a scale drawing, two train stations are 4 cm apart.
   The scale of the drawing is :-   **1 : 100 000**.

   Calculate the **real** distance between the train stations, in kilometres.

4. **a**   Make a **scale drawing** of this balloon.

   b   Determine the **real** height of the balloon.

   scale :-
   1 cm = 20 m

   balloon

   rope

   41°

   120 metres
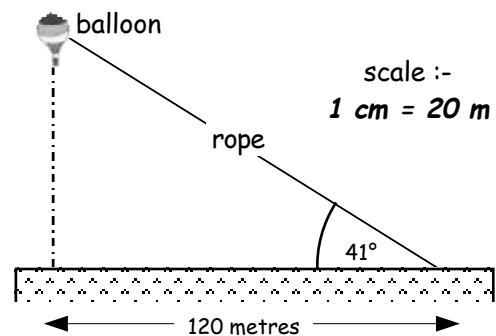
5. A helicopter leaves a pad on a 060° bearing.

   On what bearing would the helicopter pilot then have
   to fly on in order to return to the pad ?*(a sketch should help)*

6. Two planes leaves Aral Airport.

   One flies for 200 kilometres on a
   bearing of 060° to Barran Island.

   The 2nd flies from to Capa Bay,
   275 km away on a bearing of 085°.

   a   Make a **scale drawing** showing
   the two stages of the trip.
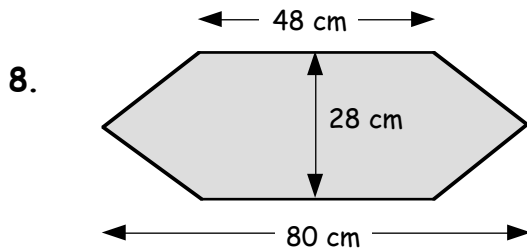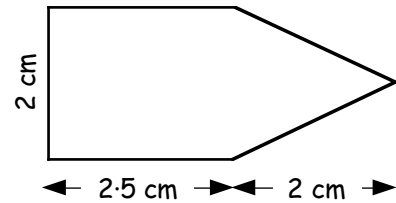
   scale **1 cm = 25 km**.

   b   Measure the distance from
   Barren Island to Capa Bay
   in centimetres.

   c   Calculate the **real** distance from Barren Island to Capa Bay, in kilometres.

   Barren
   Island

   200 km

   060°

   085°

   275 km

   Capa
   Bay

   Aral
   Airport
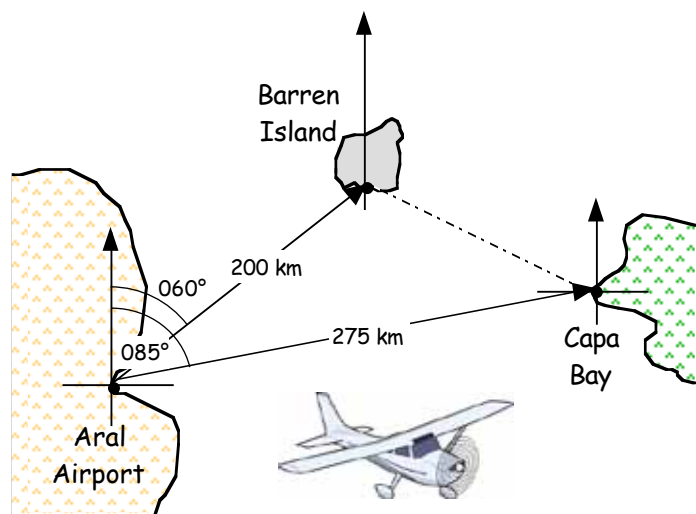
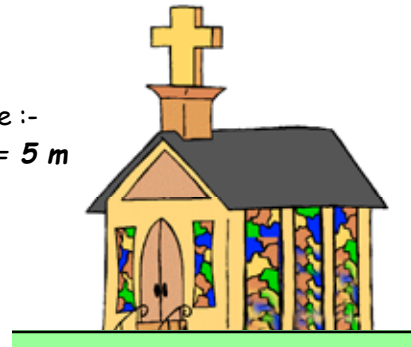**7.** Draw a neat **2 times** enlargement of this shape.

8. Make an accurate drawing of this shape but with its dimensions **one quarter** of those shown.

48 cm

28 cm

80 cm

9. A church is to be drawn using a scale of **1 cm represents 5 metres**.

scale :-
1 cm = 5 m

If the height in the scale drawing is 4·5 cm, find the height of the **real** church.

10. A model of a house is to be built $\frac{1}{40}$ of its real size.

The actual house is 12 metres tall.

What will the height of the model be, in centimetres ?

11. What is the **enlargement scale factor** in this diagram ?

2 cm

4 cm

5 cm

10 cm
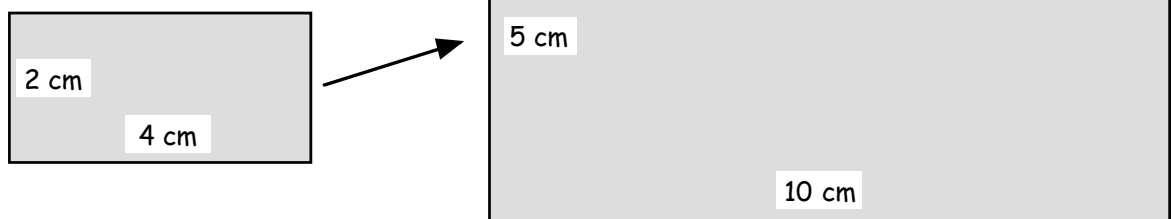
12. The scale factors of each diagram below are shown. Find the values of v, w, g and h.

a

36 m

v m

$\frac{1}{4}$

w m

5·5 m

b

g m

3 m

1·5

3 m

h m

1. Find :–   **a** 5^3 **b** $\sqrt[5]{243}$.

2. For the set of numbers 4, 6 and 15 write down the :–
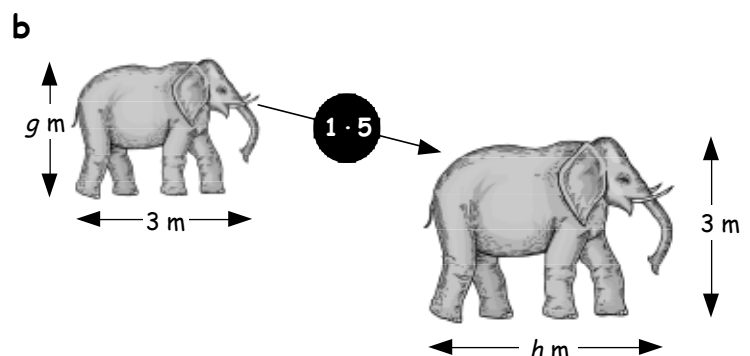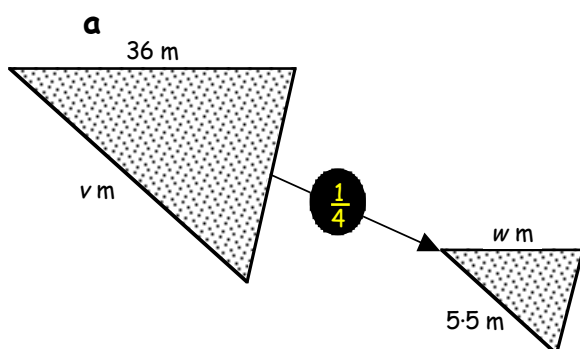
   a lowest common multiple (l.c.m.)   **b highest common factor** (h.c.f.).

3. Write down **all** the **prime** numbers between eighty and a hundred.

4. Write as the **product** of **prime factors a** 45   **b** 140.

5. This table shows the connection between pairs of values.

   Write down a **formula** of the form
   $y = \dots x + \dots$

x	2	4	6	8
y	–5	–3	–1	1

6. Solve for x :–

   a $4x - 1 = 6x + 11$ **b** $5(4x - 1) = 35$ **c** $6(2x - 1) - 7x = 14$
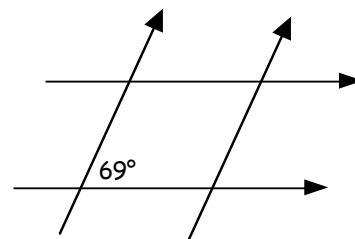
   d $4x - 11 < 33$ **e** $3(3x + 2) < -3$ **f** $\frac{2}{5}(3x - 1) < x$.

7. Copy the sketch shown and fill in ALL missing angles.

   69°

8. Change to litres :–

   a 8600 ml   **b** 50 ml

   c 3 ml   **d** 10 million ml.

9. Change to ml :–   **a** 6 litres   **b** 0·02 litres   **c** 8·07 litres.

10. Make an accurate drawing of triangle ABC with sides 8 cm, 5 cm and 7 cm.

11. Change to a **mixed number** :–   **a** $\frac{73}{8}$ **b** $\frac{147}{9}$.

12. Rewrite as a **top-heavy fraction** :-   **a** $2\frac{1}{5}$ **b** $4\frac{7}{8}$.

13. Simplify fully (where possible) :–

   a $\frac{2}{3} \times \frac{7}{8}$ **b** $\frac{1}{5} \times \frac{8}{9}$ **c** $1\frac{2}{3} \times 2\frac{1}{2}$ **d** $\frac{5}{8} \times \frac{4}{5} \times \frac{1}{4}$

   e $\frac{6}{15} \div \frac{1}{9}$ **f** $\frac{7}{8} \div \frac{2}{3}$ **g** $7\frac{1}{4} \div 2$ **h** $7\frac{1}{2} \div 1\frac{1}{4}$.

14. The area of a rectangle is $9\frac{1}{2}$ cm and has length $4\frac{3}{4}$ cm. Find its breadth.

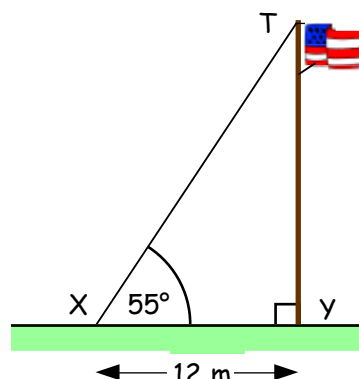**15.** Write the **3 figure bearing** for :-   **a**   East   **b**   North West.

16. A model house has been made to a scale :- **1 cm to 2·5 m**.

     If the length of the model house is 8 cm, what is the length of the **real** house ?

17. **a**   Make a **scale drawing** of this flag pole.

     b   Determine the height of the **real** flag pole.

            scale :- 1 cm = 3 m.

18. A soldier leaves HQ on a 115° bearing. What would be the return bearing ?

19. A Desert platoon leaves Arak.

    • They hike 60 kilometres on a bearing of 070° to Sambuc.

    • The next day they hike on a 200° bearing for 45 km to Mojit.

    a   Make a **scale drawing** showing the two stages of the trip using a scale of **1 cm = 5 km**.
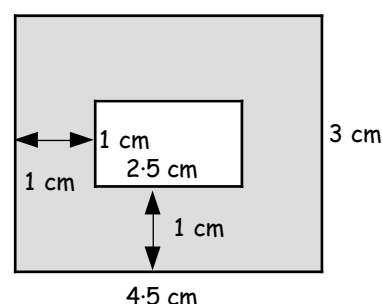
    b   Measure the distance from Arak to Mojit in centimetres.

    c   Calculate the **real** distance from Mojit back to Arak.

    d   If they started their hike directly back to Arak from Mojit at an average speed of 5 km/hr, how long (to the nearest minute) would they take ?
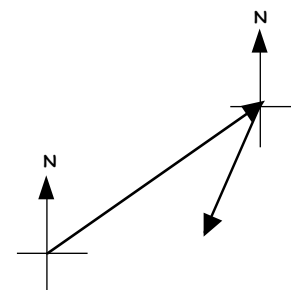
20. Draw a neat **3 times** enlargement of this shape.

21. This shape is not drawn to scale.

    Make an accurate drawing of the shape, but with its dimensions **one quarter** of those shown.