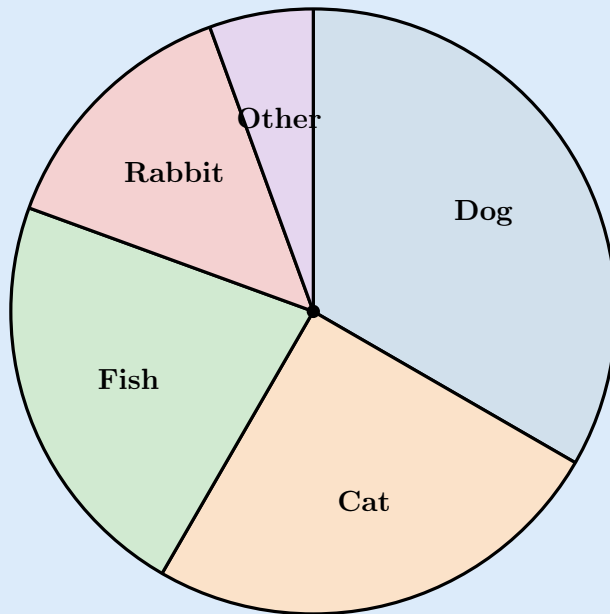


Worked Solutions: Drawing Pie Charts with a Protractor

Teacher Copy — Completed tables and angle workings

Key formula: $\text{sector angle} = \frac{\text{amount}}{\text{total}} \times 360^\circ$

Chart 1 – Favourite Pets (class of 36 students)



Pet	No.	Fraction	Angle
Dog	12	$\frac{1}{3}$	120°
Cat	9	$\frac{1}{4}$	90°
Fish	8	$\frac{2}{9}$	80°
Rabbit	5	$\frac{5}{36}$	50°
Other	2	$\frac{1}{18}$	20°
Total	36	1	360°

Angle working:

$$\frac{12}{36} \times 360 = 120^\circ, \quad \frac{9}{36} \times 360 = 90^\circ, \quad \frac{8}{36} \times 360 = 80^\circ,$$

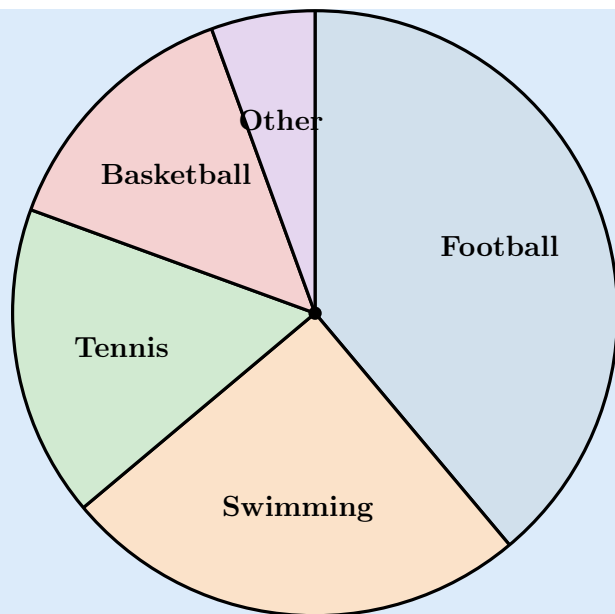
$$\frac{5}{36} \times 360 = 50^\circ, \quad \frac{2}{36} \times 360 = 20^\circ.$$

Check: $120 + 90 + 80 + 50 + 20 = 360^\circ$.

Answers:

- Completed chart shown above. The remaining sectors are Fish 80° , Rabbit 50° , Other 20° .
- Dog, because $\frac{12}{36} = \frac{1}{3}$.
- Cat: 9 students corresponds to a 90° sector.

Chart 2 – Sports Club Memberships (36 members)



Sport	No.	Fraction	Angle
Football	14	$\frac{7}{18}$	140°
Swimming	9	$\frac{1}{4}$	90°
Tennis	6	$\frac{1}{6}$	60°
Basketball	5	$\frac{5}{36}$	50°
Other	2	$\frac{1}{18}$	20°
Total	36	1	360°

Angle working:

$$\frac{14}{36} \times 360 = \frac{7}{18} \times 360 = 140^\circ, \quad \frac{9}{36} \times 360 = 90^\circ, \quad \frac{6}{36} \times 360 = 60^\circ,$$

$$\frac{5}{36} \times 360 = 50^\circ, \quad \frac{2}{36} \times 360 = 20^\circ.$$

Check: $140 + 90 + 60 + 50 + 20 = 360^\circ$.

Answers:

1. Completed chart shown above.
2. Swimming has a 90° sector because $\frac{9}{36} = \frac{1}{4}$.
3. Tennis fraction = $\frac{6}{36} = \frac{1}{6}$.
4. The three smallest sports are Tennis, Basketball and Other:

$$60^\circ + 50^\circ + 20^\circ = 130^\circ.$$

Chart 3 – How Students Spend Most of Their Pocket Money (36 students)



Category	No.	Fraction	Angle
Food & Drink	12	$\frac{1}{3}$	120°
Games	9	$\frac{1}{4}$	90°
Clothes	6	$\frac{1}{6}$	60°
Savings	6	$\frac{1}{6}$	60°
Other	3	$\frac{1}{12}$	30°
Total	36	1	360°

Angle working:

$$\frac{12}{36} \times 360 = 120^\circ, \quad \frac{9}{36} \times 360 = 90^\circ, \quad \frac{6}{36} \times 360 = 60^\circ,$$

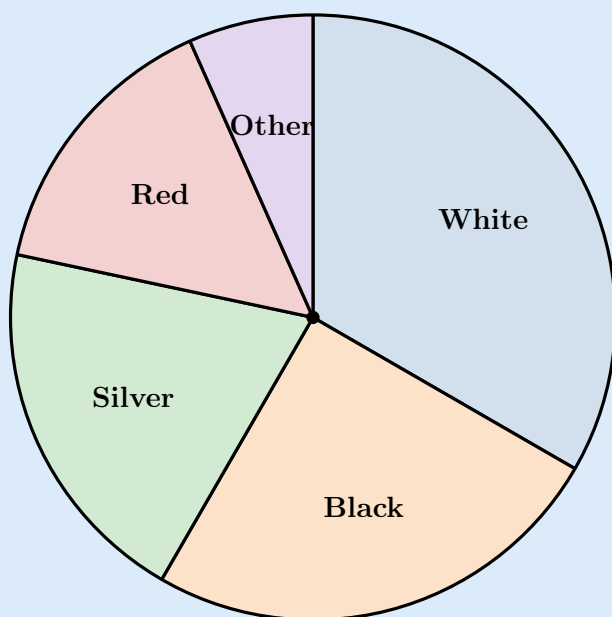
$$\frac{6}{36} \times 360 = 60^\circ, \quad \frac{3}{36} \times 360 = 30^\circ.$$

Check: $120 + 90 + 60 + 60 + 30 = 360^\circ$.

Answers:

1. Completed chart shown above.
2. Clothes and Savings both have 6 students, so they both have a sector angle of 60° .

Chart 4 – Colours of Cars in a Car Park (60 cars)



Colour	No.	Fraction	Angle
White	20	$\frac{1}{3}$	120°
Black	15	$\frac{1}{4}$	90°
Silver	12	$\frac{1}{5}$	72°
Red	9	$\frac{3}{20}$	54°
Other	4	$\frac{1}{15}$	24°
Total	60	1	360°

Table working:

$$\begin{aligned}\text{White: } \frac{20}{60} &= \frac{1}{3} \Rightarrow \frac{1}{3} \times 360 = 120^\circ, \\ \text{Black: } \frac{15}{60} &= \frac{1}{4} \Rightarrow \frac{1}{4} \times 360 = 90^\circ, \\ \text{Silver: } \frac{12}{60} &= \frac{1}{5} \Rightarrow \frac{1}{5} \times 360 = 72^\circ, \\ \text{Red: } \frac{9}{60} &= \frac{3}{20} \Rightarrow \frac{3}{20} \times 360 = 54^\circ, \\ \text{Other: } \frac{4}{60} &= \frac{1}{15} \Rightarrow \frac{1}{15} \times 360 = 24^\circ.\end{aligned}$$

Answers:

1. Completed table shown above.
2. Completed pie chart shown above.
3. White angle:

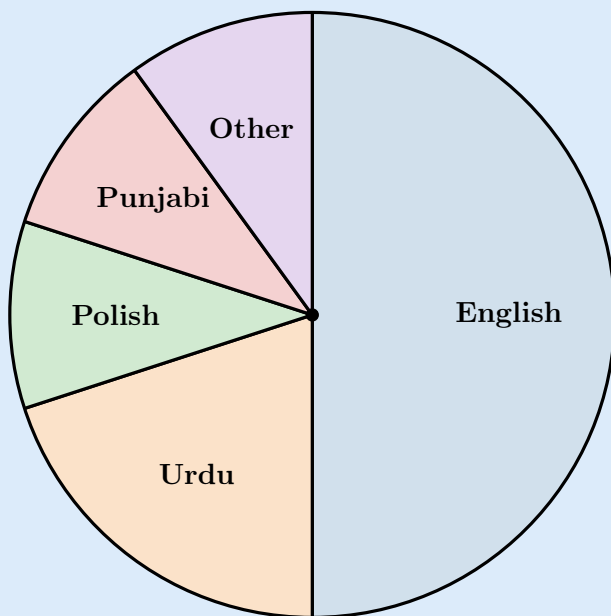
$$\frac{20}{60} \times 360 = \frac{1}{3} \times 360 = 120^\circ.$$

4. Black fraction = $\frac{15}{60} = \frac{1}{4}$.

5. Angle sum check:

$$120 + 90 + 72 + 54 + 24 = 360^\circ.$$

Chart 5 – Languages Spoken at Home (survey of 90 students)



Language	No.	Fraction	Angle
English	45	$\frac{1}{2}$	180°
Urdu	18	$\frac{1}{5}$	72°
Polish	9	$\frac{1}{10}$	36°
Punjabi	9	$\frac{1}{10}$	36°
Other	9	$\frac{1}{10}$	36°
Total	90	1	360°

Table working:

$$\frac{45}{90} = \frac{1}{2} \Rightarrow \frac{1}{2} \times 360 = 180^\circ, \quad \frac{18}{90} = \frac{1}{5} \Rightarrow \frac{1}{5} \times 360 = 72^\circ,$$

$$\frac{9}{90} = \frac{1}{10} \Rightarrow \frac{1}{10} \times 360 = 36^\circ \quad \text{for Polish, Punjabi and Other.}$$

$$\text{Check: } 180 + 72 + 36 + 36 + 36 = 360^\circ.$$

Answers:

1. Completed table shown above.
2. Completed pie chart shown above.
3. Polish, Punjabi and Other all have 9 speakers, so each sector is

$$\frac{9}{90} \times 360 = \frac{1}{10} \times 360 = 36^\circ.$$

4. English fraction = $\frac{45}{90} = \frac{1}{2}$.

5. Challenge:

New total = $90 + 10 = 100$, New number of Polish speakers = $9 + 10 = 19$.

$$\text{New Polish angle} = \frac{19}{100} \times 360 = 68.4^\circ.$$

So the new sector angle for Polish is 68.4° (accept 68° or 69° to the nearest degree).