7. A parallelogram $PQRS$ has area $50\,\text{cm}^2$

Given

- PQ has length $14\,\text{cm}$
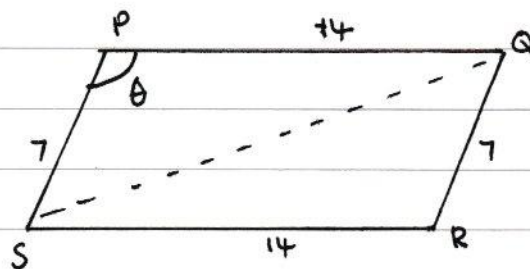- QR has length $7\,\text{cm}$
- angle SPQ is obtuse

find

(a) the size of angle SPQ, in degrees, to 2 decimal places,

(3)

(b) the length of the diagonal SQ, in cm, to one decimal place.

(2)

$\theta = S\hat{P}Q$ is obtuse

(a) Need a $\triangle$ to get θ so draw in SQ (also needed in (b))

$$\text{Area } \triangle = \tfrac{1}{2}ab\sin\theta$$

so area of parallelogram $= 2\times$ Area of $\triangle$

$$= ab\sin\theta$$

giving

$$50 = 7\times14\sin\theta$$

$$\theta = \sin^{-1}\left(\frac{50}{98}\right)$$

Calculator gives $30.68°$, But we want the obtuse equivalent

$$= 180 - 30.68 = \underline{149.32°}$$

(b) Here need the cosine rule (two sides + included angle)

$$SQ^2 = 7^2 + 14^2 - 2\times7\times14\cos(149.32) \quad (\cos \text{ is } -\text{ve here})$$

$$= 413.57$$

$$\text{so } SQ = \underline{20.3\,\text{cm}} \text{ to 1 dec pl.}$$