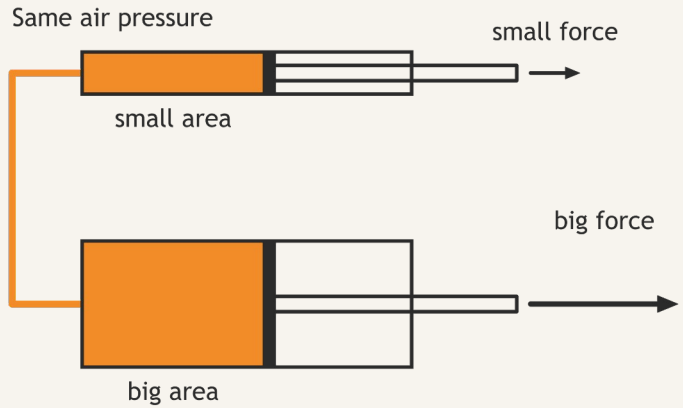
Daily Review



1. **Name** the rod moving in.
2. **State** what pushes a double-acting rod back.
3. **State** check 1 when fault-finding.
4. **State** our safe gauge reading.
5. **Find** the area of a 10 mm by 20 mm rectangle.

Force, Pressure and Area

How big a force can the air make?



S3 Engineering Science

By the end of this lesson…



1. I can **use** P = F/A to find a **pressure**
2. I can **find** a **force** or an **area** from P = F/A

Why a Bigger Cylinder Pushes Harder

Same pressure

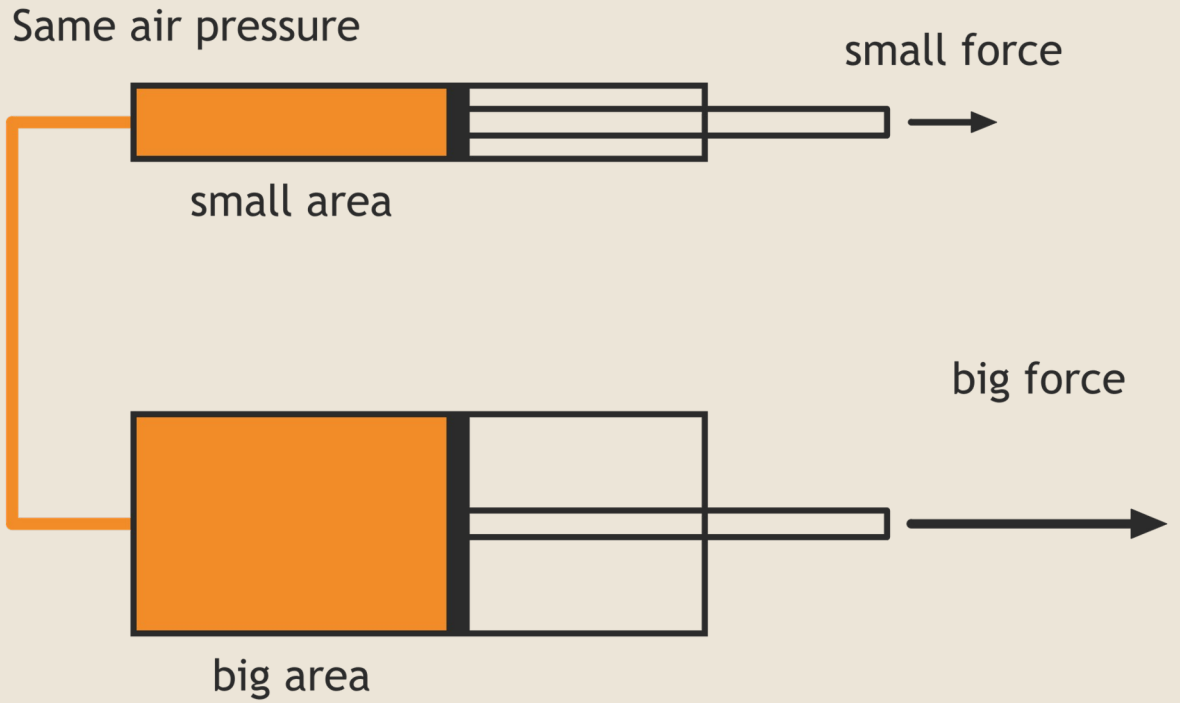
the same push on every **mm²** of piston

Bigger area

more mm² for the air to **push** on

So

a bigger **force**



Pressure, Force and Area

$$P = F/A$$

P = pressure, in **N mm^{-2}**

F = force, in **N**

A = area, in **mm^2**

Our gauge: 1 bar = 0.1 N mm^{-2}



Worked Example 1: Find the Pressure (2 marks)

A piston has an area of 250 mm^2. It outstrokes with a force of 40 N. Calculate the air pressure supplied.

$F = 40\ N$

$A = 250\ mm^2$

$P = ?$

$P = F/A$

$P = 40/250$

$P = 0.16\ N\ mm^{-2}$

We Do: Find the Pressure (2 marks)

A piston has an area of 300 mm^2. It outstrokes with a force of 54 N. Calculate the air pressure supplied.

$F = 54\ N$

$A = 300\ mm^2$

$P = ?$

$P = F/A$

$P = 54/300$

$P = 0.18\ N\ mm^{-2}$

Your Step: Find the Force (3 marks)

The air pressure is 0.30 N mm^{-2} and the piston area is 200 mm^2. Calculate the outstroking force.

$P = 0.30\ \text{N mm}^{-2}$

$A = 200\ \text{mm}^2$

$F = ?$

$P = F/A$

$0.30 = F/200$

$F = 0.30 \times 200$

$F = 60\ \text{N}$

Second Start

1. **State** the formula for pressure.
2. **State** the unit of pressure.
3. **State** the unit of area.
4. **Find** P: F = 40 N, A = 200 mm^2.
5. **State** which pushes harder: big or small piston.

Worked Example 2: Find the Area (3 marks)

Cylinder A is supplied with an air pressure of 0.40 N mm^{-2} and outstrokes with a force of 180 N. Calculate the piston area.

$P = 0.40$ N mm^{-2}

$F = 180$ N

$A = ?$

$P = F/A$

$0.40 = 180/A$

$A = 180/0.40$

$A = 450$ mm^2

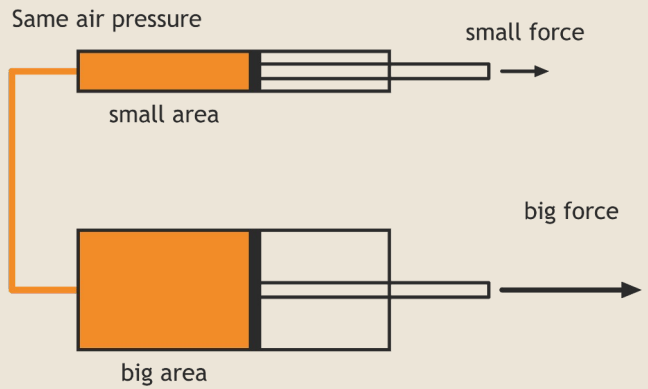
Your Turn

Show Me board

1 $F = 90$ N, $A = 300$ mm^2. **Find** P.

2 $P = 0.25$ N mm^{-2}, $A = 320$ mm^2. **Find** F.

3 $P = 0.50$ N mm^{-2}, $F = 210$ N. **Find** A.



Answers: Your Turn



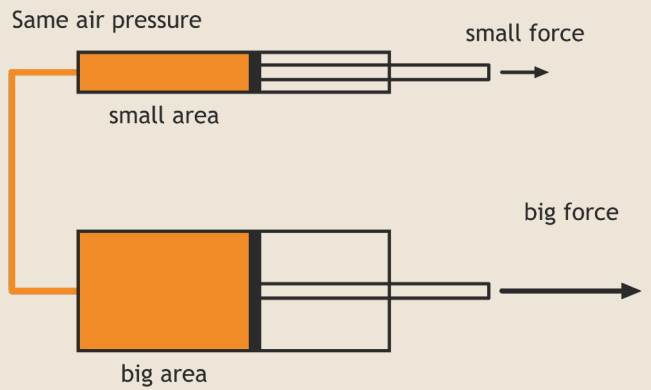
1. 1 P = 90 ÷ 300
2. 2 F = 0.25 × 320
3. 3 A = 210 ÷ 0.50

Review Questions

Booklet page 13

Answer Questions 1 to 5 on your own.

Finished? Try the Challenge.



Answers: Review Questions



Question	Answer
1	
2	
3	
4	
5	
Challenge	

Look back — by the end of this lesson…



1. I can **use** P = F/A to find a **pressure**
2. I can **find** a **force** or an **area** from P = F/A

Credits

Drawings: Sources: cylinder and piston drawings by R Stewart.

Worked example layout: © Qualifications Scotland (SQA). Worked examples set out as the N5 Engineering Science marking instructions set out 2021 Question 12(c), 2022 Question 15(c) and 2025 Question 8(d); numbers are new.

Challenge: 2026 Q14(b): © Qualifications Scotland (SQA). N5 Engineering Science 2026, Question 14(b).

R Stewart - October 2026