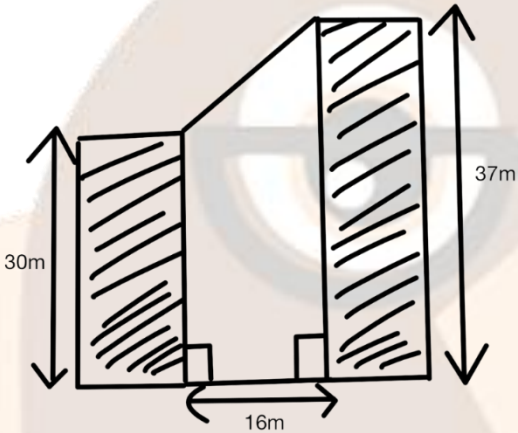
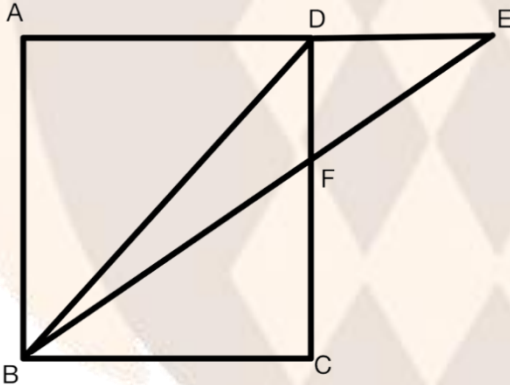
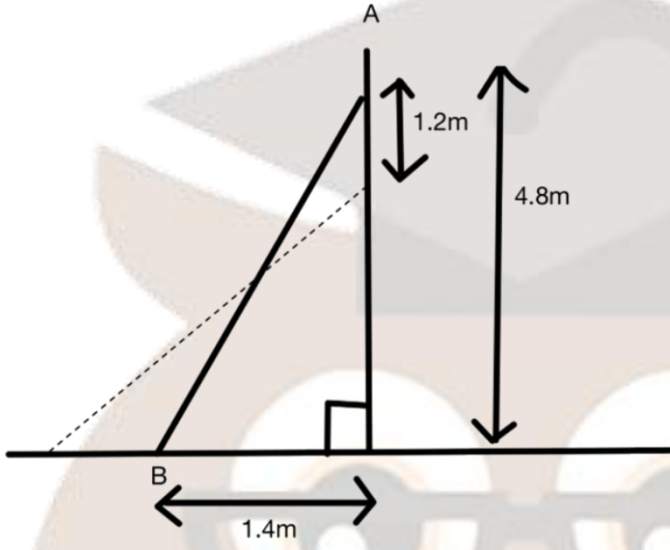
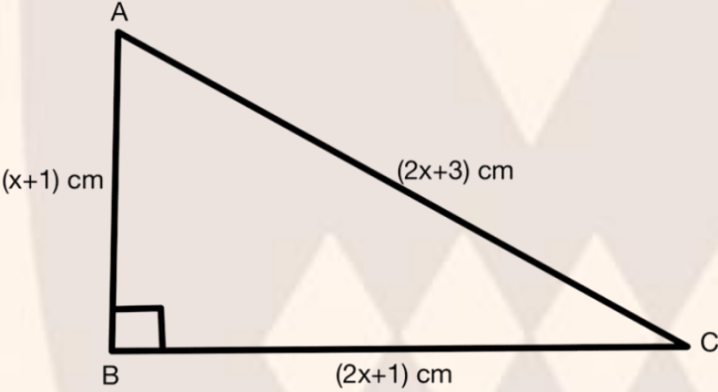
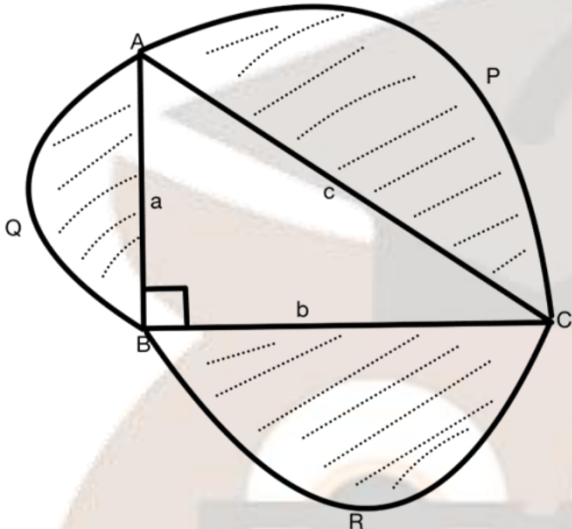
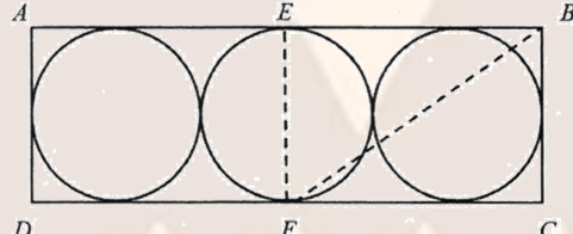


6 ESSENTIAL QUESTIONS TO MASTER

PHYTHAGORAS' THEOREM

1	Two vertical buildings of heights 30 m and 37 m are 16 m apart. A cable is pulled taut and attached from the top of one building to the top of the other building. Find the length of the cable. 	
2	The diagram below is not drawn to scale. It shows a square ABCD of side 9cm. ADE and BFE are straight lines. Given that DE = 5cm, find (a) Length of BE (b) Area of Triangle BDE (c) The shortest distance from D to BE 	
3	In the diagram, a ladder AB, leans against a vertical wall. The foot of the ladder is 1.4 m from the wall and the ladder reaches a height of 4.8 m. The ladder then slides 1.2 m down the wall. Find how far the foot of ladder has moved from its original position.	

		
4	The diagram shows $\triangle ABC$ in which $\angle ABC = 90^\circ$, $AB = (x + 1)$ cm, $BC = (2x + 1)$ cm, and $AC = (2x + 3)$ cm.  (a) Use Pythagoras' theorem to form an equation in x and show that it reduces to $x^2 - 6x - 7 = 0$. (b) Solve the equation $x^2 - 6x - 7 = 0$ and hence calculate the perimeter and the area of $\triangle ABC$.	
5	Given $\triangle ABC$ is a right-angled triangle. A semicircle is constructed on each of the sides AB, BC, and AC. $AB = a$, $BC = b$ and $AC = c$	

	 Show that Area of semicircle APC = Area of semicircle AQB + Area of semicircle BRC.	
6	The diagram below shows three identical circles fitted inside a rectangle. The diameter of each circle is 12 cm. Line EF passes through the center of the circle.  Find the length of line BF.	

Answer Key:

1	Cable ($= \sqrt{7^2 + 16^2} = 17.5 \sim \text{m}$) (3.s.f)	
2	(a) In $\triangle ABE$, $BE^2 = AB^2 + AE^2$ (Pythagoras's theorem) $= 9^2 + 14^2$ $= 81 + 196$ $= 277$ $BE = \sqrt{277}$ $= 16.6 \text{ cm}$ (3 sig. fig.) (b) Area of $\triangle BDE$	

	$= \frac{1}{2} \times \text{Base} \times \text{Height}$ $= \frac{1}{2} \times DE \times AB$ $= \frac{1}{2} \times 5 \times 9$ $= 22.5 \text{ cm}^2$ (c) Area of $\triangle BDE = 22.5 \text{ cm}^2$ (From part (b)) $\frac{1}{2} \times BE \times DG = 22.5$ $\frac{1}{2} \times \sqrt{277} \times DG = 22.5$ $DG = \frac{22.5 \times 2}{\sqrt{277}}$ $= 2.70 \text{ cm (3 sig. fig.)}$ Therefore, the shortest distance from D to BE is 2.70cm.	
3	In $\triangle ABX$, $AB^2 = BX^2 + AX^2 \text{ (Pythagoras' theorem)}$ $= 1.4^2 + 4.8^2$ $= 25$ $AB = \sqrt{25}$ $= 5\text{m}$ Therefore, the length of the ladder is 5 m. $CX = 4.8 - 1.2 = 3.6 \text{ m}$ $CD = AB$ (Length of ladder) $= 5 \text{ m}$ In $\triangle CDX$, $DX^2 + CX^2 = DC^2 \text{ (Pythagoras' theorem)}$ $DX^2 + 3.6^2 = 5^2$ $DX^2 = 5^2 - 3.6^2$ $= 12.04$ $DX = \sqrt{12.04} \text{ cm}$ Distance moved by the foot of the ladder $= DX - BX$ $= \sqrt{12.04} - 1.4$ $= 2.07 \text{ m (3 sig. fig.)}$	
4	(a) Applying the Pythagorean Theorem $AB^2 + BC^2 = AC^2 \text{ (Pythagoras' theorem)}$ $(x + 1)^2 + (2x + 1)^2 = (2x + 3)^2$ $x^2 + 2x + 1 + 4x^2 + 4x + 1 = 4x^2 + 12x + 9$ $5x^2 + 6x + 2 = 4x^2 + 12x + 9$	

	$x^2 - 6x - 7 = 0$ (Shown) (b) Solving the Quadratic Equation $x^2 - 6x - 7 = 0$ $(x + 1)(x - 7) = 0$ Therefore, $x + 1 = 0$ or $x - 7 = 0$ $x = -1$ or $x = 7$ (rejected since length is positive, $x + 1 = -1 + 1 = 0$) Therefore, $x = 7$ cm $AB = x + 1 = 7 + 1 = 8$ cm $BC = 2x + 1 = 2(7) + 1 = 15$ cm $AC = 2x + 3 = 2(7) + 3 = 17$ cm Perimeter of $\triangle ABC$ $= 8 + 15 + 17$ $= 40$ cm Area of $\triangle ABC$ $= \frac{1}{2} \times \text{Base} \times \text{Height}$ $= \frac{1}{2} \times BC \times AB$ $= \frac{1}{2} \times 15 \times 8$ $= 60$ cm ²	
5	Area of semicircle APC = $\frac{1}{2} \left(\frac{c}{2}\right)^2 (\pi) = c^2 \left(\frac{\pi}{8}\right)$ Area of semicircle AQB = $\frac{1}{2} \left(\frac{a}{2}\right)^2 (\pi) = a^2 \left(\frac{\pi}{8}\right)$ Area of semicircle BRC = $\frac{1}{2} \left(\frac{b}{2}\right)^2 (\pi) = b^2 \left(\frac{\pi}{8}\right)$ Since by Pythagoras' theorem, $a^2 + b^2 = c^2$ AND Area of semicircle APC = $c^2 \left(\frac{\pi}{8}\right)$ Area of semicircle AQB + Area of semicircle BRC = $(a^2 + b^2) \left(\frac{\pi}{8}\right)$ Thus, Area of semicircle APC = Area of semicircle AQB + Area of semicircle BRC	
6	Find the length of line BF . By Pythagoras Theorem, $BF = \sqrt{18^2 + 12^2}$ $= 21.633$ $= 21.6$ cm	

