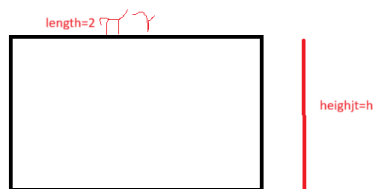


Curved surface is made by the rectangle



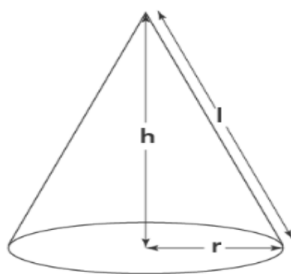
Curved surface area, A , of cylinder of radius r , height h . $=2\pi rh$

Curved surface area, A , of cone of
radius r , sloping edge l :

$$A = \pi rl$$

Preview from Notesale.co.uk
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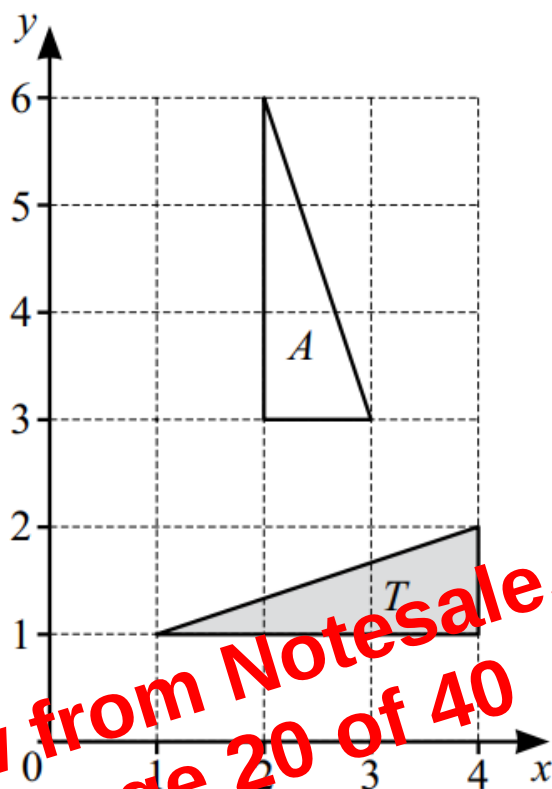
Figure 10.20



Where slant height $=l$

$$\text{Range} = x_5 - x_1 = 10$$

Q15



Describe fully the single transformation that maps triangle T onto triangle A.

Solution $f(x,y)$ to $f(y,x)$

Or

$$\begin{pmatrix} x \\ y \end{pmatrix} \rightarrow \begin{pmatrix} y \\ x \end{pmatrix}$$

Q16

A student measures the height, h cm, of each of 400 plants.

(a) The cumulative frequency diagram shows the results.

In triangle $\triangle ADB$

$$\angle BAD + \angle ABD + \angle ADB = 74 + \delta + \gamma = 180 \text{ Or}$$

$$74 + \delta + 34 = 180 \text{ Or}$$

$$\delta + 108 = 180 \text{ Or}$$

$$\delta = 180 - 108 = 72^\circ \text{ Or}$$

$$\text{angle } ABD = 72^\circ$$

(b) In the diagram, triangle ADX is similar to triangle BCX.

$$BC = 4.5 \text{ cm, } AD = 9\text{cm and } CX = 3.3\text{cm.}$$

To Work out XD.

$$\text{Since } \triangle ADX \sim \triangle BCX \implies$$

$$\angle CAD = \angle CBD = \phi$$

$$\text{Now } \frac{BC}{CX} = \frac{AD}{DX}$$

$$\text{Or } \frac{4.5}{3.3} = \frac{9}{DX}$$

$$DX = \left(\frac{3.5}{4.5}\right)(9) = \left(\frac{35}{45}\right)(9) = 7\text{cm}$$

$$\text{Or } f(x) = 3 - 2x, g(x) = 2x - 2, h(x) = 2^x$$

(a) (i) Find $f(-3)$.

(ii) Find $gf(-3)$.

(b) Find $f^{-1}(x)$

(c) Find x when $gg(x) = 7$.

(d) Find x when $h^{-1}(x) = 5$.

Solution

$$(i) f(-3) = 3 - 2(-3) = 3 + 6 = 9$$

$$(ii) gf(x) = g(3 - 2x) = 2(3 - 2x) + 3 = 6 - 4x + 3 = 9 - 4x$$

$$gf(-3)=9-4(-3)=9+12=21$$

(b) To find $f^{-1}(x)$

$$\text{Put } y=f(x)=3-2x$$

$$\text{Or } 3-2x=y$$

$$\text{Or } 3-y=2x$$

$$\text{Or } 2x=3-y$$

$$\text{Or } x = \frac{3-y}{2}$$

$$\text{Since } f(x)=y \implies x = f^{-1}(y)$$

$$\text{Hence } x = f^{-1}(y) = \frac{3-y}{2}$$

$$f^{-1}(y) = \frac{3-y}{2}$$

Since y is dummy variable

$$f^{-1}(x) = \frac{3-x}{2}$$

(c) To find x when $gg(x) = 7$

$$g(x)=2x+3$$

$$gg(x)=g(2x+3)=2(2x+3)+3=4x+6+3=4x+9=7$$

$$4x = 7 - 9 = -2$$

$$x = \frac{-2}{4} = -\frac{1}{2}$$

(d) To find x when $h^{-1}(x) = 5$.

$$h(x)=2^x$$

Taking $\ln$

$$\ln h(x) = \ln 2^x$$

$$\ln h(x) = x \ln 2$$

$$x \ln 2 = \ln h(x)$$

$$\begin{aligned}
& \frac{3}{x-4} - \frac{4}{x+3} \\
&= \frac{3(x+3)}{(x-4)(x+3)} - \frac{4(x-4)}{(x+3)(x-4)} \\
&= \frac{3(x+3)-4(x-4)}{(x-4)(x+3)} \\
&= \frac{3(x+3)-4(x-4)}{(x-4)(x+3)} \\
&= \frac{3x+9-4x+16}{(x-4)(x+3)} \\
&= \frac{-x+25}{(x-4)(x+3)}
\end{aligned}$$

Q24 (a) Write $x^2 - 4x + 7$ in the form $(x - a)^2 + b$

Solution

$$x^2 - 4x + 4 + 3 = (x^2 - 4x + 4) + 3 = (x - 2)^2 + 3$$

(b)

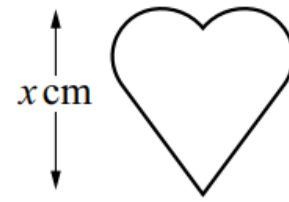
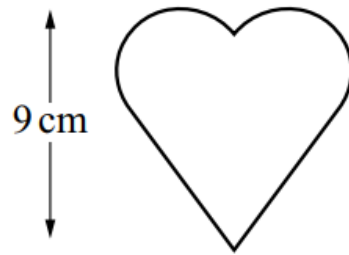
$$y = (x - 2)^2 + 3$$

$$y - 3 = (x - 2)^2$$

Putting $x - 2 = X$, $y - 3 = Y$

$Y = X^2$ Or $X^2 = Y$ is equation of parabola with axis of symmetry $x = 2$

At $x = 2$, $y = 3$ So turning point $(2, 3)$ is shown in figure



The two shapes are mathematically similar.

The area of the larger shape is 36cm^2

and the area of the smaller shape is 25cm^2

The height of the larger shape is 9cm and the height of the smaller shape is x cm.

Find the value of x.

Solution

Since shape are similar

$$\frac{x}{9} = \frac{\text{area of smaller figure}}{\text{area of larger figure}} = \frac{25}{36}$$

$$x = \frac{25}{36} \times 9$$

$$x = \frac{25}{36} \times 9 = \frac{25}{4} = 6.25\text{cm}$$

Q26