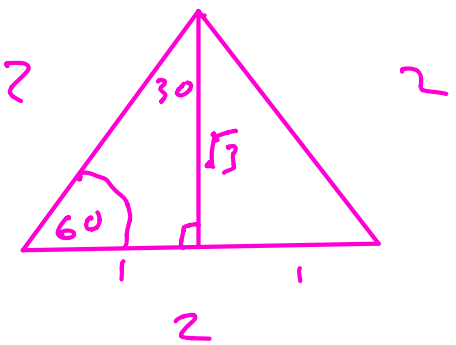
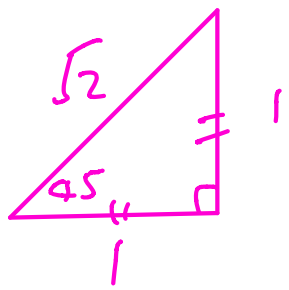
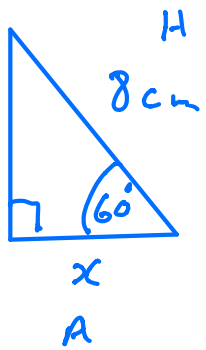
Trig Ratios For 30°, 45°, 60°

	0°	30°	45°	60°	90°
Sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
Cos	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
tan	0	$\frac{1}{\sqrt{3}}$	1	$\frac{\sqrt{3}}{1}$	∞







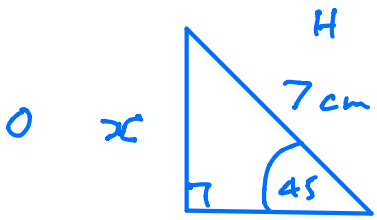
Find x

$$\cos 60 = \frac{x}{8}$$

$$8\cos 60^\circ = x$$

$$8 \times \frac{1}{2} = x$$

$$x = 4\text{cm}$$



Find x

$$\sin 45 = \frac{x}{7}$$

$$7\sin 45 = x$$

$$\frac{7}{\sqrt{2}} = x$$

$$\text{or} \quad x = \frac{7\sqrt{2}}{2}$$

Direct and Inverse Proportion

Ex1 y is directly proportional to the square of x. When $x = 5$, $y = 75$

Find y when $x = 4$

Find x when $y = 27$

$$y = kx^2$$
$$75 = k \times 5^2$$
$$75 = 25k$$
$$\frac{75}{25} = k$$
$$3 = k$$

$$y = 3x^2$$

when $x = 4$

$$y = 3 \times 4^2 = 48$$

when $y = 27$

$$27 = 3x^2$$
$$9 = x^2$$
$$x = \pm 3$$

Ex 2 p is inversely proportional to the cubic root of q

when $q = 64$, $p = 25$

Find the relationship linking p and q

$$p = \frac{k}{\sqrt[3]{q}}$$

$$25 = \frac{k}{\sqrt[3]{64}}$$

$$25 = \frac{k}{4}$$

$$25 \times 4 = k$$

$$100 = k$$

$$p = \frac{100}{\sqrt[3]{q}}$$

kg

1 T is directly proportional to x^2. If $T = 36$ when $x = 3$, find the following.

a T when $x = 5$

b x when $T = 400$

2 W is directly proportional to M^2. If $W = 12$ when $M = 2$, find the following.

a W when $M = 3$

b M when $W = 75$

1) $T = kx^2$

$36 = k \times 3^2$

$36 = 9k$

$\frac{36}{9} = k$

$4 = k$

$T = 4x^2$

$x = 5$ $\quad T = 4 \times 5^2 = 100$

$T = 400$ $\quad 400 = 4x^2$

$100 = x^2$

$x = \pm 10$

2) $W = kM^2$

$12 = k \times 2^2$

$12 = 4k$

$\frac{12}{4} = k$

$3 = k$

$W = 3M^2$

$M = 3 \quad W = 3 \times 3^2 = 27$

$W = 75 \quad 75 = 3M^2$

$25 = M^2$

$M = \pm 5$

3 Q varies inversely with $(5 - t)$. If $Q = 8$ when $t = 3$, find the following.

a Q when $t = 10$

b t when $Q = 16$

4 M varies inversely with t^2. If $M = 9$ when $t = 2$, find the following.

a M when $t = 3$

b t when $M = 1.44$

3) $Q = \frac{k}{5-t}$

$8 = \frac{k}{5-3}$

$8 = \frac{k}{2}$

$8 \times 2 = k$

$16 = k$

$Q = \frac{16}{5-t}$

4) $M = \frac{k}{t^2}$

$9 = \frac{k}{2^2}$

$9 = \frac{k}{4}$

$9 \times 4 = k$

$36 = k$

$M = \frac{36}{t^2}$

Completing the Square

Ex 1 Write x^2+6x+5 in the form $(x+a)^2+b$

$$x^2+6x+5 = (x+3)^2+5-9$$
$$= (x+3)^2-4$$

Ex 2 x^2-5x+7

$$x^2-5x+7 = \left(x-\tfrac{5}{2}\right)^2+7-\tfrac{25}{4}$$
$$= \left(x-\tfrac{5}{2}\right)^2+\tfrac{28}{4}-\tfrac{25}{4}$$
$$= \left(x-5/2\right)^2+\tfrac{3}{4}$$

Exercise Complete the squares

1) x^2-8x-1

$$= (x-4)^2-1-16$$
$$= (x-4)^2-17$$

2) x^2+3x+5

$$= \left(x+\tfrac{3}{2}\right)^2+5-\tfrac{9}{4}$$
$$= \left(x+3/2\right)^2+\tfrac{20}{4}-\tfrac{9}{4} = \left(x+\tfrac{3}{2}\right)^2+\tfrac{11}{4}$$