Extended Question

Solve the following simultaneous equations with three unknowns.

$$\begin{cases} a + b + c = 4 \quad\text{.................... (1)} \\ 2a - b + c = 0 \quad\text{.................... (2)} \\ 2a + b - 3c = 10 \text{.................... (3)} \end{cases}$$

(Hint: Try to eliminate one of the three unknowns and reduce the simultaneous equations into equations in two unknowns.)

Learning from Mistakes

There are mistakes in the following calculation. Make necessary corrections.

Solve $\begin{cases} \dfrac{x}{2} - \dfrac{y}{3} = 3 \quad\text{..................... (1)} \\ \dfrac{x}{4} + y = -2 \quad\text{.................. (2)} \end{cases}$.

From (2), $y = -2 - \dfrac{x}{4}$ .... (3)

Substituting (3) into (1),

$$\frac{x}{2} - \frac{-2 - \dfrac{x}{4}}{3} = 3$$

$$\frac{x}{2} + \frac{2}{3} - \frac{x}{12} = 3$$

$$\frac{5}{12} x = \frac{7}{3}$$

$$x = \frac{28}{5}$$

Open-ended Question

Two simultaneous linear equations in two unknowns have 0, 1 or infinite number of solutions. How do we know that? State your reasoning.

Enrichment Mathematics

Weather forecast

In summer, when a typhoon is approaching Hong Kong, we will watch out for the weather bulletin produced by The Hong Kong Observatory（香港天文台）. Have you ever thought of how weather is forecasted? This can be done by solving simultaneous equations with more than two equations and unknowns. You will learn how to solve them in higher form.

Weather Forecast

Monday   Tuesday

Meteorologists（氣象學家）make use of advanced mathematics and technology to set up simultaneous equations with many unknowns. These simultaneous equations reflect the pattern of atmospheric changes. Solving these simultaneous equations gives the climatic changes in the future.
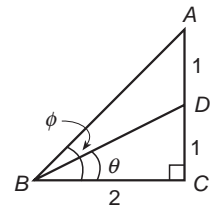
Glossary

graphical method	圖解法	linear equations in two unknowns	二元一次方程
method of elimination	消去法	method of substitution	代入法
point of intersection	交點	simultaneous equations	聯立方程

9. If $\cos \theta = \dfrac{9}{41}$, find $\sin \theta$ and $\tan \theta$.
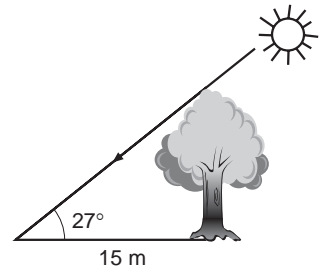
10. Find the value of $3 \sin 10° + 2 \cos 15° - 3 \tan 20°$. (Give the answer correct to 3 decimal places.)

Level 2

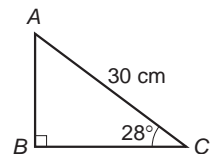11. In the figure, $AD = CD = 1$ and $BC = 2$. Find θ and ϕ. Is $\phi = 2\,\theta$?

12. A boy wants to measure the height of the tree as shown in the figure. The sun ray makes an angle 27° with the horizontal ground. If the shadow of the tree is 15 m, find the height of the tree. (Give the answer correct to 2 decimal places.)

13. In the figure, find, correct to 3 significant figures,
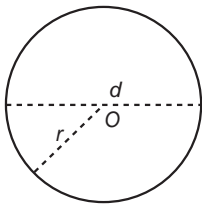
   (a) AB and BC;

   (b) the area of $\triangle ABC$.
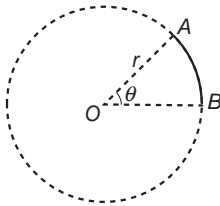
11 Areas and Volumes (2)

Let's Review

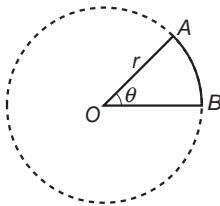### 1. Circle

Circumference $= 2\pi r = \pi d$

Area $= \pi r^2$

2. Arc

Arc AB is denoted by $\overset{\frown}{AB}$.

Arc length of $\overset{\frown}{AB} = 2\pi r\left(\dfrac{\theta}{360°}\right)$

3. Sector

Area of sector $OAB = \pi r^2\left(\dfrac{\theta}{360°}\right)$

e.g. Arc length of $\overset{\frown}{AB} = 2\pi(3)\left(\dfrac{60°}{360°}\right) = \pi$ cm

Area of sector $OAB = \pi r^2\left(\dfrac{60°}{360°}\right) = \dfrac{3\pi}{2}$ cm^2
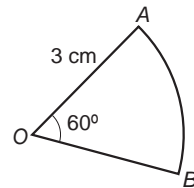
4. Cylinder
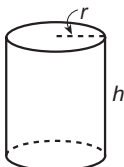
Curved surface area of a cylinder $= 2\pi rh$

Total surface area of a cylinder $= 2\pi rh + 2\pi r^2$

Volume of a cylinder $= \pi r^2 h$
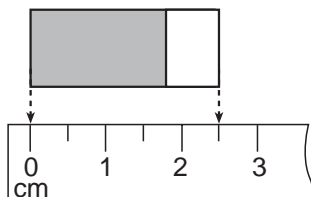
Choose the most suitable answer from the four choices.

1. Round off 123 to the nearest tens.
   A. 100
   B. 120
   C. 123
   D. 130

2. In the figure, the percentage error of the length of the rubber is

   A. 20%.
   B. 10%.
   C. 5%.
   D. 0.5%.

3. Expand $\left(2x + \dfrac{1}{2x}\right)\left(2x - \dfrac{1}{2x}\right)$.

   A. $2x^2 - \dfrac{1}{2x^2}$

   B. $4\left(x + \dfrac{1}{x}\right)\left(x - \dfrac{1}{x}\right)$

   C. $\left(2x - \dfrac{1}{2x}\right)^2$

   D. $4x^2 - \dfrac{1}{4x^2}$

4. $(2x - 4)^2 =$
   A. $4x^2 - 16$
   B. $4x^2 - 8x - 16$
   C. $4x^2 - 8x + 16$
   D. $4x^2 - 16x + 16$

5. Simplify $\dfrac{5}{12x^3y^2} - \dfrac{1}{18x^2y^4} + \dfrac{3}{16x^3y^3}$.

   A. $\dfrac{5x^3 - xy}{12x^3y^4}$

   B. $\dfrac{5 + y}{36x^3y^2}$

   C. $\dfrac{7y^2 - 3}{72x^3y^2}$

   D. $\dfrac{60y^2 - 8x + 27y}{144x^3y^4}$

6. Factorize $12x^2 - 27y^2$.
   A. $(4x - 3y)(3x - 9y)$
   B. $3(2x + 3y)(2x - 3y)$
   C. $3(2x - 3y)^2$
   D. $3(2x - 9y)(2x + y)$

7. What of the following is NOT a factor of $x^4 - 16$?
   A. $x + 2$
   B. $x - 2$
   C. $x^2 + 2$
   D. $x^2 + 4$

8. Factorize $4x^2 - 4xy + y^2 - 9$.
   A. $(2x - y)^2$
   B. $(2x - y - 3)^2$
   C. $(2x + y - 3)^2$
   D. $(2x - y + 3)(2x - y - 3)$

1 Approximation and Errors

1. When a number is either corrected to 2 significant figures or 3 significant figures, the results are the same. Write down the number.

2. The figure shows a kitchen scale. If the weight of an apple is measured to be 48 g, find two possible values of the actual weight of the apple.