1 Make P the subject of the formula $A = P + \frac{PRT}{100}$.

$$\left(A = \frac{P}{1} + \frac{PRT}{100}\right) \times 100$$

$$100A = 100P + PRT$$

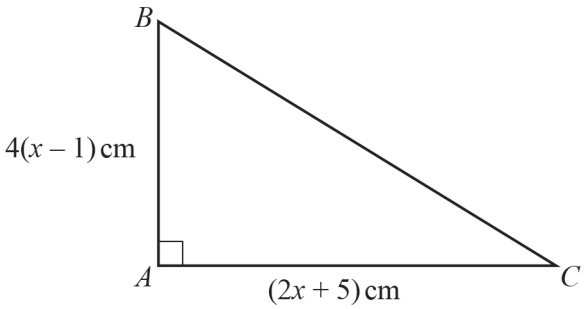
$$100A = P(100 + RT)$$

$$P = \frac{100A}{100 + RT}$$

$P =$ ..... [3]

[Total: 3]

2 The diagram shows a right-angled triangle ABC.



NOT TO SCALE

The area of this triangle is $30\,\text{cm}^2$.

(a) Show that $2x^2 + 3x - 20 = 0$.

$$A = \frac{1}{2} \times b \times h$$

$$30 = \frac{1}{2} \times (2x + 5) \times 4(x - 1)$$

$$\frac{30}{2} = \frac{2(2x + 5)(x - 1)}{2}$$

$$15 = 2x^2 - 2x + 5x - 5$$

$$-15 \quad\quad -15$$

$$2x^2 + 3x - 20 = 0$$

[3]

2

(b) Use factorisation to solve the equation $2x^2 + 3x - 20 = 0$.

-40, 8, -5

$2x^2 + 8x - 5x - 20 = 0$

$2 \cdot x\,x \quad 2 \cdot 2 \quad 2 \cdot x$

$2x(x+4) - 5(x+4) = 0$

$(x+4)(2x-5) = 0$

$x + 4 = 0$

$x = -4$ ✓

$2x - 5 = 0$

$x = \frac{5}{2} = 2.5$ ✓

$x =$ ..... or $x =$ ..... [3]

(c) Calculate BC.

$x = 2.5$

$AB = 4(2.5 - 1) = 4 \times 1.5 = 6$

$AC = 2 \times 2.5 + 5 = 5 + 5 = 10$.

$(BC)^2 = (AC)^2 + (AB)^2$.

$BC = \sqrt{10^2 + 6^2} = \sqrt{100 + 36}$

$= \sqrt{136} = 11.7$ cm.

$BC =$ ..... cm [3]

[Total: 9]

3 $A = (2\pi + y)x^2$

Rearrange the formula to make x the subject.

$\sqrt{\frac{A}{2\pi + y}} = \sqrt{x^2}$

$x = \pm\sqrt{\frac{A}{2\pi + y}}$

$x =$ ..... [2]

[Total: 2]

4 Make p the subject of this formula.

$H = 7p - 3$

$+3 \quad +3$

$\frac{H+3}{7} = \frac{7p}{7}$

$p = \frac{H+3}{7}$

$p =$ ..... [2]

[Total: 2]

5 Find the value of $5u - 2v$ when $u = 11$ and $v = -3$.

$5 \times 11 - 2 \times -3$

$= 55 + 6$

$= 61$

..... [2]

[Total: 2]

6 Rearrange the formula to make x the subject.

$k = \frac{2m - x}{x}$ $\times x$

$kx = 2m - x$

$+x \quad +x$

$kx + x = 2m.$

$x(k+1) = 2m.$

$x = \frac{2m}{k+1}$

$x =$ ..... [4]

[Total: 4]

7 Make t the subject of the formula $s = k - t^2$.

$s = k - t^2$

$+t^2 \quad +t^2$

$s + t^2 = k$

$-s \quad -s$

$t^2 = k - s$

$t = \pm\sqrt{k-s}$

$t =$ ..... [2]

[Total: 2]

8 Make p the subject of the formula.

$$rp + 5 = 3p + 8r$$

$rp + 5 = 3p + 8r$

$-3p \quad -3p \quad -5$

$rp - 3p = 8r - 5$

$p(r-3) = 8r - 5$

$$p = \frac{8r-5}{r-3}$$

..... [3]

[Total: 3]

9 Make a the subject of the formula $s = ut + \frac{1}{2}at^2$.

$s = ut + \frac{1}{2}at^2$

$-ut \quad -ut$

$2(s-ut) = \frac{1}{2}at^2 \times 2$

$$a = \frac{2(s-ut)}{t^2}$$

Answer $a =$ ..... [3]

[Total: 3]

10 Make x the subject of the formula.

$$y = ax^2 + b$$

$y = ax^2 + b$

$-b \quad +b$

$\frac{y-b}{a} = \frac{ax^2}{a}$

$$x = \pm\sqrt{\frac{y-b}{a}}$$

Answer $x =$ ..... [3]

[Total: 3]

11 Make r the subject of this formula.

$$v = \sqrt[3]{p+r}$$

cube both sides

$v^3 = \left(\sqrt[3]{p+r}\right)^3$

$v^3 = p + r$

$p \quad -p$

$$r = v^3 - p$$

Answer $r =$ ..... [2]

[Total: 2]

12 $V = \frac{1}{3}Ah$

(a) Find V when $A = 15$ and $h = 7$.

$V = \frac{1}{3} \times 15 \times 7 = 35$

Answer(a) $V =$ ..... [1]

(b) Make h the subject of the formula.

$3 \times V = \frac{1}{3}Ah \times 3$

$3V = Ah$

$h = \frac{3V}{A}$

Answer(b) $h =$ ..... [2]

[Total: 3]

13 Expand and simplify.

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

$(2x+3)(x-2)(x-2)$

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

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

$2x^3 - 8x^2 + 8x$

$+ 3x^2 - 12x + 12$

$= 2x^3 - 5x^2 - 4x + 12$

..... [3]

[Total: 3]

14 Factorise completely.

$1 + x - y - xy$

$(1+x) - y(1+x)$

$= (1+x)(1-y)$.

..... [2]

[Total: 2]

15 Factorise completely.

$2x^3 - 18xy^2$

$2x(x^2 - 9y^2)$

$= 2x(x-3y)(x+3y).$ ..... [3]

[Total: 3]

16 Factorise completely.

$1 - q - a + aq$

$= (1-q) - a(1-q)$

$= (1-q)(1-a).$ ..... [2]

[Total: 2]

17 Factorise completely.

$5x^2 - 20y^2$

$= 5(x^2 - 4y^2)$

$= 5(x-2y)(x+2y).$

..... [3]

[Total: 3]

18 Factorise completely.

$mt - n - m + nt$

$= mt - m + nt - n$

$= m(t-1) + n(t-1)$

$= (t-1)(m+n)$

..... [2]

[Total: 2]

19 Factorise completely.

$2m + 3p - 8km - 12kp$

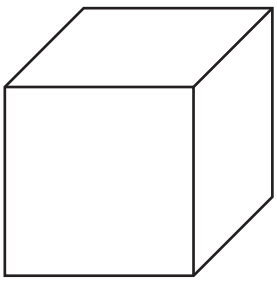
$(2m+3p) - 4k(2m+3p)$

$= (2m+3p)(1-4k)$

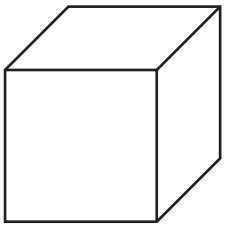
..... [2]

[Total: 2]

20



$(y+1)$ cm



y cm

NOT TO SCALE

The volume of the larger cube is 5 cm^3 greater than the volume of the smaller cube.

$V_L = V_S + 5$

$(y+1)^3 = y^3 + 5$

$(y+1)\underbrace{(y+1)(y+1)} = y^3 + 5$

$(y+1)(y^2+2y+1) = y^3+5$

8 **(a)** Show that $3y^2 + 3y - 4 = 0$.

$y^3+2y^2+y+y^2+2y+1 = y^3+5$

$-y^3 \quad -5 \quad -y^3$

$3y^2+3y-4=0$

[4]

(b) Find the volume of the smaller cube.
Show all your working and give your answer correct to 2 decimal places.

$y = \dfrac{-b \pm \sqrt{b^2-4ac}}{2a}$ $\quad a=3,\ b=3,\ c=-4$

$y = \dfrac{-3 \pm \sqrt{3^2-4\times3\times-4}}{2\times3} = \dfrac{-3 \pm \sqrt{57}}{6}$

$y = 0.76$

$V_s = y^3 = (0.76)^3 = 0.44$

..... cm^3 [4]

[Total: 8]

21 **(a)** Show that $y = (x + 1)(3 - x)(3 + x)$ can be written as $y = 9 + 9x - x^2 - x^3$.

$y = (x+1)(9+3x-3x-x^2)$

$y = (x+1)(9-x^2)$.

$y = 9x - x^3 + 9 - x^2$

$y = 9 + 9x - x^2 - x^3$.

[2]

21 **(b)** Calculate the x–values of the turning points of $y = 9 + 9x - x^2 - x^3$.
Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... , $x =$ ..... [7]

(c) The equation $9 + 9x - x^2 - x^3 = k$ has one solution only when $k < a$ and when $k > b$, where a and b are integers.

Find the maximum value of a and the minimum value of b.

$a =$ .....

$b =$ ..... [3]

[Total: 12]

22 Expand and simplify.

$(2x - 3)\ (x + 6)\ (x - 4)$

$(2x-3)(x^2-4x+6x-24)$

$=(2x-3)(x^2+2x-24)$.

$=2x^3+4x^2-48x-3x^2-6x+72$.

$=2x^3+x^2-54x+72$

..... [3]

[Total: 3]

23 Simplify.

$a - 2b - 3a + 7b$

$a-3a-2b+7b$

$=-2a+5b$

or $5b-2a$.

..... [2]

[Total: 2]

24 Expand and simplify.

$4\ (x - 5) - (3 - 2x)$

$4x-20-3+2x$

$=6x-23$

..... [2]

[Total: 2]

25 Factorise completely.

$12a^3 - 21a$

$3a(4a^2-7)$.

..... [2]

[Total: 2]

26 Expand and simplify.
$(x + 1)\,(x - 2)\,(x + 3)$

x^3+2x^2-5x-6 .

..... [3]

[Total: 3]

27 Expand and simplify.
$(x - 2)\,(2x + 5)\,(x + 3)$

$2x^3+7x^2-7x-30$

..... [3]

[Total: 3]

28 Expand and simplify.
$(x - 3)\,(x + 1)\,(3x - 4)$

$3x^3-10x^2-x+12$

..... [3]

[Total: 3]

29 Factorise.

$4x^2 - y^4$

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

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

..... [2]

[Total: 2]

30 Factorise.

$15(k + g)^2 - 20(k + g)$

Let $u = k + g$

$15u^2 - 20u$

$5u(3u - 4)$

$5(k+g)(3(k+g) - 4)$

$5(k+g)(3k+3g-4)$.

..... [2]

[Total: 2]

31 Factorise.

$5am + 10ap - bm - 2bp$

$5a(m + 2p) - b(m + 2p)$.

$(m + 2p)(5a - b)$.

..... [2]

[Total: 2]

32 $(x + a)^2 = x^2 + 22x + b$

Find the value of a and the value of b.

$(x+a)(x+a) = x^2+22x+b$.

$x^2+ax+ax+a^2 = x^2+22x+b$.

$x^2+2ax+a^2 = x^2+22x+b$

$2a = 22$

$\frac{2a}{2} = \frac{22}{2}$

$a = 11$

$b = a^2 = 11^2 = 121$

$a =$ .....

$b =$ ..... [2]

[Total: 2]

33 Factorise completely.

$20x^2 - 45y^2$

$5(4x^2 - 9y^2)$

$5(2x-3y)(2x+3y)$.

..... [3]

[Total: 3]

34 Expand and simplify $(x + 3)(x - 5)(3x - 1)$.

$3x^3 - 7x^2 - 43x + 15$.

..... [3]

[Total: 3]

35 Expand and simplify.

$(3x - 5y)(2x + y)$

$6x^2 - 7xy - 5y^2$. ..... [2]

[Total: 2]

36 Simplify.

$3a - 5b - a + 2b$

$2a - 3b$ ..... [2]

[Total: 2]

37 Expand and simplify.

$(x + 1)(x + 2) + 2x(x - 3)$

$x^2 + 2x + x + 2 + 2x^2 - 6x$

$= 3x^2 - 3x + 2$

..... [3]

[Total: 3]

38 **(a)** Factorise $p^2 - q^2$.

$(p - q)(p + q)$. ..... [1]

38 **(b)** $p^2 - q^2 = 7$ and $p - q = 2$.

Find the value of $p + q$.

$(P-7)(P+7) = 7$

$2(P+7) = 7$

$P+7 = \frac{7}{2}$

$P+7 = 3.5$

..... [2]

[Total: 3]

39 $x^2 + 4x - 9 = (x + a)^2 + b$

Find the value of a and the value of b.

$x^2+4x-9 = (x+a)(x+a)+b$

$x^2+4x-9 = x^2+ax+ax+a^2+b$

$x^2+4x-9 = x^2+2ax+a^2+b$

$2a = 4 \rightarrow a = 2$

$a^2+b = -9$

$4+b = -9$

$-4 \quad -4$

$b = -13$

$a =$ 2

$b =$ −13 [3]

[Total: 3]

40 Complete this statement with an expression in terms of m.

$18m^3 + 9m^2 + 14m + 7 = (9m^2 + 7)($ 2m + 1 $)$

$9m^2(2m+1) + 7(2m+1)$

$= (9m^2+7)(2m+1)$

[2]

[Total: 2]