

Student Text *UNIT 21 Formulae*

Answers

21.1 Using Formulae

1. (a) $A = 8, P = 12$ (b) $A = 30, P = 26$ (c) $A = 22, P = 26$
(d) $A = 20, P = 18$
2. (a) 16 (b) 12 (c) 15 (d) 20
3. (a) 30 (b) 400
4. (a) 30 (b) 12 (c) 17
5. (a) 60 (b) 105 (c) 144
6. (a) 26 (b) 14 (c) 19 (d) 46
(e) 18 (f) 12 (g) 4 (h) 2
(i) 26 (j) 50 (k) 30 (l) 40
(m) 6 (n) 10
7. \$380
8. 17.4 cm

21.2 Construct and Use Simple Formulae

1. (a) $P = 2a + b, P = 16$ cm (b) $P = 4a, P = 20$ cm
(c) $P = 5a + b, P = 40$ cm (d) $P = a + 2b + c, P = 27$ cm
(e) $P = 6a, P = 60$ cm (f) $P = 2a + 2b + 2c, P = 36$ cm
(g) $P = 2a + 2b + c, P = 520$ cm (h) $P = 3a + b, P = 21$ cm
2. (a) $A = ab, A = 60$ cm² (b) $A = a^2, A = 9$ cm²
(c) $A = a^2 + ab, A = 20$ cm² (d) $A = ab + bc, A = 48$ cm²
(e) $A = \frac{1}{2}ab, A = 10$ cm² (f) $A = \frac{1}{2}ab + b^2, A = 45000$ cm²
3. (a) $(x + 1)$ and $(x + 2)$ (b) $T = 3x + 3$
4. (a) $M = \frac{x + y}{2}$ (b) $M = \frac{p + q + r + s + t}{5}$
5. (a) $T = 6p + 4q$ (b) \$380
6. (a) $P = 2x + 2(x + 3) = 4x + 6$ (b) $A = x(x + 3)$
7. (a) $x + 1$ (b) $x - 3$ (c) $3x - 2$
8. (a) $C = 800 + 400n$ (b) J\$ 4000

Student Text *UNIT 21 Formulae*

Answers

21.2

9. (a) $C = 5 + 4x$ (b) \$17
10. (a) $2n$ (b) $2n + 6$
11. (a) $100 - 8x$ (b) $(20 - 2x)(30 - 2x)$
12. $C = 27n$
13. (a) $C = 80l$ (b) $C = xl$
14. Total cost = $\$(8x + 2y)$
15. (i) \$640 (ii) \$780

21.3 Revision of Negative Numbers

1. (a) -2 (b) 4 (c) -3 (d) -8 (e) 24 (f) 54
 (g) 8 (h) -8 (i) 27 (j) 8 (k) -13 (l) -35
 (m) -24 (n) -11 (o) -5 (p) 3 (q) 11 (r) 3
 (s) -8 (t) -6 (u) -1
2. (a) 1 (b) 16 (c) 25
3. -3°C
4. 24°C

21.4 Substitution into Formulae

1. (a) 50 (b) 68 (c) 14 (d) 23 (e) -4 (f) 59
2. (a) 10 (b) 40 (c) 11.25 (d) 4 (e) -10 (f) 7.04
3. (a) 19.6 (b) 18.4 (c) 18.08 (d) 18.8
4. (a) -280 (b) -40 (c) 80 (d) 800 ; 4
5. (a) 80 (b) 51 (c) ± 4 (d) ± 3 (e) -3 (f) ± 5
 (g) 0 (h) $\frac{3}{4}$ (i) 1 (j) 10 (k) -2 (l) -10
 (m) ± 10 (n) 0.18 (o) 0.38 (p) ± 5 (q) ± 8 (r) ± 15
6. (a) 3.8 (b) 0.225 (c) 2.6 (d) 7.5 (e) 9.7 (f) 2.4
7. (a) 20 (b) -3
8. -20°C
9. (i) 14 (ii) 1
10. (a) $-\frac{13}{8}$ (b) $-\frac{5}{8}$

Student Text *UNIT 21 Formulae*

Answers

21.5 More Complex Formulae

1. (a) $\frac{12}{7}$ (b) -30 (c) $-\frac{21}{4}$ (d) $-\frac{20}{3}$
2. (a) ± 1.3 (b) ± 8 (c) ± 3.4
3. (a) $-\frac{3}{2}$ (b) $\frac{12}{25}$ (c) -10 (d) $\frac{10}{4} \left(= \frac{5}{2} \right)$
 (e) -4 (f) $-\frac{1}{3}$ (g) $-\frac{17}{7}$ (h) $\frac{7}{9}$ (i) 1
4. (a) ± 5 (b) ± 12 (c) ± 7
 (d) ± 11 (e) ± 2 (f) ± 13
5. (a) $\frac{60}{11}$ (b) 588.24 (2 d.p.) (c) 572.67 (2 d.p.)
6. 33.5 (1 d.p.)
7. (a) -32.3 (3 s.f.) (b) -30

21.6 Changing the Subject

1. (a) $x = \frac{y}{4}$ (b) $x = \frac{y-3}{2}$ (c) $x = \frac{y+8}{4}$
 (d) $x = 4y - 2$ (e) $x = 5y + 2$ (f) $x = y - a$
 (g) $x = ya + b$ (h) $x = \frac{y-c}{a}$ (i) $x = \frac{yc-b}{a}$
 (j) $x = \frac{yb+c}{a}$ (k) $x = y - a - b$ (l) $x = yc + a - b$
 (m) $x = \frac{y}{ab}$ (n) $x = \frac{y-c}{ab}$ (o) $x = \frac{3cy+b}{4a}$
 (p) $x = \frac{pd+bc}{a}$ (q) $x = \frac{y}{b} - a$ (r) $x = \frac{4y}{a} - 3$
 (s) $x = \frac{2q}{3} + 4$ (t) $x = \frac{4v}{5} - y$ (u) $x = 4(z-a) + 3$
2. $I = \frac{V}{R}$; $R = \frac{V}{I}$
3. $m = \frac{F}{a}$; $a = \frac{F}{m}$
4. $r = \frac{C}{2\pi}$
5. (a) $t = \frac{v-u}{a}$ (b) $a = \frac{v-u}{t}$

Student Text *UNIT 21 Formulae*

Answers

21.6

6. $z = 3m - x - y$

7. (a) $a = \frac{v^2 - u^2}{2s}$ (b) $a = \frac{s}{(t + \frac{1}{2}t^2)}$

8. (a) $r = +\sqrt{\frac{V}{\pi h}}$ (only a positive value because r is radius) (b) 2.82 cm

9. (a) $h = \frac{V}{x^2}$; $h = \frac{A - 2x^2}{4x}$ (b) 2 cm (c) 2.5 cm

10. (a) $a = \frac{2A}{h} - b$ (b) $A = \frac{1}{2} \times 3a \times h = \frac{3ah}{2}$; $a = \frac{2A}{3h}$

11. (a) $v = \frac{d}{t}$ (b) (i) 10.32 m s⁻¹ (ii) 10.36 m s⁻¹ (iii) 10.78 m s⁻¹

The average speed for the 200 m is faster than the 100 m as the slowest part of both races is the 'standing' start. So for 200 m, more of the race is run at top speed.

The average speed for the 4 × 100 m is even higher as only *one* of the runners has a 'standing' start; the others are already running at pace when the baton is passed to them.

21.7 More Change of Subject

1. (a) $x = \frac{5-y}{3}$ (b) $x = \frac{8-y}{6}$ (c) $x = \frac{a-y}{2}$

(d) $x = \frac{6-5y}{2}$ (e) $x = \frac{8-2y}{7}$ (f) $x = \frac{3y+5}{7}$

(g) $x = a - b - 2p$ (h) $x = 10 - aq$ (i) $x = \frac{q-rb}{5}$

2. (a) $a = 4q^2$ (b) $a = bz^2$ (c) $a = \frac{c}{z^2}$

(d) $a = \frac{3y^2}{8}$ (e) $a = 32bv^2$ (f) $a = \frac{\pi r^2}{25}$

(g) $a = 4p^2 - b$ (h) $a = b - 12r^2$ (i) $a = \frac{18}{c^2} - b$

3. (a) $\frac{2}{2a-1}$ (b) $\frac{1}{b+2}$ (c) $\frac{1}{2-x}$

(d) $\frac{3x}{3-x}$ (e) $\frac{5p}{5+p}$ (f) $\frac{6x}{3-x}$

(g) $\frac{4rv}{v-2r}$ (h) $\frac{7q}{q-7}$ (i) $\frac{ap}{p-a}$

Student Text *UNIT 21 Formulae*

Answers

21.7

4. (a) $g = \frac{4\pi^2 l}{T^2}$ (b) 10.07 (2 d.p.)

5. (a) $v = \frac{uf}{u - f}$ (b) -24

6. (a) $h = \frac{v^2}{2g}$ (b) 1.8 (c) $g = \frac{v^2}{2h}$ (d) 0.8

7. (a) $R = \frac{u^2}{g}$ (b) 14.4

8. (a) $X = \frac{RYZ}{YZ - RZ - RY}$ (b) 24

9. (a) $r = \sqrt[3]{\frac{3V}{4\pi}}$ (b) 2.62 (2 d.p.)