

Name _____

Date _____

2.2 Using expressions and formulae — worksheet

Substitute numbers into expressions, and write and use formulae. · 56 questions · Show your working.

Remember

- A **formula** is a rule connecting quantities. It always has an equals sign.
- To **substitute**, replace each letter with its number and then calculate.
- Keep the order of operations: brackets and indices before $\times \div$, and those before $+$ $-$.
- Be careful with negatives: when $x = -4$, $3x^2$ means $3 \times (-4)^2 = 3 \times 16 = 48$.
- You can **derive** your own formula. Choose letters that suggest what they stand for, and always say what each one means.
- You can work backwards from a formula: if $T = 25h + 40$ and $T = 190$, then $h = 6$.

A · Fluency — Substitute values into expressions and formulae.

- 1 Work out the value of $3x + 2$ when $x = 4$.

- 2 Work out the value of $5n - 7$ when $n = 3$.

- 3 Work out the value of $2a + 3b$ when $a = 5$, $b = 2$.

- 4 Work out the value of $4(y + 1)$ when $y = 6$.

- 5 Work out the value of $x^2 + 1$ when $x = 5$.

- 6 Work out the value of $10 - 2k$ when $k = 7$.

- 7 Work out the value of $p/2 + 4$ when $p = 10$.

- 8 Work out the value of $6m - m$ when $m = 9$.

- 9 Work out the value of $3(c - 2)$ when $c = 8$.

- 10 Work out the value of $ab + 5$ when $a = 3$, $b = 4$.

- 11 Work out the value of $2x + 3y - z$ when $x = 4$, $y = 2$, $z = 5$.

- 12 Work out the value of $t^2 - 3t$ when $t = 6$.

- 13 Work out the value of $50 \div w$ when $w = 5$.

- 14 Work out the value of $2(a + b)$ when $a = 7$, $b = 3$.

- 15 Work out the value of $9 - 4h$ when $h = 2$.

- 16 Work out the value of $5x - 2$ when $x = -3$.

- 17 Work out the value of n^2 when $n = -4$.

- 18 Work out the value of $3d + 8$ when $d = -5$.

- 19 $A = l \times w$ — The area A of a rectangle of length l and width w . Work out A when $l = 5$, $w = 4$. Give your answer in cm^2 .

- 20 $P = 2(l + w)$ — The perimeter P of a rectangle of length l and width w . Work out P when $l = 9$, $w = 4$. Give your answer in cm .

- 21 $C = 5n$ — The cost C of n tickets at \$5 each. Work out C when $n = 7$. Give your answer in dollars.

- 22 $D = st$ — The distance D travelled at speed s for time t . Work out D when $s = 60$, $t = 3$. Give your answer in km .

- 23 $V = lwh$ — The volume V of a cuboid. Work out V when $l = 4$, $w = 3$, $h = 5$. Give your answer in cm^3 .

- 24 $C = x + y$ — The total cost C of one adult ticket \$ x and one child ticket \$ y . Work out C when $x = 12$, $y = 7$. Give your answer in dollars.

B · Reasoning — Write formulae and judge whether they are clear.

- 25 Write a formula for the perimeter P of a square with side length s .

- 26 Write a formula for the total cost C , in dollars, of n books at \$8 each.

- 27 Write a formula for the number of minutes M in h hours.

- 28 Write a formula for the change C , in dollars, from \$50 after spending \$ x .

- 29 A plumber charges a \$40 call-out fee plus \$25 per hour. Write a formula for the total charge T for h hours.

- 30 Using $T = 25h + 40$, what is the charge for 3 hours, in dollars?
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- 31 Yola uses $C = x + y$ for the total cost of an adult and a child swim. Why is this formula hard to use?
- ☐ It has too many letters
 - ☐ The letters x and y do not suggest what they stand for
 - ☐ It should use multiplication
 - ☐ It is wrong
- 32 Mateo uses $W = p - q$ for the wire left after cutting a small piece from a large piece. What must p stand for?
- ☐ The small piece
 - ☐ The large piece
 - ☐ The wire left over
 - ☐ Either piece
- 33 What value of k makes $k + 10$ and $3k$ give the same answer?
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- 34 What value of k makes $3k$ and $20 - k$ give the same answer?
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- 35 The formula for converting degrees Celsius to Fahrenheit is $F = 1.8C + 32$. Work out F when $C = 20$.
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- 36 Using $F = 1.8C + 32$, work out F when $C = 0$.
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C · Challenge — Work backwards and handle negatives.

- 37 The formula for the perimeter of a rectangle is $P = 2(l + w)$. A rectangle has $P = 30$ cm and $l = 9$ cm. Work out w , in cm.
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- 38 Using $A = lw$, a rectangle has area 48 cm^2 and length 8 cm. Work out its width, in cm.
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- 39 The formula $T = 25h + 40$ gives a plumber's charge. A job cost \$190. How many hours did it take?
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- 40 Work out the value of $3x^2$ when $x = -4$.
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- 41 Work out the value of $2a - 3b$ when $a = -5$ and $b = 2$.
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- 42 $V = lwh$ gives the volume of a cuboid. A cuboid has volume 60 cm^3 , length 5 cm and width 4 cm. Work out its height, in cm.
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- 43 A taxi fare is $F = 2k + 3$ dollars for k kilometres. A fare was \$19. How many kilometres was the journey?

- 44 Two formulae give the same answer: $A = 4n$ and $B = 2n + 18$. For what value of n ?

D · Word problems — Formulae from real contexts.

- 45 A phone plan costs $C = 15 + 0.2m$ dollars, where m is the number of extra minutes. Work out the cost, in dollars, for 40 extra minutes.

- 46 A rectangle is 12 cm long and 7 cm wide. Use $A = lw$ to find its area, in cm^2 .

- 47 The same rectangle: use $P = 2(l + w)$ to find its perimeter, in cm.

- 48 A car travels at 80 km/h for 2 hours. Use $D = st$ to find the distance, in km.

- 49 A cuboid box is 6 cm by 5 cm by 4 cm. Use $V = lwh$ to find its volume, in cm^3 .

- 50 A shop sells notebooks for \$3 each with a \$2 postage charge. The total cost is $C = 3n + 2$. Find the cost, in dollars, of 7 notebooks.

- 51 Using $C = 3n + 2$, how many notebooks can be bought for exactly \$32?

- 52 A gym charges a \$50 joining fee plus \$30 a month. Write the total for 8 months, in dollars.

- 53 The number of legs L on a farm with c cows and h hens is $L = 4c + 2h$. Work out L when $c = 12$ and $h = 30$.

- 54 A tank holds $W = 25t$ litres after t minutes. How many litres after 7 minutes?

- 55 Using $W = 25t$, how many minutes to reach 500 litres?

- 56 A printer costs \$80 plus \$12 for each ink cartridge. Find the total cost, in dollars, of the printer and 5 cartridges.
